A Factorial View of Knowledge Exchange and Sharing: a European Perspective

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Abstract:
There is surprisingly little literature specifically concerned with theorising and conceptualising of the transfer and sharing of complex information and/or knowledge, despite the fact that its significance is widely and without restriction acknowledged throughout the (mostly Anglo-American) literature on knowledge management and organisational learning. It is the aim of this paper to provide a brief review - from a predominantly European perspective – that allows an overview of the state of the literature on this subject. After an introductory definition and limitation of the concepts involved they are illustrated with the use of a set of models – selected predominantly for their link to empirical research and the capability to delimit the field. The empirical grounding of the models makes it possible to view them as partial investigations contributing individual elements of a more overarching research framework into which future studies may be integrated. In conclusion, a systemic approach of knowledge exchange is proposed and the frameworks are further categorised as to the type of knowledge for which they would be of maximum utility.

Keywords: Complexity, Information Sharing, Knowledge Transfer, Process Models of Knowledge/Information Exchanges, Influence Factors

Introduction
“Progress is achieved by the exchange of knowledge” (Becker 1995). The changes of the last decade or so in business as well as in society have brought with them a much accelerated availability (and volume) of information. To turn this into increased knowledge requires both effective communication processes and a continuing will to learn on behalf of individuals as well organisations. The transformation of the industrial society to one of information and knowledge work points to far reaching socio-cultural change. Concepts such as Total Quality Management and Business Process Re-engineering during the decade of the 90s were mainly concerned to optimise ‘hard facts’. The observed lack of unqualified success and often distinctly sub-optimal results (Gertz 1998) highlighted the fact that ‘soft facts’, i.e. factors dependent on the culture of the enterprise such as Change Management, Team Building and methods of Organisational Learning (Neumann et al. 1998) also possessed some hidden potential. From the end of the 90s this was accepted wisdom and from then on the hunt for diversification factors that were at once hard to imitate and competitively effective concentrated on the ideas, knowledge and creativity inside the head of an enterprise’s people. Most applications of knowledge management seem to deal with explicit knowledge, such as expert have, which is defined by its functional use, i.e. by what tasks it can help complete or which problem it can assist in solving. Implied, or tacit knowledge, however, is equally important.
Thus the knowledge in an organisation exists in a large variety of manifestations, from ‘hard facts’ to ‘softer’ representations such as general Weltanschauung, specific visions, myths, symbols and behaviour patterns.

Selected Knowledge Exchange Models
Models of the process by which exchanges of knowledge take place have played an important role in the building of explanatory propositions in this field. The models selected for discussion were all required to have a sound empirical base. The selection does not aim for completeness, but rather at demonstrating a delimiting spectrum of the phenomenon.

**Boeglin’s Model of Know-How Transfer**
For Boeglin (1992) transfer of know-how is a major competitive potential and an important synergy source for internal re-structuring, rapid growth and increased performance of decentralised organisations. Know-how transfer, however, always depends on the compatibility of the sender’s and receiver’s attitude and capabilities. Incompatibilities result in diverse problem/action types, as demonstrates.

The **Leadership Problems** result from the lack of willingness to participate in a knowledge transfer transaction, whereas **Communications Problems** on both the senders’ and receivers’ sides can be the result of communication channel problems, but more often have their causes in language difficulties, culture or context considerations and divergent experiences. Management of the problem/action process complex requires a balance between guidance and control as well as acknowledging and influencing the context for the process.

**Szulanski’s Step-Model of ‘Best-Practice Transfer’**
Transferring successful ways of operating to other parts of the enterprise is the focus of ‘Best-Practice Transfer’. This type of knowledge exchange often also includes strong elements of tacit knowledge, which are embedded in personal skills and previous experiences of collaborations and their social context. The model was developed by assimilating a number of research results from studies in the fields of innovation diffusion, social change, systems implementations and technology transfer (Szulanski 1996).

In the **Initiation** phase the decision is taken whether or not to transfer. **Installation** is the first actual transfer step, where resources between the first sender/receiver pair(s) are established and actual knowledge is transferred in the planned manner. The outcomes of these first attempts are then used to update the plan and to fine-tune the procedure accordingly. The focus during the **Ramp-up** phase is the facilitation of smooth provision of the right knowledge, the willing acceptance of the transfer by the receiver(s) and reaching (or otherwise) the required level of performance improvement. This will necessitate further refinements in the process, mostly to cope with unexpected occurrences or with under- or overestimated organisational or cultural factors. Once an acceptable level of improvement can be assured, the **Integration** of the transferred knowledge and any process modifications/enhancements resulting from it need to be undertaken. This aims to institutionalise the new procedural context as ‘routine’ work, i.e. making it stable and predictable.

Szulanski’s investigation furthermore focuses on the possible difficulties encountered in the transfer process. He found nine possible “internal stickiness” factors of which, however, only three would have a significant potential to disrupt or obviate the transfer:
- **Ambiguity** of the knowledge to be transferred seems to have the most influence;
• Absorptive Capacity: if this is insufficient to deal with the complexity (or ambiguity) of the knowledge (to be) transferred, then the probability of transfer failure increases;
• Arduous Relationships are the third, interconnected, obstacle to smooth transfers.

Richter’s Absorption Potential Model

The model was built following a study investigating the learning behaviour of German heavy engineering firms in Japan. It focused mainly on the transfer of cultural knowledge with a view to decide to what extent Japanese management philosophies and organisational and enterprise culture such as decision behaviour and customer orientation could be integrated into their German head office. The main finding was that the key factor for learning behaviour and thus for successful knowledge transfer was the nature and quality of the personal relationships between the centre and the subsidiary's offices (Richter 1995).

Analysing such personal relationships by themselves, however, is not enough to establish conclusions about the effect this learning behaviour may have on the quality of the resulting transfer of cultural knowledge. There are further influences that shape such a transfer – and also shape each other in a cyclical process (Krogh and Köhne 1998). These reactive measures, however, require additional operational and cultural knowledge to create an adaptive potential. If this potential not only leads to behavioural adaptation, but also affects and modifies the target norm and expectations – which the learning process is based on – then double-loop (context sensitive) learning is occurring. Single-loop learning is an imperative precursor to double loop learning.

If the centre of an international enterprise selects double-loop learning as a strategy to acquire knowledge across larger cultural and geographical distances, then this juxtaposes the transfer potential of the subsidiary against the absorption potential of the centre. The Transfer Potential is given through the power of transfer, the resources employed for mediation and the capability to communicate effectively. It subsumes the learning content of the preceding single-loop learning processes that can no handed on to the centre. The Transfer Power is the capability of the Japanese subsidiary to prevail in the German centre. The more they manage to be heard and be listened to the more they will prevail in transmitting the learning content accumulated. To assist this process, the centre delegated a dedicated staff member with the mission to act as a knowledge transfer “promoter”, which accelerated and smoothed the process considerably. The Mediation Resources represent the organisational, temporal and financial investments that the subsidiary can use to effect the transfer. Communications Capability refers to the quality with which the knowledge content could be verbalised, codified and eventually transferred.

The Absorption Potential of the centre illustrates the extent to which the transferred knowledge can be accepted, digested and integrated. It is determined by implementation power, absorption resources and interpretation capability.

The Implementation Power reflects the will and readiness of the management and staff in the centre to actually accept the transferred knowledge. To act upon it requires Absorption Resources, which mirror the mediation resources in the subsidiary. They are the sum of all that is necessary to assure that learning can occur. To make it effective may then require further Interpretation Capability, such as language (Japanese or English, at least) as well as a base modicum of knowledge about Japan (or the country from where the transfer originated, in general terms).
The study concluded that learning, i.e. effective knowledge transfer, is only successful if both Transfer and Absorption potentials are high. One sided potentials remain ineffective and the efforts invested evaporate (Richter 1995). Furthermore, even if both potentials are high, there is a danger that too little cultural knowledge is gained in the double loop-learning phase if the preceding single-loop learning turned out unsuccessful.

**The Transfer and Imitation Model of Zander and Kogut**

The basic hypothesis underpinning Zander and Kogut’s model (Zander and Kogut 1995) is that internal transfer (defined especially for manufacturing technology across business units of the same enterprise) and imitation (the capability to copy competitors’ products) are identical phenomena of organisational capabilities and diffusion processes, determined by common – and not specific, i.e. different – factors. Following the work of Winter (1987) and Roger (1980), Zander and Kogut recognise six main influence elements. An explanation of the influence factors and the hypotheses about their effect on transfer and imitation are shown in Table 4, below.

<table>
<thead>
<tr>
<th>Influence Factors</th>
<th>Hypothesis</th>
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<tr>
<td><strong>Codifiability</strong>: how far can the required knowledge be articulated into software and/or documents</td>
<td>The higher codifiability, the faster the transfer and the higher the risk of early imitation</td>
</tr>
<tr>
<td><strong>Complexity</strong>: the number of capabilities and competencies required</td>
<td>The higher the complexity, the more difficult (and slow) the transfer and imitation</td>
</tr>
<tr>
<td><strong>Teachability</strong>: how easy/hard it is to disseminate, teach and demonstrate the required knowledge</td>
<td>The easier it is to teach, the faster the transfer – and imitation</td>
</tr>
<tr>
<td><strong>System Dependence</strong>: the effort required to assemble the necessary groups of experts and the technology needed</td>
<td>The higher the systems dependence, the longer before the transfer can be effected and imitations could be started.</td>
</tr>
<tr>
<td><strong>Parallel Development</strong>: the number of competitors engaged in similar transfer and/or product development projects</td>
<td>The higher the competitive pressure, the faster the transfer and the earlier the risk of imitation</td>
</tr>
<tr>
<td><strong>Product Observability</strong>: how easy is it to ‘reverse engineer’ the product in question or reconstruct it from published Information?</td>
<td>The more observability, the sooner imitations may be expected; (this factor does not apply to internal transfers)</td>
</tr>
</tbody>
</table>

The processes of transfer and/or imitation are furthermore expected to be determined by the nature of the underlying base knowledge and the ease with which this knowledge can be copied or re-constructed. A further influence is the degree to which the participating firms use common or distinctly different manufacturing facilities. This is especially of importance when the transfer is not internal, but an imitation between competitors. The hypotheses about the effect the factors had on the speed of transfer and the ease of imitation were tested in a study of 35 innovations by firms in Sweden. On the strength of these findings, the original hypothesis that the internal transfer of technology capability and external imitation both work along the same mechanism did not hold up. A possible reason is that successful imitation of innovations relies on a number of other factors, outside manufacturing, such as marketing and other value chain management. Indirect factors, such as the imitating firm’s reputation and the legal environment it operates in are still further factors.
Factors Supporting or Inhibiting Information Sharing and Knowledge Exchange

There is widespread consensus about the importance of knowledge and about the fact that information sharing and knowledge exchange are central processes for the optimal use and distribution of the knowledge resource. The theory in this field goes to some depth about the different types and categories of knowledge and what distinct distribution corollaries result from them (e.g. Nonaka’s knowledge ‘spiral’). Applied research literature, aimed mostly at the practitioner, focuses more on the barriers to successful knowledge transfer and the dependency of these processes on their specific, often individual context.

Another focal point for the literature is the degree of difficulty with the implementation of information sharing and knowledge transfer processes in different fields, often coupled with analyses of the causes for the failure to actualise the theoretical insights when it comes to practical application. Part of this difficulty is that the frameworks and models discussed all come from different perspectives of knowledge and from different environments in which the transfer and sharing of such knowledge would be anchored. It may therefore be assumed that not every such model and framework is equally well suited to all situations of knowledge transfer. In the following, the models are categorised as to their usefulness for transferring and sharing the different types of knowledge encountered in the practical applications and contexts of knowledge management.

To find a categorisation scheme for different knowledge types, Zander & Kogut’s (1995) framework of ‘influence elements’ seems the most useful. However, for the purposes of this discussion, only the factors affecting “Internal Transfer” are of relevance. Of these, furthermore, Parallel Development, as an external influence, should be excluded from a model of the transfer process per se. The remaining four factors are closely related to each other – in fact only two of the ‘elements’ are not directly related to each other, as Figure 5. shows.

![Figure 5. (Co)relationships among knowledge transfer ‘elements’ that ‘influence’ and imitation.](image-url)

The relationships between the factors involved in the dynamics are here represented as “cause-effect-loops” introduced by Weick (1979, ch3, p65-88) with a notation of A+B meaning “the more of A, the more of B” and A-B standing for “the more of A the less of B” Teachability and Systems Dependence both are correlated to Codifiability: the higher the Codifiability, the higher the Teachability and the less Systems Dependence. Conversely, the higher the Complexity of the underlying knowledge, the more Systems Dependence, the less
Teachability and the less opportunities for Parallel Development there are. Complexity and Codifiability, however, are not correlated as the effects of any other factor – on the contrary, they themselves are multiple causations for the other factors. Complexity and ‘Codifiability’ (here interpreted as the extent to which the knowledge in question is tacit or explicit) can then be regarded as the bounding dimensions for classifying the type of knowledge to be transferred or shared.

Boeglin’s (1992) model, with its somewhat mechanical dynamics, is thus particularly useful for explicit knowledge of low complexity, where more sophisticated methods would most likely constitute an overkill. At the other extreme, for achieving the efficient transfer and effective sharing of more – or highly - complex knowledge, especially in explicit manifestation, Richter’s (1995) model seems more appropriate. This two-station model is characterised by a broad and deep structure of determinants which are engaged in an iterative cycle to enable ‘double-loop’ learning. Where knowledge is mostly tacit, i.e. difficult to codify, but of limited complexity, Szulanski’s (1996) stepwise progression model suffices and is very useful. In contrast, Zander & Kogut’s (1995) model can cope with high levels of complexity, and its processual nature and pre-defined factor structure means that the knowledge to be transferred may be at different levels of codification. Furthermore, the inclusion of the ‘teachability’ factor means that if a suitable communications structure and process configuration can be established than this model is of specific use for the exchange of tacit knowledge.

Whereas a factorial model may highlight the interconnection between the dynamic elements of knowledge sharing and exchange, a further common cause for the failure of knowledge transfer projects is often seen in the neglect of human factors and an overemphasis on information and communications technology solutions. Since humans play a critical role in the exchange of information and knowledge, there is a growing agreement building in the literature that such emotional factors as power, trust, likes/dislikes need to be taken into the theoretical considerations to much higher degree. This is reflected in the accounts of practical problems, which seem to boil down to two essential problem areas: for one this is the \textit{ex ante} definition of knowledge demand in the enterprise and, secondly, to engender enough positive motivation among employees to participate actively and in an engaged manner in any subsequent communications and exchange processes (Bullinger et al. 1998).

\textbf{Conclusion}

In conclusion, information sharing and knowledge transfer cannot be considered in isolation from the context that individuals, groups and organisational units find themselves when they participate in the transfer. The behaviour of the actors in this process depends on their individual and collective experiences, entry level of knowledge, their will to learn and the emotions towards other participants, determined by such factors as power seeking/preserving and (dis)trust. Groups are influenced by their collective behavioural characteristics, which themselves are dependent on culture and interaction potential, in turn governed by motivational factors and an open or closed ‘climate’. These factors are reflected in all aspects and phases of information sharing and knowledge transfer. They are all in correlation to one another, although the nature and depth of their relationship often differs considerably.

This underlying complexity is in stark contrast with the relative simplicity of the models introduced in this review and paucity of their predictive power. It is therefore difficult not to agree with (Krogh and Köhne 1998) that, given the current level of our understanding of knowledge exchange at the phenomenological level, we are some way away from being able
to govern or manage information sharing and knowledge transfer processes to a level approaching effective control. A much deeper degree of insight in the epistemological sense – to which the models, however, can and do contribute – seems to be necessary before we can begin to think of ours as a knowledge management culture.

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