Within-Team Variation of Shared Knowledge Structures: A Business Performance Study

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Abstract

This pre-post exploratory study looks at the interplay between individual and team level knowledge structures, proposing a new method for conceptualizing and operationalizing within team knowledge variation. This research quantitatively analyzes variation between an individual’s knowledge organization versus their team’s shared knowledge structure. Team process success is measured by financial results as teams compete in a dynamic ERP simulation market. Higher team knowledge structure metrics are found to be insufficient indicators of success when high within-team variance exists.

Contrasting individual-level versus team-level business process knowledge provides a rich explanation for team performance outcomes. Initial findings show that high with-in team variance results in lower performance in comparison to teams with low within-team variance of knowledge structures. This finding is supported even when high-variance teams contain a highly knowledgable individual. This study suggests that teams with high similarity of shared team knowledge structures achieve better team financial performance.

1. Introduction

In business environments, individual knowledge workers organize their conceptual knowledge into mental models (MM), also referred to as knowledge structures (KS) that are considered important determinants for processing information relating to the efficient and effective operation of the organizational systems. MM/KS are defined as organized frameworks that allow individuals to describe the purpose and form of systems, explain system functionality and predict future system states as well as describe, explain and predict behavior [1]. With the increasing prevalence of enterprise resource planning (ERP) systems and emphasis on business processes, organizations are relying on individual knowledge workers, with potentially varying KS, to function effectively in a team environment. Individuals within teams that have different KS possess points of friction between members that could inhibit efficient execution of processes.

In team environments, MM/KS have been described as organized mental representations of knowledge regarding critical components of a team’s task environment [2]. In workflow systems like ERP and other interdependent work environments, a shared team understanding of process is an important predictor of performance outcomes [3]. The shared MM of a team is formed by creating a composite KS of each team (T-KS) using Pathfinder Associative network techniques, a leading method for representing a team’s shared understanding. It captures both the content and organizational structure of the knowledge [4]. Research addressing the effects of individual KS, a team’s T-KS, and the interrelation these two types of knowledge representations on organizational financial outcomes are sparse. This study has two goals: a) to propose an approach to T-KS analysis with respect to individual KS variation within a team (referred to as within T-KS variance) and b) to investigate team performance outcomes as influenced by the inter-relationship between the KS and T-KS metrics. A key aspect of this study is that it compares the influence of individual KS variability (within T-KS variation) on the efficient operation of the team. The context of this study is the execution of enterprise business processes supported by an ERP system used in the highly interdependent team’s work environment. Thus, the theoretical model analyzed in this pilot study includes the antecedents of individual KS and T-KS as they interact and subsequently influence financial performance outcomes of organizations operating in a competitive enterprise business market.

KS research is relatively new, largely developed since the 1990’s, and analysis of T-KS is a growing area of KS focus. In section 2, the prior literature will be reviewed, including how KS are conceptualized and measured. The theoretical approach to T-KS and the proposed method of measurement will be discussed as well. Section 3 outlines the propositions for this exploratory study. Section 4 provides additional details on the measurement of KS and T-KS. Section 5 provides the study setup details and Section 6 the data results. Section 7 identifies the support for the propositions. Section 8 includes the conclusions and contributions. Finally, section 9 reviews limitations and future research.
2. Theoretical Background

The 1990’s saw renewed interest in teams and team performance, initially taking a behavioral focus but soon expanding to address cognitive factors [5]. This work builds on prior shared mental model (SMM) research where a mental model is defined as organized conceptual knowledge that allows individuals to interact with their environment by describing, explaining and predicting events within their task environment [3]. Rouse and Morris describe a KS as supporting a person’s description of a system, their explanation of the systems functionality, and predictions of future system states [7]. The concept of a shared KS has been previously introduced to explain the smooth cooperation that was often observed in successful teams [8].

Building on the work of Guzzo & Shea [9] and Hackmann [10], an early framework for team mental models, equivalent to T-KS, proposed that individual capacity influences team capability, affecting team performance as moderated by team processes [2]. Much of the research in this area builds on the nomological network proposed by Kraiger & Wenzel [5] where shared KS may represent knowledge, behaviors or attitudes. In that model, shared KS mediates between environmental-organizational factors and the outcomes of team performance and team effectiveness. Prior research has motivated expanding the conceptual and empirical work linking SMM to team outcomes [6]. They point to the theories of information sharing, transactive memory, group learning and cognitive consensus as interdisciplinary theories to help expand the underlying theory in T-KS influenced outcomes. This current study focuses only on MM/SMM representations that both 1) elicit the content of conceptual knowledge and 2) evaluate the collective representation (similarity) of knowledge representation. This subcategory was explicated in a recent meta-analysis and found to predict process-related outcomes [11], whereas other subcategories of SMM did not. The terms KS and T-KS are used in this paper to clearly identify this sub-category within the broader MM literature.

The shared team understanding represented in a T-KS is a complex construct that is difficult to measure directly. Different methods used include direct observation or video review of task behavior [3], individual construct measurement through surveys, and implicit knowledge measurements based on associative network representations of knowledge structures [11] [12]. As done in this study, more recent work has often analyzed KS using associative network graph analysis techniques supported in network structure analysis tools like Pathfinder Associative Networks [1] [13] and UCINET [14].

In team environments, KS is described as organized mental representations of knowledge regarding critical components of a team’s task environment [2]. These knowledge mechanisms support team collectively learning, storing, retrieving and applying information within a knowledge domain. The shared team KS (T-KS) serves as a common information processing framework. This T-KS depicts job characteristics, duties, needed interactions and other dependencies for member interaction in pursuit of shared team goals [15].

Mathieu, et al. proposed a model where the antecedents of T-KS influenced team process that in turn affected team performance [14]. This study supports the importance of a high quality T-KS and that team processes partially mediated the relationship between T-KS and performance. This study points to the importance of studying KS in a context of team processes. Due to the complexity of T-KS, several different methods have been used to assess the makeup and quality of a team’s composite KS. In various studies, the focus has been on the team’s similarity to the expert investigator’s KS [13], to a composite expert KS [16], to co-leader’s KS [12], or to the relation between team members [11], relation between co-leader’s KS [12] or shared KS (i.e. T-KS) among all team members [1]. Few studies use multiple KS referents or attempt multiple levels of analysis by looking at within team variance between individual KS and their T-KS as well as an expert referent. The T-KS vary in terms of internal consistency, accuracy and in terms of similarity to members’ KS. Team members need to hold accurate representations of their team performance environment to be effective, and they need to hold similar representations to be efficient [17] [18].

To provide an observable and controlled study over time, an ERP business simulation is utilized to provide a complex and dynamic work context. To address the dynamic nature of T-KS, this study observes team performance by assessing both pre and post KS and T-KS. Business process knowledge is proposed as a critical type of shared knowledge required for high performance in complex, dynamic environments. When assessing different conceptualizations and operationalizations of MM/SMM, DeChurch and Mesmer-Magnus [4] found that only the KS/T-KS approach predicted process performance.

3. Research Propositions

The assessment of knowledge structures occur at the individual level and provide both numerical
metrics and a graphical representation of key concepts used to form the structure of the knowledge domain. In this study, KS concepts are key elements of the enterprise as executed in the participant’s task environment. For a Pathfinder KS, the metric for internal consistency is coherence (COH). COH refers to a KS’s overall degree of structural efficiency and consistency [19]. It is calculated by analyzing a fully interrelated network graph built from rating the closeness of every pair of concepts in a domain of knowledge. When the COH metric is higher, then the KS is considered more internally consistent, meaning that the direct (concept to concept) pairwise ratings correspond more closely to the indirect ratings (of the relationship path between two concepts through other possible intermediate concepts).

The KS of two individuals can be compared, but are more commonly compared with a standard reference or referent KS. A referent KS can be based on a single expert’s KS or be formed from combining multiple experts’ KS’s. A multiple expert composite KS is considered better than a single expert referent KS [16]. Here, the expert composite referent KS is referred to as the expert KS (E-KS). Similarly, to represent each team’s shared knowledge structure, a composite team KS (T-KS) can be formed.

With composite referents created (a single E-KS and a T-KS for each team), a comparison between individual KS and either referent KS determines the similarity metric (SIM). SIM is calculated when comparing a network structure with a referent, in this case either the KS or the T-KS to the E-KS. SIM is defined as the similarity, closeness, or accuracy among the reduced set of network links connecting the weighted concept relationships. Prior research has shown that the metric of SIM is the preferred measurement for comparing KS and uniquely captures important predictive variance not found in the other measures [20]. Higher SIM numbers indicate closer similarity or greater accuracy with respect to the given referent used. In this study, each KS will be compared with the related T-KS based on individual’s team membership, and also compared to determine similarity to the E-KS. Each T-KS is also compared with the E-KS to assess the accuracy of that composite T-KS. Figure 1 illustrates the set of KS and composite KS in this study and also provides what comparisons (labeled A, B and C) were made among the three types of KS analyzed in this study: the individual’s KS, the composite T-KS in which the individual belongs, and the Expert-KS.

In the pre-activity stage, the more similar a T-KS is to the E-KS would indicate that the team has a more accurate understanding of the business concepts required for efficient execution. Higher SIM teams start off with a critical understanding of the relationship among key business activities which is lacking in low SIM teams. The accuracy or SIM of the T-KS to the E-KS indicates that this team should perform better in the course of business activities within the business simulation, especially under time pressures where communication is limited [1]. External forces, like time pressures and acute stress, can not only reduce effective communication among team members, but actually disrupt team interaction hampering cooperative efforts for learning, remembering, and communicating relevant knowledge within the team [17]. This leads to the initial proposition of our study.

**Proposition 1:** Higher pre-activity SIM of the T-KS to the E-KS is related to team performance.

T-KS theory states that similarity among individual’s knowledge organization allows individuals to coordinate their behavior and to anticipate the actions of others [1]. The influence of T-KS is found to be especially important in cases of performing complex tasks in stressful situations and under time pressures [17]. T-KS are likely more heavily relied upon when time pressures limit communication among team members and when tasks are more complex to coordinate.

With respect to the learning that occurs during the execution of tasks within an organization, the structure of business process knowledge continues to be refined as individuals gain experience in executing business processes and in coordinating within their team. An increase in a team’s shared understanding of business processes will increase similarity of conceptual knowledge organization within the team. This improved common understanding will improve within-team coordination, help team members anticipate the needs within the team and support efficiency improvements as team members adapt to dynamic business conditions. As teams are successful
at developing a closer common business process understanding, they are better able to perform complex tasks and achieve higher team performance. In sum, this move toward a more cohesive team structure indicated by a higher KS to T-KS SIM can translate to a greater shared understanding of the business concepts leading to improved team performance under pressure.

**Proposition 2:** Higher post-activity SIM between KS and T-KS is related to team performance.

In prior research, the COH of an individual’s KS has been found to explain additional variance beyond the KS similarity metric when predicting skill-based individual performance [21]. Results showed that individual COH was not itself an indicator of individual performance, but was a beneficial metric when both COH and SIM are combined to predict a small incremental improvement of individual level skill transfer and adaptability. Similar work has not yet been accomplished to assess the value of the T-KS COH metric at a team level of analysis. As such, team coherence (TCOH) remains an area of debate and mixed findings [18]. Part of the difficulty in this research is that, after merging KS into a T-KS, much detail is lost and the dominant, streamlined organization is visible in the T-KS. Any range of variation among each individual’s KS is then hidden or lost. Further, high TCOH scores could indicate several different underlying causes which are difficult to discern after the details are lost by combining KS’s. Therefore, TCOH in isolation would not seem to lend much insight alone without the combined analysis of KS metrics of team members or even a more comprehensive set of rich team metrics. To further evaluate TCOH’s relationship to performance would require combining its analysis with other metrics; therefore, the third proposition suggests that it is unlikely that higher TCOH alone can predict team performance.

**Proposition 3:** Higher pre-activity TCOH is not related to team performance.

It might be expected that teams with high levels of post-activity internal consistency (TCOH), indicating low levels of within team variation, would exhibit higher performance. But, TCOH alone does not give any indication of what the SIM metrics might reveal. Therefore, TCOH has a relatively narrow explanatory value as discussed in the prior proposition. An especially high TCOH metric is not informative because the team cohesiveness alone does not reveal if shared knowledge is accurate. But low COH does indicate an increased need for communication and explicit task coordination which will inhibit performance of the team by reducing team process efficiencies. High variation of KS quality, i.e. low TCOH, has been associated with lower levels of team process performance [14]. A low individual SIM with the T-KS (as well as a high degree of within-team variation in the KS similarity metric among team members) is evidence of disparate T-KS. If these factors have persisted to the post-activity phase, then a low TCOH would indicate that the ability to anticipate the needs of other team members is poor. Therefore, low post-activity TCOH should be associated with low team performance, but high post-activity TCOH alone is not an informative indicator of team performance.

**Proposition 4:** High Post-activity TCOH is not related to high team performance

**Proposition 5:** Low Post-activity TCOH is related to low team performance.

Team performance relies on consistent goals and a shared understanding of the task completion process. When individual’s on the team do not fully understand a common procedure, they are not able to anticipate the needs of team members. Such teams operate in an inefficient manner at best, and at worst can work at cross-purposes to each other. Even an accurate shared team understanding of a business process could be undermined by a team member who only shares a part of the team’s business process knowledge. Using a single measure of shared team knowledge misses the richer perspective provided by considering how much each individual has internalized the shared process description which is meant to be enacted by the whole team.

A richer analysis is achieved when within-team knowledge is found to be cohesive, i.e. internally consistent with shared knowledge. Low team cohesiveness identifies potential for variation in team operations which can negatively affect performance. Low pre-activity cohesiveness could be overcome if members work toward alignment early in the business activity. However, low team cohesiveness after the activity can seriously affect performance as members continue to be disjointed, failing to use operational experience to align knowledge.

4. **Knowledge Structure Measurement**

The measurement of T-KS is considered a challenging undertaking given that KS are conceptual, dynamic, and can take on many different forms. Past methods of KS analysis are varied and include verbal protocol analysis, analytical modeling, multidimensional scaling, interactively elicited cognitive mapping, text-based cognitive mapping and card sorting, among other methods [15]. Recent research captures the structure of tacit (i.e. non-declarative, unconscious) conceptual KS and analyzes structure as an associative network using
tools such as Pathfinder and UCINET. Network analysis focuses on the assessment of structure using a set of explicit concept anchors. This approach supports aggregation of KS’s into a T-KS and supports different KS comparisons using associative network analysis, shared taskwork and teamwork KS interact with KS quality (accuracy and similarity) to help predict team performance. This current study addresses research calls to investigate other types of T-KS in additional contexts [1] [14], focuses on the enterprise business context and investigates how business process activity achieves financial results.

Pathfinder analysis reveals underlying structural characteristics by reducing the complexity and highlighting related links in the network. The Pathfinder 6.2 Windows-based application is utilized to produce a network structure of the most salient links for analysis [22]. Pathfinder analysis techniques are applied in this study to understand all forms of the KS as this technique is acknowledged to be effective in assessing knowledge in many domains and has been used in recent studies [1] [12] [13].

Pathfinder associative network analysis is a data reduction method which takes pairwise concept relation ratings, eliminates redundant multiple paths (representing the relationship closeness between pairs of concepts) to synthesis a streamlined network graph that represents the essence of the individual’s (or group’s) conceptual knowledge. Novices tend to have a less well-formed KS which include more linkages among concepts, have a lower degree of internal consistency (lower COH scores) and a less streamlined overall structure to the Pathfinder network graph. Experts, on the other hand, tend to have developed efficient, streamlined organization of knowledge based on experience and study [23]. Well-formed KS display fewer links between concepts, have higher internal consistency and support more effective use of the domain of knowledge. For this study, business process concepts were identified from expert interviews, pilot KS survey and an independent expert review.

5. Study Setup

This longitudinal study puts six teams of 3 to 4 students through a accelerated hands-on learning experience using a leading commercial ERP system to run a simulated manufacturing business. Teams operated their business across 6 quarters of financial reports indicating degree of business success. Business was run exclusively through the commercial ERP system and occurred based on an accelerated, simulation timeclock where an hour of classtime provided 20 to 30 days of business operations. The common learning experience contains exposure to manufacturing business processes, ERP user interface navigation and related experiential learning components. The exercise is designed to inform both tacit and declarative knowledge. A total of 21 students participated and participant demographics are presented in Table 1.

In addition to the team experience, individuals were given data analysis assignments that are distinctly focused on different functional areas. This intervention is aimed at creating a diversity of functional knowledge within teams to create within-team variation of KS. Functional group assignments are indicated by two letter codes for the functional area and are included in participant ID code designations of: PL (planning/procurement), FI (finance), SA (sales) and PR (production).

To provide an observable and controlled longitudinal study, an ERP business simulation is utilized to provide a complex and dynamic work context. The complexity of an ERP system and integrated business processes within organizations requires that all members of an organization must have a shared understanding of business activities in order to cooperate effectively and efficiently in performing business activities. After a period of learning the user interface and practicing basic ERP commands, the business simulation is run for 6 time periods representing 6 quarters of business activities. Longitudinally, team performance is collected to observe how T-KS evolution may influence team performance outcomes. Specifically, financial results for net income and total sales are collected at the end of each quarter to determine and rank team performance.

Pre and post KS for individuals are assessed to better address the dynamic nature of T-KS. Nine concepts that anchor the relevant business processes are used in Pathfinder pairwise comparisons to collect the KS. These concepts are foundations of the

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Table 1 - Demographics
enterprise sales, procurement and production processes. Pathfinder network analysis then produces the KS, T-KS, E-KS and SIM metrics. The Pathfinder methodology steps include a) collect the concept relatedness measures, b) analyze network graph structure performing data reduction and c) compare reduced network graph with a referent’s graph to determine SIM (accuracy). The accuracy measure SIM has a range from 0 to 1 with higher numbers indicating a greater degree of similarity or closeness to the referent KS, either T-KS or E-KS.

6. Data Results

The initial analysis of the KSs SIM requires that the E-KS be created. Two experts KS were used to create the composite E-KS. Individually, the two experts displayed acceptably high COH of 0.8869 and 0.7878. The E-KS COH is considered very high at .9089. While thresholds of acceptability are not well-established, reference to prior work indicated useable levels for expert KSs where COH scores of .67, .74 and .43 were considered adequate [21]. This places the E-KS COH score for this study well above that used in prior research. The graphical representation of the E-KS can be seen in Figure 2.

Table 2 provides the pre-activity COH of each KS. The table items group team members and are ordered by team final competition rank. Once all study participant KS were created, the composite referent T-KS was created for the six teams. The final two columns provide the pre-activity SIM comparison of the KS to the T-KS and the E-KS. SIM scores below .400 have been highlighted to indicate the location of the KS that were least similar to either the T-KS or the E-KS. In addition, there were one member where the COH was not able to be calculated (A6FI) and one that resulted in a negative COH (D7SA). This provides the baseline comparison to evaluate individual learning and team learning when analyzing the post-activity survey.

Post activity, the final data collection step occurred immediately after six quarters of the competitive simulation were completed. For comparison purposes with the E-KS in Figure 2, three of the T-KS of the post-activity survey have been selected for visual comparison. The three T-KS are first place team F (Figure 3), third place team C (Figure 4) and fourth place team D (Figure 5). Visual analysis of the different graphical representations starts with recognizing that the key business concepts are configured identically in each T-KS figure. Links between concepts reflect the SIM comparison with the E-KS. Pictorially, the figures indicate missing Since all T-KS must be created from the KS of the participants, * Net Income in million Ford.

Figure 2 - Composite Expert Network Graph (COH=0.9089)

Figure 3 - Team F - T-KS

Figure 4 - Team C - T-KS

Figure 5 - Team D - T-KS
where the connections diverge at Forecast materials to the Planned Production and Purchase requisition nodes. Team F is missing the Planned Production to Purchase Requisition link and has added a link between the Purchase Requisition and the Vendor Payment. The “agreements” with the E-KS contribute to a higher SIM score for team F. Note that with team C, there is a consistency of concept progression even if the end nodes are not similar to the expert referent. Finally, note that Team D has many more connections between nodes than team F, team C and the E-KS. For team D, this indicates less consistency in the T-KS and would lead to greater misunderstanding of the actions needed for success as indicated by the lower SIM value. The metrics of the different team in terms of the similarity to their respective T-KS and the E-KS are provided in Table 4. These measures consist of the TCOH for the pre and post activity and the SIM (comparison to the E-KS) for both the pre and post activity.

Table 4 is also ordered based on the team rank and provides the team letter as well as the number of team members participating in the simulation exercise. As indicated in Table 4, the top two teams, F and A, each had three members, while the third place team C had four members.

Two additional alternate team KS calculations were made to highlight the most significant within-team discrepancies. These were for team A and team B. In team A, team member A6Fl had no variation in survey results when rating concept relationship scores (COH). Because of this, Pathfinder analysis could not compute a pre COH metric for team member A6Fl (* Net Income in million)

Table 2). The post COH value was extremely low at -0.758 for A6Fl. The lack of a computable COH value and negative COH metrics indicate an outlier who failed to carefully answer the survey or badly misunderstood concept relationships. This outlier was dropped and an alternate A’s team value was computed and used in analysis. Subsets B(2 high) and B(2 low) were created from the lowest ranked team B consisting of 4 members. This data shows that team B contained two individuals in B(2 high) subset with the highest post COH and a mid-range post SIM, but the other half of the team B(2 low) displays extremely low COH and low SIM in both pre and post. This high within-team variation appears to have greatly hampered the team’s business process coordination and performance. High within-team variation is more likely in larger teams and indeed teams of 3 dominate the top ranks where teams of 4 trends towards the bottom rank. The team C of four members is an exception but note that team C displays high TCOH and relatively high SIM compared with the E-KS.

Table 3 has been provided to show the individual KS change between the pre and post-activity. For those individuals that have enhanced their understanding and further developed their KS, an increase in COH and SIM scores are expected between the pre and post-activity. In addition, individual KS should become more similar to the T-KS based on the interaction the team members had during the simulation participation period. The table has been sorted in descending order by the post-activity E-KS SIM score. The team rank for each participant is also provided. Scores below 0.4 and the lowest teams, ranked as 5 and 6, have also been shaded to facilitate analysis.

7. Discussion

Lending support to proposition 1, the highest pre-activity accuracy or similarity (SIM) occurs in the top three teams. All of the top three teams had the highest SIM (.571, .583 and .583) when comparing the T-KS to the E-KS (Table 4). While the first place team was only slightly low among these top three SIM scores, it did also have the highest COH.
which likely provided enhanced efficiencies based on a consistent, streamlined T-KS. Based on these results, having a higher pre-activity understanding (SIM) of the business process concepts and their relatedness led to enhanced team performance. This provides preliminary support for proposition 1.

Proposition 2 submits that post-activity SIM could be a possible indicator of performance. Results for the top three teams (again including alternate A' without outlier) reveals all have very high SIM. Team C (ranked 3rd) demonstrates the highest SIM, just as it has the highest pre-activity SIM. As team C is the only team with 4 members in the top three teams, its size incurs additional coordination and communication overhead. The lower three teams have the lower post-activity SIM metrics. Again the alternate team B is used in analysis where their original high SIM results of 0.692 masked the disparity revealed by splitting the team into two higher and two lower scores. That alternate ad hoc analysis of B(2 high) and B(2 low) reveals each subset has smaller SIM scores of 0.582 and 0.222, respectively. High within-team variation in team B hampered performance, resulting in the last place rank. In this way, individual’s post-activity SIM metrics do provide a rough approximation of the performance outcomes. Likely, such understanding could be further enhanced using the individual’s SIM measure with respect to the T-KS as a more granular measure of within-team variation. This will be studied in later research. These initial results for post-activity SIM provide preliminary support for proposition 2.

Proposition 3 does not expect pre-activity team COH to explain performance but that meets with mixed results across the teams. While the first place team did have the highest TCOH score at .776, the 2nd place team’s TCOH scored 4th at .533 (Table 4). Team D in 4th place has the 2nd highest TCOH score of .708 and the 3rd place team has the 3rd highest TCOH score. Since the two last place teams also had the lowest TCOH scores, the proposition that TCOH is not related to team performance lacks support. Beginning with a very cohesive team may lead to performance benefits, perhaps shared learning ability.

All teams, with the exception of team F who had the highest pre-activity TCOH at .758, showed improved team cohesiveness in post-activity TCOH scores. The 6th place team B showed the greatest TCOH improvement ending at .867, although only the B(2 high) half of the team showed all the improvement. That almost all teams showed strong improvement in TCOH post-activity scores indicates that TCOH alone does not indicate performance. So proposition 4 is supported. However, there is insufficient results to determine support for proposition 5 due to the lack of low TCOH post results.

### 8. Conclusion and Contributions

Team performance relies on consistent goals and a shared understanding of the knowledge domain and the task completion process. Prior work has established the value of shared team knowledge, but questions remain. Is within-team consistency as important to team success as is the accuracy of shared team knowledge with respect to the defined business
process? This study assesses team business process knowledge as a predictor of team financial performance when using a commercial ERP system to achieve success in a business simulation study. To refine team measures, additional focus is on the importance of within-team-variation regarding the shared understanding of the business processes. Team performance ranks use the financial measures of net income in a longitudinal study across six quarters of simulated business operation.

Knowledge organization, known both as knowledge structures or mental models, is an accepted method for assessing foundational knowledge underlying a shared understanding within teams. This exploratory investigation utilizes knowledge structures at both the individual and team level to assess the consistency of business process knowledge within the team. Explaining team performance is best done using multiple measures. High within team variation is a valuable indicator to further explain why teams with an accurate shared knowledge may not perform well.

The major contribution of this study is proposing a novel method for conceptualizing and operationalizing within-team knowledge variation. The proposed summary measure of within-team variation is team cohesiveness. Since a possible shortcoming of highly cohesive teams is that they may all have the same shortcoming in understanding the domain, this measure should be used in conjunction with team knowledge accuracy as a joint predictor of performance. Future research could delve deeper into team knowledge organization by comparing an individual’s knowledge organization against their team’s knowledge organization. Evaluation of the individual to team similarity may better reveal exactly where team process execution and interactions break down and, therefore, where within-team variation exists.

Looking at the accuracy (SIM) of team’s KS to the expert KS as well as the similarity of each team member’s KS to the team’s KS revealed somewhat surprising findings. While the team’s KS accuracy is a predictor of performance outcomes, teams with the highest KS were not as successful when some team members had the lowest individual KS. Greater within team variation of individual KS did reduce the team’s ability to be successful. High variation of the within-team KS appears to inhibit the team’s ability to perform in the ERP environment. Cohesive team KS are more successful, even when individuals exhibit lower KS accuracy themselves, but to be fully successful, teams need both a high cohesiveness metric and a high quality KS. For a richer understanding of team knowledge, cohesiveness within the shared team understanding should be considered in addition to shared team knowledge accuracy. Preliminary findings provide evidence that within team variation can be an indicator of shared team understanding of business processes needed to achieve financial success in business environments. The metric of within-team variation based on team knowledge coherence including individual KS similarity to team KS appears to improve prediction and explanation of team outcomes. Preliminary support for 3 of the 5 propositions sets the stage for future research into shared team KS of business processes in dynamic technology-supported environments in a full scale empirical study.

9. Limitations & Future Research

While this small exploratory dataset does not provide sufficient data to assess the propositions in depth, initial findings lend some support to the first two propositions, suggesting further research is worthwhile. Based on the preliminary findings, a new proposition for future study would be that improvements in TCOH from Pre-activity to Post-activity are not related to team performance. Alone, increased cohesiveness within a team is not an indicator of sufficient accurate knowledge to perform necessary tasks for success. The design of the future research study should again provide several stages (4-6 quarters) for assessing longitudinal performance at the team level. Future studies should expand the types of team metrics analyzed. A richer set of composite team metrics could be used such as utilizing a differentiated formulation for accuracy and similarity measures as assessed by [1]. Additional instrumentation is planned for the future study which should reveal more of how individual-level performance contributes to T-KS and resulting team performance outcomes. Much of knowledge structure and teams research is contextual, so future research should more fully explore the enterprise business process context endeavoring to understand COH and SIM thresholds for resulting levels of team performance and looking towards expanding the domain applicability of this line of research.

References


