

Towards Sociotechnical Management of Intra-Organisational Knowledge Transfer

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Abstract. The internal transfer of knowledge is a critical success factor for research organisations. However, little emphasis is placed on the intra-organisational transfer of knowledge due to the focus on knowledge transfer to external stakeholders. We introduce our research in progress project that aims to uncover opportunities for the intra-organisational transfer of knowledge at a research organisation. We propose a sociotechnical system that supports the management of the internal transfer of knowledge. Furthermore, we introduce the organisational role of the Knowledge Transfer Manager, which is a central part of the proposed sociotechnical system.

Keywords: knowledge transfer, knowledge management, knowledge sharing, research information network, linked data

1 Introduction

Making efficient use of knowledge is a critical success factor in research organisations [1–2]. Taking a communication theory perspective [3], the intra-organisational transfer of knowledge in research organisations is realized via the exchange of information between members of the organisation. This internal transfer of knowledge (IKT) requires coordination mechanisms [4]. This coordination of the IKT in today’s research organisations is left either unmanaged or in the hands of supporting functions, such as knowledge and technology transfer offices [5]. However, little emphasis is placed on the intra-organisational transfer of knowledge due to the focus of the knowledge transfer activities on external stakeholders [6].

In this paper, we take a computer-supported cooperative work perspective of knowledge management [7]. Thus, we propose a sociotechnical system that supports both the self-directed social sharing of knowledge between researchers and the directed management of the inner-organisational advice-seeking relationships in research organisations. We propose that a new organisational role, the Knowledge Transfer Manager (KTM), is in charge of managing the interpersonal relationships at the organisation. We use semantic web technologies for integrating heterogeneous data distributed in disparate information silos in the research organisation with the aim of supporting the KTM in the identification of actionable opportunities for ITK based on this data. Our overarching aim is to generate useful and actionable insights into the

Multikonferenz Wirtschaftsinformatik 2018,
March 06-09, 2018, Lüneburg, Germany

research activities and competencies of the research organisation, to support the active management of the IKT and to overcome the “stickiness” [4] impeding the transfer of knowledge in research organisations.

The contributions of this paper are as follows. We explain the need for managing the transfer of knowledge within research organisations. We outline a sociotechnical system addressing these challenges and enabling research organisations to actively manage their internal knowledge transfer. We discuss the role of the Knowledge Transfer Manager in this system and explain the benefits of our approach. Lastly, we give an illustrative example of a potential for knowledge transfer.

The paper is structured as follows. We locate our project in the research area and highlight some of the challenges of internal knowledge transfer in research organisations in section 2. We explain our preliminary research questions and design in section 3. The proposed solution is presented in section 4 and we conclude in section 5.

2 Knowledge Management in Research Organisations

From a strategic perspective [8, p. 32ff.], the intra-organisational knowledge transfer may be oriented along two strategies. The traditional view of knowledge management follows a repository model [7, p. 532]. According to this strategy, the intra-organisational transfer of knowledge is implicitly assumed as a consequence of codifying knowledge in systems, such as knowledge bases (e.g. Wikis) and research information systems. However, this transfer of knowledge is not guaranteed [9]. The hope of knowledge transfer through codification is frequently not realised [10, p. 352].

The second generation of knowledge management [7, p. 546] follows a personalization strategy [11]. This strategic view recognises that knowledge is a tacit or explicit property inherent in the individual [12]. The strategy encourages individuals to share their knowledge directly with other individuals with the support of recommendation systems (e.g. expertise locators) and, more recently, in social networks and research networking systems (RNS).

The RNS are systems which support individual researchers in identifying and maintaining relationships to other researchers [13]. The RNS may, for example, help junior researchers who lack extensive personal networks in finding information [14]. The RNS are gaining in popularity in universities [15], with the VIVO system as a prominent example [16]. VIVO codifies the competencies and research activities of researchers in a repository accessible by other researchers at the research organisation.

When following the personalization strategy, the intra-organisational transfer of knowledge may be inhibited by many factors. As research funding has moved to a result-based model [17], the transfer of knowledge to external stakeholders has been the main centre of attention of the research on knowledge transfer [18]. Research on factors influencing intra-organisational knowledge transfer in research organisations, such as universities, is, therefore, sparse [19, p. 124]. However, we can draw conclusions from research in other contexts. The three key aspects that influence intra-organisational knowledge transfer are technology, organisational structure and culture [20]. We discuss each of these challenges briefly in the context of research networking.

Technology. Information technology can foster the transfer of knowledge by extending the individuals' reach beyond their personal networks [8, p. 95]. The lack of an appropriate system and absence of mechanisms of coordination have been identified as significant barriers to knowledge sharing [21]. While RNS have experienced an uptake in recent years [15], these systems follow the codification strategy. Finding implicit opportunities for networking with other researchers in these systems is a time-intensive process. The researchers do not have the time to use the RNS to its full potential due to their high workload [22].

Organisation. Leadership plays a pivotal role in intra-organisational knowledge transfer "through providing opportunities for and managing the processes" [19, p. 125]. Knowledge and technology transfer offices have been created in most universities and research centres to manage the dissemination of knowledge. However, little emphasis is placed on the intra-organisational transfer of knowledge due to the commercial focus on transfer of knowledge to external stakeholders [6]. This focus weakens the position of knowledge managers in the organisation. The knowledge and technology transfer managers have a "dual identity" that requires them to consider the needs of both external and internal stakeholders [23]. The influence that knowledge transfer managers can exert on members of the research organisation regarding improving the IKT is, therefore, limited.

Culture. Culture has been identified as one of the most important factors that impedes intra-organisational knowledge transfer [24, 25, 26]. While researchers were found to have a positive attitude towards the sharing of knowledge [19], the knowledge sharing practices vary between the disciplines [27]. Knowledge hiding [28] or hoarding [29] behaviour may impede the sharing of knowledge. Having a working social network and intact communication channels may help the individual to overcome these knowledge transfer barriers. However, even if the individual researchers maintain their social relations, the researchers are unlikely to encounter new knowledge in their immediate personal networks [8, p. 95]. Expanding the researchers' knowledge requires relationship maintenance and the expansion of the individuals' social networks.

The information above underlines the need for an active approach to managing the intra-organisational transfer of knowledge in research organisations. Since RNS follow the codification strategy, taking full advantage of RNS, such as VIVO, would require the augmentation of the systems with additional reasoning capabilities [16, p. 25]. Our proposed system fills this gap by combining codification of research project information with personalization facilitated by the provision of reasoning capabilities.

3 Research Questions and Research Design

Motivated by the need for an integrative and adaptive approach to the management of the IKT, we formulate our design problem as follows¹: *Accelerate knowledge exchange in a research organisation by designing a sociotechnical system that satisfies the requirements of the knowledge transfer manager and researchers to support the*

¹ Following the template for technical research questions given by [30].

knowledge transfer manager in matching researchers who have mutual interests and complementary expertise.

We are in the very early stages of this project. Our preliminary knowledge goals are:

1. What are the data sources available in research organisations that can be integrated? What relationships can be inferred between the members of the organisation, based on these data sources?
2. How can we present the inferred relationships to produce insights that are useful and actionable for both knowledge managers and researchers?

As we are building and evaluating a complex computational artefact, we follow the Design Science approach [31] and the Design Science Methodology by Peffers et al. [32]. Given the project context and problem statement above, we will elicit and define the requirements of the solution in a user-centred approach with researchers at a research organisation. The system envisioned consists of a prototypically implemented sociotechnical architecture. Following the design and implementation of this prototype, we will demonstrate and evaluate the solution in a research organisation in Germany. The prototype will be evaluated on two levels (data and system) and with two stakeholder groups (KTM and researchers). Our work will also include the application of measurement instruments for knowledge transfer [24].

4 Sociotechnical Management of Internal Knowledge Transfer

Researchers are flexibly matched for the transfer of knowledge based on *in-situ* project requirements in our approach to knowledge management. Our proposed architecture (Figure 1) aims to support the facilitation and management of the relations and communications between the members of the organisation.

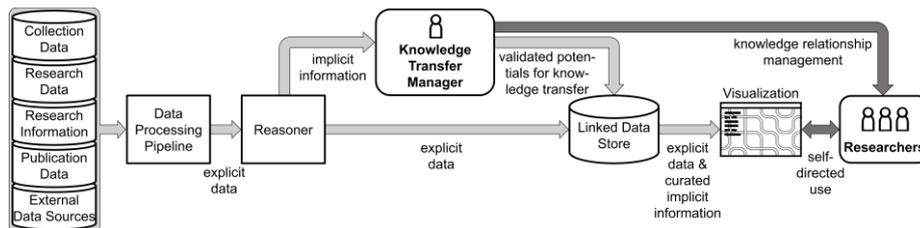


Figure 1. High-level architecture of the sociotechnical system proposed

The main data sources of the system are structured descriptions of research projects at the research organisation. We will acquire several other heterogeneous data sources (such as research collection data and publication metadata). A data processing pipeline integrates the heterogeneous data, describes it with the Resource Description Framework (RDF) vocabulary [33] and stores it in a Linked Data store. The ontological basis for the conversion to RDF is the “Core Dataset Research” [34], a normative recommendation for the description of research projects in the German scientific system. Together with representatives of the research organisation, this ontology [35]

will be extended to describe the competencies, methods and attributes of current research activities in research organisations. We will employ reasoning mechanisms (e.g. rule reasoning or feature-based machine learning) on this research project data to identify the implicit potentials for intra-organisational knowledge transfer.

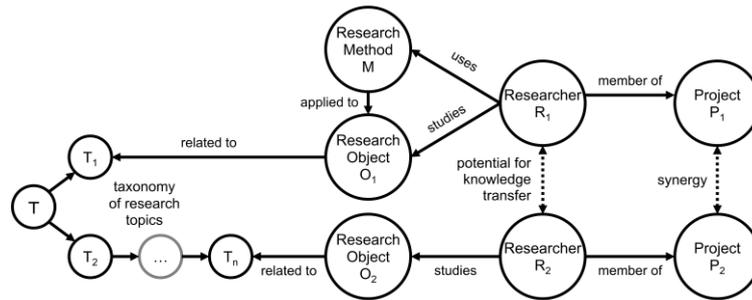


Figure 2. Example of a potential for knowledge transfer between two researchers

An example of a reasoning mechanism is illustrated in Figure 2. Two researchers, R_1 and R_2 , study research objects, O_1 (e.g. *Crustacean*²) and O_2 (e.g. *Scleractinia*³), respectively. The objects are part of a taxonomy of research topics $T_1...T_n$ (e.g. the *World Register of Marine Species*). One of the researchers used a research method M (e.g. the *MNCR methodology*, an expert diver survey technique of marine biology). Since this research method could benefit the other researcher in the study of O_2 , we can infer a new relationship between the two researchers.

Central to this architecture is a new organisational role, the Knowledge Transfer Manager. The KTM acts as both a gatekeeper and boundary spanner [36] in the sociotechnical system. The former is realised by reviewing and judging the inferred relationships between the knowledge workers provided by the reasoner. Only the validated relationships pass the gate and are accessible by other members of the organisation. The latter is realized by acting as a facilitator of knowledge transfer and as a manager of knowledge relationships. Based on the information inferred, the KTM may take steps to facilitate the communication between the researchers matched. We argue that the information inferred is a valuable support for the KTM's day-to-day work. The information enhances the KTM's capability of recognising actionable opportunities for the intra-organisational exchange of knowledge. The system proposed will support the KTM in 1) matching knowledge workers and facilitating advice-seeking to improve the knowledge utilization at the organisation, 2) catalysing collaboration at the organisation, 3) designing, managing and cultivating a knowledge exchange community and 4) fostering a culture of open innovation.

The validated knowledge transfer potentials will be presented in an adaptable and interactive visualisation accessible by all employees of the organisation. Through this visualisation, the system additionally supports the self-organised networking and competence development of the researchers.

² For example, crabs, lobsters, crayfish, shrimp, etc.

³ Scleractinia are a biological order of corals.

5 Conclusions

We reported on a research in progress project that aims to increase the knowledge transfer within a research organisation. We introduce a new organisational role, the Knowledge Transfer Manager, which is supported by a proposed sociotechnical system. The system materialises opportunities for intra-organisational knowledge transfer. We aim to make implicit potentials for internal knowledge transfer actionable by integrating the manager into the system.

Acknowledgement: This work is supported by the German Federal Ministry of Education and Research, grant 03IO1633 (“IKON – Visualizing the potential for knowledge transfer in research museums”).

References

1. Conner, K.R., Prahalad, C.K.: A Resource-Based Theory of the Firm: Knowledge Versus Opportunism. *Organ. Sci.*, 7(5), 477–501 (1996)
2. Argote, L., Ingram, P.: Knowledge Transfer: A Basis for Competitive Advantage in Firms. *Organ. Behav. Hum. Dec. Proc.*, 82(1), 150–169 (2000)
3. Shannon, C.E., Weaver, W.: *The Mathematical Theory of Communication*. University of Illinois Press, Urbana and Chicago (1963)
4. Szulanski, G.: Exploring Internal Stickiness: Impediments to the Transfer of Best Practice Within the Firm. *Strategic Manag. J.*, 17(S2), 27–43 (1996)
5. Macho-Stadler, I., Pérez-Castrillo, D., Veugelers, R.: Licensing of University Inventions: The Role of a Technology Transfer Office. *Int. J. Ind. Organ.*, 25(3), 483–510 (2007)
6. Chugh, R.: Workplace Dimensions: Tacit Knowledge Sharing in Universities. *J. Adv. Manag. Sci.*, 1(1), 24–28 (2013)
7. Ackerman, M.S., Dachtera, J., Pipek, V., Wulf, V.: Sharing Knowledge and Expertise: The CSCW View of Knowledge Management. *Comput. Support. Coop. Work*, 22(4–6), 531–573 (2013)
8. Gottschalk, P.: *Strategic Knowledge Management Technology*. Idea Group Publishing, Hershey et al. (2005)
9. Argote, L., Miron-Spektor, E.: Organizational Learning: From Experience to Knowledge. *Organ. Sci.*, 22(5), 1123–1137 (2011)
10. Porter, M.E.: *Competitive Advantage: Creating and Sustaining Superior Performance*. Free Press, New York (1985)
11. Hansen, M.T., Nohria, N., Tierney, T.: What’s Your Strategy for Managing Knowledge? *Harv. Bus. Rev.*, 77(2), 106–116 (1999)
12. Nonaka, I.: A Dynamic Theory of Organizational Knowledge Creation. *Organ. Sci.*, 5(1), 14–37 (1994)
13. Schleyer, T., Butler, B.S., Song, M., Spallek, H.: Conceptualizing and Advancing Research Networking Systems. *ACM Trans. Comput. Hum. Interact.*, 19(1), Article 2 (2012)
14. Spallek, H., Schleyer, T., Butler, B.S.: Good Partners Are Hard To Find: The Search for and Selection of Collaborators in the Health Sciences. *Proc. Int. Conf. on eScience*, IEEE Computer Society, Indianapolis, IN, 462–467 (2008)

15. Kahlon, M., Yuan, L., Daigre, J., Meeks, E., Nelson, K., Piontkowski, C., Reuter, K., Sak, R., Turner, B., Weber, G.M., Chatterjee, A.: The Use and Significance of a Research Networking System. *J. Med. Internet Res.*, 16(2), e46 (2014)
16. Börner, K., Conlon, M., Corson-Rikert, J., Ding, Y.: *VIVO: A Semantic Approach to Scholarly Networking and Discovery*. Morgan & Claypool Publishers (2012)
17. Bentley, P.J., Gulbrandsen, M., Kyvik, S.: The Relationship between Basic and Applied Research in Universities. *High. Educ.*, 70(4), 689–709 (2015)
18. Bozeman, B.: Technology Transfer and Public Policy: A Review of Research and Theory. *Res. Policy*, 29(4), 627–655 (2000)
19. Fullwood, R., Rowley, J., Delbridge, R.: Knowledge Sharing amongst Academics in UK Universities. *J. Knowl. Manag.*, 17(1), 123–136 (2013)
20. Gold, A.H., Malhotra, A., Segars, A.H.: Knowledge Management: An Organizational Capabilities Perspective. *J. Manag. Inf. Syst.*, 18(1), 185–214 (2001)
21. Ajmal, M., Helo, P., Kekäle, T.: Critical Factors for Knowledge Management in Project Business. *J. Knowl. Manag.*, 14(1), 156–168 (2010)
22. Asrar-ul-Haq, M., Anwar, S.: A Systematic Review of Knowledge Management and Knowledge Sharing: Trends, Issues, and Challenges. *Cogent Business & Management*, 3(1), 1127744, 17 pages (2016)
23. O’Kane, C., Mangematin, V., Geoghegan, W., Fitzgerald, C.: University Technology Transfer Offices: The Search for Identity to Build Legitimacy. *Res. Policy*, 44(2), 421–437 (2015)
24. Argote, L., Fahrenkopf, E.: Knowledge Transfer in Organizations: The Roles of Members, Tasks, Tools and Networks. *Organ. Behav. Hum. Dec. Proc.*, 136(C), 146–159 (2016)
25. McDermott, R., O’Dell, C.: Overcoming Cultural Barriers to Sharing Knowledge. *J. Knowl. Manag. Pract.*, 5(1), 76–85 (2001)
26. De Long, D.W., Fahey, L.: Diagnosing Cultural Barriers to Knowledge Management. *Acad. Manag. Exec.*, 14(4), 113–127 (2000)
27. Landry, R., Amara, N., Ouimet, M.: Determinants of Knowledge Transfer: Evidence from Canadian University Researchers in Natural Sciences and Engineering. *J. Technol. Transf.*, 32(6), 561–592 (2007)
28. Connelly, C.E., Zweig, D., Webster, J., Trougakos, J.P.: Knowledge Hiding in Organizations. *J. Organ. Behav.*, 33(1), 64–88 (2012)
29. Bock, G.W., Zmud, R.W., Kim, Y.G., Lee, J.N.: Behavioral Intention Formation in Knowledge Sharing: Examining the Roles of Extrinsic Motivators, Social-Psychological Forces, and Organizational Climate. *MIS Quarterly*, 29(1), 87–111 (2005)
30. Wieringa, R.J.: *Design Science Methodology for Information Systems and Software Engineering*. Springer, Berlin and Heidelberg (2014)
31. Hevner, A.R., March, S.T., Park, J., Ram, S.: Design Science in Information Systems Research. *MIS Quarterly*, 28(1), 75–105 (2004)
32. Peffers, K., Tuunanen, T., Rothenberger, M.A., Chatterjee, S.: A Design Science Research Methodology for Information Systems Research. *J. Manag. Inf. Syst.*, 24(3), 45–77 (2007)
33. Schreiber, G., Raimond, Y. (eds.): *RDF 1.1 Primer*. W3C Working Group Note, 24 June (2014)
34. Biesenbender, S., Hornbostel, S.: The Research Core Dataset for the German Science System: Developing Standards for an Integrated Management of Research Information. *Scientometrics*, 108(1), 401–412 (2016)
35. Gruber, T.R.: Toward Principles for the Design of Ontologies Used for Knowledge Sharing. *Int. J. Hum. Comp. Stud.*, 43(5–6), 907–928 (1995)
36. Allen, T.J.: *Managing the Flow of Technology*. MIT Press, Cambridge, MA (1977)