
The relation between knowledge transfer and productivity in knowledge work

Abstract

Within the modern ICT-enabled knowledge work context, questions related to access to information and knowledge-sharing practices have received growing research attention. However, there is still surprisingly little empirical research exploring the actual impact of effective knowledge transfer to work productivity. The purpose of this paper is to fulfil this research gap and empirically study whether there are any differences in subjective work productivity based on how the knowledge worker perceives the level of information flow and knowledge transfer within the organisation. Furthermore, the aim is to determine whether there are differences between the extent to which the positively experienced information flow and knowledge transfer impact experienced work productivity. Through the survey method, data were collected from 998 knowledge workers from Finland in various sizes of organisations. The quantitative data were analysed using SPSS software descriptive statistics, correlations and U-tests. The practical value of the study is in the analysis results. The paper presents the value of information flows and knowledge transfer to knowledge work productivity. This increased understanding will help managers to evaluate the effects of investing in supporting information flows and knowledge transfer within their organisations.

Knowledge transfer, information flow, work productivity, organisational performance, knowledge work, survey

Introduction

For an organisation to perform its activities successfully, it needs to create, share and utilise information and knowledge (Grant, 1996; Nonaka, 1994). Often the problem is not being short of knowledge with which to operate, but rather that knowledge is scattered throughout the organisation. The larger the size, the vaster the geographical dispersion and the faster the operating speed of the organisation, making it even more essential for information and knowledge to flow effectively throughout the organisation (Nissen, 2002).

In knowledge-intensive organisations, the effective flows of information and knowledge are emphasised even more, as they are the main resources of knowledge workers (Blackler, 1995). Moreover, in previous studies (see e.g. Kianto et al., 2016 about knowledge management (KM) processes), it has been noted that the level of information flows and knowledge sharing within organisations is related to work satisfaction. But what does this phenomenon mean from the viewpoint of work productivity? As the positive correlation of work satisfaction and productivity is quite well known (Miller and Monge, 1986; Spence Lashinger, Finegan and Shamian, 2002) and can be rationalized in the context of knowledge work (Bakker and Bal, 2010), this leads to the following question: What is the link between poor knowledge transfer and knowledge worker's productivity. Previous research has identified the relation between knowledge transfer and job satisfaction (see e.g. De Vries et al. 2006), but there is a lack of empirical research that looks more carefully at the relation between knowledge transfer and work productivity specifically.

In this paper we examine the actual impacts of knowledge-transfer dissatisfaction on subjective work productivity in the context of knowledge work. The study was conducted using survey method including 998 knowledge workers from Finland. The results tackle subjective work productivity rather comprehensively, as work productivity is evaluated from several dimensions, addressing such issues as the relation between the knowledge workers' own goals and achieved results, quality issues, the relevance of tasks and clients' expectations. Knowledge transfer is examined in the survey with more limited variables, but they still cover the important perspectives of the individual and organisation (Schwartz, 2007).

Theoretical background

Knowledge transfer

Knowledge sharing, knowledge transfer and knowledge flows are central concepts in the knowledge management literature. Knowledge sharing can be defined as a voluntary, conscious act between and among individuals or organisations that results in joint ownership of knowledge between the source and the recipient (Davenport, 1997; Lee, 2001; Bock and Kim, 2002; Ipe, 2003, Lin and Lee, 2004; King, 2006). Simply put, knowledge sharing is providing one's knowledge to others (Ipe, 2003, Ryu et al., 2003). The same definition is often applied to knowledge transfer as well, as it is frequently used interchangeably with knowledge sharing, as academics are not in unison regarding their differences (cf. Paulin and Suneson, 2012; King, 2006; Schwartz, 2007). The extant literature proposes, for example, that knowledge transfer is focused and has a clear objective and recipient, whereas knowledge sharing can happen unintentionally in multiple directions and does not necessarily have a specific objective (King, 2006). Another proposed difference is the perspective of the activities: Knowledge sharing focuses on the individual's view ("people share knowledge"), while knowledge transfer takes the organisational perspective ("organisations transfer knowledge") (Schwartz, 2007). A more common distinction between the two relates to the utilisation of knowledge: Knowledge sharing is merely imparting knowledge to others, whereas knowledge transfer embraces using the shared knowledge (Argote, 1999; Darr and Kurtzberg, 2000; Bircham, 2003, Abou-Zeid, 2005; King, 2006).

Information and knowledge flows are additional interrelated concepts. Both depict how information or knowledge moves in flows from the source to the recipient or within an organisation. However, in knowledge management it is common to distinguish information from knowledge, as the latter is seen as building from pieces of information and always people-bound, whereas information can also be transferred and interpreted by information systems without human input (cf. e.g. Nonaka, 1994). Experts such as knowledge workers operate with knowledge rather than mere information (Laihonen, 2006), and thus discussing knowledge flows instead of information flows is reasonable. Even if knowledge flows have gained considerable attention, especially in early knowledge management literature (around year 2000), it seems that contemplating knowledge flows may, in fact, be discussing knowledge sharing (cf. Appleyard, 1996) or knowledge transfer (cf. Laihonen, 2006). What seems to distinguish knowledge flows from the two is that it takes to account

the place (where in the organisation knowledge is located or is transferred to) and the medium (how the knowledge is transferred from the source to the recipient). For example, Laihonen (2006, p. 129) defines knowledge flows referring to “knowledge that is transferred from one person or place to another”. Zhuge (2002, p. 24) states that a knowledge flow is “a process of knowledge passing between people” including the direction (sender and receiver), the content (knowledge) and the carrier (medium) (Zhuge, 2002, p. 24). Furthermore, the temporal aspect of knowledge transfer is also noteworthy (Szulanski et al. 2016), especially when measuring the impacts of successful knowledge transfers within organisations. In this paper we use the term knowledge transfer to depict the process of making knowledge available to others for them to use as they may.

Whichever term is being used, the fact remains that the process is by no means simple and straightforward. On its way from the source to the recipient, knowledge may face several obstacles, referred to as knowledge barriers (e.g. Paulin and Suneson, 2012), complicating its journey. Knowledge barriers can be divided in categories based on their origin. Riege (2005) identifies these to be related to individual, organisational and technological levels. Individual-related knowledge barriers are, for example, personal features (such as age, social skills, experience and education), a general lack of time and trust issues. Knowledge barriers in the organisational level include, among others, a lack of leadership in knowledge sharing, an unsupportive organisational culture and restricted knowledge flows. The technology-related knowledge barriers consist of, for example, insufficient training and support regarding information systems for knowledge transfer, and unrealistic expectations for information systems’ performance (Riege, 2005). It can be argued that organisational and technological barriers derive from the individual level, as individuals are always the actors sharing knowledge, whatever the platform.

Based on the literature about knowledge barriers (e.g. Hansen 1999; Haldin-Herrgard, 2000; Cabrera and Cabrera, 2003; Riege, 2005; Christensen, 2007), there are numerous obstacles that hinder effective knowledge transfer. However, by creating and supporting a suitable cultural, structural and technical infrastructure, management could help create a context in which it is stimulated and facilitated (van den Hooff & Huysman, 2009). By recognising typical barriers to knowledge transfer, management can steer their actions towards the elimination and prevention of these barriers. Consequently, as job satisfaction and knowledge transfer rather often go hand in hand (see e.g. Bontis et al., 2011), enhanced knowledge transfer may promote job satisfaction, which again is linked to better

productivity (Miller and Monge, 1986; Spence Lashinger, Finegan and Shamian, 2002; Kianto et al. 2016).

Knowledge transfer and work productivity

Knowledge work productivity has been studied a great deal in the previous literature since Drucker created the concept of knowledge work (1959). Measuring knowledge work productivity has been a challenge for researchers, as both inputs and outputs can be intangible, and thus difficult to define and measure (Ramirez and Nembhard, 2004; Laihonen et al., 2012). In general, recent studies have recognised that knowledge work productivity is highly related to the work environment and knowledge workers themselves (Davenport et al., 2002; Bosch-Sijtsema et al., 2009). More specifically, if a knowledge worker is able to focus on productive tasks and have all the required information and knowledge to do the task (Campbell, 1990; Palvalin et al., 2013). Several studies have focused only on the relationship between knowledge transfer and work productivity, and the results of those studies are presented next.

Goldman (1959) studied the effects of information flows on worker productivity as early as 1959 by testing a concept of circular information flow within a team to exploit all of the team's talents to improve workers' productivity. Subsequently, other researchers have also noted the link between productivity and knowledge. For example, Darr et al. (1995) found that experience and learning enabled by knowledge transfer resulted in better productivity in service organisations. Moreover, Lahti et al. (2002) have highlighted the importance of learning, as according to them the mentoring programs aimed to introduce newcomers to knowledge sources within organisations enable better task performance and thus increase workers' productivity. Furthermore, Dayasindhu (2002) states that mentoring is an antecedent of intra-organisational knowledge transfer, which increases productivity by efficiently transferring skills between workers.

Titus and Bröchner (2005) as well as Dyer and Nobeoka (2000) state that effectively managed knowledge transfer improves productivity. This is backed up by Ben-Arieh and Pollatscheck (2002), who found that information overload (often a product of poorly managed knowledge transfer) reduces productivity on both individual and organisational levels. Kang, Kim and Chang (2008) state that individual work performance is improved by effective knowledge sharing, which again is dependent on, for example, employee training and support of the top management. Haas and Hansen (2007) propose that

knowledge work productivity consists of two types of knowledge sharing (electronic documents and personal advice) as well as their content and process dimensions accompanied by three primary task performance outcomes (time savings, work quality and signs of competence), which are critical to knowledge work productivity.

The type of knowledge determines, for example, the mediums and channels through which it can be transferred (e.g. Nonaka, 2002) and how easy it is to absorb and use (e.g. Szulanski, 2002). Therefore, it can be argued that productivity varies depending on the type of knowledge (cf. e.g. Haas and Hansen, 2007). The significance of time as a factor for knowledge work-related productivity seems to be inseparable. According to Wu et al. (2004) the effectiveness of knowledge transfer sets the basis for how quickly individuals can plan and perform their tasks. Schmenner (2004) agrees by stating that productivity rises in line with the speed by which information flows through the process.

In this research, productivity is distinguished between the quantitative and qualitative output of the employees as e.g. Drucker (1999) and Parasuraman (2002) suggest for knowledge-intensive work. Another distinction is made between two productivity levels – individual productivity and team productivity. This is important because knowledge transfer may have a positive impact, especially on team productivity, while having the same negative impact on individual productivity and vice versa. For example, an open office setting makes it easier to exchange knowledge, but it also results in more distractions. Measuring productivity is challenging in the context of knowledge work due to the intangible nature of outputs and inputs (Laihonen et al., 2012). The common approach for measuring work productivity is using subjective and indirect measures even if such methods have some limitations (Ramirez and Nembhard, 2004). The quantity dimension of productivity can be measured, for example, if a worker can achieve the goals or it is possible to use time efficiently and work fluently. The quality dimension can be measured using customer satisfaction and the quality of the output evaluations. At the team level, productivity can be measured using team efficiency, which is typically evaluated worse than personal productivity (Ramirez and Nembhard, 2004; Ramirez and Steudel, 2008; Koopmans et al., 2014).

Research approach

Subjective methods, while having their limitations, are very common for measuring knowledge work productivity (Ramirez & Nembhard, 2004). Through the survey method,

data were collected from 998 knowledge workers from Finland in various sizes of organisations representing mainly public sector or public-owned corporations. The data were collected as a part of bigger study from the participating organisations that were interested in developing their work environment, and the data were also used for the organizations' own purposes. This makes the survey sub-optimal for detailed analysis on knowledge transfer, but on the other hand it offers a large data set for general analysis. The respondents completed the survey in Finnish, and the questions in this paper are translated in English.

In this paper, only the questions related to knowledge transfer were analysed in relation to productivity questions. Two knowledge transfer-related questions were:

- 1KT Operations at my workplace are open (e.g. decision-making and information flow)
- 2KT Knowledge transfer is good among the people important for my work.

The first is a higher-level question on how the organisation-level decisions and operations are experienced (van der Voordt, 2004; Schwartz, 2007). The second is a more-lower level question on how workers' experience knowledge transfer with workers closely related to respondents' work (Haas and Hansen, 2007; Schwartz, 2007). In Finnish, question 2KT includes both dimensions of knowledge and information, as both can be translated into one word, "tieto". Below are seven productivity related items:

- 1P I achieve satisfactory results in relation to my goals
- 2P I can take care of my work tasks fluently
- 3P I can use my working time for matters which are right for the goals
- 4P I have sufficient skills to accomplish my tasks efficiently
- 5P I can fulfil clients' expectations
- 6P The results of my work are of high quality
- 7P The group(s) of which I am a member work efficiently as an entity

The first three questions are connected to the quantity dimension of productivity (Reichelt and Lyneis, 1999; Drucker, 1999; Ramirez and Nembhard, 2004). Questions 5P and 6P are connected to the quality dimension of productivity (Parasuraman 2002; Ramirez and Nembhard, 2004; Erne, 2011). While the first six questions are about personal productivity, question 7P is about the team productivity (Ramirez and Nembhard, 2004; Koopmans et al., 2014). Question 4P is a control variable that is not supposed to be connected to any knowledge transfer questions (Koopmans et al., 2014).

The quantitative data were analysed using SPSS software descriptive statistics, correlations and the Mann-Whitney U-test. The role of descriptive statistics in addition to background information is to point the overall view to respondents' satisfaction to the level of knowledge transfer. Spearman's correlation analysis is used to analyse the connection between knowledge-transfer variables and productivity variables. Comparing the groups of satisfied and dissatisfied respondents offers a more practical view of the questions, and the U-test can confirm the difference. Spearman's correlation and the U-test are used instead of Pearson's correlation and the t-test because the variables are not continuous.

Results

Survey overall results

The first expectation was that the Finnish knowledge workers included in the study are not satisfied with the level of knowledge transfer. Table 1 presents the variables, means, standard deviations, skewness and kurtosis for each variable. The means for variables 1KT and 2KT are among the least satisfactory variables. This indicates that the Finnish knowledge workers are not satisfied with the knowledge transfer as expected. Although the means in both variables 1KT and 2KT are above 3.00 and the majority of the respondents have agreed that the knowledge transfer is good (see also Table 2).

Table 1. Variables, means, standard deviations, skewness and kurtosis.

Code	Key variable	Mean	Std. dev	Skewness	Kurtosis
1KT	Operations at my workplace are open (e.g. decision-making and information flow)	3.23	1.16	-0.32	-0.85
2KT	Knowledge transfer is good among the people important for my work	3.39	1.12	-0.46	-0.71
1P	I achieve satisfactory results in relation to my goals	4.09	0.81	-0.90	0.95
2P	I can take care of my work tasks fluently	4.04	0.83	-0.91	1.00
3P	I can use my working time for matters which are right for the goals	3.62	0.99	-0.61	-0.07
4P	I have sufficient skills to accomplish my tasks efficiently	4.26	0.77	-1.19	2.06
5P	I can fulfil clients' expectations	4.01	0.79	-0.78	1.00
6P	The results of my work are of high quality	4.11	0.72	-0.52	0.20
7P	The group(s) of which I am a member work efficiently as an entity	3.53	1.00	-0.56	-0.15

For the upcoming analyses, the results of variables 1KT and 2KT were recorded to the new variables, which combined the groups responding with “disagree” and “somewhat disagree” with the group “not satisfied” and the groups of “agree” and “somewhat agree” with the group “satisfied”. Respondents who neither agree nor disagree were excluded from the upcoming U-test analysis.

Table 2. Frequencies for variables 1KT and 2KT.

	Disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Agree (5)
1KT Operations at my workplace are open (e.g. decision-making and information flow)	85 (8.5%)	209 (20.9%)	216 (21.6%)	368 (36.9%)	120 (12.0%)
	Combined with the “not satisfied” group			Combined with the “satisfied” group	
	294 (29.4%)			488 (28.8%)	
2KT Knowledge transfer is good among the people important for my work	56 (5.6%)	200 (20.0%)	179 (17.9%)	428 (4.29%)	135 (13.5%)
	Combined with the “not satisfied” group			Combined with the “satisfied” group	
	256 (25.6%)			563 (56.3%)	

Correlations

Spearman’s correlations between the variables 1KT and 2KT with productivity variables 1P–7P are presented in Table 3. The results show significant positive correlations between all the variables. The strength of the correlation varies considerably between the variables, and it is very mediocre at best. Variable 4P (“I have sufficient skills to accomplish my tasks efficiently”), which is used as a control variable, as it should not be influenced by knowledge transfer, works as expected and the correlations are very low. The correlations between the variables 1KT and 2KT with productivity are, in general, very similar. However, in each case, variable 2KT has a slightly higher correlation than 1KT, which is a very interesting result. The strongest correlations between the knowledge transfer and productivity statements are with variable 7P: “The group(s) of which I am a member work efficiently as an entity”. In addition, knowledge transfer variables have stronger correlations with the quantity dimension of productivity related variables 3P, 2P and 1P.

Instead, the quality dimension of productivity related variables 5P and 6P have much weaker correlations.

Table 3. Correlations (Spearman, two-tailed).

	1KT	2KT	1P	2P	3P	4P	5P	6P	7P
1KT		.680**	.220**	.233**	.263**	.088**	.190**	.117**	.316**
2KT			.269**	.312**	.325**	.108**	.239**	.174**	.361**
1P				.716**	.543**	.441**	.526**	.602**	.359**
2P					.645**	.459**	.542**	.548**	.365**
3P						.345**	.437**	.442**	.382**
4P							.536**	.568**	.229**
5P								.660**	.370**
6P									.375**
7P									

**Correlation is significant at the 0.01 level (two-tailed).

U-test analysis

In addition to the correlation analysis, the results were also analysed using the U-test. First, the means for each productivity variable were calculated for both groups: respondents who were satisfied with variable 1KT and those who were not satisfied. Then, the same analysis was conducted with variable 2KT. The means and U-test results can be found from Tables 4 and 5.

Table 4. U-test analysis for variable 1KT: Operations at my workplace are open (e.g. decision-making and information flow).

1KT	1P	2P	3P	4P	5P	6P	7P
Means							
Satisfied	4.31	4.28	3.92	4.35	4.18	4.21	3.83
Not satisfied	3.85	3.78	3.23	4.19	3.78	4.01	3.01
Difference	0.46	0.5	0.69	0.16	0.40	0.40	0.82
U-test	*	*	*	-	*	*	*

*, significant U-test at the 0.05 level.

The results in Table 4 suggest that there is a difference in how respondents satisfied with variable 1KT and those who were not satisfied experience productivity. The difference

was the greatest in variable 7P, followed by variable 3P. The control variable 4P has the smallest between-groups difference, and it was the only one where the U-test was not significant, i.e. there is no significant difference between the groups. In the other productivity variables, the difference is significant. The U-test results show that there is a difference in how workers satisfied and not satisfied with knowledge transfer (1KT) experience their productivity.

Table 5. U-test analysis for variable 2KT: Knowledge transfer is good among the people important for my work.

2KT	1P	2P	3P	4P	5P	6P	7P
Means							
Satisfied	4.30	4.28	3.90	4.35	4.18	4.22	3.82
Not satisfied	3.79	3.69	3.17	4.16	3.74	3.96	2.98
Difference	0.51	0.59	0.73	0.19	0.44	0.26	0.84
U-test	*	*	*	*	*	*	*

*, significant U-test at the 0.05 level.

The results in Table 5 suggest that there is a difference in how the respondents satisfied with variable 2KT and those not satisfied experience productivity. This difference is the greatest in variable 7P, followed by variable 3P (as in Table 4). The control variable 4P again has the smallest between-groups difference, but this time the difference is still significant according to the U-test. In the other productivity variables, the difference is significant. Differences are greater in Table 5 than in Table 4 in every case aside from 6P, where it is smaller. The U-test results show that there is a difference in how workers satisfied and not satisfied with knowledge transfer (2KT) experience their productivity.

Summary of the results

According to the correlations and U-test analyses, there were two major findings: First, 2KT has a greater impact on productivity than 1KT, although neither is very strong. The difference between 1KT and 2KT is small, but it is clearly present in every productivity variable and in both analyses. Second, both variables 1KT and 2KT have similar order how they influence productivity: knowledge transfer has the greatest impact on experienced team productivity (7P), followed by how efficiently and fluently knowledge workers can perform tasks (3P, 2P, 1P). Quality related productivity variables (5P, 6P) have a smaller association to knowledge transfer. The control variable (4P) shows in each analysis that there is some amount of method bias (significant correlations and positive differences in

U-tests), but even if this is taken into account, there is still a difference between the groups of satisfied and not satisfied.

Discussion

The starting point for the current research was that Finnish knowledge workers were dissatisfied with knowledge transfer. Knowledge transfer was studied on two levels: the organisational level (1KT, organisations transfer knowledge) and the individual level (2KT, people share knowledge) (Schwartz, 2007). The results support our previous notion from practice that Finnish knowledge workers are indeed, according to job satisfaction surveys, least satisfied with knowledge transfer. Our survey data indicated that they were especially dissatisfied with knowledge transfer from an organisational perspective. However, it should be noted that although respondents were least satisfied with knowledge transfer compared to other variables in the survey, the overall scores for knowledge transfer variables were still slightly skewed more towards satisfied than not satisfied.

The second assumption in this study was that knowledge transfer is positively related to work productivity (e.g. Drucker 1999; Schmenner, 2004; Haas and Hansen, 2007). This study confirms this association, but the strength was quite weak. In particular, it was very weak from an organisational perspective. However, it is logical that experienced knowledge transfer with close colleagues is more important than the openness of operations at the organisational level for experienced productivity. This is in line with previous research emphasising that the role of mentoring and learning from other employees is closely linked to knowledge transfer and consequently leads to improved productivity (Darr et al., 1995; Lahti et al., 2002, Dayasindhu, 2002). The strength of the relationship between knowledge transfer and work productivity is weaker than expected. This is interesting for two possible options, is the role of external knowledge for the actual outputs of the knowledge worker smaller than expected? On the other hand, is the knowledge transfer on good level for things that matter for productivity, but on bad level for things that are secondary for productivity? Whichever the explanation is, it is certainly dependent on what kind of work is in question, as work tasks determine what kind of knowledge is transferred. As noted earlier, the type of knowledge impacts the medium of knowledge transfer (e.g. Nonaka, 2002), which again affects productivity (e.g. Haas and Hansen, 2007) from the perspective of, among others, time efficiency (Schmenner, 2004) and task performance (Wu et al., 2004).

Another interesting result to be discussed is the stronger correlation between knowledge transfer and team-level productivity. While it is natural that better knowledge transfer leads to better team productivity, it also leaves doubt that this is that the only explanation. Because productivity is measured as experienced productivity, it is possible that the relation to team productivity is not as high as it appears. Could it be that if the knowledge worker knows better what is happening in the team, it only feels that the team is more productive?

Although the relationship between knowledge transfer and work productivity was not as strong as expected, it is important to note that the results only relate to the experienced knowledge transfer and experienced productivity. They do not take into account any other important dimensions (e.g. innovations or work satisfaction) that may have a significant relationship to knowledge transfer. The actual productivity can be also improved through better work satisfaction and better innovation.

Conclusion

It is clear that knowledge transfer must be positively related to productivity, but it is not clear that experienced knowledge transfer and experienced productivity are associated. Regardless, the results of this study support the idea that there is a connection between knowledge transfer and productivity at some level. The results seem to be reliable and are approximately what was expected. For example, the control variable did not have a significant relation and the team-level productivity had the most significant association with knowledge-transfer variables.

The most important limitation of this study was that the data were not collected solely for this paper. This kind of approach enabled a large data set, but it also hindered the opportunities in data collection. In the survey, there were only the two appropriate variables purely on knowledge transfer and, as it turned out, these questions should be re-translated. Another clear limitation is that both dimensions, knowledge transfer and productivity, are subjective opinions. Subjective measures are by far the easiest way to capture this information, but at the same time, it is unknown whether the results be different with objective measures.

This paper provides a fruitful ground for future studies, as it leaves many questions open. A clear opportunity for future research would be including other parts of the survey in the analysis. Riege has presented many barriers to knowledge sharing, and some of these could be included as background variables, or researchers could define how these barriers

impact experienced knowledge transfer. Another opportunity could be to include the work satisfaction variables and study whether knowledge transfer is linked to work productivity through work satisfaction. The survey data also include two open-ended questions, which could be analysed to gain better insight into respondents' beliefs of what is important for their work productivity.

In conclusion, while this study likely leaves more questions than it gives answers, it also opens up many new possibilities for future research and highlights the importance of productivity in relation with knowledge transfer.

References

- Abou-Zeid E-S (2005) A culturally aware model of inter-organizational knowledge transfer. *Knowledge Management Research & Practice* 3(3), 146-155.
- Argote L (1999) *Organizational Learning: Creating, Retaining, and Transferring Knowledge*. Kluwer Academic Publishers, Boston.
- Bakker AB and Bal MP (2010) Weekly work engagement and performance: A study among starting teachers. *Journal of Occupational and Organizational Psychology* 83(1), 189-206
- Ben-Arieh D and Pollatscheck MA (2002) Analysis of information flow in hierarchical organizations. *International Journal of Production Research* 40(15), 3561-3573.
- Bircham H (2003) The Impact of Question Structure When Sharing Knowledge. *Electronic Journal of Knowledge Management* 1(2), 17-24.
- Blackler F (1995) Knowledge, knowledge work and organizations: An overview and interpretation. *Organization studies* 16(6), 1021-1046.
- Bock G and Kim Y (2002) Breaking the myths of rewards: an exploratory study of attitudes about knowledge sharing. *Information Resources Management Journal* 15(2), 14-21.
- Bontis N, Richards D and Serenko A (2011) Improving service delivery: Investigating the role of information sharing, job characteristics, and employee satisfaction. *The Learning Organization* 18(3), 239-250.
- Bosch-Sijtsema P, Ruohomäki V and Vartiainen M (2009) Knowledge work productivity in distributed teams. *Journal of Knowledge Management* 13(6), 533-546.
- Cabrera Á and Cabrera EF (2003) Knowledge-sharing Dilemmas. *Organization Studies* 23(5), 687-710.
- Campbell J (1990) Modeling the performance prediction problem in industrial and organizational psychology. In M. D. Dunnette & L. M. Hough (Eds.), *Handbook of Industrial and Organizational Psychology* (pp. 687-732). Palo Alto, CA: Consulting Psychologists Press, Inc.
- Christensen PH (2007) Knowledge sharing: moving away from the obsession with best practices. *Journal of Knowledge Management* 11(1), 36-47.
- Darr ED, Argote L and Epple D (1995) The acquisition, transfer, and depreciation of knowledge in service organizations: Productivity in franchises. *Management science* 41(11), 1750-1762.

- Darr ED and Kurtzberg TR (2000) An investigation of partner similarity dimensions on knowledge transfer. *Organizational Behavior and Human Decision Processes* 82(1), 28-44.
- Davenport TH (1997) *Information ecology*. Oxford University Press, Oxford.
- Davenport T, Thomas R and Cantrell S (2002) The mysterious art and science of knowledge-worker performance. *MIT Sloan Management Review* 44(1), 23-9.
- Dayasindhu N (2002) Embeddedness, knowledge transfer, industry clusters and global competitiveness: a case study of the Indian software industry. *Technovation* 22(9), 551-560.
- De Vries RE, Van den Hooff B and de Ridder JA (2006) Explaining knowledge sharing: The role of team communication styles, job satisfaction, and performance beliefs. *Communication research* 33(2), 115-135.
- Drucker P (1959) *The Landmarks of Tomorrow: A Report on the New" Post-Modern World*. Harper Colophon Books, New York.
- Drucker P (1999) Knowledge-worker productivity: the biggest challenge. *California Management Review* 41(2), 79-94.
- Dyer JH and Nobeoka K (2000) Creating and managing a high-performance knowledge-sharing network: the Toyota case. *Strategic management journal*, 345-367.
- Erne R (2011) What is Productivity in Knowledge Work? -A Cross-Industrial View. *J.UCS* 17(10), 1367-1389.
- Goldman AS (1959) Information flow and worker productivity. *Management Science* 5(3), 270-278.
- Grant RM (1996) Toward a knowledge-based theory of the firm. *Strategic management journal* 17(S2), 109-122.
- Haas MR and Hansen MT (2007) Different knowledge, different benefits: toward a productivity perspective on knowledge sharing in organizations. *Strategic Management Journal* 28(11), 1133-1153.
- Haldin-Herrgard T (2000) Difficulties in Diffusion of Tacit Knowledge in Organizations. *Journal of Intellectual Capital* 1(4), 357-365.
- Hansen MT (1999) The Search-Transfer Problem: The Role of Weak Ties in Sharing Knowledge across Organization Subunits. *Administrative Science Quarterly* 44(1), 82-111.
- Ipe M (2003) Knowledge Sharing in Organizations: a Conceptual Framework. *Human Resource Development Review* 2(4), 337-359.
- Kang YJ, Kim SE, and Chang, GW (2008) The impact of knowledge sharing on work performance: an empirical analysis of the public employees' perceptions in South Korea. *International Journal of Public Administration* 31(14), 1548-1568.
- Kianto, A., Vanhala, M. & Heilmann, P. (2016) "The impact of knowledge management on job satisfaction", *Journal of Knowledge Management*, Vol. 20 Issue: 4, pp.621-636, King WR (2006) Knowledge transfer. Schwartz, D.G. (Ed.), *Encyclopedia of Knowledge Management*, Idea Group Reference, Hershey, PA, 538-543.
- Koopmans L, Bernaards CM, Hildebrandt VH, de Vet HC, and van der Beek AJ (2014) Measuring individual work performance: Identifying and selecting indicators. *Work*, 48(2), 229-238.

- Lahti RK, Darr ED and Krebs VE (2002) Developing the productivity of a dynamic workforce: The impact of informal knowledge transfer. *Journal of Organizational Excellence* 21(2), 13-21.
- Laihonen H (2006) Knowledge flows in self-organizing processes. *Journal of knowledge management* 10(4), 127-135.
- Laihonen H, Jääskeläinen A, Lönnqvist A and Ruostela J (2012) Measuring the productivity impacts of new ways of working. *Journal of Facilities Management* 10(2), 102-113.
- Lee J (2001) The impact of knowledge sharing, organizational capability and partnership quality on IS outsourcing success. *Information & Management* 38(5), 323-335.
- Lin H and Lee G (2004) Perceptions of senior managers toward knowledge-sharing behavior. *Management Decision* 42(1), 108-125.
- Miller KI and Monge PR (1986) Participation, satisfaction, and productivity: A meta-analytic review. *Academy of management Journal* 29(4), 727-753.
- Nissen ME (2002) An extended model of knowledge-flow dynamics. *Communications of the Association for Information Systems* 8(1), 251-266.
- Nonaka I (1994) A dynamic theory of organizational knowledge creation. *Organization science* 5(1), 14-37.
- Palvalin M, Lönnqvist A, Vuolle M (2013) Analysing the impacts of ICT on knowledge work productivity. *Journal of Knowledge Management* 17(4) 545-557.
- Parasuraman A (2002) Service quality and productivity: a synergistic perspective. *Managing Service Quality* 12(1), 6-9.
- Paulin D and Suneson K (2012) Knowledge Transfer, Knowledge Sharing and Knowledge Barriers - Three Blurry Terms in KM. *The Electronic Journal of Knowledge Management* 10(1), 81-91.
- Ramirez YW and Nembhard DA (2004) Measuring knowledge worker productivity: a taxonomy. *Journal of Intellectual Capital* 5(4), 602-628.
- Ramirez YW and Steudel HJ (2008) Measuring knowledge work: the knowledge work quantification framework. *Journal of Intellectual Capital* 9(4), 564-584.
- Reichelt K and Lyneis J (1999) The dynamics of project performance: benchmarking the drivers of cost and schedule overrun. *European management journal* 17(2), 135-150.
- Riege A (2005) Three-dozen knowledge-sharing barriers managers must consider. *Journal of knowledge management* 9(3), 18-35.
- Ryu S, Ho SH and Han I (2003) Knowledge sharing behavior of physicians in hospitals. *Expert Systems with Applications* 25(1), 113-122.
- Schmenner RW (2004) Service businesses and productivity. *Decision Sciences* 35(3), 333-347.
- Schwartz DG (2007) Integrating knowledge transfer and computer-mediated communication: Categorizing barriers and possible responses. *Knowledge Management Research & Practice* 5(4), 249-259.
- Spence Laschinger HK, Finegan J and Shamian J (2002) The impact of workplace empowerment, organizational trust on staff nurses' work satisfaction and organizational commitment. *Advances in Health Care Management*, 59-85.
- Szulanski G (2002) Sticky knowledge: Barriers to knowing in the firm. Sage.

- Szulanski, G., Ringov, D. and Jensen; R. (2016) Overcoming Stickiness: How the Timing of Knowledge Transfer Methods Affects Transfer Difficulty. *Organization Science* 27:2 , 304-322.
- Titus S and Bröchner J (2005) Managing information flow in construction supply chains. *Construction innovation* 5(2), 71-82.
- van den Hooff B and Huysman M (2009) Managing knowledge sharing: Emergent and engineering approaches. *Information & Management* 46(1), 1-8.
- van der Voordt TJ (2004) Productivity and employee satisfaction in flexible workplaces. *Journal of Corporate Real Estate* 6(2), 133-148.
- Wu F, Huberman BA, Adamic LA and Tyler JR (2004) Information flow in social groups. *Physica A: Statistical Mechanics and its Applications* 337(1), 327-335.
- Zhuge H (2002) A knowledge flow model for peer-to-peer team knowledge sharing and management. *Expert systems with applications* 23(1), 23-30.