

Enablers and Barriers of Knowledge Spiral: A Case Study

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ABSTRACT

Knowledge Management (KM) and knowledge sharing (KS) have become crucial tasks for both Middle Managers and Top Managers of many organizations, especially those who highly rely on the type of knowledge which is difficult to transfer from one person to another, or what is called "Tacit Knowledge". The objective of this case study is to review the practical knowledge transfer techniques, the main motivators and demotivators of a tacit knowledge transfer process, and the measures that can be taken to overcome the demotivation factors. Siemens is chosen for this case study because it has been recently rated as one of the top Knowledge-Management-driven companies. We present here our own observations on some of the KM practices that Siemens strives to implement in its branches in the Middle East countries and the barriers which are challenging such practices.

CCS Concepts

CCS → Human-centered computing → Collaborative and social computing → Collaborative and social computing theory, concepts and paradigms → Computer supported cooperative work

Keywords

Siemens, Knowledge Management Maturity Model, Knowledge Transfer, Knowledge Sharing, Barriers, Enablers

1. INTRODUCTION

A genuine part of knowledge which accumulates through experience within an organization is tacit knowledge. Michael Polanyi, the chemist who established the theory of tacit knowledge in 1958, explained that there are two types of knowledge: tacit knowledge and focal knowledge; each human has tacit knowledge but it is not easy for him to define [9]. He wrote: "Take an example: We know a person's face, and can recognize it among a thousand, indeed among a million. Yet we usually cannot tell how we recognize a face we know. So most of this knowledge cannot be put into words" [10].

How to play Karate, how to speak a language, how to understand body language, how to sell a product to a customer, and how to draw a surreal painting are some other examples of tacit knowledge. Many organizations, including Siemens, rely heavily

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on this type of knowledge. As a result, it was necessary to develop mechanisms of sharing this knowledge inside organizations.

The other type of knowledge, which contrasts tacit knowledge, is explicit knowledge. It is an articulated knowledge that is communicated to other people. Codified/articulated explicit knowledge is normally very structured and it can be found in databases and other means [13]. It's obvious that transferring/sharing this type of knowledge is much easier than handling tacit knowledge.

1.1 SECI Knowledge Transfer

Tacit knowledge can be transferred from one person to others either in a tacit-to-tacit form, or by converting it into explicit forms. The same is applicable to explicit knowledge which can be transferred either to tacit knowledge or a combined form of explicit knowledge. Ikujiro Nonaka and Hirotaka Takeuchi are two Japanese professors of international business strategy who used this idea of knowledge transfer in their research work and brought Polanyi's concept closer to business management field through their SECI (Socialization, Externalization, Combination, Internalization) Knowledge Management Model in 1995.

According to Nonaka and his co-researchers, knowledge creation practice is a spiral process of exchanges between tacit and explicit knowledge. Such exchanges between these types of knowledge create new knowledge for the organization.

Takeuchi [14] explained that the SECI model puts emphasis on the Socialization, Externalization, Combination and Internalization processes as shown in Figure 1:

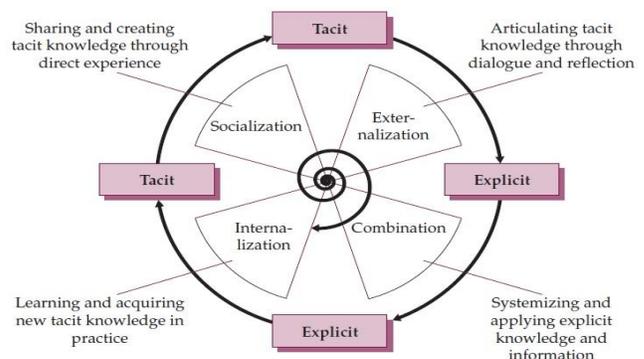


Figure 1: The SECI Model [14]

2. RESEARCH METHODOLOGY

We have used a mixed method approach in this research work. First, we went through a qualitative exploration and investigation through addressing main KS concepts and earlier studies, and then we used our own experience and direct observations in the field of managing KS inside organizations. Last but not least, we designed

a survey questionnaire to test our hypothesis about the factors that affect the willingness of employees to share knowledge.

We also asked the participants to indicate the KS barriers that some of their colleagues are facing in their current organization. The purpose of this question is to identify the barriers which are commonly faced by employees and the dimension of each barrier through analyzing its frequency.

We used the SurveyMonkey website to publish our survey questionnaire. The 174 respondents who participated in our survey are distributed as follows:

- 60% from Siemens and 40% from other companies
- 38% Females and 62% Males
- 72% from Middle East and 28% other countries
- 85% from multi-culture organizations, 15% others

In order to check if there is dependency between variables, we used the SPSS software to calculate the Spearman correlation coefficients as most of the collected data is either Nominal or Ordinal. Regression was also calculated through SPSS to check the significance of relationship between independent and dependent variables.

3. KM AT SIEMENS

Siemens is an international company in the field of electrical and electronics engineering which was founded in year 1847. According to the company's official website, it has more than 348,000 employees (as of 30th September 2015) who work to design, manufacture and install various systems. Siemens employees are distributed in more than 200 countries. In fiscal year 2015, they generated revenues of more than €75 billion [12].

Ardianto and Tanner [1] summarized Siemens initiatives in knowledge management starting from year 1998 when Siemens developed its first KM system (ShareNet). This KM system was first applied to the Sales and Marketing functions of the Information and Communication Network (ICN) business division. Later, ShareNet was applied to some other business units and was linked with other parts of the system like document management and e-learning program. Ardianto and Tanner [1] briefly went through Siemens' KM initiatives as follows:

In 1998, ShareNet was first introduced as a KM idea in Siemens' ICN Division. Then in the same year, the communities of KM practice were come into view.

In 1999, the KM program at Siemens was launched. In 2002, Siemens spending on KM was reduced due to the international financial decline of telecom market. Then ShareNet was expanded to PeopleShareNet which has had many features like transferring knowledge between individuals through intranet.

In 2004, research and development functions were included in ShareNet. In 2008, Siemens KM tools included a social networking approach.

Keyes [6] mentioned that Siemens has been considered a knowledge management success story as it became a model of an organization that took KM as a "strategic tool". On 17th of November 2015, Siemens was named the Overall European MAKE Winner. Siemens was recognized for innovation and new product development (first place), and transforming enterprise knowledge into stakeholder value (first place). Siemens is a 13-time European MAKE Winner, including six-time Overall European MAKE Winner [16].

3.1 Siemens and the SECI Model

Saxena [11] presented the derived KM model which Siemens Global Application Management (GAA) IT Services business employs to achieve the best KM practices. He explained that Siemens GAA KM services include: (1) Pull services which give and receive knowledge whenever it is needed, (2) Push services which are directed by the need of the company and (3) Community exchange in which the experts discuss and exchange knowledge.

As Siemens is a well-integrated large organization which is distributed in multiple sectors and geographies, it has had a huge legacy of management information systems. Some of these systems are classified as knowledge management systems. Therefore, it was decided by Siemens to tie together the existing tools and functionalities in order to maximize returns on investments and avoid duplications [11].

3.2 Socialization at Siemens

Socialization at Siemens involves the sharing of knowledge between the organization's members through both face-to-face and electronic interactions (e.g. Web 2.0 chats, Live Meetings, etc) in which empathizing/sympathizing plays a main role. In this process, a Siemens employee can gain tacit knowledge either with or without using language.

The results of our conducted survey indicate that the most-preferred method for sharing knowledge between employees is physical meetings. Table 1 shows that 74% of the 174 respondents prefer meetings/workshops, compared to 16% for emails and much lesser percentages for other methods

Answer Choices	Responses
Meetings/workshops	74.14% 129
Emails	16.09% 28
Telephone	3.45% 6
Intranet	1.15% 2
Special Software Tools (e.g. Customer Relation Management "CRM" software)	1.72% 3
Other	3.45% 6
Total	174

Table 1: Survey Results: Preferred KS Method

In order to facilitate frequent meetings between employees and management personnel, Siemens offices in the Middle East employed the open-plan workspace concept in which closed-room offices are avoided as much as possible. Despite some visible disadvantages of employing such office structure, it has been chosen by Siemens management as a socialization process enabler. Easy access to employees, peers and managers makes everyone more comfortable to ask for any specific knowledge or to share his/her own experience with others.

An online tool called TechnoWeb is also developed by Siemens and made available for its technical staff. It is a communication platform in which Siemens technical personnel exchange their experience on various field of theoretical and practical knowledge.

Team events (football competition, common dinners, birthday parties, etc) are also used by Siemens as enablers for breaking the socialization ice. Without such events, it would be really difficult for the employees of such large organization to personally interact with each other or to connect a face to a name. Experiences, lessons learned, customer contacts, problems and solutions are part of the common but casual interchanges during such events.

Management also encourages dedicated technical and sales workshops for each functional group in order to facilitate tacit knowledge transfer. Usually, all employees of certain function (e.g. Sales) meet together with their management to discuss certain topics or business concepts. The workshops often include brainstorming sessions and lessons-learned reports.

Temporary job assignment is another socialization enabler that Siemens uses in many of its branches. For example, sales personnel are often requested to join proposals preparation team and vice versa. This makes it easier for every employee to understand the requirements, the complexity and the constraints of the other functions in the company. It is also a sort of learning-by-doing technique for transferring and creating knowledge.

Although many good efforts are made to promote socialization within the employees of a Siemens division, it is noticed that cross-division socialization processes are not sufficiently active. The reason can be the low necessity of technical knowledge transfer between divisions, however – given that most of Siemens divisions deal with the same customers of other divisions – it would be very helpful if employees/managers of certain roles meet with their peers of the other divisions more often. An exception to this general observation is the close interaction between the employees of the Digital Factory division and the Process Industry & Drives division as these two divisions handle very similar technical challenges and processes.

3.3 Externalization at Siemens

Externalization involves translation of tacit knowledge into comprehensible forms that can be understood by others. Siemens has made good progress in articulating its tacit knowledge. The following documents are just few samples of the documented experiences, procedures and guidelines that are made available for all employees either at Siemens global website, Intranet or servers' shared folders: Products User Manuals, Sales Presentations, Technical Presentations, Training Manuals, HSE Manuals, Quality Manuals, Programming/Coding Procedures, Installation Procedures, Testing & commissioning procedures, Online E-Learning Portal, Site Survey Procedures and Reports, Troubleshooting Procedures and Reports, etc

However, these tons of documents may sometimes cause confusions for new employees who are not familiar with the company's shared media. Some of them might not be even aware that the information which they need is readily available in a well-documented form. It is therefore recommended that the induction sessions for new employees shall be followed by a specialized induction on the available documents related to the new employee's field, function and job profile.

3.4 Combination at Siemens

This is the stage where most of the new knowledge is created at Siemens. In this process, Siemens' explicit knowledge is converted into more complex sets of explicit knowledge. This puts in the elements of explicit knowledge all together. The combined explicit knowledge in this process is the first step of amplification of the externalized tacit knowledge of each individual.

It's really hard to mention all available combined-knowledge tools and facilities that are made available for a Siemens employee. However, in this section we will mention some of these tools for illustration purpose:

For a Siemens automation engineer, a full library of control function blocks is made available in a documented form and in a programmable logic controller's software form. Such library

provides excellent exposure for every automation engineer to the functionalities that are required for each industrial control application.

Another excellent tool for automation and electrical drives engineers is the Combined Interactive Catalog (CA01). This electronic catalog does not only combine all necessary technical and cost information about each Siemens hardware and software item, but also provides a configuration tool which automatically selects the necessary components based on the given design inputs.

With this tool, proposal engineers can easily select the necessary automation, drives, instrumentation and electrical components for any application. They also use the tool for generation of commercial offers wherein the expected delivery time for each component is provided.

For all sales employees, Philos business intelligence web-based tool is made available. Philos is the Standard Customer Relationship Management (CRM) tool within Siemens. It provides technology for managing Siemens customer interactions and is intended to support all Siemens Sales representatives and key account managers to organize, plan and report Siemens business with their Customers.

However, it is noticed that some of these useful features are not fully utilized by all members of the sales team. Moreover, there is a need for mechanisms to ensure timely update of opportunities' status at Philos so that the quality of the combined knowledge would be sufficient for quick decisions by management without the need of persistent verification.

Our survey results show that more than 54% of Siemens employees in the Middle East use their CRM either regularly or sometimes for KS purposes. The percentage was only 42% for other companies in the Middle East. See Figure 2.

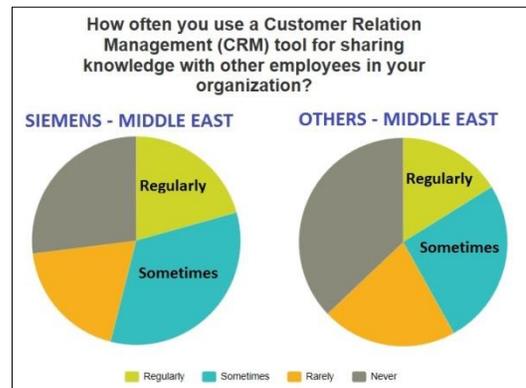


Figure 2: Survey Results: CRM as a KS tool

For the service sales team, a special combined explicit sales knowledge tool is created; that is the Global Footprint Tool. This web-based tool utilizes Google Earth to locate Siemens equipment's installations and local sales/service centers. The tool is a perfect example about combined explicit knowledge as it combines data of different global tools (e.g. Philos) as well as external databases (e.g. database for mining locations) and manually obtained data (e.g. training center and spare parts warehouse locations).

With this footprint tool, it is possible to visualize complex and integrative correlations for faster and easier understanding. It also helps management to develop strategic decisions for organizational setup and resources between headquarters and

regions. The tool also supports proactive service sales approaches and efficient service deliveries, and helps Siemens gain market transparency for industry service offerings.

Our survey results show that more than 65% of Siemens employees in the Middle East rated their Intranet as either Excellent or Good in KS. The percentage was only 48% for other companies in the Middle East. See Figure 3.

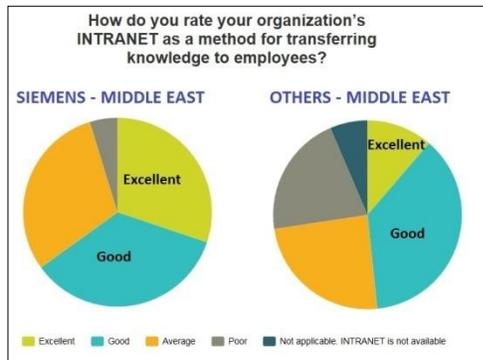


Figure 3: Survey Results: INTRANET as a KS tool

3.5 Internalization at Siemens

Internalization is the process in which the newly created Siemens explicit knowledge is converted and “embodied” into the organization’s tacit knowledge. Here we notice that the dose of tacit knowledge given to each individual is high as it is the outcome of the combined tacit knowledge’s of different individuals. Training, exercises and learning-by-doing allow each individual to access the knowledge pool of the entire organization.

Siemens created an online E-Learning Portal where each employee can take basic and advance training courses on any topic (business, technical, sales, etc) at anytime. The employee can also book the available classroom training sessions or Live Meeting training sessions.

However, the internalization journey does not end inside a training classroom. To activate the internalization process, Siemens promotes the concept of multiple technical and sales workshops where all members of a certain function group meet to share their latest learned lessons and newly acquired technical/sales experience.



Figure 4: Survey Results: Training as a KS tool

Our survey results show that more than 57% of Siemens employees have rated their internal training program as either Excellent or Good. The percentage was only 42% for other companies in the Middle East. See Figure 4.

4. SIEMENS KMMM

In order to ensure that the knowledge spiral processes are active, there was a need for creating mechanisms to monitor the progress of knowledge creation and enhancement processes. For this purpose, Siemens Competence Center for Knowledge Management developed a Knowledge Management Maturity Model (KMMM) which helps any organization to carry out objective assessment of its current KM position. See Figure 5.

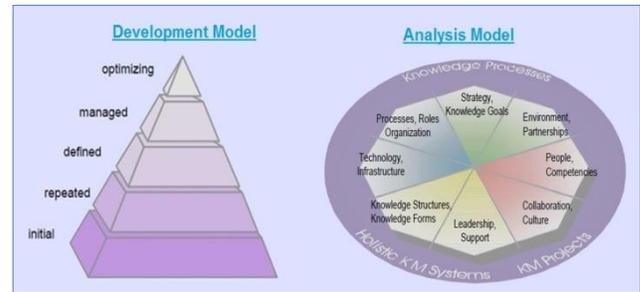


Figure 5. Siemens KM Maturity Model [8]

The model was first introduced by Karsten Ehms and Dr. Manfred Langen of Siemens. Ehms and Langen [3] indicated that the first step that shall be taken before carrying out new KM ideas is to evaluate the initial maturity of KM. The development model of Siemens KMMM is based on the CMM (Capability Maturity Model) which was developed earlier by the Software Engineering Institute (SEI) at Carnegie Mellon University. However, the KMMM was tailored by Siemens to serve the assessment of knowledge management activities. The analysis model of the KMMM is based on the EFQM (European Foundation for Quality Management) Model for Business Excellence [8].

Langen [8] briefly described Siemens Knowledge Management Maturity Model (KMMM) which consists of two elements: (1) “Analysis model” and (2) “Development model”. The analysis model is developed to create transparency in all main areas of Knowledge Management and to demonstrate the possible enhancements. The development model gives information to reach the next maturity level. In order to ensure ideal interlinking of key areas, both Analysis and Development models shall be combined.

Augusto [2] indicated that the development model’s pyramid consists of five levels:

- **Initial:** In this level, the KM is a one-time process where there formal KM practices do not exist. The KM activities in this level are non systematic.
- **Repeatable:** In this level the importance of KM is noticed. Its processes are executed and examined.
- **Defined:** In this maturity level, the KM processes are practiced every day, and dedicated KM roles are created.
- **Managed:** At this level all KM-related activities are standardized and their effectiveness is measured persistently.
- **Optimized:** This is the highest KM maturity level where KM is perfected and fine-tuned.

Combinations of several techniques (like interviews of individuals/groups, addition of various roles/functions in the company, etc) are used to complete the assessment process which shall be carried out by experienced KM officers who shall work on site so that they can obtain reasonable ideas about the maturity

level of the KM. Siemens KM officers work with situational descriptions from many topics which can determine the KM maturity level [8].

The results of our survey questionnaire show that Siemens in the Middle East has reached good level in promoting knowledge sharing practices inside the organization. More than 65% of Siemens employees in the Middle East are satisfied with their organization's willingness to share knowledge. The percentage was only 40% for other companies in the Middle East. See Figure 6.

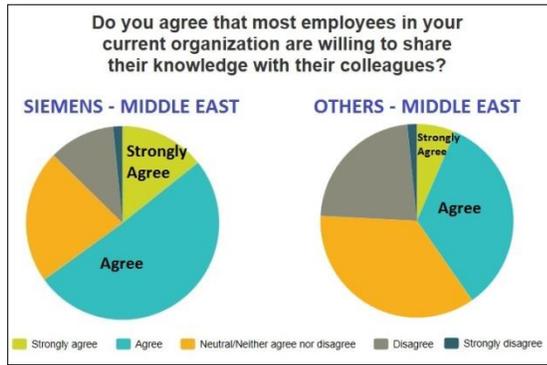


Figure 6: Survey Results: Organizational willingness to share knowledge

Moreover, 89% of Siemens employees in the Middle East confirmed their personal willingness to share their knowledge with all their colleagues. The percentage was only 55% for other companies in the Middle East. See Figure 7.



Figure 7: Survey Results: Personal willingness to share knowledge

5. POTENTIAL BARRIERS

Most of the multinational organizations in the Middle East countries – especially the Gulf Cooperation Council (GCC) countries - have been facing common difficulties and barriers during implementation of knowledge transfer processes especially that related to transferring tacit knowledge from one person to any other person.

In our survey questionnaire, we asked the participants about the reasons why could some employees in their current organization

face knowledge-sharing problems. The received answers sorted based on their frequencies are as follows:

- Lack of time (68 %)
- Lack of cross-division communications (45 %)
- Lack of incentives (41 %)
- Lack of Lessons-Learned sessions (39 %)
- Cultural & language barriers (38 %)
- Competition between employees (32 %)
- Lack of job security (28 %)
- Lack of trust & respect (28 %)
- Inability to locate the correct knowledge source (24 %)
- The culture of “I know everything” (27.6 %)
- Far distance between work locations (23 %)
- Improper utilization of KS tools (21 %)
- Lack of KS tools and assets (14 %)
- The culture of “it is shame to ask” (8 %)
- The barrier of "different gender" (6 %)
- Other barriers (5 %)

After testing the correlation and the regression for the dependent and independent variables in our conducted survey, we concluded that the personal willingness of an employee to share his/her knowledge with other employees is not related to gender, total years of experience or duration of employment. However, we noticed significant relationship between the employee's willingness to share knowledge with the levels of job security and trust inside the organization.

In the following sub-section, we discuss some of the identified KS barriers:

5.1 Insufficient Time

As you should have noticed, this barrier got the highest ranking (68%) by the respondents in our survey. Indeed lack of sufficient time to practice tacit-knowledge transfer between employees is an important barrier to the success of the KM spiral. Even when an organization succeeds in creating a knowledge sharing spirit among its employees, the knowledge transfer processes do not work correctly if the usual day-to-day production works consume all the employees' times.

The workload of the managers themselves is also an important factor. Obviously these managers would not be able to identify the members who need knowledge sharing unless they spend sufficient time to review and locate such need.

This issue can be resolved when knowledge sharing becomes one of the day-to-day job tasks that are considered in the job targets and the job incentives.

By including different socialization activities (team events, workshops, etc) in the work calendar of each group, we believe that Siemens has succeeded so far in creating a work culture that considers knowledge-sharing to be part of the business drivers rather than considering it to be a cost factor.

5.2 Cultural Barriers & Lack of Trust

GCC countries are mixed culture societies in which a genuine percentage of each country's population is from foreign nationalities. For example, the UAE relies heavily on foreign workers from over 200 countries, who make up 85% on the country's population [4]. Such mixtures of cultures, nationalities, ethnic groups, religions and languages are real challenges for tacit knowledge transfer processes.

As trust and comfort are necessary for achieving a smooth tacit knowledge transfer, it is sometimes difficult to provide such environment when varieties of cultures and languages are present. People used to trust those who share with them the same culture, language and values. It is therefore necessary for the organization's management to create the necessary environment of trust and comfort among all workers and managers. Such challenging mission can be made easier when the organization gives more emphasis on socialization activities. These activities would of course have financial load on the overall business in the short term; however they will definitely have long-term benefits when they contribute to the success of knowledge creation and knowledge sharing processes.

Nonetheless, management's failure to break these cultural and language barriers may create additional demotivators for the overall KM process like:

- Grouping and lobbying between workers inside the work space, which provide fuel to the office politics. Consequently an uncomfortable work environment that resists knowledge sharing is created.
- Lack of trust and respect between employees.

Siemens in the Middle East has so far managed to handle this challenging task in a proper way. The results of our survey show more feeling of trust inside Siemens Middle East (70%) compared to other companies in the Middle East (55%). See Figure 8.

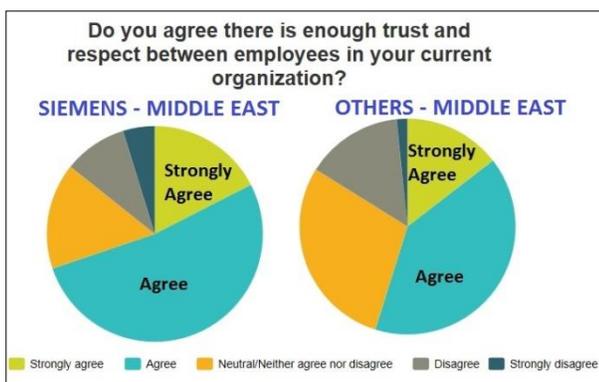


Figure 8: Survey Results: Trust inside Middle East organizations

5.3 Job Security

It's obviously noticed that many workers are reluctant to share their knowledge with others as they may think that sharing knowledge can put their job security at risk. Although such concern is somehow comprehensible, the workers must understand that the aim of knowledge sharing is to improve the overall knowledge management process. As a result of such

improvement, both workers and their organizational business will be benefitted.

A credit shall be given to Siemens in the Middle East as the company succeeded so far in building a reputation of secured work environment. The results of our conducted survey show that good feeling of job security is higher at Siemens in the Middle East (75%) compared with other companies in the same region (52%). See Figure 9.

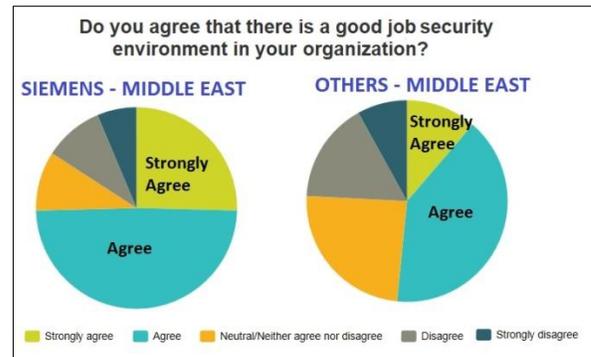


Figure 9: Survey Results: Job security inside Middle East organizations

This itself is a great achievement, given that the unstable global market turned many organizations into hire & fire hubs. The enforced Competency Management Tools make it mandatory for each manager at Siemens to jointly discuss and plan the career path of his/her employees at each stage of the employment duration.

5.4 Implementing KM Practices within the Division's Boundaries

This is a factor that Siemens – like many other large organizations – needs to carefully control as it influences multiple sub-factors. Although the knowledge sharing tools are accessed by most of the organization's divisions, there is still low emphasis on the face-to-face interactions between the employees of different divisions.

Such physical interaction might not look vital when efficient Web 2.0 and online tools are utilized, however there should be no dispute that the local working culture in the GCC is still more comfortable with the conventional face-to-face tacit knowledge transfer procedures. Siemens management has already identified the importance of such physical interactions between the employees of each division, however we still believe that some parallel efforts – even with smaller magnitude - shall be made to activate the physical interactions between different divisions.

5.5 Lack of KM Performance Indicators

As indicated in section 3 of this case study, the knowledge spiral processes shall be persistently monitored in order to ensure that each and every knowledge transfer process is sufficiently active. Although some organizations take KM tasks seriously, they fail to create suitable monitoring mechanism for their KM processes. As a result, their pilot KM projects fail.

However, as mentioned earlier, Siemens was a pioneer in developing a Maturity Model to monitor and analyze all KM

activities. For example, Siemens created different tools to measure the personal competency level for each job function.

Both the employee and his/her manager enter their assessment on every knowledge aspect, and then they both view their different assessments on the same charts. The final step in this exercise is to conduct a discussion session between the employee and the manager in order to agree on the necessary actions (e.g. training courses, mentoring, etc) which are required to bridge the knowledge and experience gaps.

5.6 Loss of Knowledge through Staff Leaving the Organization

As a significant part of the work-force in the GCC is from foreign single expats, frequent changing of jobs is very common. Many of them are willing to relocate if a slightly better job offer is available. For example, almost 90% of the professionals surveyed in the UAE are ready to change their jobs and more than 60% are searching online, according to a LinkedIn survey's finding[7]. Consequently, maintaining the expertise within a GCC organization is not an easy challenge.

Loss of staff means loss of particular tacit knowledge for the old employer. Usually, for a KM-driven organization, such loss of staff would not have major impact on the overall knowledge management process as a genuine part of the necessary tacit knowledge is already shared between employees. However, this is based on the assumption that most of the employees spend sufficient time inside the organization so that they would participate in all phases of the knowledge spiral processes.

It should be therefore sensible to conclude that the concept of spiral knowledge (SECI Model) does not work perfectly when the created tacit knowledge frequently leaves the spiral's space. As Siemens in the GCC has succeeded so far in maintaining a reasonable staffing stability, it could reduce the negative impact of this general phenomenon in the GCC market.

5.7 Lack of Incentives

By creating the culture of "sharing is caring" among the employees, transferring tacit knowledge becomes one of the business values of each member. The success level of creating such business value reflects the KM maturity level of the organization. However, it is also necessary to provide personal knowledge-sharing incentives in order to speed up the knowledge spiral process and to motivate those employees who are still unwilling to voluntarily share their knowledge with others.

We noticed a very nice practice related to the rewards by the Digital Factory division and the Process Industry & Drives divisions of Siemens in the Middle East. It is called "Small Gift Recognitions. These are gift vouchers which are distributed to each business unit within the division so that a manager can immediately reward his/her employees without the need of formal top management approval. Although such rewards are not dedicated to KM activities only, they can be very useful motivators for the tacit knowledge transfer processes. We would therefore recommend dedicating part of these gift vouchers to the employees who are more active than others in the knowledge sharing events and workshops.

5.8 Geographically Distributed Work Locations

Although face-to-face interactions are not vital for the success of tacit knowledge transfer processes when alternative communication technologies are sufficiently available, such face-to-face interactions are still strongly recommended in order to increase the efficiency and the speed of the knowledge sharing activities.

As Siemens offices in the Middle East are distributed in 37 locations inside 15 different countries [12], it is indeed impractical and financially unfeasible to maintain high frequency of physical meetings between the employees of different locations. In order to overcome such barrier, Siemens decided globally to adopt the concept of Lead Country offices in which most of the technical and sales teams are based.

Although some neighbor countries of a Lead Country do have their own technical and sales personnel, some of them basically rely on the main competence centers which are located in the Lead Country. This concept ensures that most of the tacit knowledge is located in a geographically limited area where it is easy to enforce face-to-face knowledge sharing practices.

Siemens assigned two Lead Countries for its business in the Middle East: (1) UAE (2) KSA. The later has had its own standalone technical, sales and management teams. Nevertheless all remaining 15 Middle East countries shown in Figure 10 are linked to the Lead Country of UAE in which the main technical, sales and management teams are located.



Figure 10. Siemens in the Middle East [12]

5.9 Improper Utilization of Knowledge Sharing Tools

Although the availability of many knowledge sharing tools is an important sign of knowledge-driven business practices, it might become a cause of confusion and disruption for those employees who are not familiar with these tools or do not utilize them efficiently and sufficiently in their day-to-day business activities.

In order to avoid such improper utilization of tools, Siemens made it mandatory for every employee to complete his/her assigned training sessions within a certain period of time. An electronic training certificate is automatically generated by the system whenever the employee successfully completes the online test of an e-Learning training session. Then it is the responsibility of the employee to present the certificates of all mandatory courses to the line manager.

However, although the procedure is sufficiently structured in the system, and there is a persistent follow up to complete the

assigned training courses in a timely manner, some employees still fail to complete all the training courses on time either because they didn't have time due to work load, or because these trainings are not part of their incentive targets. We therefore recommend that timely completion of the mandatory tools-familiarization-courses shall be included in the personal targets of the employees.

Furthermore, some of the KM tools do not have dedicated training sessions either because they are very user-friendly, or because they are quite new tools. For both cases, management shall ensure that proper induction is given for the employee so that improper utilization of the tools can be avoided.

6. CONCLUSIONS

There is a well-known saying in Germany which The Economist [15] believed that it summarizes the strong and weak points of Siemens: "If Siemens only knew what Siemens knows .."

Nonetheless, we believe that Siemens could prove this opinion wrong many times after year 2001 when it was frequently named the Overall European MAKE Winner. Certainly, nowadays we can comfortably state that: Siemens does know what Siemens knows. This could not have been achieved without applying the best KM practices.

The variety and quality of knowledge sharing tools that Siemens provided for its employees demonstrate that Siemens is a good example of a KM-driven company. Though we've presented here our observations on the weak cross-division socialization processes and our comments on some tool utilization practices, we still believe that - in general - such knowledge sharing tools are part of the key success factors which Siemens could wisely employ so far to drive its business in the Middle East region and to create the necessary knowledge sharing culture among its employees. This conclusion is strongly supported by the presented results of our conducted survey questionnaire.

In our study, we emphasized on the need of persistent KM processes' monitoring to ensure that the knowledge creation and sharing techniques are sufficiently active. We presented Siemens Knowledge management Maturity Model (KMMM) which Siemens uses to monitor the performance of the KM processes.

Our conducted survey shows that the most preferred method by employees for sharing tacit knowledge inside organizations is personal meetings/workshops. Therefore companies need to focus on increasing the socialization activities for their employees in order to motivate the KS processes.

We also discussed in this case-study the potential barriers which face the Knowledge Spirals of Siemens and other similar multinational organizations in the Middle East region. The main KS barriers that face organizations in the Middle East are concluded through the conducted survey questionnaire. Nevertheless a priority rating is given for each barrier based on its frequency results in the survey. The top five KS barriers are: Lack of time, Lack of incentives, Cultural & language barriers, Lack of cross-division communications and Lack of Lessons-Learned sessions.

We briefly presented our recommendations for the ways out in order to break some of the barriers, however we hope this study will motivate more researchers in the near future to carry out additional detailed analysis for each presented barrier so that more-comprehensive and detailed solutions can be developed.

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