KNOWLEDGE TRANSFER TO AND AMONG END-USERS IN PRE-PACKAGED ENTERPRISE APPLICATION SOFTWARE IMPLEMENTATION:

An Exploratory Study of the Roles of Communities of Practice

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Abstract: This paper is concerned with the roles of Communities of Practice (CoPs) in knowledge transfer during the implementation of a particular IT artefact, i.e. the Pre-packaged Enterprise Application Software (PEAS[i]) or also known as Enterprise Resource Planning (ERP) software. Using an in-depth longitudinal case-study across different stages of a Financial PEAS implementation in a large Australian university, we assess the effectiveness and applicability of the practices of CoPs for transferring the PEAS knowledge to and among end-users. The key finding of this paper is that CoPs can be utilized to enhance knowledge transfer for a better PEAS implementation result. Our findings also indicate that CoPs can be assigned to steward[ii] this dynamic PEAS knowledge in its most updated version among the very people who are its owners.

1 INTRODUCTION

Previous studies have indicated that it has become popular for both large and medium-sized organizations to license a Pre-packaged Enterprise Application Software (PEAS) for their enterprise system (Howcroft and Light 2002; Robey *et al.* 2002; Shang and Seddon 2003). However, the PEAS comes with its own 'established way of doing business' (Lee and Lee 2000 p.282) and 'imposes its own logic' (Davenport 1998 p.122) on the adopting organization's business practice. In most of the adoption cases, if not all, the configured PEAS capabilities or functionalities embed a "best" business practice which is not exactly the same as the adopting organization's legacy business practice. This necessitates knowledge transfer or even changes to the organization's values, structure, and culture. Regarding the knowledge transfer issue, Robey *et al.* (2002 p.32) suggest adopting organizations to exercise formal training along with a phased implementation approach to help PEAS end-users assimilate the new PEAS business practice.

As the PEAS "best" business practice contains more than the canonical and codified element (Lee and Lee 2000), formal training alone will be insufficient and incapable of transferring the whole aspects of this PEAS' knowledge to its end-users. Boudreau (2003) also indicates that PEAS end-users learn to use a PEAS through formal and informal ways. Communities of Practice (CoPs) with their situated learning approach, which exist in the daily life of the PEAS-adopting organization's end-users (Boudreau and Robey 2001 as quoted from Robey *et al.* 2002 p.41; Wenger *et al.* 2002), can be exploited to integrate and share the PEAS knowledge (Jones and Price 2001; Pan *et al.* 2001) for this knowledge transferring purpose.

For the preceding reason the research question in this study is: *What are the roles of Communities of Practice in the knowledge transfer during a PEAS implementation?*

While the bulk of academic research has put the top management involvement and satisfaction as, consecutively, a critical success factor and benefit measurement of a PEAS adoption, little consideration has been given to end-user justified requirements, participation and gratification. Inevitably, in exploring the end-users knowledge transfer issue, this paper is also exposing the end-users' perspective about the PEAS implementation.

2 WHAT IS ALREADY KNOWN ABOUT THE TOPIC

This section is organized into two subsections. The first subsection provides background on PEAS and their implementation issues in relation to knowledge transfer. It ends with an explanation about how practice and informal training as part of situated learning play a significant role in PEAS knowledge transfer. The next subsection depicts CoPs as a social structure in relation to situated learning and knowledge sharing.

2.1 PEAS & Knowledge Transfer

Enterprise Systems can be defined as integrated systems of people and organizational business units, software [e.g. PEAS] and hardware, and telecommunications networks for handling all core corporate functions such as sales and marketing, distribution, production and planning, finance and human resources (Robey *et al.* 2002; Shang and Seddon 2003).

Implementing a PEAS for an organization's enterprise system can span over a significant time frame. According to Markus and Tanis (2000), the whole implementation process can be ideally staged into four following phases:

1. *chartering* phase [comprises decision making leading up to the funding of an enterprise system adoption; cut-over: finalized PEAS selection based on fit-gap analysis],
2. *project* phase [comprises activities purposed to get the selected PEAS up and running; cut-over: system goes live],
3. *shake-down* phase [is the organization's coming to grips with the PEAS; cut-over: normal operation has been achieved], and
4. *onwards & upwards* phase [continues from normal operation until the system is replaced with an upgrade or a different system].

The people component of enterprise systems is crucial in each of the aforementioned implementation phases. For example it is people [either top management, project team members, vendors, consultants, local IT staff or end-users] who determine whether the execution of each implementation phase is successful and whether the benefits of the ongoing PEAS adoption have been achieved. Howcroft and Light (2002) found that end-users were marginalized during the procurement process of packaged software in their case study. This is intriguing as it 'contradicts the rational approach commonly reported in IS literature' (p.76). They implicitly suggest two consequences of a distinct lack of end-user involvement: end-user resistance and system implementation failure. It is interesting to see the effect of end-user participation [or lack of participation] in packaged software selection on knowledge transfer.

PEAS, same as in-house application software, were also developed based on a kind of business practice[1] – normally, a hybrid of all the best practices which might well mean that no such practice exists in any of the real organizations. Hence, for most organizations, the PEAS-embedded practice is normally out-of-tune with their legacy business practice.

This can be preliminarily identified by the gaps and/or misfits between the PEAS capabilities and the organization system requirements. Soh *et al.* (2000) suggest a spectrum of resolution strategies ranging from a greater PEAS customization to a greater organizational change to resolve the implementation barriers {*Figure A* below}. Adopting organizations interested in embracing the "best" business practice embedded in the PEAS will likely prefer organizational changes to customization.

Robey *et al.* (2002) identify PEAS knowledge as the knowledge of software technical navigation and business practice. Lee and Lee (2000) further classify

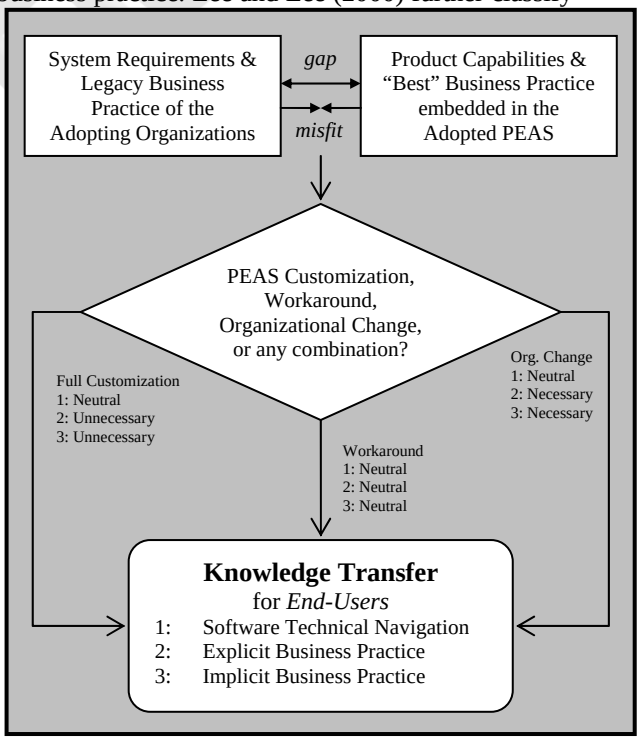

Figure A: PEAS Implementation & Knowledge Transfer

[1] A business practice is incorporated in an organization structure and relationship as well as with an information technology infrastructure (Holland and Light 1999 p.31).

the knowledge of this business practice as implicit and explicit. The explicit or codified part can be represented by sets of defined procedural steps to accomplish a certain task or operation. The implicit part governs how that task or operation is actually being carried out effectively; for example work culture, networks, values and norms. The cross-functional nature of PEAS intensifies the impact of the new implicit business practice on system adoption - as compared to most of other packaged software.

As PEAS are enterprise-wide, complex, tightly integrated, cross-functional, and "not easily modifiable to fit an individual organization's requirements" (Jones and Price 2001 p.551), any customization will risk some failures towards system implementation (Sumner 2000). It is very costly as well (Lee and Lee 2000; Davenport 1998; Davis 1998) with no guarantee that the customization will work perfectly and in time. A small change to an existing module in one of the functions might entail serious ramifications across all other functions. Besides, present customization diminishes the future privilege for upgrading the PEAS without incurring much cost. Adding some new modules is considered of little risk though it will generate additional burden on the financial resources for software development plus some delay for "go-live".

According to Forrester Research, ninety five percent of Fortune 1000 organizations do not intend to customize their PEAS (Davis 1998). This means that the incorporated "best" business practice from the PEAS is mapped and transferred directly with little or no modification into the adopting organization (Lee and Lee 2000). If there is no customization but the business practices between the adopted PEAS and the adopting organization are different, then the organization should exercise a significant change management program like job redesign or redistribution. This situation also implies that a more intensive knowledge transfer, especially in relation to the knowledge of business practice, is needed. Robey *et al.* (2002) suggest a knowledge transfer through formal training that included both technical and business practice along with an incremental PEAS implementation approach.

However, Boudreau (2003) indicates that individual end-users learn to use the PEAS through different knowledge transfer channels. She argues that informal training, as one of the possible knowledge transfer channels, has a positive impact on end-users' learning. This informal training, often called peer-to-peer learning or legitimate peripheral learning, together with practice are an integral part of situated learning and knowledge sharing, which are the central ideas of Communities of Practice (Lave and Wenger 1991; Wenger 1998).

2.2 Communities of Practice (CoPs)

According to Wenger *et al.* (2002), CoPs are groups of people who *share* a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by sharing and interacting on an ongoing basis. These groups can be formally institutionalized or, on the other hand, completely unrecognized by their parent organization (p.27).

Brown and Gray (1995) share a similar definition with Wenger *et al.* (2002) as they try to define what kinds of people are grouped or grouping themselves. Brown and Gray (1995) claim that these people are peers in the execution of 'real work'. They all know the practice and not merely the explicit knowledge. Brown and Gray (1995) also find that there are many communities of practice within a single company, and most employees belong to more than one of them. Furthermore, most of these communities are not named though each boundary is clearly set. It is also not uncommon that one community can be a subset of a larger community or in the other case it can overlap with another community. A community can also exist within one business unit – mostly for a "communal memory" purpose (Wenger *et al.* 2002, p.26). The size of a community (p.24) can be small [a few people] or very large [hundreds of people]. CoPs can be colocated [same location] or distributed, they can also be homogeneous [same function] or heterogeneous (p.25). These simple concepts can help to understand and analyze the phenomena of CoPs in an organization.

But still, people might not really realize that they belong to CoPs as CoPs have become so integrated with their daily lives. This obscurity can be tackled using the reificative and participative identification methods (Wenger 1998). The reificative identification method is to identify members as people that fall into a certain category or description. While the participative method helps them identify themselves with people whose experience is constitutive of whom they are.

PEAS knowledge is dynamic and complex. It evolves along the implementation phases and as software upgrade is pretty much inevitable, this knowledge will certainly need to be managed for future purpose. Apparently, a CoP can also contribute as a knowledge management tool partly based on its situated practice approach.

CoPs as a knowledge-management tool

The social structure of an organization can play a significant role in managing knowledge. Wenger *et al.* (2002) reveal that conventional structures can not address knowledge-related problems effectively.

Though learning does occur in conventional structures [such as teams], the lessons learnt are easily lost. They propose CoPs as the ideal social structure to address knowledge stewardship. By assigning practitioners the task to create and communicate the necessary knowledge, CoPs provide a social forum that supports the living nature of knowledge.

3 RESEARCH APPROACH

3.1 Research Case

The case organization is a large Australian university with around 1200 faculty/departmental [local] end-users and 60 Central Finance [central] end-users. Central Finance is a department by itself – a central administrative department indeed. It is seen as the main owner of the University's Finance Administrative IT System [F-AITS]. Beside the F-AITS, the University is also supported by two other major administrative IT systems, i.e. Human Resources Administrative IT System [HR-AITS] and Student Administrative IT System [S-AITS] – mainly owned by the Human Resources department and the Student Admin department respectively[2].

A review of the University's AITSs was established in 1999 as a means of assessing the capacity of the University's current AITSs to support the requirements articulated in the University Agenda towards the Future.

The review concluded that many of the University's current business practices were unlikely to meet the University's longer term needs, as defined by the University Agenda. The review also stated that the University's AITSs were found to have served the University very well to date, but had some limitations which would prevent them from supporting the University's activities well in the future.

This review triggered a university-wide project to revamp and integrate all three existing administrative IT systems plus a new Research Administrative IT System [R-AITS]. The main focus of this project is the S-AITS but for some particular reasons[3] the F-AITS was implemented first.

The case organization exercised an incremental implementation approach in adopting the new F-AITS. The incremental implementation approach can be detailed as spreading the implemented modules over the time and focusing heavily on the Central Finance as the live testing and maturing entity before it is implemented to other business units, including the Human Resources and Student Admin departments. Implementation Stage 1 went live in early 2003 and was considered successful. The switch to accrual accounting for internal use was initially delayed for another year and later, is postponed for another additional year due to end-users' learning pace and resistance.

3.2 Research Design & Data Collection

The case study research methodology was employed to assess the roles of CoPs in knowledge transfer during PEAS implementation. This methodology was chosen for a number of reasons. CoP is an informal issue and cannot be manipulated as investigators have no control over actual behavioral events (Yin 1998). Also, CoP is still a novel issue (Eisenhardt 1989) especially in relation to PEAS implementation. As the implementation is currently being executed in the case organization, investigators can gain a real-time and inside view (Yin 1998). Furthermore, an in-depth longitudinal perspective was chosen here to capture the 'reality' of different aspects of the unpredetermined phenomenon in details across time and at different phases of PEAS implementation.

Data were collected from multiple sources and analyzed in different ways before being synthesized for the discussion. Data collection was started with the case-organization documentations [such as Fit-Gap Analysis Review, Project Status Reports and Newsletter, Training Needs Analysis Forms]. This was followed by participant observation to the end-users training, in-person and telephone interviews, passive observation to the user-group meetings, and through emails. The investigator also subscribed to the end-users mailing list.

Several groups of people who work for different sections of the University, including department-level, faculty-level, the Central Finance central administrative department, and the Project Team [especially the Training/Change Management team] were interviewed. Each group [except the Training/Change Management team] was comprised of at least one other person who use the system intensively and another person who only use the system indirectly. Each person was interviewed more than one time over a period of approximately nine months. Except for Central Finance (central) end-

[2] These two departments are also categorized as central administrative departments in the case university, just like the Central Finance.

[3] Two main reasons: first, financial systems are more or less world-wide standardized (also evidenced in Soh *et al.* 2000) hence do not need much streamlining; second, the University felt that it was good to provide more time for Student PEAS to mature before acquiring one.

users, all other (local) end-users were interviewed for the first time before the new financial information system went live. All first interviews were in-person, semi-structured with more general and open-ended questions. The list of interview questions was developed from themes based in the literature review (Neuman 1997) as well as the practical work issues in relation to the usage of information system and the organization documentation review. The second and later rounds of interviews were guided with more specific questions based on their answers in the first round. Some of these later interviews were conducted in-person and some over the phone.

4 RESULTS & DISCUSSION

The *Financial and Accounting* [*F&A*] CoP was present in the case university even before the new F-AITS was implemented. The most concrete evidence was the old Financial User Group Meeting [oFUGM] and the old Financial User Mailing List [oFUML]. The focus of these periodic informal meetings and mailing list was at the F-AITS and its usage. That is why both were named after the system – and were renamed after the new F-AITS went live as FUGM and FUML respectively. Both of these community entities are university-wide, and included both local and central end-users.

Table 1: CoPs Involvement & Participation

<table>
<tr><th></th><th>CENTRAL COP</th><th>LOCAL COPS</th></tr>
<tr><td>LIAISON GROUPS</td><td colspan="2">Selected Representative</td></tr>
<tr><td>TESTERS</td><td colspan="2">Selected Representative</td></tr>
<tr><td>TRAINERS</td><td rowspan="2">Selected Representative</td><td rowspan="2">Selected Representative</td></tr>
<tr><td>EARLY SUPPORTS</td></tr>
<tr><td>SITUATED LEARNING</td><td>Collective</td><td>Collective</td></tr>
<tr><td>MAILING LIST</td><td colspan="2" rowspan="2">Collective
as
University-wide CoP</td></tr>
<tr><td>PERIODIC MEETING</td></tr>
</table>

The *F&A* CoP also exists at the business unit level[4], although, the existence of such community is felt more strongly among the Central Finance [central] end-users compared to among other business units [local] end-users. This is mainly because the local end-users are not only administering the local Financial and Accounting works. They, except the HR and Student Admin central administrative department

end-users, also administer the local HR and Student administrative works [including using the HR-AITS and S-AITS][5] as well as other

administrative office works. Even when using the F-AITS, the local end-users in general use more than one module while the central end-users tend to focus on one specific module. In fact, the different specializations among the central end-users have caused a varied sense of 'shared meaning' to the *F&A* CoP among diverse divisions within the Central Finance. Local end-users identify themselves as members of *F&A* CoP through the reificative identification method while central end-users identify themselves as members of *F&A* CoP either through reificative or participative identification method.

4.1 CoPs & Knowledge Transfer

In general, *F&A* CoPs were *represented* by a few key central end-users and key local management people in the PEAS presentation sessions during the chartering phase of the PEAS implementation. One representative from the central community, who also worked before as a local end-user, commented:
"*The selection rules were pretty much set by the 1999 reviews, anyway. During the three-week selection process, we were presented with three international packaged software. Each [PEAS] was tested using the same scenarios set by the Uni. … Their interface was different compared to [the old F-AITS] but it shouldn't be a major problem. All three [PEAS] did not exactly match the system requirements but each vendor is willing to patch the gaps. I guess at the end, it was the cost-benefit consideration … ehm, maybe also the after-sales support, upgrading issue and the alliance agreement that closed the deal. Anyway, the final say came from the higher people up there, if you get what I mean …*"

There is a resistance from a small number of *local* end-users in the case organization. But it is more rooted on the argument "why replace the old F-AITS", not "why choose this PEAS" as suggested by Howcroft and Light (2002)[6]. This resistance has increased the need and the importance of end-user based knowledge transfer as follows:

[4] CoPs within business units (Wenger *et al.* 2002, p.26)

[5] This means that they are also part of *other university-wide functional* CoPs.

[6] To date, the project is still considered successful though there are some adjustment made to the initial implementation plan due to a slower learning tempo and the resistance.

4.1.1 Liaison Group & User Acceptance Tests

The first significant participation of key local end-users was in the project phase, i.e. through the F-AITS Liaison Groups. Eight[7] groups altogether were formed to contribute in the configuration process of this pre-packaged software. Each Liaison Group brought together various stakeholders [local end-users, Project Team members, external consultants, and Module Experts representing central end-users] to discuss any issues related to the implementation including more directed activities like mapping existing processes, identifying opportunity for improvements, and redesigning required processes. The participation of the first three stakeholders came naturally while it was more nominated voluntary for the local end-users. The local participants' views about partaking in the Liaison Group were mixed between being useful and useless. It was *mostly* valuable especially when the discussion was still fresh. Getting in touch with other stakeholders' perspective and being able to contribute into the discussion helped to better understand the overall picture of the PEAS implementation. For the local participants, it was their first encounter with the new system though only on the surface. Expectations on the new system were high as the Project Team was selling the integrated and superior capabilities of the PEAS compared to the existing system. Some gaps and/or misfits were uncovered but they were told that customization was to be avoided as much as possible as it was costly. They were also involved in the later user-acceptance tests using some given scenarios. One of only a few local end-users who tested the system pointed out:

"*I am glad that I decided to get involved in the user testing. It was not a waste of time … It helped me to understand the new system better. I told that to other [user] trainers during our 'Train the Trainer' session and they regretted that they were not involved.*"[8]

Based on their experience of joining the Liaison Group, these local participants felt that should there be any end-users involvement during the selection process of PEAS, it would not have a significant effect on the *content* of required knowledge transfer. The only important knowledge that they could think of getting through such involvement was the pre-packaged nature of the new software which they learnt also through the discussion in Liaison Group.

Lesson: During the Liaison Group discussion, central and various local CoPs' members shared their legacy business practices (Jones and Price 2001) to form an integrated view (Pan *et al.* 2001), followed by the streamlining process through some brainstorming. This all was important for a correct PEAS configuration. Here, CoPs in relation to knowledge transfer played a role in sharing the knowledge of various business units' legacy business practice among the members who participated in the group meetings. The knowledge was also shared to the non-members, i.e. the Project Team personnel and consultants. In addition to that knowledge, those few CoPs members learnt the knowledge of PEAS business practice, though not much of the implicit part, from the non-members. Furthermore, a limited knowledge of the PEAS technical navigation was transferred through a scenario-based practice in a testing environment.

4.1.2 Formal Training by Module Experts & User Trainers

After the PEAS was configured as the case organization's new enterprise system, formal training was on the way to be delivered. The Module Experts, who were trained earlier at the vendor's headquarters, trained their colleagues, other central end-users. These Module Experts also trained the Training team [a sub-team of the Project Team] who later executed the "Train the Trainer" [TtT] program. The TtT program turned sixteen[9] key local end-users from various faculties[10] into user-trainers[11] which sequentially conducted formal training for their fellow local end-users. The final goal of this program is to create local new-system-expert end-users so that when these user-trainers return to their 'home base', they can provide a support for their faculty-wide community through a coaching/mentoring role. The core difference between these [central] Module Experts and these local expert end-users is the first group specialized in one module for the usage of both central and/or local end-users while the later group focused across modules for the local usage only.

Were the trainees ready to start using the new system after they completed their training cycle? A local end-user directly answered:

[7] E.g.: Accounts Payable Group, General Ledger Liaison Group, Reporting Liaison Group, etc.

[8] Not all the user-trainers were involved in the user acceptance tests. The test for each module only required one local end-user and one central end-user as the testers.

[9] Some of these sixteen people also partook in the earlier Liaison Groups.

[10] Though the grouping of these user-trainers was based on their faculty-origin, it did not mean that they all were from the local faculty-level CoPs.

[11] They were not expected to become professional trainers in such a short time though they were equipped with trainer skills.

"*Absolutely not. The new knowledge is huge and sort of confusing. It takes time to really munch the whole idea about this big system. Even when the trainer tried to focus down on a very specific function, you still somehow have to know about other [related] functions. But I guess it is a good idea not to confuse yourself by trying to understand every single field and its usage. And … practice makes perfect will surely apply here.*"

All other interviewed local end-users resonated with a big no to that question. They gave varied reasons but there was one commonality, i.e. they need to internalize and put the taught explicit knowledge into practice using the real system before they could be really sure. But even without testing this notion, they felt their lack of deep understanding of the implicit business practice that worked in the background had hindered them to see the whole process flow.

Another departmental end-user commented that: "*I think we need to be trained in a live system. The trainer told us more than once that 'This step is not necessary in Training as we have created for you some generic accounts. But when you return to your office, you need to do it'. And in another training session: 'You will not need to do this step in the live system because the data will have been there. This is just because we do not have the purchase order number yet, so we have to create one before we can do the matching'. … I even experienced one session where the system was down, so we just went through the training manuals.*"

In one case, a trainee showed that he could answer a question from a fellow trainee where the user-trainer could not. A further investigation revealed that this trainee had learnt about the new system informally from his colleague prior to the training. He learnt just by observing his colleague performing a task using the live-system in a real working environment and reading his colleague's training manuals. He sat in for the training partly because it was a prerequisite to get authorization in using the new F-AITS.

Overall, all end-users and even the Project Team agreed that "Train the Trainer", as just a variant of the formal training, was insufficient in transferring the whole aspect of PEAS knowledge. That is why some support channels like Help-Desk have been established to deal with the things left uncovered or that could not be covered by formal training - even conducted in a lab-based setting.

Lesson: The knowledge transferred through formal training is not considered very task specific. Voluminous materials presented in such a short time and the teaching assumption of a perfect and normal use of the new F-AITS [Wiedenbeck *et al.* 1995: absence of error recovery information] devalue the quality of formal training. At the end of the training, end-users still can not comprehend the overall data flow and the implicit business practice. Here, the roles of CoPs in relation to knowledge transfer are institutionalized. Some central and local CoP members were involved formally in transferring the knowledge of PEAS technical navigation and explicit business practice to their fellow members. The implicit business practice was intentionally not covered for various reasons. At the end, the main purpose of involving end-users in delivering the training can be seen as an approach of capturing the PEAS knowledge [especially the technical navigation and explicit business practice parts which are more easily transferred through formal ways with little preliminary practice] among the university's staff and being more independent from external help as soon as possible (Robey *et al.* 2002).

4.1.3 Support Channels & Situated Learning

Based on the prediction of a disruptive performance, the Project Team activated several formal community-based support channels, on top of the online help, to back local end-users in using the new system, especially in the earlier days of "go-live". Central end-users were covered by their Module Experts as well as by the external consultants.

The central end-users [of the Accounting Division, especially] learnt a lot through practicing and informal training. They repeated the same tasks again and again – very focused. They are the heavy-usage end-users of the system. The volume has helped them to master how to use the system and to forget the previous practice that was not relevant anymore. The other advantage of being so focused was that they had more time to explore the system as well to share among each other. They learnt more and more through simply using the system frequently [i.e. practicing]. The new business practice became clearer and sensible when they shared any new understanding to be tested by others (also evidenced in Wenger *et al.* 2002).

The local *F&A* CoP within each faculty or department is normally very small, on average it consists of only four people[12]. In any composition, at least one does the data-entry tasks and each data-entry needs to be approved by a different person. In summary, local end-users' tasks can be categorized as data-entry, budgeting and summary reporting. While data-entry task is more monotonous and frequent as

[12] This excludes the "Approver Only" end-users who will only do approvals online – they were not the old F-AITS end-users because that time approval was done on paper-base.

daily[13], budgeting is once a year and summary reporting is still more or less fed up from the Central Finance. Hence, the budgeting and summary reporting end-users are generally perceived as light-usage end-users and the data-entry end-users as the heavy-usage end-users of the system.

In the old F-AITS, local data-entry end-users normally could try to get some help from their senior colleagues first (not the other way around) before they tried the Help-Desk. The logic was: data-entry staff were newer than other staff; earlier, these other staff had worked as data-entry officers so they had the experience and knowledge to share. In the new F-AITS, it is no longer the case if their senior colleagues do not share the data-entry responsibility. Even if their seniors do, they will normally do the task more frequently than their seniors. It means they will tend to know better than their seniors. Hence, they go directly to the Help-Desk. Later, they find that the Help-Desk is very useful and quick to answer the system navigation and the *solved* operational questions but not with the new operational problems. In fact, they sometimes are referred to other more advanced data-entry end-users [which are also local end-users].

More than five hundred priority-one local end-users were trained about a month before they started to use the new F-AITS. They took the training when they were still intensively using the old system [with the old business practice mindset] to complete the end of financial year tasks. On "go-live", when they were about to perform the same task using the new F-AITS [with a different business practice], it was not surprising that they had to recall what they have learnt one month ago. But it was not the whole thing as even the priority-two and -three local end-users, who were trained after "go-live", found that most of the training knowledge could not be applied directly. There was *something* else missing or it was simply because the real practice was not as straight forward as the training example. So they had to dig deeper either from playing around and practicing, and/or getting the helps from other end-users or the support channels. One of the local end-users said:
"*The system is pretty much new to all other [local] staff. So I would prefer to go to the Help-Desk directly.*"

The rest indicated [when they were interviewed before the system went live] that they would ask their buddies – people to whom they used to relate when using the old system which are normally their superior or colleagues.

Central end-users were no better off than their local counterparts. When they started to use the system, a couple of days earlier than the local end-users, they also needed a lot of help. As they were only about 60 people, compared to around 1200 local end-users, the support from the Module Experts and consultants could be focused on them.

Both central and local end-users said that the training was not sufficient. They needed more than training knowledge to perform their work. Training was able to *introduce* the software technical knowledge and the explicit business practice. The knowledge gained from such training was still more in an explicit form (Nonaka 1994).

Though the daily usage of the accrual accounting has been deferred, the new chart of accounts itself is quite confusing. The old fifteen-character chart of accounts now was changed to a twenty-seven-character one. The initial problem was related in setting up the correct [not too specific as well not too broad] categories which was encountered before "go-live". After "go-live", the problem was how to use it consistently over the time and across all data-entry officers within each business unit. In regards to this consistent use issue, central end-users help to check the data keyed-in by the local end-users but it was not easy as each business unit has a different set of categories.

At the earlier stage after "go-live", everything was slow. The same data-entry task took a longer time as the end-users were still not familiar with the system. But after more practice, entry time improved though it has not reached expectations yet. The Mac users still find the system a bit slow because of the processing time – and are waiting for the vendor to find a better solution. More things were learnt and shared. Useful tips were gathered by the FUGM/FUML principal and passed to the local end-users during the FUGM and FUML.

Lesson: The nature of PEAS business practice and IT-navigation knowledge put CoPs' situated learning [either informal training or practice] as a significant and necessary complement to formal learning [i.e. formal training] in the context of knowledge transfer. Though both local and central end-users regard a guided informal training as superior to a formal training, this is impractical given the large number of (especially local) end-users and as the usage of the new system is rapid. Formal training can at least introduce a general knowledge of the new system. But it is not enough. The presence of support channels like the Help-Desk is undeniable evidence of formal training incapability. As the support is normally a one-to-one help, empowering capable end-users to take part in supporting novice end-users is simply effective. This can have a significant impact

[13] If the assistant is a casual (not a permanent) staff, then data-entry works are likely to happen in batches every second day or twice a week.

on the project resources as well as on CoP cultivation effort. Furthermore, this empowering process needs to be regenerated by upgrading more end-users as capable end-users to partake in this precious knowledge transfer. Another interesting thing is the evolution of local CoPs from colocated semi-heterogeneous [e.g. department X CoP] to distributed homogeneous [e.g. local data-entry CoP] because of the new financial information system adoption.

4.2 CoPs to Steward the Dynamic Nature of PEAS Knowledge

The knowledge about the PEAS is enormous and will continue to evolve as the implementation process is still ongoing. When end-users use the PEAS, they learn more. This helps them to extend their usage of the PEAS. By using it more, they learn more and vice versa.

To date, the case organization's end-users find that there is new knowledge added to their system knowledge bank every now and then through using the system as well as interacting with other end-users. The system is new so it will certainly take some time to become proficient in using the system. Also, as some deferred policy changes are being revealed, there are more new things to learn.

Further training sessions are not an effective and efficient way to convey these incremental updates unless it is about a new module. A better way could be through the periodic FUGM and/or the FUML – both are part of the University's *F&A* CoP and later, the internalization of this updates can be socialized through informal interaction among CoPs members.

The central modules experts and the local super-users can play more significant roles in chairing and addressing any ongoing issues in the FUGM and FUML as the stewards of the PEAS knowledge. As for the rest, FUGM and FUML can be a melting point for newly-hired vs existing and heavy- vs light-usage end-users. The existing end-users tend to revisit and compare the logic between the new and old system while the newly-hired ones do not. These two groups apparently are heading in different directions. The FUGM and FUML can be exploited to guide the direction of these two groups. As for end-users with different usages of the system, their learning speeds are unequal. The meeting and the mailing list can promote knowledge sharing among them to help the slower ones to catch up with the rest. The light-usage end-users can learn the mistakes from the heavy-usage ones in using the system instead of reinventing the wheel again. Also, in a practical way, these two communication channels can be used to detect any unwanted workarounds which can lead to identifying unseen misfits [not mentioned in Fit Gap Analysis]. They can also function to promote the use of the organization's social capital in either a formal and informal way as implied by one informant:

"*I feel that there was a shift of knowledge sources around the [university-wide F&A CoP]. People can feel it through the meetings and the mailing list. … But anyway, my point is even if one is shy to ask or to contribute in the open forum, at least, he or she knows to whom they should relate in regard to a certain issue. So, he or she can do it later in a more private way.*"

5 CONCLUSIONS

Although the implementation program of the case organization is still ongoing as well as its formal and informal knowledge transfer processes, some important lessons can be learnt.

Implementing any PEAS entails the adoption of its "best" business practice. This business practice contains more than just the canonical and codified element (Lee and Lee 2000). Hence, formal training alone, even with an incremental implementation (Robey *et al*. 2002) – like this case study, is insufficient and incapable of transferring all required aspects of this knowledge. Furthermore, as each individual learning approach is different (Boudreau 2003), it is best to exercise a wide-range of knowledge transfer strategies – from formal to informal ways. This is also inline with the nature of the knowledge to be transferred. The knowledge of software technical navigation and explicit business practice needs to be internalized (Nonaka 1994) by each end-user as part of individual learning process before the canonical operation can be performed. This internalization process takes time and needs practice. It forms end-users' quality of use (Boudreau 2003) of the new system in conducting their daily works.

In the case organization, the PEAS adoption is rapid although its implementation is gradual. All end-users, either central or local, had to switch from the old system to the new one in the course of a few of days. Everybody is learning, and sometimes unlearning as well as relearning. No one knows everything, but there is massive knowledge to be incorporated and more to come as the implementation advances. Having decided to be knowledge-independent as soon as possible, some key members of the organization-wide CoP were assigned to understand the new knowledge and to synthesize it with the existing knowledge. Later they disseminated the synthesized knowledge through formal and informal ways.

The main role of CoP in the knowledge transfer to and among the end-users is as an enabler. CoPs enable the PEAS end-users to share their knowledge that they have learnt either formally and informally. As end-users use the PEAS differently in terms of usage-load and background, their learning process differs in speed and direction. Here, CoPs enable the PEAS end-users to avoid reinventing the wheel by learning from others' mistakes. At the same time, CoPs also enable the PEAS end-users to assess, revise, and shape the desired business practice for competitive advantage purposes (Lee and Lee 2000) through policy amendments, roles and responsibilities redistribution. CoPs' periodic informal meetings and mailing list can be cultivated to accommodate the above goals as well as to promote the social capital usage.

Future research should investigate whether CoPs can address end-user resistance towards a PEAS adoption. That issue was not thoroughly investigated in this study because it was categorized "sensitive" by the case organization.

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[i] This term is developed from a very similar term coined in a paper by Shang and Seddon (2003). Every letter in this acronym "PEAS" is essential to distinguish PEAS from other IT products. For example, the word 'pre-packaged' is to distinguish PEAS from custom-built EAS, or other packaged EAS that do not need a significant configuration [and, *likely*, customization] process before they can be used appropriately.

[ii] The word 'steward' is coined as a verb by Wenger *et al.* (2002) [e.g. in p.7 and p.26 of their book].