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Methods and Practices of Tacit Knowledge Sharing Within an Enterprise: an Empirical Investigation

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Abstract: *The paper focuses on the internal knowledge sharing, namely on the methods and practices used in the case of tacit knowledge exchange among the individuals within an enterprise. Therefore, the first aim of the paper is to present the methods and practices that are recommended by knowledge management's experts in the process of tacit knowledge sharing. The second research purpose is to determine which of those methods and practices are most frequently used by surveyed enterprises and how employees evaluate their utility in tacit knowledge sharing. In order to achieve the second purpose of the research, a survey was carried out in 153 enterprises located in the region of Wielkopolska in Poland, operating on domestic and foreign market.*

The first section of the work provides a brief summary of guidelines on tacit knowledge sharing within an enterprise highlighted in the relevant literature and a set of methods and practices that are used in tacit knowledge sharing which are

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recommended by the specialists in the field of knowledge management. Then the paper presents the results of own study on the surveyed group of enterprises. In the concluding remarks possible implications for the development of tacit knowledge sharing are suggested.

The research results allow the conclusion that according to what is reported in the literature, tacit knowledge sharing is associated with broad defined staff training system. So exchange of tacit knowledge mainly takes two forms in surveyed enterprises: collective learning and transmission of accumulated previously knowledge to other employees within a company. However, as the research results suggest, the degree of using methods and practices for tacit knowledge sharing could be higher. Rather small level of tacit knowledge sharing in surveyed enterprises may be caused by insufficient activities focused on developing a strong organizational culture based on trust and cooperation.

Introduction

Employees should share knowledge with each other within the knowledge management system to gain maximum performance in business activity. The methods and practices by which knowledge is shared within different kinds of organizations belong to the core issues in knowledge management. Our study on knowledge sharing is indeed performed from a perspective of knowledge management methods and practices that can facilitate this process. Therefore, in this paper knowledge management system is considered as a set of proper methods and practices of sharing knowledge in an enterprise.

Knowledge sharing, as define this phenomena for example D. Hong, E. Suh and CH. Koo (2011), is the process by which knowledge held by an individual is converted into a form that can be understood, absorbed and used by other individuals through channels or networks between knowledge providers and seekers. Researchers who are training to explain the term knowledge sharing usually emphasize the collective character of this process and that it takes place in direct knowledge exchange among people. Thus it is important to create and shape relationships among co-workers, and various social networks that facilitate knowledge sharing within an enterprise (see Fan, Ku, 2010; Hong et al., 2011; Renzl, 2008; Szulczyńska, 2009).

The paper focuses on the internal knowledge sharing, namely on the methods and practices used in the case of tacit knowledge exchange among the individuals within an enterprise. It has to be stressed that the typical characteristics of knowledge is essential in the selection of appropriate methods or practices to share effectively a specific type of knowledge (see

Majewska, Szulczyńska, 2012). Therefore, the first aim of the paper is to present the methods and practices that are recommended by KM experts in the process of tacit knowledge sharing. The second research purpose is to determine which of these methods and practices are most frequently applied in surveyed enterprises and how employees evaluate their utility in tacit knowledge sharing. In order to achieve the second purpose of the research, a survey was carried out in 153 enterprises located in the region of Wielkopolska in Poland, operating on domestic and foreign market.

This paper is organized as follows: the first section of the work provides a brief summary of guidelines on tacit knowledge sharing within an enterprise highlighted in the relevant literature, and a set of methods and practices that are used in tacit knowledge sharing which are recommended by the specialists in the field of KM. Then, the paper presents the results of own study on the surveyed group of enterprises. Finally, in the concluding remarks, possible implications for the development of tacit knowledge sharing within an enterprise are suggested.

Tacit knowledge sharing among workers within an enterprise

It is much more difficult for an enterprise to capture, share, and store tacit knowledge than explicit knowledge. Successfully enterprises effectively develop and accumulate tacit knowledge through various methods and practices of knowledge sharing among employees that is vital in gaining a competitive advantage. Then, the intensifying tacit knowledge sharing gives a chance, such crucial for sustaining a competitive advantage, to develop tangible assets as an intellectual capital (see Leonardi, Treem, 2012; Majewska-Bator, Bator, 2009; Fay, Furu, 2008; Majewska, Bator, 2006; Szulczyńska, 2005).

Tacit or explicit knowledge is sharing with other employees directly by personal contacts, or indirectly through information and communication technology (ICT). However, compared to explicit knowledge exchange, the tacit knowledge is primary shared through direct interaction among individuals and groups at various levels within an enterprise. To a large extent it depends on the kind of organizational culture which should promote social networks development (e.g. integration meetings and trips; initiation meetings among employees who need to cooperate, circles of interest), trust and collective work, solidarity and egalitarianism in order to obtain an increase in the sense of unity and greater social cohesion among members of an enterprise. Such a culture should also include a system of rewards that facilitates collective action and learning. In other words, this type of culture

is the collaborative environment for knowledge sharing among its members. So the main obstacle in spreading knowledge sharing behaviors within an enterprise is a bureaucratic and hierarchical culture based on the cult of the individual and promoting elite thinking.

Information and communication technology (ICT), in turn, enables creating an organization memory through which an enterprise can capture tacit and explicit knowledge resources and share them within an organization. Information and communication technology facilitates sharing of tacit knowledge (like expert systems, extranets and intranets, databases, videoconferences, virtual bulletin boards or collaboration software like groupware), but is not able to replace direct contact and mutual relations among employees. So that in this case information and communication technology is primarily intended to facilitate collaboration and foster the ability of people to work together without personal contact. Therefore, information and communication technology is very useful in the situation when employees are physically separated from one another in their workplace and cannot communicate directly (Leonardi, Treem, 2012; Hong et al., 2011; Majewska-Bator, Bator, 2009; King, Marks, 2008; Majewska, 2006; Majewska, Bator, 2006).

The main purposes of knowledge sharing tools and practices are to exchange existing personal knowledge in order to create new knowledge, and that knowledge does not go away from the company with a worker who has it. Effective knowledge sharing methods and practices allow individuals also to reuse and regenerate existing knowledge, and can leverage the level of cooperation among workers within an enterprise. Enterprises should select methods and develop routines due to knowledge sharing process among their employees. Once such system of sharing knowledge is developed, knowledge belonging to one person, usually called an expert, moves to another employee, which results in an increase of organizational tacit knowledge resources, and thus the productivity achieved by an enterprise.

In the knowledge management literature experts are very often treated as individuals who are seen by employees having more tacit knowledge about a particular domain than other people. It is worth stressing that the methods and practices of tacit knowledge sharing are especially useful in developing new products and processes, which is the key to sustaining a competitive advantage on a market. Thus new product and process development should also take place among various experts working together in a task team. Then team members can share their cross-disciplinary knowledge during collective action (e.g. product design, product analysis, simulation testing) (see Leonardi, Treem, 2012; Zhen et al., 2012; Hong et

al., 2011; Fan, Ku, 2010; Majewska-Bator, Bator, 2009; Szulczyńska, 2007).

In the literature of the subject various methods and practices of tacit knowledge sharing are described. Among them, the most frequently mentioned seem to be just those taken into account in the empirical investigation presented in this paper. They include the following methods and practices recommended for tacit knowledge sharing, not only in an enterprise:

- Employees and management meetings, where current problems and ways of solving them are discussed.
- Reports from projects that failed and presenting them to the board meetings or other employee groups.
- Pursuit of training a successor.
- Different types of mentoring and coaching.
- Developing and providing best practices databases to employees.
- Participation in task teams.
- Rotation of staff in various workstations.
- Visits by employees in other departments in order to learn.
- Education system of managerial staff by the practice in various company units.
- Teams of individual learning managers.
- Sharing of knowledge accumulated on previous work stations.
- Transfer of knowledge by employees who took part in training other staff members.
- Analysis of the reports prepared by the sellers and the people involved in client services.
- Organizing knowledge fairs.
- Boxes of submitting rationalization projects and ideas of employees.

Material, methodology and research results

In this research the authors decided to include a set of methods and practices usually used in sharing of tacit knowledge in an enterprise, which has been presented above. The study covered 153 enterprises whose structure according to selected segmentation criteria is shown in Table 1. In the surveyed sample small enterprises with Polish capital and operating on the domestic market are dominant. So the research results can be primarily related to such group of enterprises. It should also be emphasized that our research is not a representative survey due to the insufficient sample size.

However, on the basis of research results some conclusions of general nature about the preferences of using certain tacit knowledge sharing methods and techniques, and their utility in this process can be drawn.

Table 1. Structure of surveyed enterprises according to segmentation criteria in %

Size of enterprises according to the number of workers			Capital			Scope of market	
Small (1-49)	Medium (50-249)	Large (250 - ...)	Polish	Mixed	Foreign	Domestic	Foreign
47.68	25.83	26.49	63.82	18.42	17.76	63.40	36.60

Source: own calculation.

At the beginning, the frequency of using 15 methods and practices considered in the study was calculated as their percentages in the total sample of enterprises and according to the adopted segmentation criteria of researched companies (see Table 3). The most frequently applied methods and practices of tacit knowledge sharing in surveyed enterprises were: employees and management meetings where current problems and ways of solving them are discussed; transfer of knowledge by employees who took part in training other staff members; and sharing of knowledge accumulated on previous work stations. Among the least used methods and practices there were boxes of submitting rationalization projects and ideas of employees, education system of managerial staff by the practice in various company units, and organizing knowledge fairs.

In all considered groups of enterprises in the first place there were employees and management meetings, where current problems and ways of solving them are discussed. The frequency of applying certain methods and practices increases with the growth in the size of an enterprise and the share of foreign capital. This type of tendency has also appeared in the scope of market, but only in the case of 6 methods and practices. However, Spearman's rang correlation analysis has confirmed statistically significant relationship on the level 0.05 only for the dependency between the percentage frequency values of using considered methods and practices and the share of foreign capital. The value of Spearman's rank correlation coefficient for this relationship was 0.39. But this difference in favor of foreign capital decreases over time, which shows a comparison of the results of current

research with previous studies on the issue of knowledge sharing in enterprises (see Majewska-Bator, Bator, 2009).

The application levels of considered tacit knowledge sharing methods and practices were calculated for enterprises in total as well as for their groups (Table 2). A low application level means that an enterprise uses 1-5 considered methods and practices, medium 6-10, and 11-15 high. The results have shown that up to 66.67% of surveyed enterprises used less than 6 of considered methods and practices. This situation points to a rather small level of tacit knowledge sharing by the employees of surveyed enterprises. The largest percentage of enterprises with mixed capital was characterized by high application levels of researched methods and practices. In turn, the largest number of medium-sized enterprises reached the lowest application levels.

Table 2. Application levels of considered tacit knowledge sharing methods and practices in surveyed enterprises in total and by their groups in %

Application level	Total	Size of enterprises			Capital			Scope of market	
		Small	Medium	Large	Polish	Mixed	Foreign	Domestic	Foreign
Low	66.67	66.67	74.36	60.00	47.42	48.15	57.14	47.42	67.01
Medium	27.45	26.39	23.08	32.50	43.30	40.74	35.71	43.30	28.87
High	5.88	6.94	2.56	7.50	9.28	11.11	7.14	9.28	4.12

Source: own calculation.

Then the following procedure of determining the ranking of considered methods and practices according to their degree of utility in the opinion of employees working in researched enterprises was applied. First, the utility of these methods and practices was determined basing on the grades given by respondents. Respondents evaluated their utility on a scale from 1 (little utility) to 5 (large utility). Secondly, we calculated arithmetic means and standard deviations of scores granted by employees to rank particular methods and practices by these statistical measures. The obtained results allowed us to assign a successive position from 1 to 15 to a given method or practice (see Table 4).

Table 3. Frequencies of using tacit knowledge sharing methods and practices in surveyed enterprises in total and by their groups (in %)

Methods and practices	Total	Size of enterprises			Capital			Domestic market	Foreign market
		Small	Medium	Large	Polish	Mixed	Foreign		
Employees and management meetings where are discussed current problems and ways of solving them	68.87	65.28	69.23	75.00	63.92	81.48	75.00	70.10	67.86
Reports from projects that failed and presenting them to the board meetings or other employee groups	33.11	26.39	38.46	40.00	29.90	37.04	46.43	37.11	28.57
Pursuit of training a successor	29.14	25.00	38.46	27.50	24.74	48.15	25.00	25.77	33.93
Developing and providing best practices databases to employees	35.76	37.50	28.21	40.00	28.87	44.44	53.57	31.96	42.86
Rotation of staff in various workstations	33.11	27.78	30.77	45.00	28.87	37.04	42.86	28.87	39.29
Different types of mentoring and coaching	35.76	34.72	35.90	37.50	29.90	51.85	39.29	38.14	30.36
Education system of managerial staff by the practice in various company units	13.91	15.28	5.13	20.00	10.31	22.22	17.86	11.34	17.86
Teams of individual learning managers	21.19	18.06	15.38	32.50	19.59	18.52	32.14	22.68	19.64
Organizing knowledge fairs	11.92	15.28	12.82	5.00	10.31	11.11	21.43	10.31	16.07
Sharing of knowledge accumulated on previous work stations	40.40	50.00	25.64	37.50	29.18	40.74	42.86	40.21	39.29
Transfer of knowledge by employees who took part in training other staff members	40.40	37.50	46.15	40.00	39.18	37.04	46.43	41.24	37.50
Analysis of the reports prepared by the sellers and the people involved in client services	29.14	31.94	20.51	32.50	24.74	25.93	50.00	24.74	37.50
Boxes of submitting rationalization projects and ideas of employees	13.91	11.11	10.26	22.50	6.19	22.22	32.14	9.28	21.43
Participation in task teams	22.52	25.00	17.95	22.50	20.62	25.93	25.00	22.68	21.43
Visits by employees in other departments to learn	21.19	23.61	15.38	22.50	19.59	14.81	35.71	18.56	26.79

Source: own calculation.

Table 4. Utilities of using tacit knowledge sharing methods and practices in surveyed enterprises in the opinion of the respondents: the arithmetic mean and standard deviation

Position	Methods and practices	Arithmetic mean	Standard deviation
1	Employees and management meetings where are discussed current problems and ways of solving them	4.11	0.10
2	Reports from projects that failed and presenting them to the board meetings or other employee groups	3.89	0.16
3	Pursuit of training a successor	3.87	0.12
4	Developing and providing best practices databases to employees	3.82	0.12
5	Rotation of staff in various workstations	3.82	0.13
6	Different types of mentoring and coaching	3.78	0.16
7	Education system of managerial staff by the practice in various company units	3.73	0.16
8	Teams of individual learning managers	3.45	0.19
9	Organizing knowledge fairs	3.43	0.17
10	Sharing of knowledge accumulated on previous work stations	3.30	0.25
11	Transfer of knowledge by employees who took part in training other staff members	3.29	0.16
12	Analysis of the reports prepared by the sellers and the people involved in client services	3.25	0.19
13	Boxes of submitting rationalization projects and ideas of employees	3.19	0.20
14	Participation in task teams	3.09	0.23
15	Visits by employees in other departments in order to learn	2.88	0.23

Source: own calculation.

Thanks to this procedure the ranking of analyzed methods and practices according to their degree of relevance in the process of tacit knowledge sharing was prepared. The first three places in this ranking were occupied by employees and management meetings, where current problems and ways of solving them are discussed, reports from projects that failed and presenting them to the board meetings or other employee groups, and pursuit of training a successor. The last position was held by visits by employees in other departments in order to learn.

Additionally, the analysis of researched methods and practices utility given by respondents shows that all but one obtained arithmetic means higher than 3 on the five-point scale. That is why a rather small variation of the utility evaluations, measured arithmetic means occurred, as all of them were in the range from 2.88 to 4.11.

It was also decided to check the extent to which surveyed companies supported the development of knowledge sharing among their employees through information and communication technology and practices that promote social networks development (see Table 5). Respondents were asked first about the use of certain tools of ICT in order to share knowledge. The second question concerned the presence of the three methods which facilitate the development of trust and cooperation among employees in their companies. Therefore, the frequency of use these tools of ICT and practices aimed to facilitate the process of knowledge sharing within an enterprise was identified:

- Integration meetings and trips.
- Initiation meetings among employees who need to cooperate.
- Circles of interest.
- E-mail.
- Databases.
- Teleconferences.
- Videoconferences.
- Real or virtual bulletin boards
- Intranet.
- Collaboration software like groupware.

The most frequently used tools or practices aimed to facilitate the process of knowledge sharing in the total sample of surveyed enterprises were: e-mail, integration meetings and trips, real or virtual bulletin boards. The percentages of applying were the smallest for circles of interest, videoconferences, and collaboration software like groupware. In all considered groups of enterprises the first three places were also taken by the same tools or practices as in the total sample of surveyed enterprises.

Table 5. The frequency of using tools and practices aimed to support knowledge sharing in surveyed enterprises in total and by their groups (in %)

Methods and practices	Total	Size of enterprises			Capital			Domestic Market	Foreign Market
		Small	Medium	Large	Polish	Mixed	Foreign		
Practices that promote social networks development									
Integration meetings and trips	48.34	45.83	41.03	60.00	38.14	62.96	67.86	42.27	58.93
Initiation meetings among employees who need to cooperate	23.84	29.17	20.51	17.50	21.65	25.93	28.57	23.71	23.21
Circles of interest	9.27	9.72	12.82	5.00	10.31	3.70	14.29	12.37	5.36
Arithmetic mean of applying the three practices that promote social networks development		28,24	24,79	27,50	23,37	30,86	36,91	26,12	29,17
Tools of ICT									
Intranet	27.81	20.83	28.21	40.00	22.68	29.63	42.86	22.68	37.50
Databases	32.45	30.56	25.64	42.50	29.90	40.74	32.14	32.99	30.36
Teleconference	17.88	18.06	5.13	30.00	12.37	22.22	32.14	15.46	21.43
Videoconferencing	9.93	8.33	0	22.50	4.12	11.11	28.57	6.19	16.07
Collaboration software like groupware	10.60	9.72	10.26	12.50	9.28	7.41	17.86	9.28	12.50
E-mail	55.63	52.78	51.28	65.00	53.61	59.26	57.14	55.67	55.36
Real or virtual bulletin boards	41.72	36.11	46.15	47.50	32.99	59.26	50.00	37.11	48.21
Arithmetic mean of applying the seven tools of ICT		25,20	23,81	37,14	23,56	32,80	37,24	25,63	31,63

Source: own calculation.

Only in the case of intranet, collaboration software like groupware, and real or virtual bulletin boards, the percentage of using them increased with the growth in the size of an enterprise. The frequency of applying such tools and practices like circles of interest, e-mail, databases, real or virtual bulletin boards, and collaboration software did not grow with the growth in the share of foreign capital. However, the percentage of using all the tools and practices was higher for foreign-owned enterprises compared to researched companies with Polish capital only. This advantage of foreign-owned enterprises was also confirmed by the calculated average use for all considered groups of enterprises in the empirical research (see Table 5). The scope of market turned out, as might have been expected, to be the more significant factor affecting the frequency of using considered tools and practices by researched enterprises for tools of ICT than for practices that promote social networks development.

Conclusions

The research results allow for the conclusion that, according to what is reported in the literature, tacit knowledge sharing is associated with broadly defined staff training system. So exchange of tacit knowledge mainly takes two forms in surveyed enterprises: collective learning and transmission of accumulated previously knowledge to other employees within a company.

However, as the research results suggest, the degree of applying methods and practices for tacit knowledge sharing could be higher. The tacit knowledge sharing means primary direct exchange of knowledge among employees, and it requires different kinds of support in order to develop trust and reduces the resistance against transfer of knowledge to others. This is due to the fact that without trust there is no effective knowledge sharing within an organization. Thus the insufficient level of tacit knowledge sharing in surveyed enterprises, which indicates that the results of the studies presented above may be caused by insufficient activities which are focused on developing a strong organizational culture based on trust and cooperation. Therefore, managers should care more about the development of favorable knowledge sharing environment and be themselves more involved in various initiatives enhancing a culture based on trust and cooperation. This is desirable, since such an attitude of managers also shows employees which values and practices are preferred in an enterprise.

References

- Fan Yi.-W., Ku E. (2010), *Customer focus, service process fit and customer relationship management profitability: the effect of knowledge sharing*, „The Service Industries Journal”, Vol. 30, No. 2, <http://dx.doi.org/10.1080/02642060802120141>.
- Fay C. F., Furu P. (2008), *Top management incentive compensation and knowledge sharing in multinational corporations*, „Strategic Management Journal”, Vol. 29, No. 12, <http://dx.doi.org/10.1002/smj.712>.
- Hong D., Suh E., Koo Ch. (2011), *Developing strategies for overcoming barriers to knowledge sharing based on conversational knowledge management: A case study of a financial company*, „Expert Systems of Applications”, Vol. 38, No. 12, <http://dx.doi.org/10.1016/j.eswa.2011.04.072>.
- King W. R., Marks Jr. P. V. (2008), *Motivating knowledge sharing through a knowledge management system*, „The International Journal of Management Science”, Vol. 36, No. 1, <http://dx.doi.org/10.1016/j.omega.2005.10.006>.
- Leonardi P. M., Treem J. W. (2012), *Knowledge management technology as a stage for strategic self-presentation: Implications for knowledge sharing in organizations*, „Information and Organization”, Vol. 22, No. 1, <http://dx.doi.org/10.1016/j.infoandorg.2011.10.003>.
- Majewska M. (2006), *Warunki i metody rozwoju współpracy między pracownikami w ramach zarządzania wiedzą* [in:] *Marketing przyszłości. Trendy – Strategie – Instrumenty. Interakcje w tworzeniu partnerstwa organizacji z otoczeniem*, „Zeszyty Naukowe Uniwersytetu Szczecińskiego”, No. 438.
- Majewska M., Bator P. (2006), *Kultura organizacyjna sprzyjająca zarządzaniu wiedzą* [in:] A. Stabryła (ed.), *Doskonalenie systemów zarządzania w społeczeństwie informacyjnym*, Wydawnictwo Akademii Ekonomicznej w Krakowie, Kraków.
- Majewska M., Szulczyńska U. (2012), *Innowacje przyrostowe jako źródło postępu technologicznego w gospodarce opartej na wiedzy* [in:] J. Buko (ed.), *Gospodarka elektroniczna. Wyzwania rozwojowe*, tom I, „Zeszyty Naukowe Uniwersytetu Szczecińskiego”, No. 702, „Ekonomiczne Problemy Usług”, No. 87.
- Majewska-Bator M., Bator P. (2009), *Proces dzielenia się wiedzą w przedsiębiorstwie – wyniki badań empirycznych* [in:] H. Babis, R. Czaplewski (ed.), *Rynki przesyłu i przetwarzania informacji – Stan obecny i perspektywy rozwoju*, część II, „Zeszyty Naukowe Uniwersytetu Szczecińskiego”, No. 544, „Ekonomiczne Problemy Usług”, No. 35.
- Renzl B. (2008), *Trust in management and knowledge sharing: The mediating effects of fear and knowledge documentation*, „The International Journal of Management Science”, Vol. 36, No. 2, <http://dx.doi.org/10.1016/j.omega.2006.06.005>.
- Szulczyńska U. (2005), *Kapitał intelektualny w działalności innowacyjnej przedsiębiorstw* [in:] M. G. Woźniak (ed.), *Nierówności społeczne a wzrost gospodarczy. Kapitał ludzki i intelektualny*, część II, Wydawnictwo Naukowe Uniwersytetu Rzeszowskiego, Rzeszów.

- Szulczyńska U. (2007), *New product development on the B2B markets* [in:] W.M. Grudzewski, I. Heiduk, S. Trzcieliński (ed.), *Value Stream Activities Management*, IEA Press International Ergonomics Association, Madison.
- Szulczyńska U. (2009), *Zarządzanie procesami dzielenia się wiedzą dla potrzeb działalności innowacyjnej przedsiębiorstwa* [in:] H. Babis, R. Czaplewski (ed.), *Rynki przesyłu i przetwarzania informacji – stan obecny i perspektywy rozwoju*, część II, „Zeszyty Naukowe Uniwersytetu Szczecińskiego”, No. 544, „Ekonomiczne Problemy Usług”, No. 35.
- Zhen L., Song H.-T., He J.-T. (2012), *Recommender systems for personal knowledge management in collaborative environments*, „Expert Systems of Applications”, Vol. 39, No. 16, <http://dx.doi.org/10.1016/j.eswa.2012.04.060>.