

KNOWLEDGE STICKINESS, KNOWLEDGE MANAGEMENT, AND THEIR IMPACT ON FIRM LEVEL COMPETITIVE ADVANTAGE

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Abstract

This paper explores the areas of Knowledge Stickiness and Knowledge Management. In doing so, it develops a set of propositions for considering the Stickiness of Knowledge as a construct to be used to understand the impact of knowledge management strategies and firm-level performance within a given industry. The result of this work builds on previous work in knowledge management and business strategy thus providing a research stream that looks at the relationship between a firm's knowledge management strategy and how the firm views its boundaries with other firms in the industry.

Keywords: *Knowledge management, sticky knowledge, competitive advantage, tacit knowledge, explicit knowledge.*

Introduction

Management scholars strive to answer the questions of why firms exist and why certain firms out-perform others. In the process, multiple theories have been developed. Many of the leading theories suggest that firms exist to facilitate the development, sharing, and dispersion of knowledge; and the organizations that excel have developed superior competencies in managing this process (Li & Hsieh, 2009). This paper adds new dimensions to the theory that discrepancies in firm performance within an industry can be answered, at least in part, by knowledge asymmetries among the firms within the industry (Earl, 2001) and how firms manage the flow, or stickiness of this knowledge. The interpretation and transfer of knowledge requires multiple stakeholders (Busch, 2008, 1). Due to its importance, the topic has been widely explored, but researchers find that knowledge management and stickiness remain a fruitful area for exploration as many key questions remain open for debate and new ideas are formulated (Venkitachalam & Busch, 2012; Collins, 2010).

Von Hippel (1994,1998) worked to define knowledge stickiness. The more difficult it is to obtain, transmit, and employ information at a new location, the stickier it is. Management scholars have argued that knowledge is the most valuable resource for firms (Lee, 2000; Drucker, 1994). As such, organizations have embarked on numerous programmes to increase the availability of knowledge via training programmes and networks to their employees. Unfortunately, successful knowledge networks represent the occasional island dotting a sea of failures. While many organizations are eager adopters of knowledge networks stems, individual users frequently abandon them, leaving a trail of million-dollar paperweights. To be self-sustaining, knowledge networks must be sticky, though stickiness is an elusive design objective (Bush & Tiwana, 2005). Knowledge must flow within an organization, but not right out the door. One approach to address firm advantages is to consider knowledge asymmetries. As such, in seeking a competitive advantage management scholars argue that firms exist to coordinate the knowledge efforts of diverse individuals within the marketplace (Conner & Prahalad, 1996). Knowledge management which targets explicit knowledge being able to identify and codify knowledge makes knowledge transfers more successful (Mooradian, 2005) Under this coordination of knowledge-efforts view, firms exist to facilitate the transfer of knowledge where appropriate, and combine knowledge types where needed to produce a higher order good. The firm as knowledge facilitator view assumes that the firm is a more efficient means to transfer or to bring together diverse units of knowledge than one can achieve in a market dynamic; the transaction costs are less in a firm than in market dynamics (Conner & Prahalad, 1996).

This paper draws from and adds to the stream of literature arguing that firms exist to facilitate knowledge (Grant, 1996; Kogut & Zander, 1992). The coordination of the knowledge efforts of diverse individuals and effective knowledge management is paramount for long-term success in organizations. Therefore, developing an effective strategy with respect to both dispersing and protecting their knowledge assets and processes, given the industry and market position occupied, is necessary for firms to achieve a long-term competitive advantage.

Given these assumptions, this paper develops a set of propositions to address the stickiness of knowledge and the firms' knowledge-management strategies as a way to understand firm performance within a given industry. The result of this work will build upon previous work in knowledge management and business strategy and

provide a pathway to a research stream focusing on the relationship between a firm's knowledge-management strategy and how the firm views its boundaries with other firms in the industry. In order to accomplish this task, section 2 of this paper consists of a brief literature review of knowledge-management and the stickiness of knowledge, key terms, and definitions; section 3 is devoted to the development of the propositions suggested by this research; section 4 summarizes the work presented here, and section 5 suggests future efforts and directions in relation to the propositions developed.

Literature Review

The field of organizational knowledge research stems from Ryle's (1949) distinction between knowing-that and knowing-how Polanyi (1967) later refined this concept into tacit and explicit knowledge. Since the publication of these two works, knowledge issues have polarized the distinctions made by Ryle and Polanyi and continue to this day.

Von Hippel (1994) was the first to suggest the term "sticky" in relation to business applications. His research concerns technical development areas and in particular, he is concerned with the impact that sticky information has on innovation and problem-solving within organizations. He defines sticky information as knowledge that is costly to move from one location to another. The problem for Von Hippel is in the recognition that (a) any monopoly may be broken since the information, once out, may be reproduced by anyone; and (b) in order to solve a problem, the information necessary to answer the question must be brought to a single location--either "physically or 'virtually'" (p. 429).

For instance, considering the generalized labourer possessing a high degree of gestalt, one is left questioning what type of stickiness this might be since this type of classification carries little meaning. However, one can easily conceptualize a specialized expert with a high degree of gestalt; for instance, an expert carpenter whose knowledge is not easy to replicate and therefore, the most cost-effective way to transfer the knowledge (or information for Von Hippel) is to co-locate the source and the recipient. The problem with knowledge is that it is costly to acquire, transfer, and use in a new location. For instance, in the case of the carpenter, not only does one have to bring in the expert from outside, but the firm also has to pay

for the non-productive training time. Additionally, there may exist a need to later bring the expert back to the location as unanticipated problems are encountered. Thus, for Von Hippel, any information that is costly because of acquisition or transfer expenses is considered “sticky”; moreover, the greater the degree of stickiness, the higher the associative costs. Knowledge requires a high degree of gestalt such as Polanyi’s knowing by doing where there is a long apprenticeship period or a great deal of education required for individual training.

Von Hippel (1994) makes four claims regarding sticky information and the locus of problem solving:

1. If sticky information is held at one location and the problem may be addressed at that location, then the problem-solving activity will be carried out at this location.
2. If multiple locations of sticky information are called upon in order to address a problem (i.e., if the resolution to the problem is dependent on multiple sites), then the problem resolution will occur through an iterative process passing from location to location until the problem is resolved.
3. If the iterative process is cost prohibitive, then the problem will be partitioned into “subproblems” so that each location will handle a specific portion of the problem.
4. Finally, where possible, efforts will be made to reduce the cost of stickiness of the information. Von Hippel operationalizes a unit of stickiness as the additional incremental costs necessary to transfer one unit of information from one location to another in a format that is usable by the second location in a given instance. This paper adopts Von Hippel’s operationalization of a unit of stickiness.

For Szulanski (2003, 1996), information is relatively costless and easy to transfer; it is simply data. However, knowledge containing a set of expert heuristics, making it more difficult to codify knowledge gets closer to this paper’s definition of knowledge as an actionable heuristic and exemplifies Polanyi’s knowing in action. He conceptualizes a theory of sticky knowledge as a dyadic exchange of information between a source and a recipient where the source attempts to transfer a firm best-practice to the recipient in a process that involves four stages: initiation, implementation, ramp-up, and integration. Szulanski uses the term “transfer” rather than diffusion for his theory of sticky knowledge to emphasize that the act of the knowledge transference is discrete and deliberate.

Although Szulanski and others use the word “tacit” to speak about the stickiness of knowledge, they do so only to indicate the internal nature of the knowledge. As the literature evolved, scholars have come to see stickiness as a continuum rather than see knowledge as dichotomously tacit or explicit; there is friction (understood in the literature as stickiness) in all knowledge transfer. (Chon, 2011; Li & Hsieh, 2009). Tacit knowledge is seen as vague and ambiguous. This ambiguity creates confusion that in turn makes developing and implementing knowledge strategies more difficult (Mooradian, 2005). Collins (2010: 6–7) goes so far as to suggest that there is a problem understanding what “explicit” knowledge means. He states that explicit knowledge is rooted in tacit knowledge and also proclaims that tacit knowledge depends on the explicit. He further states that the debate goes back, at least, as far as the Greeks.

For Szulanski, tacit is used in the Rylean sense of knowledge held internally and not externally verifiable by another human; the knowledge of one individual may only be approximated by another. Recall that Polanyi’s knowledge is a gestalt knowledge developed over time and therefore, knowledge transferred in a discrete act fails to earn the level of Polanyi’s gestalt. Knowledge falls on a continuum from tacit to explicit or from gestalt to information.

With the preceding foundation established and some of the differences in the interpretation of information and various types of knowledge, it is now possible to talk about how one might conceptualize an integrated theory of sticky knowledge and firm strategy in order to further explain competitive advantages and knowledge asymmetries in an industry. The remainder of this paper focuses on the development of propositions that suggest how to capture some of the variances in firm performance.

Proposition Development

Much of the research on knowledge management assumes that knowledge is a dichotomous variable where it is either explicit or tacit. Although this makes the coding of research easy, it does not accurately reflect the true nature of what knowledge is or how it might reside in organizations. Rather than the “either-or” assumption stemming from Ryle and Polanyi, it is far more likely that knowledge resides on a continuum between explicit and tacit that reflects various degrees of “knowing” (Albino, Garavelli & Schiuma, 2001). The fact

that knowledge cannot be labelled dichotomously is reflective of the imperfect nature of the transfer of knowledge between individuals. Hence, a firm exists to manage and coordinate the knowledge efforts of individuals to produce higher order goods and industry heterogeneity exists because of differences in the abilities of firms to manage those assets. Therefore, a firm is able to maintain long-term competitive advantages under conditions where the firm either inherently reduces the difficulty in the transfer and duplication of knowledge or when the difficulty is purposively created so that outside firms experience difficulty in the capture or duplication of knowledge. This leads to the following propositions:

- P1: *A firm's long-term competitive advantage is positively correlated with the firm's ability to maintain or induce knowledge stickiness across firm boundaries relative to competitors in an industry.*
- P2: *There is a direct relationship between a firm's attempt to decrease the permeability of its boundaries and the increase in internal stickiness.*

It is important to note that a firm may have an overall strategy for its knowledge “management” but in certain circumstances it may opt to alter its procedures to achieve specific goals. When managerial knowledge which is difficult to transfer from one firm to another owing to its sticky characteristics is considered, the possession of absorptive capacity becomes more important (Park, 2010). This is premised on the theory of information processing (Galbraith, 1977; Subramaniam, Rosenthal et al., 1998) that views the firm as an information processor. The purpose of the firm under the theory of information processing is to reduce firm uncertainty and lack of knowledge by processing information. Given this view of the firm, if information gets “stuck” at any location--whether that locus is temporal, spatial, or human (Orlikowski, 2002)--then the firm fails to reduce uncertainty and may even increase it. Firm orientation may be seen as an additional attempt to mitigate those places where knowledge may get stuck or to stick knowledge where the firm does not want to allow diffusion. Hence, the firm may have two knowledge strategies: strategy one is for knowledge that must be kept immobile; strategy two is for knowledge that must be mobile. Given that a firm may have several knowledge strategies, knowledge management then becomes an issue of controlling knowledge practices relative to context.

Firm orientation is defined as the way that the firm views its boundaries with other organizations especially within the same or similar industry. Furthermore, the firm's orientation may be selected based

on a continuum between porous and compartmentalized boundaries with respect to other firms in the industry. For instance, in the case of a firm with an extremely porous orientation (PO), the organization is willing to allow any individual to walk into the organization and openly inspect all aspects of the operation. A firm that is said to be absolutely porous might be represented by an organization that openly and honestly allows the public and competing firms to inspect every aspect of its operations to include contracts as well as profit and loss statements. At the other end of the continuum is the organization that selects a compartmentalized orientation (CO). The CO is represented by an organization that places each aspect of its operations into various relatively autonomous departments so that should information “leak” from one unit, it would be useless without information leaks in other units. In this case, one can make a claim that what “leaks” is not knowledge as it has been defined here but information; the knowledge comes from the limited number of agents who possess the ability to synthesize the information. A firm that is absolutely compartmentalized may be represented by an organization where no individual within the firm has knowledge of what any other individual in the firm has knowledge of. In fact, one would only expect to rarely, if ever, see a firm that represents or aspires to be at either end of the orientation spectrum.

- P3: *There is a direct positive relationship between a firm with a porous-boundary orientation and the amount of “public” transparency.*
- P4: *There is a direct negative relationship between a firm with a compartment-boundary orientation and the amount of “public” transparency.*

Firm Orientation

Knowledge strategy is defined as the course of action that the firm may elect to take with respect to how it deals with the assets of its knowledge production. Since the firm is interested in the maintenance or the development of competitive advantages, the firm must develop action sets that allow it to capture better than average rents from the production of organizational knowledge. This view assumes that knowledge can, at least to some degree, be objectified. The object of knowledge does not necessarily have to exist as a codified text that is saleable, but it can exist in the minds of individuals within the organization who may be outsourced as either employees or consultants to other firms.

A pure diffused or open-sourced strategy may exist where absence of stickiness is desired in order to secure long-term rents. One may expect to see this type of strategy employed in industries such as high tech or emergent areas where a certain critical mass needs to be achieved for technology acceptance; LINUX system is the prime example of a near pure diffused strategy employed by a firm (Lee & Cole, 2003). The developers post their code for applications so that other developers can inspect, critique, and alter.

One might expect that a firm employing a pure patent or licensing strategy to be represented best by research firms. In this type of organization, the firm employs researchers to develop new compounds or formulae that need little or no expertise to use, but the knowledge is easily transferable through the knowledge of the compound itself. The firm then sells the use of its “discovery” to other firms who may have specialized knowledge in the production processes necessary to capitalize on the new compound. The firm that developed the new compound may not possess the skills necessary to capitalize on the discoveries themselves and therefore licenses the production of all intellectual capital. The production of the intellectual capital in this type of pure strategy must be easily codified for packaging.

The pure protectionist strategy is best represented by the government-intelligence community. Within the government-intelligence community the production of the intellectual capital is highly guarded since the release of the information may represent serious threats to security. Additionally, this type of information is extremely tacit and specific. Often the production of the knowledge is not easily codified since the knowledge must be translated by particular specialists.

There is a direct relationship between the firm’s orientation and the strategy that it employs with respect to knowledge. Therefore, if on average, as a firm engages in a protectionist strategy with respect to internal knowledge, the firm will be represented by a more compartmentalized structure. One would expect to find such strategies in industries that are R&D intensive and produce the products of their own research. This is not to say that all firms will be found on the central regression line since some firms may find it cost prohibitive to develop a compartmentalized organizational structure while others may find that it is more cost beneficial to have a more porous border. However, one would expect that under no circumstance will it be beneficial to have both a protectionist strategy and a completely porous orientation. This suggests that as firm

strategy increases toward complete protectionism and as the firm trends toward complete compartmentalized orientation, the costs associated with stickiness increase.

The above discussion leads to the following propositions:

- P5: *The greater the degree of protectionist strategy, the greater the degree of compartmentalized orientation with respect to organizational boundaries.*
- P6: *The greater the degree of diffused strategy that the firm adopts, the greater the degree of permeability in the organizational boundaries.*

An industry of type X will compartmentalize information to a measurable degree represented by a knowledge function that will limit the diffusion of proprietary knowledge in order for the firm to capitalize on rents. On the same continuum, a firm of type Y will spend resources to develop a porous internal boundary in order to facilitate the transfer of “best” practices despite the diffusion of knowledge outside of the organization in order to minimize internal costs and hence maximize revenues from the transfer of knowledge. In each case, the researcher may develop a “sticky” function that allows him or her to predict both the orientation of the organization for various types of organizational activities and the firm’s expenditures during various parts of the industry’s life-cycle. However, in order to accomplish this task, the researcher must have a thorough conceptualization of a theory of knowledge stickiness. This theory must clearly outline the boundary conditions, units of analysis and system states (Dubin,1978).

In reality, one should not expect that there will be any firms or industries that employ pure strategies for several reasons. Albino et al. (2001) have demonstrated that in reality there are finer distinctions for knowledge metrics than just tacit or implicit knowledge. Additionally, other authors have demonstrated that knowledge does not exist as a dichotomous polarization between explicit and implicit but that in reality knowledge more likely exists as a continuum between the polar classifications. Moreover, it is unlikely that a firm will be able to control all aspects of its boundary. Thus one would expect them not to find a firm with either completely porous or purely compartmentalized boundaries. The question remains: how does sticky knowledge relate to the above theory of firm strategy with respect to firm orientation?

- P7: *The more a firm employs a porous orientation and a diffused strategy, the more the firm will make efforts to reduce the stickiness of knowledge.*
- P8: *The more a firm employs a compartmentalized orientation and a protectionist strategy, the more the firm will attempt to make knowledge sticky or ensure knowledge remains sticky.*

The theory of sticky knowledge presented here is premised on the ability of a firm to leverage its knowledge to collect “rents” where rents are defined as the incremental increase in revenues that the firm may receive from the application of practices derived from the knowledge obtained or sold. However, also included in this definition, is that savings in operations may be realized from the application of the knowledge being leveraged. However, abnormal rents gained from knowledge asymmetries may only be collected if the knowledge remains tacit to outside organizations (Hayward, 2002; McEvily & Chakravarthy, 2002). In the resource-based view (RBV), knowledge is perceived as an asset that differentiates the firm’s abilities from other firms in an industry and gives it a strategic advantage over other firms in the market (Kearns, 2003; Spender, 1996; Barney, 1991; Wernerfelt, 1984). For RBV, rents gained from knowledge advantages are short-lived since knowledge is quickly diffused within an industry through employee contact with other individuals outside of their firms, backward engineering, employee turnover, and so forth and hence is too limited a conceptualization of firm knowledge since some firms are able to leverage their knowledge base despite the widespread diffusion of information. Hence, this paper builds on the premise that some organizations are better able to leverage their knowledge base than others despite the widespread availability of existing knowledge.

Summary

There remains a great debate in the knowledge management literature on how best to codify and share or conversely protect knowledge and in each instance use it to enable organizations to achieve a sustainable competitive advantage. The propositions in this paper posit that firms will attempt to induce sticky knowledge under certain circumstances and reduce sticky knowledge under other circumstances. This is a function of how the firm attempts to actualize its boundaries with other organizations in the industry. Additionally, this paper suggests that firm orientation and knowledge strategy are functions of the nature of the industry in which the organization exists.

Future Efforts

This paper has suggested several propositions with a potential set of test metrics for both laboratory testing and data collection. Testing these propositions will enable organizations to make better informed decisions on optimal knowledge-management strategies based on the organization's individual circumstances. Many propositions in this paper can be tested in the laboratory with a series of experiments conducted with MBA-level professionals. Others will require collecting data from a diverse sample of organizations and the most practical method would be a series of questionnaires and subsequent analysis of the data to test the propositions. This testing will provide a venue for rapid development of the ideas presented here as well as a refinement of the key concepts. The results of the laboratory-test environment will also help to clarify the boundary conditions and system states for actual data collection. The result will be a more fully-developed theory on the relationship between the stickiness of knowledge and firm orientation that will help focus time and effort in the collection and analysis of actual firm data. A research study that focuses on the actual collection of firm data will help to elaborate on the strategic question of why firms exist. In addition, a study of the type suggested here will help provide insights into firm orientation and strategy that will help the knowledge-management practitioner focus his or her efforts.

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