IT Enablers for Task Organization and Innovation Support to drive Team Performance

Completed Research Paper

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Abstract

Teams drive organizational innovation by applying knowledge to solve complex problems. However, many teams underperform and organizations do not sufficiently harvest the benefits they could gain from effective IT support for team processes consisting of creative (exploration) and structurally controlled (exploitation) processes. This paper investigates the impact of knowledge application on support for innovation, task organization, and team performance in a mixed method case study in two medium-sized, knowledge-intensive, information technology-affine organizations. We surveyed 204 employees and found that knowledge application positively affects task organization. Knowledge application and task organization positively affect support for innovation. Both, task organization and support for innovation positively affect team performance. Subsequent focus group interviews with 16 employees provided us with an in-depth understanding of factors that support team performance. Qualitative content analysis resulted in nine IT enablers, which can be adapted by organizations to foster coordination while at the same time promote innovation.

Keywords

Knowledge Application, IT enablers, Mixed Methods, Support for Innovation, Task Organization, Team Performance.

Introduction

Organizations employ teams to speed up product development, foster creativity, or ultimately success (Hackman 2009). The ongoing development of information technology (IT) enables teams to work together even though they are distributed across space and time (Salas et al. 2007). This changes the nature of work in organizations (Orlikowski and Scott 2008). The rise of social media (Kaplan and Haenlein 2010) and user-generated content (Cha et al. 2007) continuously reshapes the way how teams communicate and collaborate not only in people's private lives, but increasingly also in the business context. Organizations seek effective and efficient ways to develop knowledge as well as of turning knowledge into process, product, and service innovation (Maier and Schmidt 2014). In this respect, organizations need to deal with paradox demands. They need to manage for (short-term) efficiency and at the same time for (long-term) innovation to sustain their competitive advantages (Smith and Tushman 2005). However, their executing units, i.e. teams, often face challenges related to their collaboration process (Cramton 2001; De Vreede et al. 2003). Teams need to apply knowledge to solve problems and take decisions independently of their work settings being either (1) predominantly routine or (2) characterized by novel conditions (Holsapple and Joshi 2002). Teams in routine settings rather aggregate knowledge because the problem is defined and procedures are clear. In contrast, teams in novel settings deal with new problems for which no formalized procedures exists yet. Thus, they rather synthesize and integrate knowledge (Majchrzak et al. 2005) for problem-solving and decision-making. Both settings ask for different team processes (Smith and Tushman 2005) creating contradicting demands (March 1991). Since IT support has positive effects on knowledge application and, in turn, on team performance (Choi et al. 2010), we are interested in improving our understanding what IT suitably supports teams to apply knowledge in both settings.

To the best of our knowledge, it has not yet been established sufficiently in IS literature how IT could foster the application of knowledge in either routine or novel settings to drive team performance. This means on the one hand, that there is a gap in our understanding to what extent knowledge application affects novel and routine processes and what effect these processes have on team performance. On the other hand, there is little understanding what kind of IT support is perceived to be appropriate to foster these processes and, in turn, team performance. The goals of this paper are to assess the (1) impact of knowledge application and the mediating role of exploration and exploitation activities on team performance as well as (2) to understand what IT enablers foster exploration and exploitation activities to drive team performance. We administered a survey to two medium-sized, knowledge-intensive and IT-affine organizations in Europe. We further performed focus group interviews with selected personnel from the two organizations who perceive themselves as members of high-performing teams.

Hypotheses development

Knowledge application describes the utilization of knowledge in products and processes (Song et al. 2005). Applied knowledge might be more stable than dynamic (Tuomi 1999), more directed towards exploiting than exploring (March 1991), or of a higher level of maturity (Maier and Schmidt 2014). However, there exist paradoxical conditions due to (1) the need for organizations to innovate in the long-run but also to (2) exploit their current products and services in the short-run (Benner and Tushman 2003).

In the first case, teams apply knowledge to tasks that are uncertain and perform procedures that are not well-defined yet (Alavi and Tiwana 2002). In such novel settings, teams have rich communication, exploit diverse expertise, and adapt team structures to find innovative solutions for uncertain problems (Alavi and Tiwana 2002). Consequently, teams introduce new and improved ways of doing things to support their innovation processes (West and Farr 1990). Thus, we hypothesize (see Figure 1 for the research model showing the concepts and hypotheses):

H1: Knowledge application positively affects support for innovation.

In the second case, teams apply knowledge to task processes that are well defined, predictable and well established (Majchrzak et al. 2005). In these settings, teams reuse existing routines and directives (Alavi and Tiwana 2002) to assign roles, agree on goals, distribute responsibilities, as well as establish rules and meeting schedules to organize their tasks (Espinosa et al. 2012). Hence, we hypothesize:

H2: Knowledge application positively affects task organization.

Task organization has also influence when dealing with new situations (Anderson and West 1998). The efficient exploitation of existing products by slack resources, knowledge, and existing routines helps launching innovation processes (Smith and Tushman 2005). We hypothesize:

H3: Task organization positively affects support for innovation.

Teams that fail to establish coordination mechanisms spend more time on managing their collaboration rather than using their time to discuss important topics of their tasks (Massey et al. 2003). Inadequate coordination, missing structures, or fuzzy goal definitions diminish the benefits of collaboration (Hackman 2009). Clear group norms efficiently regulate team behavior and, therefore, allow teams to make coordinated actions. This, in turn, enables team performance (Hackman 1990). Thus, we hypothesize:

H4: Task organization positively affects team performance.

Teams perform particularly well if their members explore and seek ideas and fresh perspectives from the outside (Pentland 2012). Creative tasks require teams to consider quality of their solutions and therefore drive team performance (Woodman et al. 1993). Hence, we hypothesize:

H5: Support for innovation positively affects team performance.

Study Design

We adopted a mixed methods approach to investigate the effects of task organization, support for innovation, and knowledge application on team performance and to gain an in-depth understanding of which IT are perceived as enablers for improved team performance. The entire study was performed in the scope of two medium-sized organizations working in two different industries in the European Union. Both organizations are considered to be knowledge-intensive according to the NACE codes that describe a standard classification of economic activities in the European community (Eurostat 2009). One organization, in the following referred to as COM, provides telecommunication solutions comprising Internet services, security solutions, and television. The other organization provides consultancy and IT development services in the healthcare sector and is referred to in the following as HC. Both organizations provided us with key informants holding a senior management position. They supported us by providing access to the workforce for distributing the surveys and managing availability of selected employees for the focus group interviews. In the first part, we conducted a survey to test the impact of knowledge application on team performance when mediated by support for innovation and task organization. The second part employed focus group interviews with members perceiving their teams to be high-performing. We deduced IT enablers for innovation support and task organization on the basis of descriptions of IT that interviewees deemed important in their work settings.

Part 1 - survey

The survey was administered in April 2012. We collected 104 responses (response rate 94.5%) from HC and 137 responses (response rate 80.3%) from COM over a 72h period. The data was cleansed for cases having more than 50% missing data. Data was further analyzed for outliers with univariate and multivariate methods resulting in a final sample of n= 204 (HC= 90 and COM=114). An overview of the sample demographics is provided in Table 1. All subjects were informed that key informants could identify respondents for the purpose of selecting participants for the focus group interviews. The survey was anonymous to all other stakeholders including the research team.

Average (median) number of members per team	7.73 (5)
Professional experience of respondents	
Less than 1 year	8 %
1 year or more, but less than 3 years	15 %
3 years or more, but less than 5 years	15 %
5 years or more, but less than 10 years	27 %
10 years or more	36%
Geographical distribution of team members	
Same building	89 %
Different building	7 %
Different country	5 %

Table 1: Demographics

We used the co-variance based structural equation modeling (SEM) software IBM® SPSS® AMOS version 21.0.0 for testing the hypotheses introduced in Section 2. All latent variables were measured on multiple-item scales. Team performance comprises the achievement of goals and objectives, as well as staying on time and working within budget (Schweitzer and Duxbury 2010). We measured *team performance* as perceived by team members with four items (Schweitzer and Duxbury 2010). We adapted those items to address not only virtual teams, but teams in general. We adopted the eight item scale of the team climate inventory for measuring *support for innovation*, which measures the team climate to support innovation as perceived by team members (Anderson and West 1998). Similarly, we measured *knowledge application* as perceived by the employees using an adapted scale of Gold et al. (2001). We measured perceived *task organization* by adopting the scale from Espinosa et al. (2012). The full item catalogue is given in the Appendix. All items were measured using a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). Table 2 depicts the descriptive statistics for each construct.

Construct	n	Means	Std. deviation
Knowledge application	204	5.1881	1.1588
Support for innovation	204	5.2100	1.1272
Task organization	204	4.9961	1.2652
Team performance	204	5.4669	1.0370

Table 2: Descriptive statistics

Part 2 – focus group interviews

In the second part of this study, we sampled 16 survey respondents (8 from each organization) for the focus group interviews on the basis of the information they gave in the survey. One selection criterion and two control criteria were applied for the interviews. First, subjects had to be with the organization for at least one year. This selection criterion was used to ensure sufficient knowledge of the organizational context. Second, subjects had to perceive their team performance as good. This control criterion was used to ensure that the focus group interviewees shared a similar team background in terms of performance. Third, subjects had to perceive their tasks to be either mostly routine or primarily non-routine tasks. This control criterion was used to assign participants to focus groups and, in turn, to ensure similar team background in terms of task characteristics. At each site, two focus group interviews were conducted approximately one month after the survey.

Each focus group was facilitated by applying thinkLets (Briggs et al. 2003; Kolfschoten and de Vreede 2009) to ensure a highly similar structure and conduction of each focus group interview. We used thinkLets for generating ideas (DirectedBrainstorm), reducing ideas (FastFocus), organizing concepts (Popcorn-Sort) and evaluating concepts (BucketWalk) (Briggs and de Vreede 2009). Each interview lasted for approximately one hour and was video and audio taped.

All interview data was transcribed and subjected to qualitative content analysis. The first round of coding connected each factor with the description given by the participants and subsequently summarized the descriptions. Factors were further aggregated in the axial coding phase to reveal more general themes (Corbin and Strauss 1990). Selective coding represents the last round of coding (Corbin and Strauss 1990). In this phase, we further combined factors to the concepts of the survey study comprising support for innovation and task organization. We concentrated on those factors that dealt with IT-support. The goal of this step was to identify IT enablers that positively influence these two concepts according to the perceptions of the members of high-performing teams.

Results

We applied a two-stage analysis to first assess reliability and validity of statistical data and to subsequently draw inferences on the tested hypotheses. We then enriched our findings with the results of the qualitative content analysis to elaborate in more detail on IT enablers.

Measurement model

We performed exploratory (EFA) and confirmatory factor analysis (CFA) for reliability and validity tests. As part of EFA, internal consistency was assessed by measuring Cronbach's α and average variance extracted (AVE) depicted in Table 3. All Cronbach's α exceed the .7 criterion (Nunnally 1978) and AVE measures are above the threshold of .5 (Hair et al. 2010). In addition, all correlation of the constructs in Table 4 are below the .9 threshold (Bagozzi et al. 1991) and the squared AVE values are higher than the correlations. The standardized regression weights (see Appendix) are above .7 and factor reliability values are above .6 (see Table 3) showing evidence for construct validity (Hair et al. 2010). CFA resulted in the following fit indices: χ2/df = 1.8091, goodness-of-fit index (GFI) = .902, normed fit index (NFI) = .922, comparative fit index (CFI) = .963, and root-mean-square-error or approximation (RMSEA) = .048. All fit indices yielded the threshold values (Hair et al. 2010). Fit indices and results of the validity and reliability tests are acceptable.

		EFA		CFA	
Construct	Items	Cronbach's α	AVE	Factor reliability	AVE
Team performance	3	.798	.5779	.818	.600
Knowledge application	3	.934	.8318	.837	.633
Support for innovation	4	.864	.5673	.919	.883
Task organization	3	.890	.5715	.812	.591

Table 3: Construct reliability and average variance extracted (AVE)

	Team performance	Knowledge application	Support for innovation	Task organization
Team performance	**.760**			
Knowledge application	.486***	**.912**		
Support for innovation	.571***	.656***	**.753**	
Task organization	.495***	.553***	.480***	**.756**

**** significant at the .01 level (2-tailed)*
bold values on the diagonal represent the square root of the AVE

Table 4: Construct correlations and square root of the AVE

Structural model

After accepting the measurement model, we estimated the research model using SEM. The model results are shown in Table 5 and Figure 1. The fit indices in Figure 1 are all above the conventional cut-off values (Hair et al. 2010). The resulting model shows that all standard coefficients for the hypothesized paths in the structural model are significant ($p<.002$). Knowledge application has a positive effect on support for innovation (H1, $\beta = .45$) and task organization (H2, $\beta = .503$). Task organization has a positive effect on support for innovation (H3, $\beta = .278$) and team performance (H4, $\beta = .420$). Support for innovation has a positive effect on team performance (H5, $\beta = .402$).

	Path coefficients (β)	t-value	Std. coeff.
H1	Knowledge application → Support for innovation	6.032	.450***
H2	Knowledge application → Task organization	6.277	.503***
H3	Task organization → Support for innovation	3.170	.278**
H4	Task organization → Team performance	4.243	.420***

H5	Support for innovation → Team performance	4.693	.402***
	R^2		
	Task organization	.253	
	Support for innovation	.407	
	Team performance	.509	

*Significant levels: *** = p ≤ .001. ** = p ≤ .002*

Table 5 : SEM results

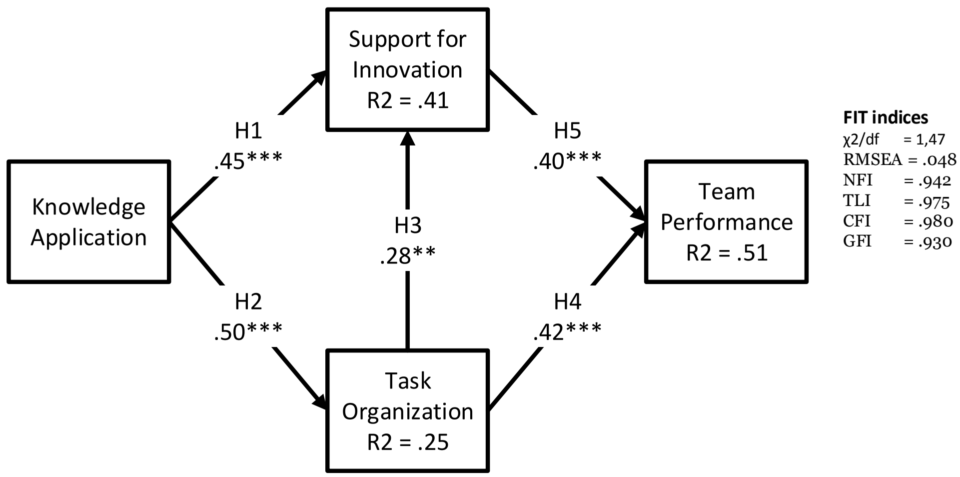

Figure 1: Path diagram with standardized results

IT enablers

The analysis of focus group interviews resulted in a set of IT-related factors enabling teams to drive their team performance. We collected three sets of factors during focus group interviews. The first set, termed *positive factors,* consists of 59 items describing what team practices work well according to focus group participants. The second set, termed *solutions*, consists of 57 items describing potential future practices that could further improve team performance and which were motivated by the third set, termed *challenges*. Table 6 shows IT enablers for task organization and Table 7 IT enablers for support for innovation. The numbers in brackets indicate the frequency of occurrence of factors related to the respective enablers.

Enabler	Description	Sample Quotes
Knowledge integration tool (4)	The organization provides a centralized and administered knowledge integration system to fill employees' knowledge gaps and preserve solutions and communication to bridge less and more mature knowledge.	"Everything [is] in one place but [interlinked] with categories for, let's say, different departments [or] for different members of the one department. So you can faster find the solution that you need."
Centralized task management system (2)	Team members share issues, problems, and solutions about assigned tasks to ease management of current and up-coming projects.	"We have an [internal tool to] track bugs and suggestions and everything it's needed to complete a specific project. Everything is centralized and organized for each task or each person of the project."

Error management support (1)	The organization provides step-by-step support for documenting problems and for solving problems.	"It's more like a step by step reporting system for errors, something like that. Error escalation. So or if one team can't trouble shoot an error it gives that problem or task to one level higher."
Individual performance monitoring (1)	The organization assesses team members' performance to identify training needs.	"So in our team or in our department we have every three months knowledge testing. […] So we have our written exam. They look at our phone calls, how we reply to our customers via email or some other communication. I think this is very important. So we can see which people of our team if they are top and which people need more help, so the team has the same knowledge. And we can work better then."
Automated documentation and reporting (1)	The organization provides tools that take over documentation and reporting duties to reduce time spent on administrative tasks and enable employees to focus on their crucial tasks.	"This is a […] problem everywhere, because is just additional work. I mean, if you do something you have to focus on the task […] One has to write two documents for one task. One for himself and one for the report."

Table 6: IT enablers for task organization

Enabler	Description	Sample quote
Cross-team collaboration tools (5)	All employees use cross-team collaboration tools to enhance team building as well as to accelerate knowledge sharing and knowledge development within and across teams.	"Tools like collaboration tools for the team [and] also […] for other teams. So the knowledge is shared also between the teams not only inside the team."
Centralized multi-channel communication tool (5)	The organization provides a centralized tool which offers a suitable communication channel for each purpose to speed up problem solving across teams.	"Email is much more official than messenger. […] so then you decide when to use one channel and when to use another channel.", "we currently use mail, Health&Biz, TocToc , FTP, Skype, SharePoint […] and reduce also the response time."
News service (2)	The organization updates team members with notifications about new organizational information to gain a common organizational understanding.	"Everyone has to know the basic stuff […] like a new marketing campaign. What's new? What are we doing now?"
Project dashboard (1)	Team members share information about ongoing important activities and results to foster a joint perspective.	"Therefore [the system] should have a dashboard, where you can put […] information and one connects them, when they are working on this project. This is dashboard or some software. Some formal dashboard."

Table 7: IT enablers for support for innovation

Discussion, limitations and outlook

We contribute to filling a gap in our understanding about what IT suitably supports teams to effectively apply knowledge when they need to innovate in the long-run or need to exploit existing products and services in the short-run. The section is structured according to the two factor groups that can be supported by IT means, i.e. enablers perceived as supporting innovation and task organization and is followed by a reflection of limitations that need to be considered when drawing on these results.

Task organization: Our findings emphasize the positive effect of task organization on support for innovation and team performance. Hence, teams can increase their performance if their tasks are organized with well-defined procedures. This relates well to the concept of exploitation activities describing structural procedures and resources that have positive impact on organizational learning and firm performance when managed accordingly (March 1991). In our study, team members stressed the importance of a knowledge integration tool and a centralized task management system to facilitate problem solving, e.g. for individuals new to a task or problem. By doing so, solutions to problems can be found quicker and with a higher reliability (March 1991). For this purpose, the IT system allows for the emergence of additional links, synthesis of relationships, or higher level entities (Boland Jr et al. 1994). At the same time documenting, structuring, and maintaining knowledge requires effort. Therefore, teams call for automated documentation and reporting as well as tool supported error management. One of our case study organization monitors individuals' performance with assessments on a regular basis to efficiently assign tasks according to individuals' competences. Other studies support the importance of such kind of practices and further argue that collecting control data with the help of centralized task management systems allows drawing conclusions regarding performance (Schermann et al. 2012). Related research emphasized the need for an integrated knowledge base to facilitate task organization and knowledge exploitation. However, it was exposed that the exploitation of existing knowledge reduces the likelihood to simultaneously develop new solutions (March 1991).

Support for innovation: Our findings emphasize the positive effect of support for innovation on team performance. This relates well to the concept of exploration activities fostering trial and error work practices to drive organizational learning and firm performance with little control (March 1991). Interviewees described four IT enablers that could help teams being innovative. Above all, they require collaboration systems providing different communication channels and supporting diverse needs of formality, speed, and visualization. Collaboration systems allow immediate and quick communication (Brown et al. 2010). For this, IT systems need to enable the easy identification of the author of a message, allow users to examine historical, situational, or analytical information of messages and to discuss multiple perspectives of solution alternatives (Boland Jr et al. 1994). Moreover, interviewees wish to be informed about ongoing organizational activities and news on the market and expect their organization to spread such news in a comprehensive way. There is a risk however, that this may lead to information overload, which, in turn, might have negative impact on performance (Eppler and Mengis 2004). Hence, interviewees emphasize the use of a dashboard to keep an overview of what is happing in fast-paced projects and enhance a common picture on objectives, priorities, current challenges, etc. This is in line with previous research suggesting dashboards to systematize and organize information needs, related management controls, analyses, and reports (Schermann et al. 2012).

Summing up, our findings describe four IT enablers supporting innovation and five IT enablers for task organization in medium-sized, knowledge-intensive, and technology-affine organizations. According to the statements made by the focus group participants, features of these IT enablers provide affordances, which can help team members, team leaders, or other stakeholders to improve their team performance. IT supporting knowledge application can be adapted by organizations to foster a more rigid coordination of team collaboration while at the same time promoting innovative behavior. Using these IT enablers can speed up problem solving through easier access to existing solutions and by facilitating the development of new solutions.

A number of potential limitations need to be considered. Due to the sample size comprising 204 employees working for only two organizations, findings might best describe organizations that are medium-sized, technology affine, and knowledge-intensive, while they might not be transferrable to organizations with different profiles. Common method bias might exist because data for our dependent and independent variables were collected at the same time. However, the focus group interviews allowed us to get more in-depth reflections of selected participants, which were corroborating the results of the survey. IT enablers emerged from a small number of focus group interviewees perceiving their teams as high-performing. This constrains the findings and calls for additional research on IT enablers that are perceived as supportive by low-performing teams.

Future research could further explore whether there are differences between high and low performing teams. By doing so, it appears to be interesting to understand potential contradicting IT demands that can explain the differences in team performance. In addition, our findings could be used to investigate what affordances IT features generate and how they affect team performance, e.g., to understand which affordances are predominantly associated with task organization processes and exploitation activities, which affordances are associated with support for innovation and exploration activities and whether they can be connected effectively. An improved understanding of these effects could open up opportunities for designing collaboration technology to seamlessly bridge exploration and exploitation activities and, in turn, improve team performance.

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REFERENCES

Alavi, M., and Tiwana, A. 2002. "Knowledge Integration in Virtual Teams: The Potential Role of Kms," *Journal of the American Society for Information Science and Technology* (53:12), pp. 1029-1037.

Anderson, N.R., and West, M.A. 1998. "Measuring Climate for Work Group Innovation: Development and Validation of the Team Climate Inventory," *Journal of organizational behavior* (19:3), pp. 235-258.

Bagozzi, R.P., Yi, Y., and Phillips, L.W. 1991. "Assessing Construct Validity in Organizational Research," *Administrative science quarterly* (36:3), pp. 421-458.

Benner, M.J., and Tushman, M.L. 2003. "Exploitation, Exploration, and Process Management: The Productivity Dilemma Revisited," *Academy of management review* (28:2), pp. 238-256.

Boland Jr, R.J., Tenkasi, R.V., and Te'eni, D. 1994. "Designing Information Technology to Support Distributed Cognition," *Organization science* (5:3), pp. 456-475.

Briggs, R., and de Vreede, G.-J. 2009. *Thinklets: Building Blocks for Concerted Collaboration*. University of Nebraska, Center for Collaboration Science.

Briggs, R.O., De Vreede, G.J., and Nunamaker, J.F. 2003. "Collaboration Engineering with Thinklets to Pursue Sustained Success with Group Support Systems," *Journal of Management Information Systems* (19:4), pp. 31-64.

Brown, S.A., Dennis, A.R., and Venkatesh, V. 2010. "Predicting Collaboration Technology Use: Integrating Technology Adoption and Collaboration Research," *Journal of Management Information Systems* (27:2), pp. 9-54.

Cha, M., Kwak, H., Rodriguez, P., Ahn, Y.-Y., and Moon, S. 2007. "I Tube, You Tube, Everybody Tubes: Analyzing the World's Largest User Generated Content Video System," *Proceedings of the 7th ACM SIGCOMM conference on Internet measurement*: ACM, pp. 1-14.

Choi, S.Y., Lee, H., and Yoo, Y. 2010. "The Impact of Information Technology and Transactive Memory Systems on Knowledge Sharing, Application, and Team Performance: A Field Study," *MIS Quarterly* (34:4), Dec, pp. 855-870.

Corbin, J.M., and Strauss, A. 1990. "Grounded Theory Research: Procedures, Canons, and Evaluative Criteria," *Qualitative sociology* (13:1), pp. 3-21.

Cramton, C.D. 2001. "The Mutual Knowledge Problem and Its Consequences for Dispersed Collaboration," *Organization Science* (12:3), pp. 346-371.

De Vreede, G.J., Davison, R.M., and Briggs, R.O. 2003. "How a Silver Bullet May Lose Its Shine," *Communications of the ACM* (46:8), pp. 96-101.

Eppler, M.J., and Mengis, J. 2004. "The Concept of Information Overload: A Review of Literature from Organization Science, Accounting, Marketing, Mis, and Related Disciplines," *The Information Society* (20:5), pp. 325-344.

Espinosa, J.A., Cummings, J.N., and Pickering, C. 2012. "Time Separation, Coordination, and Performance in Technical Teams," *IEEE Transactions on Engineering Management* (59:1), pp. 91-103.

Eurostat. 2009. *High-Technology and Knowledge Based Services Aggregations Based on Nace Rev. 2*.

Gold, A.H., Malhotra, A., and Segars, A.H. 2001. "Knowledge Management: An Organizational Capabilities Perspective," *Journal of Management Information Systems* (18:1), pp. 185-214.

Hackman, J.R. 1990. *Groups That Work (and Those That Don't)*. Jossey-Bass Inc.
Hackman, J.R. 2009. "Why Teams Don't Work. Interview by Diane Coutu.," *Harvard Business Review* (87:5), pp. 99-105.
Hair, J.F.J., Black, W.C., Babin, B.J., and Anderson, R.E. 2010. *Multivariate Data Analysis: A Global Perspective*. New Jersey: Pearson Education.
Holsapple, C.W., and Joshi, K.D. 2002. "Knowledge Manipulation Activities: Results of a Delphi Study," *Information & Management* (39:6), pp. 477-490.
Kaplan, A.M., and Haenlein, M. 2010. "Users of the World, Unite! The Challenges and Opportunities of Social Media," *Business horizons* (53:1), pp. 59-68.
Kolfschoten, G., and de Vreede, G.J. 2009. "A Design Approach for Collaboration Processes: A Multimethod Design Science Study in Collaboration Engineering," *Journal of Management Information Systems* (26:1), pp. 225-256.
Maier, R., and Schmidt, A. 2014. "Explaining Organizational Knowledge Creation with a Knowledge Maturing Model," *Knowledge Management Research & Practice* (onlineFirst), pp. 1-21.
Majchrzak, A., Malhotra, A., and John, R. 2005. "Perceived Individual Collaboration Know-How Development through Information Technology–Enabled Contextualization: Evidence from Distributed Teams," *Information Systems Research* (16:1), pp. 9-27.
March, J.G. 1991. "Exploration and Exploitation in Organizational Learning," *Organization science* (2:1), pp. 71-87.
Massey, A.P., Montoya-Weiss, M.M., and Hung, Y.T. 2003. "Because Time Matters: Temporal Coordination in Global Virtual Project Teams," *Journal of Management Information Systems* (19:4), pp. 129-156.
Nunnally, J. 1978. *Psychometric Methods*. New York, NY: McGraw-Hill.
Orlikowski, W.J., and Scott, S.V. 2008. "Chapter 10: Sociomateriality: Challenging the Separation of Technology, Work and Organization," *The Academy of Management Annals* (2:1), pp. 433-474.
Pentland, A. 2012. "The New Science of Building Great Teams," *Harvard Business Review* (90:4), pp. 60-69.
Salas, E., Stagl, K.C., Burke, C.S., and Goodwin, G.F. 2007. "Fostering Team Effectiveness in Organizations: Toward an Integrative Theoretical Framework," *Nebraska Symposium on Motivation*.
Schermann, M., Wiesche, M., and Krcmar, H. 2012. "The Role of Information Systems in Supporting Exploitative and Exploratory Management Control Activities," *Journal of Management Accounting Research* (24:1), pp. 31-59.
Schweitzer, L., and Duxbury, L. 2010. "Conceptualizing and Measuring the Virtuality of Teams," *Information Systems Journal* (20:3), pp. 267-295.
Smith, W.K., and Tushman, M.L. 2005. "Managing Strategic Contradictions: A Top Management Model for Managing Innovation Streams," *Organization science* (16:5), pp. 522-536.
Song, M., Van Der Bij, H., and Weggeman, M. 2005. "Determinants of the Level of Knowledge Application: A Knowledge-Based and Information-Processing Perspective*," *Journal of Product Innovation Management* (22:5), pp. 430-444.
Tuomi, I. 1999. *Corporate Knowledge: Theory and Practice of Intelligent Organizations*. Metaxis Helsinki.
West, M., and Farr, J. 1990. *Innovation and Creativity at Work: Psychological and Organizational Strategies*. Chichester: John Wiley & Sons.
Woodman, R.W., Sawyer, J.E., and Griffin, R.W. 1993. "Toward a Theory of Organizational Creativity," *Academy of management review* (18:2), pp. 293-321.

Appendix

Construct		*Items*	*Standardized item loading (CFA)*
Team performance (Schweitzer and Duxbury 2010)	TPER1	This team has been effective in reaching its goals in the past.	.822
	TPER2	This team is currently meeting its business objectives.	*.708*
	TPER3	This team is generally on time, when completing its work.	.789
	TPER4	This team is generally within the budget, when completing its	

		work.*	
Knowledge application (Gold et al. 2001)	KAPP1	This team has processes for applying knowledge learned from mistakes.	.765
	KAPP2	This team has processes for using knowledge to solve new problems.	.924
	KAPP3	This team matches sources of knowledge to problems and challenges.	.885
	KAPP4	This team uses knowledge to improve efficiency.*	
	KAPP5	This team is able to locate and apply knowledge to changing competitive conditions.*	
Support for innovation (Anderson and West 1998)	SUIN1	This team is always moving toward the development of new answers.	.882
	SUIN2	This team is readily available to assist in developing new ideas.*	
	SUIN3	This team is open and responsive to change.*	
	SUIN4	This team is always searching for fresh, new ways of looking at problems.	.788
	SUIN5	This team takes the time needed to develop new ideas.*	.708
	SUIN6	This team co-operates in order to help develop and apply new ideas.	.740
	SUIN7	This team provides and shares resources to help in the application of new ideas.*	.767
	SUIN8	This team provides practical support for new ideas and their application.*	.763
Task organization (Espinosa et al. 2012)	TORG1	In this team we assign roles for who was responsible for what.*	
	TORG2	In this team we have substantial agreement on goals, strategies and processes.*	.770
	TORG3	In this team we distribute responsibilities so that we could work somewhat independently from each other.	.725
	TORG4	In this team we have established ground rules, routines and meeting schedules to facilitate our team.	.809

* The asterisk (*) indicates items that were dropped from analysis

Table 8: Measurement items and loadings