Towards Behavioral Measures of Boundary Spanning Success: A Data Science Approach

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Towards Behavioral Measures of Boundary Spanning Success: A Data Science Approach

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Abstract

In recent years, the ability to mine, manage, and examine big data has sparked a strong interest among scholars and managers to leverage data science approaches for measuring and in turn enhancing the efficiency and effectiveness of various areas of knowledge management, such as boundary spanning. In this paper, we use a data science approach to delineate three distinct behavioral metrics of boundary spanning effectiveness and efficiency that are critical in determining the success of a boundary-spanning interaction—the dyadic relation between the boundary spanner and the responder, namely goal alignment, hierarchical alignment, and timeliness. These new metrics offer researchers and practitioners new means for assessing the actual rather than self-reported success of a boundary spanning activity as well as for evaluating the role of information systems in such boundary spanning interactions. Implications for research and practice are discussed.

Keywords: *Boundary Spanning Success, Enterprise Social Media, Hierarchical Alignment, Goal Alignment, Timeliness, Data Science*

Introduction

With the ubiquity of data, new opportunities have emerged for the application of data science and machine-learning approaches to help enhance the efficiency and effectiveness of knowledge management. The ability to mine, manage, and examine big data has sparked a strong interest among scholars and managers to leverage data science and machine-learning approaches for enhancing the efficiency and effectiveness of various areas of knowledge management. The success of today's enterprises increasingly depends on the efficiency and quality of their cross-boundary knowledge flows and processes (Marrone, 2010). Various information systems, specifically emerging enterprise social media (ESM) technologies, are used to increase the transparency and openness of such cross-boundary knowledge flows with the aim of enhancing team effectiveness, collaboration, knowledge sharing, and innovation.

Today, the growing adoption of ESM technologies in organizational contexts has profound implications for such boundary spanning knowledge flows in organizational teams. Social media encompass a range of information and communication tools (ICTs) for supporting interaction, collaboration, and co-creation, such as blogs, content communities, and social network sites (Leonardi, Huysman, and Steinfield, 2013; Treem and Leonardi, 2012). Studies of organizational social media use suggest that these systems have the potential to enhance cross-boundary knowledge flows—referred to as boundary spanning—by enabling the identification of and interaction with relevant external individuals and information (cf., DiMicco et al. 2008; 2009; Steinfield et al., 2009).

Within the boundary spanning literature, recent papers have proposed the need for future research to move beyond traditional offline settings to study virtual contexts and in particular assess how the use of virtual tools, such as ESM, affects the success of boundary spanning activities (Kirkman & Mathieu, 2005). However, hitherto, the success of boundary spanning activities has solely been assessed by measuring the downstream impacts of these activities on other organizational performance metrics, e.g., team innovativeness or operational performance.

However, as the goal of many novel enterprise systems, such as ESM, is to connect dispersed organizational individuals and enable the sharing of information and ideas, measuring the impact of such boundary spanning activities on team innovativeness or operational performance is questionable for two reasons. First, usage of ESM is largely at the individual level and interactions are mostly dyadic, hence, these individual or dyadic level behaviors may not be valid, reliable or even meaningful predictors of team or organizational level performance metrics. Second, measuring the impact on innovativeness or operational performance assumes that the boundary spanning activity per se is successful without offering an empirical validation of the effectiveness and efficiency of the boundary spanning interaction.

In this conceptual paper, we draw on the literature on boundary spanning to theoretically delineate three dimensions of boundary spanning success. Further using behavioral data from a large ESM database, we propose three behavioral metrics of boundary-spanning success, which include two distinct effectiveness measures—goal alignment and hierarchical alignment—as well as one efficiency measure—timeliness of response.

Boundary Spanning: A Theoretical Background
Boundary spanning can be defined as a team's or group's effort to establish and manage interactions with parties in the external environment that enhance the team and others linked to the team in meeting performance goals (Ancona, 1990; Ancona & Caldwell, 1992; Marrone et al., 2007). Boundary spanning has been proposed as a critical antecedent to the performance of not only the boundary spanning team itself, but also to the performance of other organizational parties whose work is interdependent with the boundary spanning team as well as the organization as a whole (Mathieu, Marks, & Zaccaro, 2001; Marrone, 2007). Boundary spanning has been shown to be crucial for information transfer, knowledge creation, and innovation inside organizations (c.f., Argote, McEvily, & Reagans, 2003; Hargadon, 1998).

Within the literature on boundary spanning, three distinct boundary-spanning activities have been proposed and validated empirically, namely representation, coordination of task performance, and general information search (Grabher, 2004; Ancona & Caldwell, 1992). *Representation* involves the lobbying for the group up the hierarchy in order to create favorable impressions and advocate amongst managers and senior managers. Hence, it is a largely vertical form of boundary spanning. From an internal perspective, the group member engaging in this boundary spanning process tends to be a project manager (Ancona and Caldwell, 1992). Similarly, from an external perspective, although representation can occur at all levels, the target typically holds greater power than the initiator (Ancona and Caldwell, 1992). This process is crucial for team performance as the creation of favorable impressions among senior managers is a prerequisite for obtaining access to key resources, including reputation, legitimization, higher-level commitment, and financial support for facilitating successful product development (Grabher, 2004).

Coordination, also referred to as task coordination (Ancona and Caldwell, 1992) or intergroup process (Marks, Mathieu, and Zaccaro, 2001), involves the facilitation of effective decision-making and design implementation through cross-boundary strategizing, planning, and evaluation. It is thus a horizontal form of boundary spanning that can help manage intergroup dependencies. From an internal perspective, the group members engaging in this boundary spanning process tend to be general members of the group (Ancona and Caldwell, 1992). Similarly, from an external perspective, it is general members from the organization—rather than (senior) managers—who are more likely to reciprocate coordination attempts by members of the

focal groups. Hence, coordination is crucial for the efficiency, effectiveness, innovativeness, and flexibility of goal delivery (Mohrman, Tenkasi, Lawler, and Ledford, 1995).

General information search, also referred to as scouting (Ancona and Caldwell, 1992), involves the general scanning of the external group environment in order to gain access to relevant information, knowledge, and expertise. It is also a largely horizontal form of boundary spanning. Again, from an internal perspective, general members of the group are more likely to engage in scouting than project managers (Ancona and Caldwell, 1992). From an external perspective, target actors of information search activities are often loosely coupled with the focal group and are general members from the organization rather than (senior managers) (Marrone, 2010). This boundary spanning process is crucial for group performance as it enables members to gain project-specific expertise and an understanding of trends, opportunities, and threats in the external environment (Hargadon, 1998).

In the context of developing success metrics for ESM-based boundary spanning, this typology can be useful for identifying which of these activities are most successfully enacted through ESM technologies.

Toward a Theoretical Taxonomy of Boundary Spanning Success

Investigations into boundary spanning activities almost invariably focus on the perspective of those attempting to connect to external resources, i.e., the boundary spanner. Yet boundary-spanning efforts can also be viewed from the perspective of the reciprocator who may or may not respond to the activity. In other words, attempts to access external resources must yield a favorable response from those with the desired resource in order for the boundary spanning activity to be considered successful. For instance, attempts to engage in *representation* activities must generate explicit recognition or financial support in order for the representational activity to be considered effective. The important implication here is that we can have a better insight into the potential success of boundary spanning if we not only investigate attempts by the boundary spanner, but also examine if and when such efforts are successful in terms of the effectiveness and efficiency of the dyadic interaction between boundary-spanner and responder. In what follows, we theoretically explore important dimensions of boundary spanning success.

Boundary Spanning Effectiveness: Goal Alignment

Effectiveness is related to the extent to which the goal of a particular user is satisfactorily achieved through the use of a particular system. In the context of ESM-based boundary spanning, we define this dimension of effectiveness as goal alignment. Goal alignment refers to the extent to which the strategic goal of the original boundary spanning activity (i.e., the boundary spanner) is reciprocated by a response that addresses the initiator's aim.

Hence, goal alignment measures success of a boundary spanning activity by assessing whether or not the goal of the response matches the goal of the original boundary-spanning attempt. When the nature of the response matches that of the attempt, the boundary-spanning activity can be considered *effective* from the perspective of goal alignment. For instance, if a representational activity is met with a response that offers advice or an attempt to coordinate, there is a lack of goal alignment, which, at least in the short term, implies lower effectiveness of the boundary spanning activity.

Boundary Spanning Effectiveness: Hierarchical Alignment

In addition to goal alignment as a proxy for boundary-spanning effectiveness, hierarchical alignment is equally important as different boundary spanning activities are targeted at different organizational audiences defined by their hierarchical rank in the organization. Therefore, hierarchical alignment is inherently a measure of whether or not a boundary-spanning attempt reaches the appropriate target audience and therefore has the potential to be successful.

For instance, of the three boundary spanning activities, representation is the only vertical boundary spanning activity (Ancona & Caldwell, 1992), hence, representational activities by an organizational member are normally aimed at someone of higher rank. Therefore, part of the effectiveness of representational activities should be determined by the extent to which the attempt is perceived and subsequently reciprocated by users with a higher organizational position than the boundary spanner. Although, an acknowledgement or compliment by peers may offer an intrinsic reward for the person engaging in representation, this does not generally satisfy the goal of representational activities, namely to achieve legitimization or monetary support.

On the other hand, the remaining two boundary spanning activities, coordination and information search, are considered horizontal forms of boundary spanning (Ancona & Caldwell, 1992). Coordination and information search target peers who can offer the requisite expertise or who participate in the negotiation of inter-departmental dependencies. These two horizontal boundary spanning activities—as opposed to representation—thus require hierarchical alignment, as general members of the same rank would be more likely to effectively reciprocate information search or coordination activities.

Boundary Spanning Efficiency: Timeliness of Response

In addition to the effectiveness—i.e., goal and hierarchical alignment—of a boundary spanning activity, efficiency could be an additional indicator of boundary spanning success. In the context of ESM-based boundary spanning, efficiency refers to the time lapse or interval between the initiation of the original boundary-spanning attempt and the response or reciprocation.

It is important to acknowledge that efficiency does not imply effectiveness. That is, the quickest response to an attempt for information search may not actually yield a response that offers relevant information, knowledge or expertise or is even perceived and reciprocated by the appropriate target audience. While existing studies have explored the quality and quantity of knowledge provided in online knowledge seeking attempts (c.f., Chiu, Hsu, & Wang, 2006; Wasko & Faraj, 2005), we did not identify any literature focusing on the timeliness of responses.

Although efficiency may be at odds with effectiveness; i.e., the quickest responses may not be the most applicable in terms of goal and hierarchical alignment, this does not undermine the salience of timeliness. For example, an efficient response may be more critical for boundary-spanning attempts characterized by high urgency. That is, when someone is in need of rapid advice for a fast-approaching project deadline, a quick reciprocating action may be more significant than a high-quality response.

Toward an Operational Taxonomy of Boundary Spanning Success

In order to develop our operationalizations of boundary-spanning success measures, we relied on existing data available in a large ESM database containing boundary-spanning interactions between 656 teams. The database was obtained from a large worldwide provider of workplace

products and services, which has approximately 10,000 employees across 40 countries. Their ESM tool is based on the Jive Platform[1].

Goal alignment, as a measure of effectiveness, refers to the score for whether or not the type of boundary spanning activity in which a poster or responder engages is identical. In order to measure whether or not goal alignment occurred, a machine-learning algorithm was developed that automatically assessed the type of boundary spanning activity of the parent post and child post (i.e., response). This algorithm has previously been documented in (Van Osch, Steinfield, and Zhao, 2015) and displayed a reliability score of 86.2% in detecting which boundary spanning activity a particular post belonged to[2]. Goal alignment is thus measured at the dyadic level as it measures the nature or goal of the original boundary spanning attempt and that of the response or reciprocating action. If the type of boundary spanning activity in which the poster or responder engages is identical—e.g., a representational post that is met with recognition—alignment occurs as indicated by a value of 1. If the type of boundary spanning activity in which a poster or responder engages is not identical, the alignment would be measured as 0.

Hierarchical alignment, as a measure of effectiveness, refers to the alignment of hierarchical position between a poster and responder. Like goal alignment, hierarchical alignment is also measured at the dyadic level as it compares the rank of the boundary-spanner with that of the responder. If the hierarchical level of the poster is not equal to the responder, so that the poster is lower in rank than the responder, the dyadic relationship would receive a score of 0. If the rank of the poster and that of the responder is equal, alignment occurs as indicated by a value of 1. If the hierarchical level of poster is higher in rank than the responder, their relationship is characterized by a score of 2. It is important to note that, unlike goal alignment, hierarchical alignment is not always desirable. As mentioned before, the effectiveness of coordination and information search—as horizontal boundary spanning activities—require hierarchical alignment, hence, a value of 1. Representation, on the other hand, is a vertical activity requiring higher ranked responders than boundary spanners, hence, a value of 0.

Finally, time lapse—as a proxy for efficiency—refers to the time interval between the original publishing of poster's boundary spanning attempt and the comment or reciprocating action by a responder. Time lapse is measured as a continuous value in minutes (measurement unit) so that higher values indicate less efficient responses whereas lower values indicate more efficient responses.

Discussion & Conclusion

Research on boundary spanning has proliferated, however, the majority of prior studies have focused on measuring the impact of boundary spanning on other dependent variables—such as innovativeness and operational performance—rather than measuring if the boundary spanning activity per se is successful. In this paper, we used a data science approach to propose three behavioral metrics of boundary spanning success, namely hierarchical alignment, goal alignment, and timeliness of response.

These measures have three important implications for the literature on boundary spanning. First, this paper moves beyond the dominant individual-level focus on the boundary spanner and instead offers a perspective of the dyadic interaction between a poster and a responder and uses the interaction as a starting point for delineating boundary spanning success. This approach is

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[1] Jive is a provider of corporate social technologies that support business communications and collaborations among employees. http://www.jivesoftware.com

[2] For the development of the machine-learning algorithm, we collected content data from the blogs and discussion threads of 656 groups, resulting in a total of 2029 discussions and 6500 threads.

novel as previous studies have only focused on the boundary spanning activities as enacted by the individual without considering the reciprocating actions of the responding party that are crucial in determining the success of such activities. Furthermore, by offering a set of behavioral measures of boundary spanning success, this study provides researchers with an approach to assess the actual success of a boundary spanning activity rather than the self-reported impacts of presumed successful boundary spanning activities on downstream team-level outcomes. Finally, by measuring the success of boundary spanning interactions per se, we can assess the role systems, such as ESM, play in the effectiveness and efficiency of these interactions.

Beyond implications for research, the success metrics proposed could also benefit managers interested in assessing the impact of various IS on the effectiveness and efficiency of distinct boundary spanning activities to determine which IS play a pivotal role in supporting boundary spanning. Given that organizational resources are limited, determining which systems provide the best overall support for all three activities simultaneously could help managers optimize their IS investment decisions. Furthermore, leveraging behavioral measures could offer managers with a reliable tool to assess the boundary spanning performance of teams inside the organization.

Despite the contributions offered by conceptualizing and operationalizing these three distinct dimensions of boundary spanning success—goal alignment, hierarchical alignment, and timeliness—additional dimensions may exist and require further exploration. For instance, previous studies on knowledge seeking attempts in online environments measured the quantity of knowledge provided. Such a metric may also be relevant in the context of information search and representational activities, however, is less likely to apply to coordination attempts.

Furthermore, it is important to keep in mind that even interactions that do not yield an immediately favorable response to a boundary-spanning attempt may result in the establishment of novel social connections which in turn may serve as potential future conduits to necessary legitimatory, monetary, and informational resources. Hence, the lack of goal alignment, hierarchical alignment, and/or efficiency within a specific boundary spanning interaction should not be considered as an indication of an insignificant social relationship.

Acknowledgement

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