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A SOCIOTECHNICAL MODEL FOR UNDERSTANDING ORGANIZATIONAL TECHNOLOGY AND KNOWLEDGE TRANSFER

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Abstract

Traditional technology transfer strategies tend to focus on physical organizational assets. However, these strategies tend to ignore essential social aspects of technology transfer which are key for organizations to harness the full benefits of these valuable yet usually underperforming partnerships. This paper will introduce a sociotechnical model for understanding technology transfer as an emergent result of key interactions between social and technical elements of both organizations involved. Applying a sociotechnical framework to technology transfer will allow for the application of sociotechnical concepts and tools with the potential of improving the learning quality of technology transfer efforts in which both parties will be able to learn from the other within a sociotechnical context. The paper will begin with a discussion of sociotechnical concepts within the context of knowledge and technology transfer. Recommendations for using the information in this paper to improve organizational technology transfer and absorption will be offered towards the end of the paper. This paper is mainly aimed at managers and knowledge management professionals although academics interested in technology and knowledge transfer within a sociotechnical context would also benefit from this paper.

Keywords

Knowledge Transfer, Technology Transfer, Knowledge Absorption, Organizational Learning, Sociotechnical System, Knowledge Sharing, Technology Sharing

1. Introduction

Technologies are an important element of an organization's innovation capability as they allow organizations to continuously develop innovations as a response to a changing environment (Olsson et al., 2010). Evolving environmental conditions affect the validity of existing innovations (of which technologies are a key driver) such that organizations in fast-paced industries or markets must constantly innovate to survive. Technology transfer and absorption can therefore be essential tools that organizations can utilize to remain competitive in highly complex and quickly evolving scenarios. Many organizations find this strategy difficult to execute effectively due to the tacit nature of technology and the inability of these organizations to harness these essential knowledge sources.

A sociotechnical systems model can aid managers in understanding and utilizing technology-related knowledge transfer and sharing strategies. Traditional technology transfer strategies mainly focus on configuring technical system elements such as explicit knowledge, processes, and tooling while ignoring social system elements (Salas et al., 2012). The social system is the only part of the sociotechnical system capable of adapting internal sociotechnical system elements towards required technologies to accomplish work domain requirements. Organizational technology transfer strategies which neglect social systems reduce potential competitive advantage gained through technology development and risks failing to develop needed or desired technological development the organization requires to remain competitive.

Technologies can also be viewed as both a flow and a thing much like knowledge (Snowden, 2002). This view of technology as a form of knowledge allows for knowledge transfer strategies to be applied towards organizational technology transfer. Technologies can also be viewed as an emergent phenomenon that allows organizational learning and adaptation strategies to be applied towards improving and evolving existing technologies towards specific context-driven outcomes. This view of technology counters traditional technology transfer strategies primarily focused on exploiting technical elements of the technology. These strategies fail to consider that technologies must be absorbed much like knowledge. Knowledge absorption takes place with organizational learning and knowledge absorption capability and how technologies apply to organizational goals. These technologies also evolve and flow to become high-level capabilities and competencies which define the organization's competitive niche and influence the variety of strategies an organization can pursue (Boisot, 1999).

The sociotechnical system technology transfer model proposed in this paper provides a framework for evolving social and technical system interactions into an emergent technological outcome. The model utilizes key knowledge sharing and transfer strategies within the context of the technologies through which this knowledge is a subset. The technical system will not be addressed beyond the key interactions with the social system; this paper assumes that technical system resources are well defined within existing technology strategies. This assumption will allow for the paper to focus more on the key sociotechnical elements ignored in traditional technology transfer strategies and how these interactions evolve into technologies that eventually lead to competitive advantages and the variety of potential strategies that an organization can pursue.

2. The Sociotechnical System Model

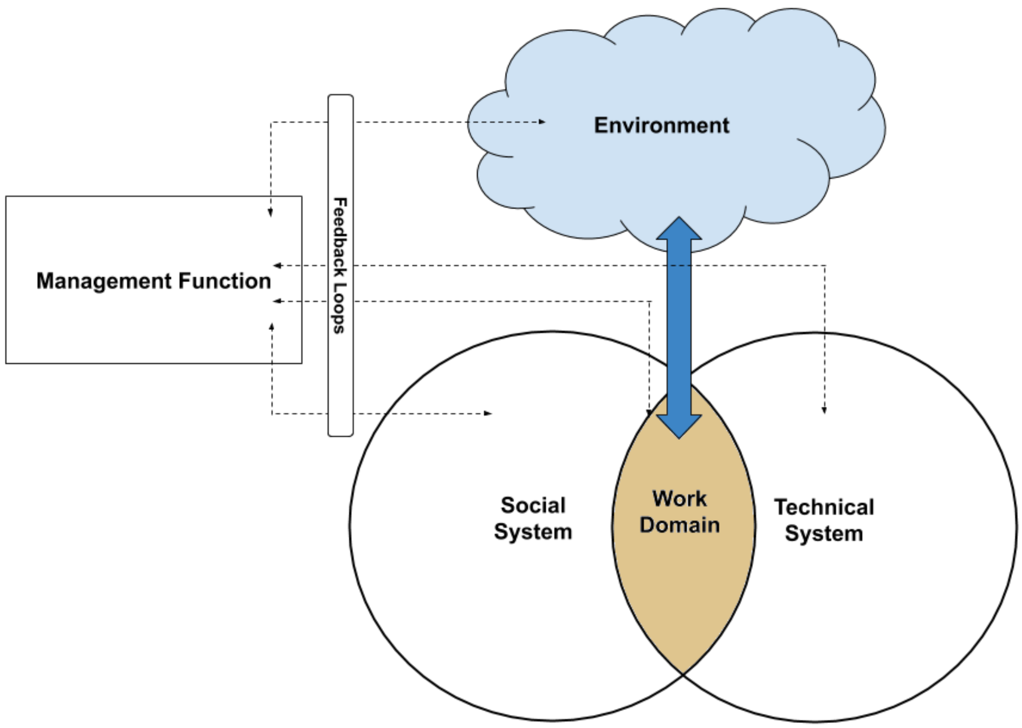
The sociotechnical system is defined as a system containing social, technical, and psychological elements whose interactions are aimed towards a particular set of goals (Vicente, 1999). Note that the psychological elements within simpler sociotechnical models such as the one used in this paper are defined as behaviors within the social system. The sociotechnical system model provides a means to understand how organizational social and technical assets are aligned and interact to achieve team and organizational goals (Pasmore, 1988). These social and technical systems are *separate but interdependent* subsystems that are *jointly optimized* to exploit environmental factors towards organizational goals (Patnayakuni & Ruppel, 2010). The social system (which represents individuals, teams, and their behaviors with specific roles aligned towards sociotechnical goals) and technical system (physical assets such as explicit stored knowledge and defined processes) are the main sociotechnical model components optimized by the management function. The management function optimizes these sociotechnical actions concerning existing sociotechnical capabilities and how they relate to local environmental needs as defined within a goal (Beer, 1981). The work domain represents key social and technical interactions aligned towards a defined configuration as defined by the management function.

Sociotechnical interactions are aligned with technical system elements using social system behaviors to exploit local environmental factors defined by the management function.

The work domain defines the particular environmental, social, and technical elements and how they interact and align towards environmental requirements (Pasmore, 1988). These interactions manifest themselves within the work domain to reflect sociotechnical goals as defined by the management function. The work domain represents the particular configuration of social and technical interactions within the context of the sociotechnical system as designed by the management function to exploit a particular local environmental strategy. Work domain and local environmental strategy alignment define how technology is configured and absorbed by sociotechnical elements through organizational learning.

The management function (which resides outside of the sociotechnical system) defines the work domain through decoding feedback signals from the local environmental (i.e., customer demands, competitor behaviors, regulatory changes) and sociotechnical subsystem elements (social system, technical system, and work domain) performance and aligning sociotechnical resources as required to address any environmental or sociotechnical system changes. It is in this way that the management system encourages sociotechnical system adaptation and which allows the management function to exploit environmental factors. The management function influences social system behaviors through such strategies as goal alignment (in which certain behaviors are encouraged over others to align internal organizational goals) and artificial scarcity (in which resources are provided or withdrawn in response to certain desired sociotechnical system behaviors) while technical system outputs are influenced through making various technical system resources available to the social system as required (Sexe, 2018).

The local environment represents the higher-level system the sociotechnical system interacts with (i.e. local system, legal system) outside the direct control of the sociotechnical system and which influences its behavior (Skyttner, 2010). The environment can be located both internally (i.e. other teams or divisions vying for resources or customers) and externally (i.e. governmental regulatory bodies, customer segments, competitors) from the sociotechnical system. Environmental elements are defined by the management function by identifying desired sociotechnical system demands concerning environmental demand (which is typically a part of an overall organizational strategy) and monitoring these external and internal environmental system factors through feedback mechanisms (Sexe, 2018). These feedback mechanisms provide information used to define its core strategy (which is subsequently used to define the work domain which is used to align sociotechnical system resources). Feedback from local and external environmental factors is used by the management function to adjust or define the type and quantity of product or service (as defined by the work domain) to accomplish defined sociotechnical or higher organizational goals.



(Sexe, 2018)

Figure 1: *Sociotechnical Model*

The social system is the only subsystem within the sociotechnical system capable of adaptation and absorbing systemic variation and variety. The social system does this by adapting to environmental stimulus and aligning behaviors (at the team and individual level) and interacting with technical system elements to meet work domain requirements (Sexe in Reis et al., 2018). The social system uses technical system resources to create sociotechnical inputs as dictated by the work domain and defined by the management function. These outputs are monitored by the management function and compared to the desired output to meet environmental demand. The management function influences the balance between sociotechnical system outputs and local environmental demands through key feedback loops with the work domain and local environment. It is essential to understand that the technical system is unable to adapt without social system or management interaction and relies on the social system to achieve work domain and strategy goals (Sexe in Reis et al, 2018).

The role of the management function is to ensure homeostasis (harmony) between the sociotechnical system and internal and external environments. The management function accomplishes this by defining the overall sociotechnical system goal and allocating resources towards this desired goal. Homeostatic balance is achieved by aligning and allocating both social and technical system resources based on defined work domain requirements to achieve a particular goal as defined by either the local (tactical-level goal setting) or high-level management functions (as part of an overall organizational strategy). The management function monitors organizational operations at several different levels to ensure a balance between the organization, internal, and external elements through feedback mechanisms which provide it with the information required to make critical decisions related to this balance (Beer, 1981).

The design and implementation of feedback mechanisms have a significant impact on management function ability to provide feedback and resources to sociotechnical entities based on what is measured (i.e., is what is measured an accurate indication of system performance?), how it is measured (is the place the feedback is gathered the best place to gather it?), and the speed at which the feedback is provided (is the feedback still an accurate representation of what it is supposed to measure?). These factors inadvertently create variation within the system, especially if the feedback mechanisms are not aligned with the overall system goals that feedback mechanisms are designed to represent (Skyttner, 2010). This feedback is used by the management function to provide a model of current system performance and is compared to desired performance as defined by desired work domain goals. This ‘current state’ is compared to the ‘desired’ work domain state to allocate and align resources accordingly (Sexe in Reis et al, 2018).

The work domain represents the alignment of sociotechnical resources based on the requirements of the overall system goal (Pasmore, 1988). The management function uses the work domain to define desired sociotechnical system interactions and provide outputs to address environmental demands. This goal is defined through higher-level organizational goals which are applied to existing local environmental context to define the most desired and likely outcomes the sociotechnical system is to achieve. This definition is also used by the management function to attenuate complexity by aligning sociotechnical system elements to focus on certain elements of the environment at the expense of others elements (reducing variety), define desired output levels within the capacity of the existing sociotechnical system design (matching potential output to environmental demand), improve sociotechnical system outputs to best imitate desired environmental demand requirements (reducing variation), or improve throughput to ensure that sociotechnical system outputs are available to the local environment. These work domain manipulations are performed with the intent of ensuring alignment between aligned resources representing the sociotechnical work domain and environmental demand it is designed to exploit. The management function performs this by monitoring sociotechnical interactions between social and technical systems and the response of outputs from the environmental system to ensure this output best addresses environmental demand requirements.

3. Technology, Capabilities, and Competencies

Technologies, competencies, and capabilities are manifestations of knowledge assets operating at different levels of the organization (Boisot, 1999). Technologies are developed at the strategic level in response to environmental demands while capabilities are more strategic and are designed to exploit larger and more complex environmental opportunities. It is important to note that capabilities suffer from lower context (being strategically defined) concerning technologies (which are tactically defined) as technologies are developed closer to the local environment. This tactical focus provides the context which defines how these technologies are developed. Capabilities are also more complex than technologies due to the increasing number of potential capabilities a technology may be applied towards. Organizations address this complexity by defining potential threats and opportunities and identifying technologies needed to address them while also configuring these technologies into competencies and capabilities. Organizations reduce this complexity in an attempt to optimize resource utilization by reducing resources allocated towards those capabilities which do not fit the organization’s desired core competencies or competitive advantage. These core competencies are aligned into core capabilities which allow for the most efficient means of developing products and services for environmental entities (i.e. the customer).

Technologies are used within the context of the management function to align resources towards desired outputs. For example, an identified need by the local environment may require a new capability to be acquired to provide organizational competence. This identified need results in the management function seeking technologies which comprise this capability as part of overall organizational competencies and which will assist the sociotechnical system in achieving desired outcomes. This technology and subsequent competencies and capabilities are then made available to other organizational functions and sociotechnical systems within the organization to address other local environmental demands within their particular context.

Technology can be defined within the context of a sociotechnical model as an emergent outcome of the application of explicit and tacit knowledge to a particular context or desirable environmental outcome (Boisot, 1999). These technology outcomes are subsequently synthesized by organizational elements and configured in either existing or future competencies. Organizations combine technologies to create or improve organizational competencies by combining multiple competencies to define organizational capabilities (Boisot, 1999). These three organizational elements develop through emergent manifestations of knowledge and tangible assets operating at different levels of the organization. These assets define upper-level elements and organizational learning to create competitive advantage. Technologies are strategically created using sociotechnical interactions in which social system elements use tacit knowledge (i.e., experience and uncodified knowledge) to manipulate technical system towards a particular aim or goal. It is important to remember that tacit knowledge can only be utilized through direct sharing between social system entities due to its highly contextual and uncodified nature. Technology development must therefore use and influence social system ability to exploit tacit knowledge inherent within its members at both the individual and team level.

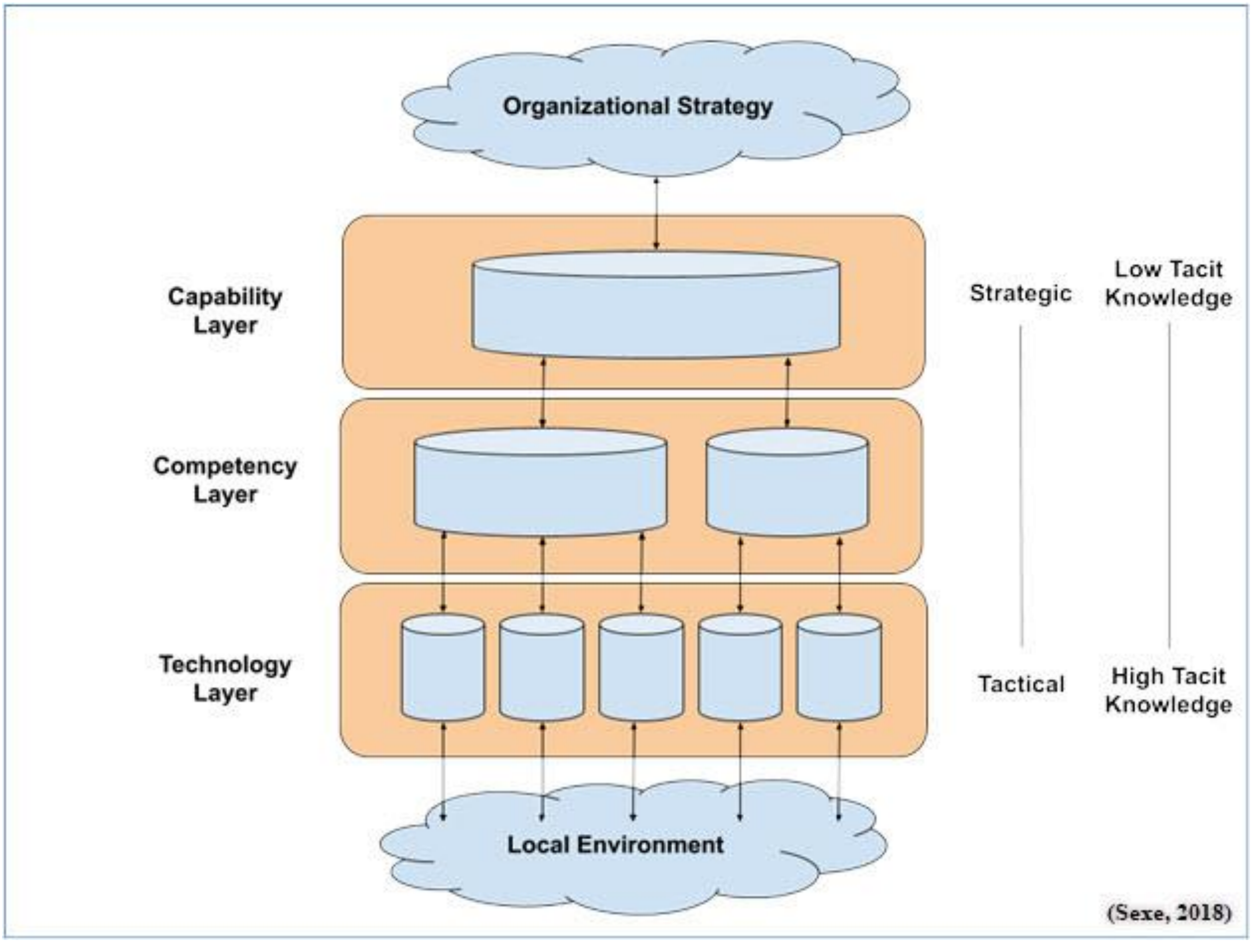


Figure 2. *Technology, Competencies, and Capabilities*

Technologies are developed at the strategic level through configuring sociotechnical systems to produce specific types of physical effects (Boisot, 1999). The management function defines physical effects and aligns organizational resources to exploit perceived opportunities or preventing perceived threats. These physical effects are defined by identifying work domain characteristics required to exploit a particular environmental demand or threat (i.e. a restaurant designing vegetarian dishes, an automobile company developing an electric transmission).

Capabilities are defined within the context of organizational development as strategies in which multiple technologies are combined with latent organizational and technical skills to achieve a certain level of performance to produce physical effects (Boisot, 1999). It is important to note that technology development by two separate organizations can create two different results which in turn may manifest different competencies within each organization. Competencies are by definition the application and integration of capabilities towards a strategic goal or plan. These competencies represent the core competencies and competitive advantages through which capabilities and technologies define the overall strategic focus. Competencies are typically political and negotiated internally to an organization based on an understanding and development of a strategy that revolves around them (Boisot, 1999).

4. Knowledge Creation and Sharing

Learning cultures deal with environmental ambiguity and uncertainty through the self-generation of ideas or exploring new options (Snowden, 2002). These cultures develop innate mechanisms using strategies using embedded organizational capabilities such as team cognition interactions to overcome or exploit uncertainty. These mechanisms require an organizational culture that is comfortable with risk and conflict to be successful as risk-averse organizations may discourage sociotechnical behaviors required to make effective use of such tools (Salas, et al., 2012). Organizational cultures comfortable with risk and conflict are more willing to engage in knowledge sharing and transfer behaviors than more risk-averse cultures since learning and absorbing new technologies is a form of risk that challenges the status quo.

Knowledge sharing between entities such as organizations and teams also requires a requisite level of abstraction for both implicit and explicit knowledge exchanges (Snowden, 2002). A requisite level of abstraction combined with low social distance is required to encourage bi-directional 'learning' for new meaning to emerge between parties as knowledge is shared freely and openly (Snowden, 2002). This continuous bi-directional knowledge sharing allows for context-specific and experiential learning to occur in which meaning-based and context-specific technologies are developed. Knowledge transactions between entities in which an abstraction imbalance exists results in 'teaching' behaviors (knowledge is communicated in one direction only) with no learning from the side of the teacher (Snowden, 2002). Extreme situations with a teaching abstraction level and high social distance between the 'student' and 'teacher' will result in little or no technology transfer from either side.

Tacit (uncodified) knowledge creation is influenced predominantly by social factors such as shared language, shared context, trust, and shared identity (Brewster et al., 2020). These social distance factors have been shown to significantly influence the level of comfort that an individual or group may have in openly sharing knowledge with others. Extreme instances of high social distance (in which individuals feel socially distant from others) create scenarios in which team members withholding knowledge from others (both tacit and explicit) as a means of maintaining their competitive advantage within the team (Brewster, et al., 2020). Technology transfer suffers from the same vulnerability as individuals from one organization may be less inclined to share their knowledge with those from other organizations or teams whom he or she may feel threatened. Team members from the partner organization receiving the technology may feel a similar desire to withdraw from technology and knowledge sharing agreements if they feel that their openness may leave them vulnerable to the other organization.

Social transfer (defined as the transfer of knowledge facilitated through social means) directly influences the amount and quality of knowledge transfer with regards to individual work domain requirements (and compatibility with partner needs), environmental strategies (alignment of strategic goals between both the partner and sharing organization), and contextual factors (i.e. the particular market or demographic being targeted by the technology). More similar or compatible social transfer factors will allow for more relevant and accurate knowledge being shared between parties (Salas et al., 2012). Tacit knowledge created and shared between parties is applied to existing explicit (codified) knowledge resources to influence new technology and knowledge sharing and creation. Note that in both cases contextual similarity and both environmental- and work domain-defined knowledge applicable to these factors influence both the amount and relevance of the technology and knowledge created and shared between parties.

Technology and knowledge sharing and creation are both emergent and context-specific activities requiring both tacit and explicit knowledge to develop (Sexe, 2018). These knowledge sources are created using both existing knowledge (i.e. prior contextual experience and previously designed processes) and context-specific knowledge related to the new technology. A result of this interaction between contextual and experiential knowledge is an evolved technology containing advantages over the local environmental factors it is designed to exploit. Figure 3 represents a technology sharing model which illustrates these factors.

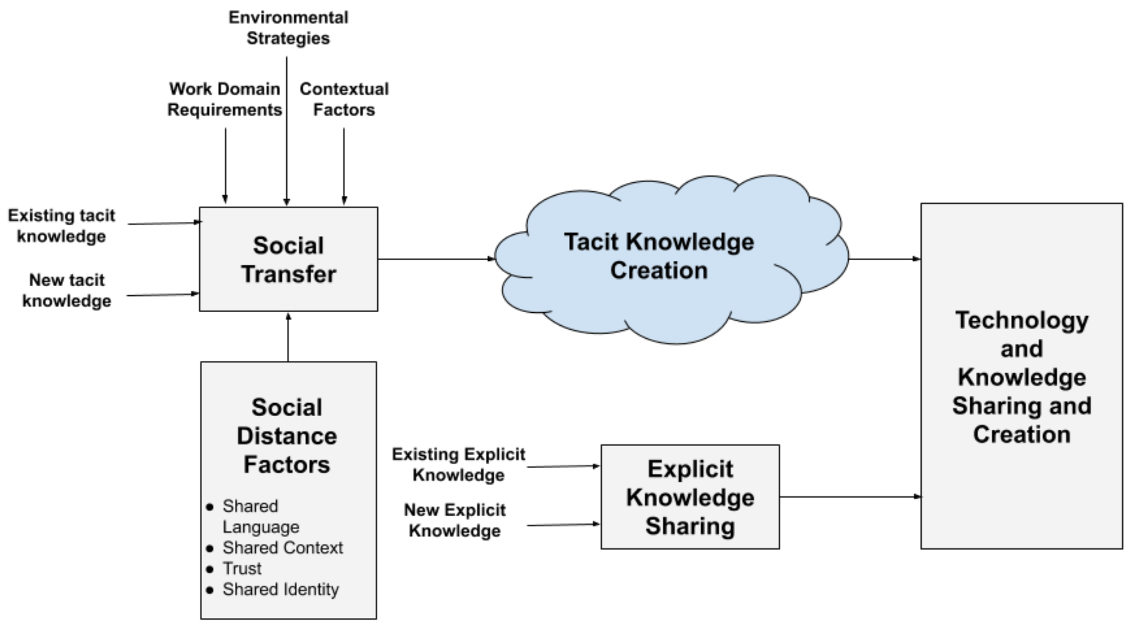


Figure 3: *Technology and Knowledge Creation Model*

Organizations attenuate complexity and reduce variability using standardization and organizational strategies (Boisot, 1999). Organizations that rely heavily on standardized processes to reduce variation may find it challenging to adopt new technologies which require high levels of process modification behaviors to execute. Simple explicit knowledge-reliant designs are unable to absorb complex changes which may discourage social system entities from adopting or evolving new technologies, especially if these new technologies require high levels of output variation and required skills and experience related to the existing technologies (Vissers & Dankbaar, 2013). These types of organizations subsequently find it difficult to adapt to environmental demands and requirements due to the inability of the social system to modify behavior outside of these defined processes. Organizations reliant on process and task standardization also find it challenging to absorb the complexity caused when new technology work domains are introduced (Vissers & Dankbaar, 2013). An organizational focus on standardized processes and contextual experience discourages adaptation through a 'this is not the way we do things here' mentality. Explicit knowledge sources also lack the depth of tacit knowledge and are unable to be readily applied to different contexts as it is a reflective artifact of the tacit knowledge from which it was developed (Snowden, 2002).

5. Sociotechnical Technology Transfer Model

Viewing technologies within the context of an organization's competencies and capabilities aids one in understanding how knowledge-intensive they are. Technologies, due to their high amount of contextual and tacit knowledge, require a significant amount of social interaction to develop. This reliance on tacit knowledge means that a technology adoption strategy focused on exploiting social system interactions would benefit greatly from knowledge transfer and increase the level and quality of technological adoption and understanding for both parties (Boisot, 1999).

Inter-organizational knowledge sharing relies on social interactions similar to intra-organizational knowledge sharing due to the high levels of tacit knowledge involved (Vissers & Dankbaar, 2013). Large organizations find it difficult to innovate due to their reliance on standardized and codified processes as a means of reducing variability between organizational entities. An exception to this rule would be mechanistic organizations using highly standardized processes which do not rely on tacit knowledge to perform (Boisot, 1999). The technology which is shared and absorbed must be similar to an organization's existing technologies and work domain configurations for technology adoption to be successful. These organizations are subsequently unable to adapt and absorb new knowledge and technologies because as they rely heavily on standardized processes as a means to improve repeatability and reduce variability. Organizations such as this are typically found in industries in which technologies and market demands rarely change; these organizations subsequently find it difficult to adapt to immediate threats due to an inability to develop adaptive processes and a culture that encourages their use (Olsson et al., 2010).

Technology transfer is similar to knowledge transfer such that it benefits from double-loop learning which allows organizations to compare the performance impact of existing technologies to environmental variables and evolve these technologies to adapt to new environmental requirements (Olsson et al., 2010). However, this double-loop learning requires high levels of tacit knowledge transfer which is heavily influenced by social system factors. These social system factors (identified in figure 4) require interactive, cumulative, and cooperative strategies which may be lacking in organizational technology transfer strategies which rely on explicit knowledge transfer to accomplish. The lack of a cohesive tacit knowledge strategy such as that provided in a learning and adaptation 'dual loop' can impede technology and knowledge transfer for a myriad of reasons such as mistrust, incompatible cultures, and poor communication quality (Sexe, 2018). The utilization and development of strong social networks both within and between companies can therefore create a learning context that fosters learning between and within organizations which is both useful and enriching for both parties by reducing the impact of high social distance and fostering a learning environment between the two entities (Olsson et al., 2010).

Figure 4 provides a diagram illustrating key interactions between sociotechnical elements. Note that the smaller sociotechnical system is a recursive representation of the larger sociotechnical system with the same key elements.

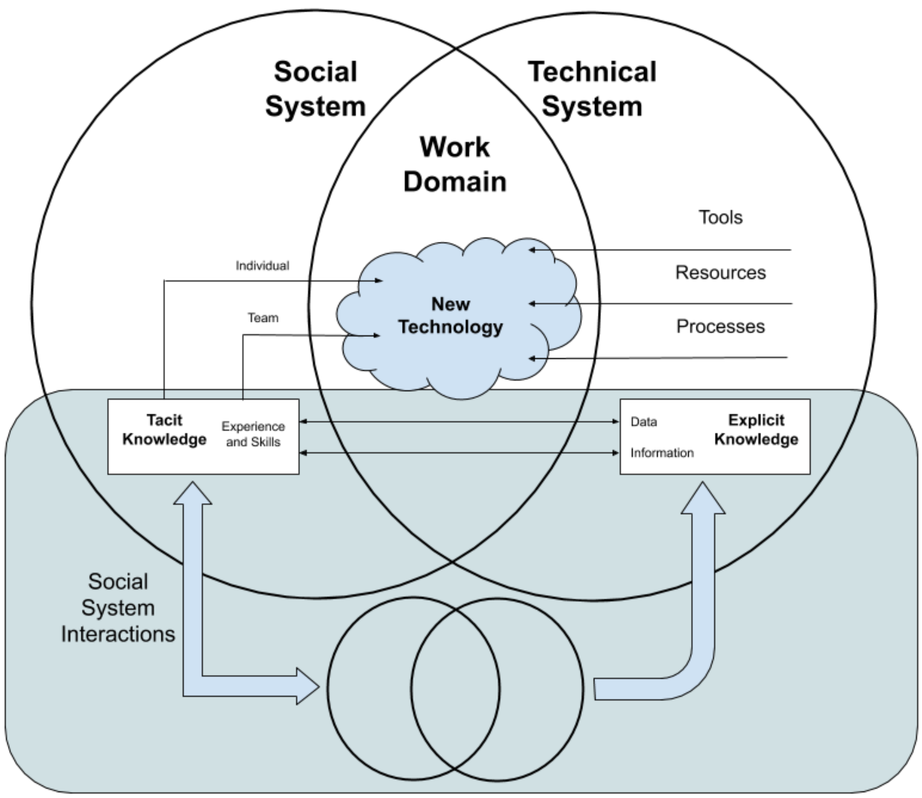


Figure 4: *Sociotechnical Technology and Knowledge Transfer Model*

Tacit (uncodified) knowledge plays a significant role in technology transfer as it is responsible for absorbing the knowledge related to new technology and applying it to the particular context represented in the work domain. Technology transfer relies heavily on tacit knowledge transfer and its application towards a new work domain context. Organizations may find it easy to absorb explicit knowledge sources (i.e. drawings, documents, processes) but difficult to absorb high-context tacit knowledge as tacit knowledge relies heavily on contextual learning.

Highly standardized organizational systems with low interdependence between roles and processes are typically low on tacit knowledge due to a high reliance on explicit knowledge sources to standardize work domain outputs (Vissers & Dankbaar, 2013). These organizations find it difficult to absorb complex technologies due to a lack of tacit knowledge-sharing strategies within the organization to metabolize these new technologies and apply them towards the desired work domain. Tacit knowledge is only possible through such social conventions as socializing which allows actors to engage in shared experiences and joint activities requiring proximity to knowledge sources and learners (Vissers & Dankbaar, 2013). These tacit knowledge activities occur on personal (person-to-person) and collective (team-based) knowledge-based interactions. These knowledge-based interactions are highly sensitive to relationship patterns which directly impact the ability of organizational actors to absorb and apply tacit knowledge towards the development of new technologies.

6. Recommendations and Future Research Suggestions

Double-loop (also called dual-loop) learning systems such as the team cognitive systems process resilience model shown in figure 5 can be very effective in improving how organizations adapt existing technologies based on evolving environmental requirements. Technology and knowledge transfer between organizations may benefit from implementing a dual-feedback mechanism as part of a learning and adaptation strategy so that each entity understands how new knowledge and technology relates to a particular work domain and its environmental demands. This understanding is key in helping to drive shared understanding between both social systems (and the larger social network) and developing shared trust between both entities (Sexe, 2018). These key factors are emergent properties in which each entity defines their particular work domain while evolving learned knowledge and technology to maximize their work domain requirements. A shared understanding of work domains between entities will aid each party in optimizing knowledge creation and transfer while ensuring that it is value-added.

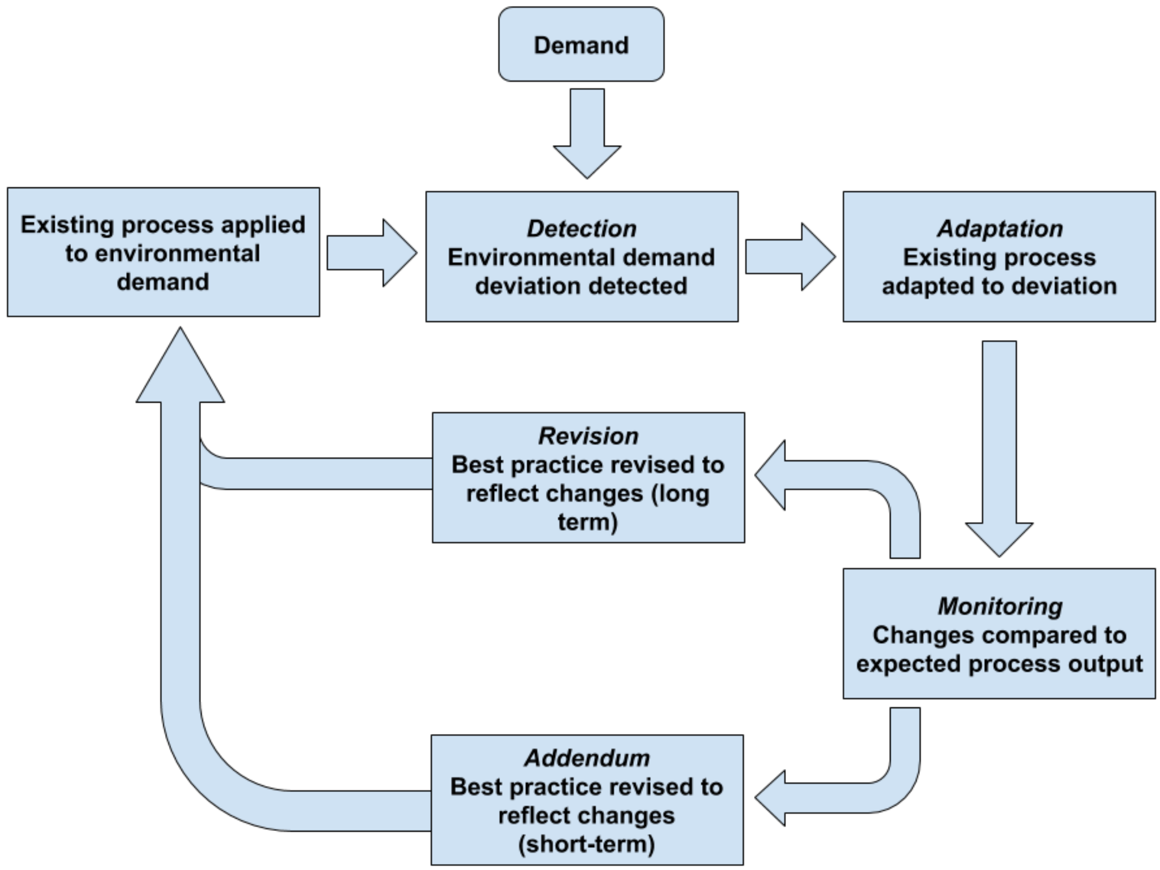


Figure 5: *Cognitive Process Model*

Future technology transfer efforts can benefit from traditional sociotechnical system tools designed to improve social and technical system interactions. These tools can be especially useful in improving knowledge transfer by simplifying interactions between social and technical system elements. Work domain and constraint-based task analyses can be used to decompose technological requirements and ensure both parties understand the resources required and how to most efficiently align them within and between organizations (Vicente, 1999).

Future sociotechnical system technology application research could improve the framework presented in this paper by providing organizational decision-makers with an understanding of how to align technical system resources to exploit social system capabilities. This research would expand upon the benefits stated in this paper while also improving technology absorption and transfer outcomes.

7. Research Limitations

A major limitation of this paper is that it did not address strategies to evolve technologies into more strategic capabilities and competencies. Organizations seeking a more holistic means of absorbing technologies as a means to improve overall organizational strategy could benefit from research that expands upon these other two forms of knowledge. An examination of the relationship between individual sociotechnical variables and knowledge and technology transfer effectiveness was also limited in this paper but could help provide an additional layer of understanding for practitioners seeking to improve internal sociotechnical system variables themselves. The concepts proposed in this paper shine when managers and practitioners focus efforts towards understanding complex technology transfer challenges by applying similar and more readily applicable knowledge assets. This lack of focus on individual sociotechnical system variables may limit the ability of managers and practitioners to apply improvements to the sociotechnical system holistically and recursively and may limit its effectiveness.

The sociotechnical technology transfer model ignores specific social system factors influencing team social and technical performance such as culture and organizational citizenship behaviors. These limitations influence sociotechnical system performance external of the behaviors proposed in this model but which may have a significant impact nonetheless.

One of the key shortcomings of this paper is that it does not provide context-specific applications from a diverse set of industries. Future efforts can apply key concepts from this paper into existing technology transfer efforts to aid academics and practitioners in understanding how these concepts apply to different types of industries. The model could benefit from the application with either existing technology transfer efforts or analysis of previous technology transfer initiatives. This analysis would provide researchers with effective feedback to both improve model performance and improve how the model can be applied to different contexts.

An assumption made within the paper was that technical system elements remain static throughout the technology transfer effort in a bid to simplify the dynamics modeled in this paper and limit the scope to a more manageable level. However, social and technical system interactions constantly evolve and change over time due to both social system and managerial engagement. Future research within the context of this paper could expand understanding of sociotechnical elements and technology transfer by including technical system influence with both social system entities and management objectives.

8. Conclusion

The dynamic nature of modern business operations requires new thinking on how to optimize social and technical system capabilities towards organizational objectives. This paper provides practitioners and researchers with a model which can be used to improve competitive advantage by leveraging key sociotechnical interactions within and between organizations. This advantage focuses on treating technology development as an emergent property of social systems similar to organizational knowledge. The paper focuses on technologies, capabilities, and competencies as manifestations of knowledge assets operating at different levels within an organization based on strategic focus and levels of tacit knowledge being leveraged. By aligning technology transfer with tacit and explicit knowledge the paper will provide a framework for applying organizational knowledge assets towards key technology transfer initiatives to both expand existing technologies or absorb key technologies from other companies.

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