

# Evaluation on Knowledge Management Process in Very Small Software Companies : A Survey

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## ABSTRACT

*Software development projects always involve knowledge intensive exchanges. Therefore, the influence of well-organized software development knowledge process could prevent organizations from suffering from the knowledge atrophy problem, i.e. loss of expert software development. In order to understand this issue, we have studied several factors (company's strategy, communication, learning and documentation) that are related to knowledge management processes (KMP) in very small entities (VSE). An open and close ended survey was conducted in a variety of VSEs. Through statistical and content analysis for the research data, results indicate that KMP in VSEs are undertaken in an informal way. Furthermore this environment helped VSEs to easily create/share knowledge that assisted in mitigating the knowledge atrophy problem.*

### Keywords

*Knowledge Management, Knowledge Atrophy, Statistical and Content analysis.*

## 1.0 INTRODUCTION

Software development is a complex activity and software process depends strongly in human commitment for its implementation (Coleman and O'Connor, 2006). In addition, individual and organizational behavior aspects also have given a great influence in the success of software development process (Baddoo and Hall, 2002). Furthermore since software development projects by their nature involves teamwork effort and involve knowledge intensive exchanges/collaborations, the influence of well organized software development knowledge could assist software companies to become more innovative and efficient (Dingsoyr et al., 2005). However, the issues of limited resources;

either or both in financial and staff; in VSEs always become a constraint in producing a competitive product in today's dynamic software business. Sapovadia (2006) stated that micro enterprise including VSEs who have limited resources, particularly in financial and human resources, are practicing unique processes in managing their business. These unique characteristics and unique situations have influenced VSEs in their business style as compared to large companies (Mtigwe, 2005). In addition, their constraints in financial and other resources also have an impact to companies' process infrastructures such as limited training allocation, limited allocation in performing process improvement, low budget to response the risk and may other constraints (Kaltio and Kinlula, 2000; Sapovadia, 2006). Moreover due to the small number of people involved in the project and the organization, most of the management processes are performed through an informal way and less documented. This situation shows that human-oriented and communication factors are very important and significant in VSEs (Valtanen and Sihvonen, 2008; Laporte et al., 2008). Therefore, it is belief that the influence of well organized software development knowledge is seen could assist small companies or VSEs in maintaining their product relevancy in market. This process also could mitigate from knowledge atrophy problem from affecting their company.

## 2.0 BACKGROUND STUDY

### 2.1 Very Small Entities (VSEs)

Most of the software industries especially in Europe, Brazil, and Canada are falls under Very Small Entities (VSEs) category which employed less than 25 employees (Laporte et al., 2008). In the context of software companies in Ireland, indicates that the majority of the Irish software companies are an

indigenous company (Laporte et al., 2008) and the majority of these software firms are employ between 10 to 99 employees (Crone, 2002). Furthermore the average size of these indigenous companies is about 16 employees (Coleman and O'Connor, 2008).

## 2.2 Knowledge Management (KM)

KM is a discipline that crosses many areas such as economics, informatics, psychology and technology. In addition, KM is also seen as a strategy that creates, acquires, transfers, consolidates, shares and enhances the use of knowledge in order to improve organizational performance and survival in a business environment (Zhang and Zao, 2006). This scenario becomes a challenge to the companies in managing their organizational knowledge (Kukko et al, 2008). Therefore specific plans and suitable tools will guide the knowledge management process (Dingsoyr and Conradi, 2002). This plans and tools must be promoted applying the old knowledge to new situations in an organization (Kukko et al., 2008).

Furthermore in KM, knowledge creation and sharing is a continuous process whereby individuals and groups within the organization and between the organizations share tacit and explicit knowledge. The organization capability to create knowledge is important in order to sustainable competitive advantage (Parent et al., 2000). Knowledge creation process is started when an individual recognize the related and useful data and information and then able to transform it into a new knowledge that brings a future value to an organization. Organizational knowledge is not only created within the organization but also can be acquired externally and this can be done through knowledge sharing (Awazu, 2004).

The importance of knowledge sharing and knowledge creation in any organization will help organization to continuously innovate, help organization to sustain their competitiveness (Rhodes et al., 2008) and prevent organization from knowledge atrophy problem (Parent et al, 2000).

## 3.0 RESEARCH STRATEGY

In order to carry out this study, we developed and distributed 15 survey questionnaires to a selection of software VSEs around Dublin, Ireland. These companies were selected according to the size of the companies, which employed less than 25 employees, and were all directly involved in software product development, for a variety of business domains. The survey consists of 19 close-ended questions that use 5 – point response scale. The close-ended questions examined the level of agreement of the related KM process and activities as proposed in the literature,

applied in their organization. Moreover, in order to gain more input from the respondents regarding the study issues, several open ended question that related to the close-ended question have been asked in the survey. The process took some time to receive back the completed questionnaires from the respondents. Therefore we regularly contacted the respondents via email and phone in order to ensure their reply.

Each received and completed questionnaire were complied and analyzed. The close-ended questionnaire were grouped according the issue and analyze using a statistical analysis. Three main statistical analysis were run in processing the data, which are the frequency, mean and descriptive analysis. For this purpose we use a statistical tool (SPSS) in processing the data. Meanwhile, on the open-ended data, we have analyzed and categorized the data according to the category that this study intends to understand. The answers were group, coded and list into a table in respect to the study category issues. In overall we adopted the qualitative contents analysis approach in analyzing the open-ended answer (Elo and Kyngas, 2008). Moreover, in order to produce details analysis result, we have divided the survey respondents into 2 main group namely the Micro VSE @ M (1-9 employees/6 companies) and Larger VSE @ L (10-25 employees/9 companies) (Laporte et al, 2008).

## 4.0 RESULTS AND DISCUSSIONS

### 4.1 Communication

In analyzing the close-ended data in the survey questionnaire, we have regrouped the questions according to the categories of analysis as shown in table 1.

Table 1: Communication Process

There is clear communication between team members.	1-5
Software development projects regularly receive feedback over stakeholder.	1-5
There is an effective communications channel between software development team members and management	1-5
There are regular informal (casual) communications between software development staff and management.	1-5

The results from the mean analysis as shown in table 2 indicated that the companies did not have a regular formal meeting and practicing an informal formal communication in their business operations. However, results show that organization have a clear communication process and channel. The comparison among company employees size, provide more detail indicator that employee size

factor influenced the formal communication process level in VSEs daily business operations.

Table 2: VSE-Communication Process

Emp. Size	Clear Com.	Reg. Feedback	Comm. Channel	Reg Informal Comm.
M	4.80	4.40	4.80	5.00
L	4.40	4.40	4.40	4.60
Average	4.60	4.40	4.60	4.80

In relation to the communication process in VSEs, the analysis on the open-ended question indicated that 90% of respondents agreed that in development projects they regularly receive feedback from the project stakeholders. However, the result showed that this process been done either in face to face, informal discussion, online communication, informal internal feedback or ‘on the job training’ process. The interview extracts below illustrated how the process has happened:

“Online communication, informal feedback, internal discussion, informal communication”  
 “We sit in one office so I talk to them all the time”  
 “Informal meeting, casual communication, report”.

#### 4.2 Learning and Sharing

In order to understand in detail the KM issues in VSEs, we have grouped related question that explain the learning and sharing activities in VSEs as shown in table 3.

Table 3: Learning and Sharing Process

We always exploit existing organizational knowledge to the maximum.	1-5
We always learn from experiences of past projects.	1-5
We always collect experience data from past projects.	1-5

From table 4, it is indicated that all respondents agreed that their development team is always sharing their knowledge and experience with others in the organization. The results in table 4 which obtained a higher mean scores, represents an indicator that in VSEs companies, staff are always utilize the knowledge and experience within the organization in performing their tasks. This analysis also showed that company size is not an issue in utilizing existing knowledge and experience in company.

Table 4: VSE- Learning and Sharing Process

Emp. Size	Staff Knowledge	Project Exp and Lesson Learned	Knowledge/ Exp Doc	Works Progress Procedure
M	2.20	2.20	2.20	2.20
L	2.80	3.20	2.80	2.60
Average	2.50	2.70	2.50	2.40

In relation to table 4, the analysis on the open-ended question also agreed and indicated that the learning and sharing activities in VSEs are been done either informal, self learning or informal sharing among the development team. This could be identified in question on how the employees enhance their skills where 90% of the respondents agreed that no formal training were given to the staff in enhancing their skills. The interview extracts below reflect the above descriptions.

“Informally through ad-hoc conversations and some code review”,  
 “Ensuring that no single member of staff has any exclusive knowledge by using a mentoring/buddy system.”  
 “Ensuring everyone talks and exchanges information about projects on an ongoing basis we can mitigate against leaving the company or forgetting knowledge”

#### 4.3 Documentation Process

Table 6 indicates that staff knowledge, experience and activities are not documented properly and the documentation process (refer Table 5) has been done more in informal process. This can be referred to the total mean score which lower than 3.0 in overall section presents that all respondents do not practice a formal documentation process in their documentation activities. In addition, table 6 also indicates that the number of employees working in the companies also gave an influence to the documentation formality process in VSEs.

Table 5: Documentation Process

Software development staff knowledge is formally documented	1-5
We regularly document experiences/lessons learned from previous projects to use in future projects.	1-5
Software development teams are regularly document and review their activities.	1-5
We regularly documented our work / project progress.	1-5

Table 6: VSE -Documentation Process

Emp. Size	Exploit Exist Org Knowledge	Learn Past Experience	Collect Past Experience
M	4.00	4.20	4.00
L	4.40	3.80	3.40
Average	4.20	4.00	3.70

In relation to the table 6, open-ended answers have highlighted that only activities that are related to business procedure and technical issues are being documented properly and organized. This could be identified in question on documentation process where 50% of the respondents claimed they felt that they are regularly update their document regularly especially on a specific works and procedures. Moreover the analysis results also showed that small team size issue has hindered VSEs from perform seriously documenting their activities as shown by below interview extracts.

*“We always document project and work specifications ... We constantly updates until such time as the represent the change /work to be complete”*

*“We documented it electronically, and having an equal decision on it”*

*“We are too small to do proper documentation process”*

The result in this part of analysis have shown us a pattern and an indication that in VSEs documentations process are done in two ways; (1) the specific documentation process which is related to business and technical process and (2) informal documentation process which are inclined toward informal, personal and online documentation.

#### 4.4 KM Process and Commitment

The questions on this part are focus particularly on KM process and commitment in the software development projects as shown in Table 7 and 8.

Table 7: KM Process

A knowledge management strategy is important in managing organisational knowledge.	1-5
Good leadership is important in leveraging peoples knowledge and experience.	1-5
Formal training is given in order to sustain and enhance software development knowledge.	1-5
Formal project post-mortems are beneficial in capturing and transferring knowledge.	1-5

Table 8: KM Commitment

Management are very committed to sharing of knowledge and knowledge transfer activities.	1-5
Good working relationships between software development staff enhance knowledge sharing / transfer.	1-5
We regularly share opinions and thoughts on our software development activities.	1-5
We regularly share our knowledge in software development projects.	1-5

The results from the analysis as in table 9 and 10 indicate that the respondents agreed that the level of KM process and commitment in VSEs are very significant. This could be identified with the average mean score for each question is relatively high. Table 9 indicates that in principle respondents are agreed they are having a clear KM strategy and a good leadership in their organization is important in organization software development knowledge. These have been shown in the mean score results for these two questions. However the results in table 9 indicate that activities related to KM within VSEs have not been performed properly. It is indicated in average total mean row that gained less than satisfied agreement level which is 2.40 and 2.00 respectively. Meanwhile, table 10 showed that the management are very supportive in the knowledge management process and peoples in the organization are always communicate, share and having good relationship among them.

Table 9: VSE -KM Process

Emp Size	KM Strategy	Good Leadership	Formal Training	Post Mortem
M	3.40	4.60	1.40	2.40
L	4.00	4.40	2.40	2.00
Average	3.70	4.50	1.90	2.20

Table 10: VSE - KM Commitment

Emp Size	Mgmt Cmmt	Working Relationship	Share Opinion /Thought	Share Experience
M	4.40	4.80	4.40	4.20
L	3.40	4.40	4.40	4.00
Average	3.90	4.60	4.40	4.10

This issue situation also could be identified in the open-ended answer related to which indicates KM process were done informally through sharing activities and informal documentation such as personal or indirect (e.g informal transferring, internal sharing) process as the interview extracts below.

*“We are doing more on self learning and sharing among us”*

*“Regular sharing process, internal sharing and team work”*

*“We informal sharing and changing knowledge. We always documenting electronically/ and having informal transferring and knowledge sharing”*

In addition to the above analysis, the answers on knowledge loss issue have indicate that the informal process environment in VSEs helps the companies to mitigate knowledge loss problems from happened. The analysis in this part showed 90% of the respondents claimed did not facing a knowledge loss problem in their company due to the informal process. Below interview extracts reflects the above situations.

*“Ensuring that no single member of staff has any exclusive knowledge by using a mentoring/buddy system.”*

*“Not a problem since we using same technology and process in all our project.... We occasionally sharing and transferring knowledge among brothers”*

*“Ensuring everyone talks and exchanges information about projects on an ongoing basis we can mitigate against leaving the company or forgetting knowledge”*

## 5.0 LIMITATIONS

As with any research project we have identified some limitation and constraints within the study. In data collection process, the researchers encountered some difficulties getting a full commitment and good response from the identified Irish Software VSEs. Limited number of staff, busy with current project, economy situation, project deadline, low level of interest and inappropriateness are among the reasons given by those companies. However, a low return rate of the questionnaire is a well known and understood as a research problem and it is not specific to this study. In addition the issue of generalizability is a common issue to many research studies of this type. The small research sample size does some limitations in the research results. However, with appropriate identified companies for this study has helped us to produce a valid indicator of the study results. The results are presented the VSE environment as a whole. This is demonstrated from the consistent research results which were produced in the analysis process.

## 6.0 CONCLUSIONS AND FUTURE WORKS

It was collectively agreed by the respondents that the KM initiatives in VSEs are done very informally, individually and specifically. In term of knowledge process and strategy issues, the result showed that all respondents claimed that they have a clear KM strategy in the organization. However the analysis

showed that this process are done informally and is not organised. In addition the result show that even though the KM was done informally either in communication, documentation, learning and sharing in VSEs, 90% of the respondents believed that this environment have led them to mitigate the knowledge loss problem in their organization. Moreover the results also indicated that in overall the size of the company given an impact to all the process that have discussed above. Overall although the results showed the high informal and indirect culture in VSE in most of their development activities, the results also indicate that VSEs commitment towards KM is very high and positive. Meanwhile, with regards the future work, we plan to wider our research participation through identifying more VSEs which located in Ireland in order to understand the issue more detail and to identified the constraints that prevent them from managing their organizational knowledge systematically. In additional, since the majority of software development companies in other countries in general and Malaysia in specific which are falls under the small and medium size category (Tan et al., 2009), we plan to replicate a similar study and approaches in order to see if there any comparison with the existing results.

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