

Individuals' Interaction with Organizational Knowledge under Innovative and Affective Team Climates: A Multilevel Approach to Knowledge Adoption and Transformation

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Abstract

Although organizational learning can be explained as mutual learning between an organization and the individuals in it, it has been mostly understood from the organization side. To understand how this mutual learning occurs from the side of the actual learners as the learning entity, we study how individuals learn organizational knowledge by adopting and transforming it and how they are influenced by the technical and social subsystems of an organization. From 350 responses within 66 teams from two companies, we investigate the effects of KMS use for strategic decision support and operational support on knowledge adoption and transformation and how innovative and affective climates moderate these relationships. Our findings show that individuals improve their work performance through both knowledge adoption and transformation and that different types of KMS use and different team climates play different roles in shaping knowledge adoption and transformation.

problematic, considering that simply hiring new employees to fill current knowledge gaps does not fully address how knowledge in organization changes and evolves [8], that knowledge creation is actually an individual activity [9], and that integrating individuals' knowledge is foundational and critical to an organization's capability [10]. Thus, we argue that we need to better understand the interaction between organizational knowledge and individuals and to examine how organizational learning is processed by individuals, the actual agents of knowledge management activities.

Taking individuals as the principal agents of knowledge activities, however, does not mean that individuals and their activities within an organization can be studied separately and independently from their context. Individuals work under the socio-technical systems of an organization [11], and thus receive technical support in their learning activities [12] and work as social actors under certain social contexts [13]. This technical support takes the form of a knowledge management system (KMS), which is a particular way of enhancing individuals' knowledge management in the context of organizational learning [12]. A KMS provides individual employees with the knowledge they need to work as members of an organization and allows those members' input to be transformed further into organizational knowledge. Therefore, KMS is a useful technical system that needs to be examined in order to better understand how knowledge is processed and learned in an organization. In addition, the social context in which this takes place plays a crucial role in employees' behaviors [13]. The social context represented as organizational climate, which refers to shared values, beliefs, and work ambience, is known to play a particularly important role in promoting their learning through their perception of knowledge management [14-18].

Therefore, in this study we investigate organizational learning by focusing on the interaction between individuals and organizational knowledge particularly from the perspective of individuals'

1. Introduction

Organizational learning and knowledge management have received much attention for their contribution to improving organizational performance [1-3]. Combining the concepts of organizational learning and knowledge management, March [4] suggested that the process of learning in organizations occurs through the interaction between organizational knowledge and individuals in an organization. However, the large amount of previous research has studied only one side of this interaction, focusing on the organization as the learning entity (e.g., [5-7]) while there is a lack of studies that examine how individuals learn from and contribute to the organizational knowledge. Viewing the organization as the entity that creates and deploys knowledge and thereby overlooking individual learning can be

activities and how their KMS use and the climate of their surroundings affect this interaction. To this end, we first adopt March [4]’s concept of mutual learning, defined as learning from an organization code and learning by an organization code, and represent these as individuals’ knowledge adoption and knowledge transformation, respectively. Furthermore, examining knowledge adoption and knowledge transformation at the individual level is important because they can operate on the continuum of knowledge reuse depending on the degree of adaptation that individuals applied to the acquired knowledge and individuals tend to choose different activities based on the tasks they face with or without realizing it [19]. Then we further distinguish between KMS use as a strategic decision support and as an operational support so as to better examine the association of the different kinds of knowledge handled in these two different types of KMS usage to knowledge adoption and transformation. We examine this relationship under the effects of innovative and affective team climates.

Specially, we ask three questions: (1) How do different types of KMS use affect knowledge adoption and transformation? (2) How do innovative and affective climates affect the relationship between KMS use and knowledge adoption and transformation? (3) How do knowledge adoption and transformation affect individuals’ performance in an organization? As our research questions are designed to incorporate the interactions between multiple levels in an organization, we gathered responses from 350 respondents within 66 teams in two different companies and used a hierarchical linear modeling approach.

2. Theoretical background and hypotheses

2.1. Mutual learning between an organization code and individuals: knowledge adoption and transformation

March [4] introduced the concept of mutual learning between an organization and the individuals within it. According to March, “Organizations store knowledge in their procedures, norms, rules, and forms. They accumulate such knowledge over time, learning from their members. At the same time, individuals in an organization are socialized to organizational beliefs” (p.73). The knowledge that an organization maintains and is shared by its members is called an organization code. March [4] refers to organizations’ learning from their members as learning by the organization code and to individuals’ becoming socialized to organizational beliefs and adopting organizational knowledge as learning from the organization code. Hence, mutual

learning addresses two-way knowledge transfers between the organization code and individuals. Through this mutual learning, the organization learns new knowledge that is potentially useful to it [7, 20]. It can also be understood as a combinative capability through which an organization learns new knowledge by combining existing and new knowledge [8]. By shifting focus from the organization to the individuals, how this learning from and by organization code is deployed within the nested system of an organization can be explained as follows. The first, learning from an organization code, refers to how individuals adopt what within the organization is considered prevalent knowledge without changing its value, and the second, learning by an organization code, refers to individuals’ experimenting with and transforming the extant knowledge for a better outcome in their work, thus changing the existing organization code. In this sense, using an organization code as a knowledge base for individuals’ work requires making a choice between the adoption and transformation of that code.

Knowledge adoption can be viewed as the act of pursuing efficiency by utilizing the certainty and clarity of an organization code, while knowledge transformation can be understood as the act of experimenting with extant knowledge to improve it [21]. Knowledge adoption requires the capability of valuing and gathering knowledge of structures and systems based on the organizational code [22]. Hence, the efficient acquisition of proper knowledge is a key aspect of the activity [23]. Knowledge transformation, on the other hand, refers to an individual’s attempts to modify the organizational code by creating new knowledge or by interpreting and integrating that knowledge in a different manner [4, 24]. Knowledge adoption and transformation from an organization code can also be interpreted, respectively, as a knowledge transfer from the organization to individuals and the transformation from tacit to explicit knowledge, in Nonaka [25]’s terms.

2.2. KMS use and knowledge adoption and transformation

To conduct knowledge-intensive work, knowledge management systems are developed and evolved to provide various types of knowledge to support various purposes of the work [26]. The different types of knowledge gained from the use of KMS can lead to different KM activities, as they are different in such characteristics as level of abstraction, content and application, and knowledge state [27]. Thus we need to examine how various kinds of KMS used to support different types of knowledge are differently associated with knowledge adoption and transformation.

Particularly, we focus on KMS use for the support of strategic decisions and of operations. The underlying reason behind this distinction is that the former focuses on knowledge for long-term planning or futurity [28] and is more related to ideas than to data [29], while the latter consists of knowledge generated from monitoring and controlling day-to-day operations [28] and shows a relatively higher level of know-how, the accumulated practical skills or expertise that allows one to do something smoothly and efficiently [8]. When individuals pursue different goals within an organization, such as the development of novel solutions and of efficiency, they are engaged in different patterns of knowledge-sourcing [21].

For the sake of efficiency, individuals tend to exploit existing knowledge [21], and the knowledge that resides in KMS not only shows such characteristics as being tacit, observable, and easy to transfer [30], but also has the virtue of being recorded and thus of being perceived as more legitimate [31]. Therefore, regardless of the purposes of KMS use, KMS use will be positively associated with individuals' knowledge adoption. Thus, the following hypotheses are posited.

Hypothesis 1a: KMS use for strategic decision support is positively associated with knowledge adoption.

Hypothesis 1b: KMS use for operational support is positively associated with knowledge adoption.

In a similar vein, KMS use is also associated with knowledge transformation. The process of strategic decision support is likely to involve combining new knowledge and existing knowledge to develop alternative ways of solving the problem [32], and when that knowledge is expressed through common languages such as statistics that are often found in operation-related knowledge, the addition of new knowledge to that existing knowledge can be enhanced [9]. In this way, new knowledge within an organization can be produced by transforming the knowledge gained from KMS [33]. Therefore, KMS use to support both strategic decision making and operations is positively associated with knowledge transformation, as suggested in the following hypotheses.

Hypothesis 2a: KMS use for strategic decision support is positively associated with knowledge transformation.

Hypothesis 2b: KMS use for operational support is positively associated with knowledge transformation.

2.3. Knowledge adoption and transformation and individual performance

Previous research has proved that access to knowledge is positively related to performance [34]. Athanassiou and Nigh [35] examined the relationship between performance of individuals and knowledge exchange and found that achieving high levels of performance required the exchange of complex knowledge. Cross and Cummings [36] verified that both networks and ties that facilitate gathering knowledge are related to individual performance in knowledge-intensive work. Teigland and Wasko [37] proved a positive relationship between boundary-spanning communication and new knowledge and performance. In their later study, Teigland and Wasko [21] verified that individuals who access knowledge more often through external knowledge transfer achieve higher levels of creative performance. Based on these findings, this study proposes that two types of knowledge activities, knowledge adoption and knowledge transformation, are important precedents to the individual's performance.

Hypothesis 3a: Knowledge adoption has a positive effect on individuals' performance.

Hypothesis 3b: Knowledge transformation has a positive effect on individuals' performance.

2.4. The impact of team climate on the relationships between KMS use and knowledge adoption and transformation

As many organizations have turned into team-based organizations in hopes of accessing individuals' unique knowledge easily and performing better in dynamic situations [38, 39], team contexts rather than organizational contexts have been more strongly related to individuals' work-related activities [40, 41]. This is in line with findings that an individual's behaviors tend to be more affected by variables closest to that individual [42]. Therefore, the climate of each team climate rather than the climate of the entire organization most affects individuals' motivation and team outcomes [43, 44].

Within the domain of team climate, Carr, Schmidt, Ford and Deshon [45] suggested three important dimensions of climate: affective (e.g., warmth and cooperation), cognitive (e.g., innovation and growth), and instrumental (e.g., hierarchy and structure). Of these, the instrumental dimension is more closely related to structural aspects of the climate, while the other two are more related to individuals' perceptions of their social surroundings. Moreover, innovative and

affective climates are known to enhance knowledge management activities [46-48]. Hence, we focus on innovative and affective climates as the target team climates of this study and further argue that they operate differently on knowledge adoption and transformation.

2.4.1. Innovative climate. An innovative climate is characterized by “the notion of openness to new ideas as an aspect of a firm's culture” (p.44) [49]. In a highly innovative climate, individuals actively seek suitable solutions and novel and different approaches for problems they face from outside knowledge sources, such as their team members and KMS [50, 51]. Through this activity, they adopt, implement, and learn new knowledge [52, 53]. This tendency to be open to and to adopt new knowledge further increases under an innovative climate [54]. Hence, the following hypotheses posit that an innovative climate is likely to strengthen the relationship between KMS use and knowledge adoption as follows.

Hypothesis 4a: The positive relationship between KMS use for strategic decision support and knowledge adoption is stronger for individuals when the innovative team climate is high than when it is low.

Hypothesis 4b: The positive relationship between KMS use for operational support and knowledge adoption is stronger for individuals when the innovative team climate is high than when it is low.

2.4.2. Affective climate. Affective climate is characterized by “shared affective responses by a work team's members” (p. 98) [55] and includes feelings of warmth, support, acceptance, cooperation, and enthusiasm that individuals gain from their surroundings [56, 57]. If a team maintains a high level of affective climate, team members are inspired to produce new knowledge by transforming existing knowledge [47, 48]. Similarly, firms can increase individuals' willingness to transform their own knowledge into knowledge that can be shared with others by creating a cooperative affective climate [48]. When such a supportive and cooperate climate is enriched within a team, its members tend to transform their existing knowledge to promote each other's learning [58]. Based on these research findings, we suggest that an affective climate is likely to strengthen the relationship between KMS use and knowledge transformation, as in the following hypotheses.

Hypothesis 5a: The positive relationship between KMS use for strategic decision support and knowledge transformation is stronger for

individuals when the affective team climate is high than when it is low.

Hypothesis 5b: The positive relationship between KMS use for operational support and knowledge transformation is stronger for individuals when the affective team climate is high than when it is low.

3. Research method

3.1. Study design and measurement

As this study incorporates five individual-level and two team-level constructs in the research model, we use hierarchical linear modeling (HLM) that is fabricated to analyze multi-level variables simultaneously. The measurements are adopted from the literature and their wording modified to address the context of the study. The operational definitions and sources for these measures are presented in Table 1. A total of 25 questions are used for the seven variables in the survey. All variables were measured using a Likert 7-point scale that ranged from “strongly disagree” to “strongly agree.”

3.2. Data collection

The data set for this study was gathered from two companies. Company A is a public corporation whose business includes insolvent debenture adjustment, credit recovery assistance, and on-line bidding. Company B is a hospital. Both companies have approximately a thousand employees. We distributed an online questionnaire to a total of 1,116 individual employees of 119 teams (the average number of team members is 10) in the two companies with the help of knowledge management personnel in each company and received a total of 601 responses (a response rate of 53.9%). To aggregate individual responses into team-level variables with validity, the responses of individuals who belonged to teams in which fewer than three members responded were eliminated to meet the minimum requirement for checking inter-rater reliability [62]. After eliminating those and incomplete responses, responses from 350 individuals within 66 teams (82 from company A and 268 from company B) were used for further analysis. In our sample, 35.1% were men, individual tenure in a team averaged about 44 months, and 27.3% of respondents belonged to staff-type teams (e.g., planning and general affairs) while the others belonged to non-staff-type teams (e.g., R&D, patient treatment, and sales).

Table 1. Operational definitions of constructs

Construct	Operational Definition	Source
	The number of total items for the construct / The example of the items	
Individual-level variables		
KMS use for operational support	The degree to which respondents use KMS for monitoring and controlling day-to-day operations	Sabherwal and Chan [28]
	3 / KMS improve the efficiency of our day-to-day business operations	
KMS use for strategic decision support	The degree to which respondents use KMS for long-term planning or futurity	Sabherwal and Chan [28]
	3 / I use KMS to facilitate strategic business planning	
Knowledge adoption	The degree to which respondents acquire knowledge within an organizational code and use it without conversing	Gold, Malhotra and Segars [23]
	3 / I devote to identify best practice	
Knowledge transformation	The degree to which respondents modify the organizational code by creating new knowledge or adding new knowledge to existing knowledge	Flatten, Engelen, Zahra and Brettel [59]
	3 / I have the ability to structure and to use collected knowledge	
Individual performance	The extent to which respondents are able to meet established objectives	Hoegl, Weinkauff and Gemuenden [60]
	5 / My output so far is of high quality	
Team-level variables		
Affective team climate	The extent to which a team shares the affective responses of its members	Tse, Dasborough and Ashkanasy [61]
	5 / In general, how enthusiastic do you feel your team is?	
Innovative team climate	The extent to which the team is open to new ideas	Hurley and Hult [49]
	3 / In our team, management actively seeks innovative ideas	

4. Results

4.1. Measurement model

The lowest being 0.828, Cronbach's alpha of all constructs showed a value greater than the desired level of 0.70, thus indicating an acceptable level of reliability [63]. The result of confirmatory factor analysis with Varimax rotation showed that all factor loadings were greater than 0.5 and cross-loading values and loaded on corresponding variables demonstrating convergent and discriminant validity [64]. Before further analyzing team climate variables, we checked the legitimacy of our sample for a team-level analysis through inter-rater agreement (r_{wg}) [62] and the inter-class correlation coefficient (ICC) [65]. They all exceeded the recommended value of 0.7 for all teams. Finally, we checked for potential common method bias using Harman's single factor test as recommended by Podsakoff and Organ [66]. The principal factor explained 18% of total variances, indicating the potential problem caused by common method bias is minimal in this study.

4.2. Hypotheses testing

HLM 7.0 was used for testing our multilevel model. To decrease the possibility of multicollinearity, we first performed group mean centering on all level 1 predictors and grand mean centering on all level 2 predictors. Then we tested hypotheses, and the results are provided in figure 1.

The relationships between KMS use and knowledge adoption are all significant ($\gamma = 0.150$, $t = 2.32$ and $\gamma = 0.269$, $t = 4.119$), indicating that KMS use for both strategic decision support and operational support are positively associated with knowledge adoption, supporting hypotheses 1a and 1b. Regarding the links between KMS use and knowledge transformation, the link between KMS use for strategic decision support and knowledge transformation is not significant ($\gamma = 0.088$, $t = 1.351$), while the link between KMS use for operational support and knowledge transformation is significant ($\gamma = 0.286$, $t = 4.447$); thus hypothesis 2a is not supported, while 2b is supported. The effects of knowledge adoption and transformation on individual performance are all significant ($\gamma = 0.161$, $t = 3.64$ and $\gamma = 0.470$, $t = 6.397$), thus supporting hypotheses 3a and 3b. The cross-level interaction shows mixed results. Innovative team climate moderates the relationship between KMS use for strategic decision support and knowledge adoption ($\gamma = 0.130$, $t = 2.777$), while it does not moderate the relationship between KMS use for

operational support and knowledge adoption ($\gamma = -0.056$, $t = -0.884$); thus hypothesis 4a is supported, while hypothesis 4b is not supported. Affective team climate does not moderate the relationship between KMS use for strategic decision support and knowledge transformation ($\gamma = -0.005$, $t = -0.068$), while it does moderate the relationship between KMS use for operational support and knowledge transformation ($\gamma = 0.116$, $t = 2.581$). Therefore, hypothesis 5a is not supported, but hypothesis 5b is supported. To control for the effect of company, team type, and individual's

tenure in a team, we tested their effect on individual performance, knowledge adoption, and knowledge transformation. The results in figure 1 show only the significant effects. The results from the public corporation show higher individual performance and knowledge adoption and transformation than those from the hospital. Staff teams demonstrate higher individual performance and knowledge transformation than non-staff teams. Lastly, the results show that an individual's tenure in a team increases knowledge adoption and transformation.

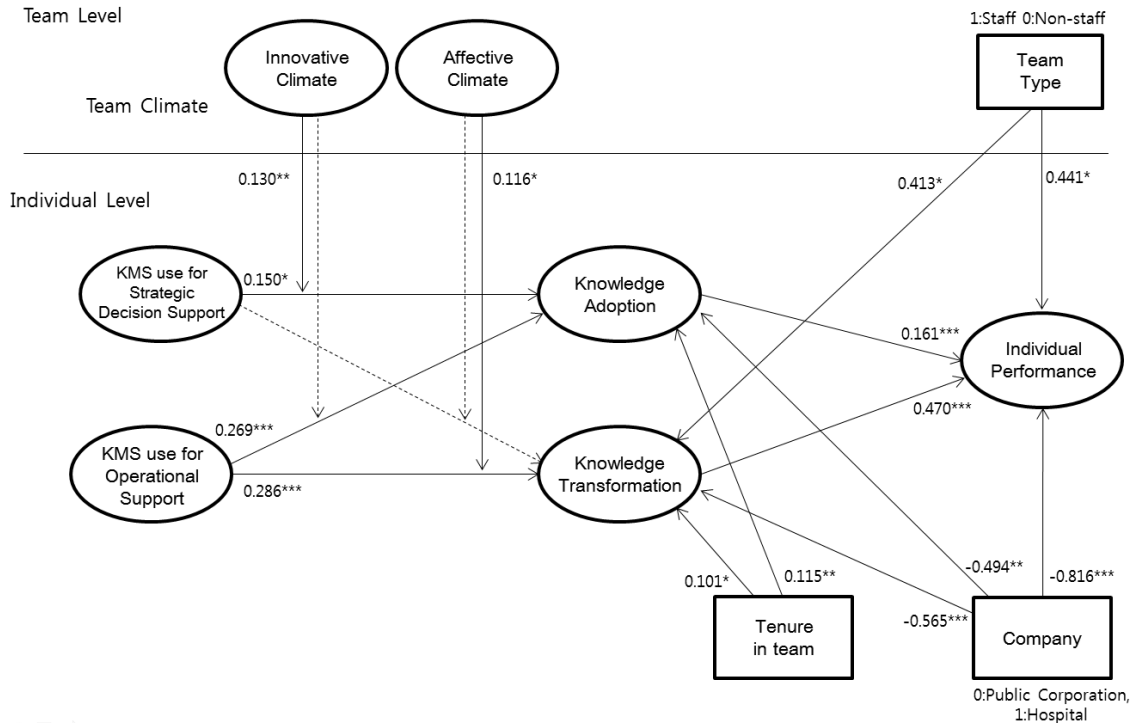


Figure 1. Results

5. Discussion

Overall, our findings show how individuals in an organization adopt and transform organizational knowledge, and how this adoption and transformation are affected by different types of KMS use. Also, our findings show that different kinds of team climates strengthen the relationships between KMS use and knowledge adoption and transformation in different ways.

The results confirm that knowledge adoption and knowledge transformation do affect individual performance. Their effects on performance, however, are not the same in their magnitude: knowledge transformation affects individual performance more strongly than knowledge adoption does. This result suggests that individuals who are adopting their

organizational knowledge without changing and adding any value gain the advantages of speed and efficiency in their work, but that transforming existing knowledge may increase their ability to find a path to better performance through internal reflection.

In our attempt to examine the antecedents of knowledge adoption and transformation, we found that KMS use for operational support is associated with both knowledge adoption and transformation, while KMS use for strategic decision support is associated only with knowledge adoption. This finding implies that certain types of knowledge found in KMS may have a better chance of being transformed or adopted than others. Knowledge found in the search for operational support may be efficient for individual employees to adopt as it is

because it adds immediate value to their daily work and, at the same time, is subject to transformation because it may exist as a form of data that can be easily integrated with other types of knowledge within an organization. However, the knowledge suitable for supporting strategic decisions may exist in a complex form that is highly dependent on the target decision, and thus is not subject to transformation but only to adoption.

Regarding team climate, an innovative team climate strengthens the relationship between KMS use for strategic decision support and knowledge adoption but not the relationship between KMS use for operational support and knowledge adoption. Interestingly, this result is the opposite in the relationship between KMS use and knowledge transformation: affective team climate strengthens the relationship between KMS use for operational support and knowledge transformation but not the relationship between KMS use for strategic decision support and knowledge transformation. The explanation for these results can be found again in the different nature of knowledge used for strategic decision and operational support. An innovative climate encourages people to be more open to bold, new, and even risky ideas, and an affective climate accepts and allows experimentation and potential failures. Knowledge for operational support is usually well-accepted know-how and factual data, and thus an innovative climate is not particularly needed for this knowledge to be adopted by organization members, while in the case of knowledge for supporting strategic decisions, an innovative climate can help it be adopted more easily to individuals. However, our findings demonstrate that an affective climate can help members experiment and transform knowledge regardless of its type.

5.1. Limitations and future study

This study has several limitations. First, the two target companies run very different types of businesses. Therefore, although we controlled for some of the relevant variables, generalizing our findings from the two companies may have sacrificed the unique insights that each company may have provided. Second, the results of this study may have been influenced by idiosyncratic characteristics of the target companies. Therefore, future research should consider conducting studies with more companies that vary in their numbers and their activities. For example, collecting data from another hospital or public corporation (or possibly both) and retesting the research model can be considered to increase the generalizability of the findings. Third, only two types

of KMS use are examined in this study. Although their roles as the antecedents of knowledge adoption and transformation provide interesting insights, future study may consider other or more various types of KMS use.

5.2. Practical implications

Overall, our findings suggest that mutual learning between employees and the organization does indeed improve the performance of individual employees. As noted earlier, our findings demonstrate that knowledge transformation affects individual performance more strongly than knowledge adoption does. It does not mean, however, that knowledge transformation should be much more valued in an organization than knowledge adoption in all circumstances. Knowledge transformation may take more time to be executed than knowledge adoption, as it requires more of individuals' cognitive and temporal inputs. If an organization pursues a follower strategy in the market and values quick operation, knowledge adoption may be the one that should be enriched, at least in the short term. Therefore, the desired degree of balance between knowledge adoption and transformation depends on the alignment between organizational strategies and their surrounding environment. In all cases, however, both knowledge adoption and transformation should be encouraged for seamless interaction between individuals and organizational knowledge.

Second, regarding the types of knowledge found in KMS, different types of knowledge should be handled in different ways. Knowledge for strategic decision support is not subject to transformation in the path to individual performance. Its quick adoption should be encouraged, while knowledge for operational support should not only be accepted as it is but also tested, modified, and changed for better performance.

Third, the managers of an organization should build the right climate to encourage employees' target behavior. If a team is placed in a situation in which company-made decisions should be quickly adopted and executed, an innovative climate should be enhanced. On the other hand, if a team is concerned about creating new knowledge from the extant knowledge, an affective climate can help its members build new knowledge.

5.3. Theoretical implications

Our study provides several important implications for theory. First, it suggests that knowledge adoption

and transformation as the representations for the each direction of the interaction between individuals in an organization and the organization code from the side of individuals. Since individuals are the actual entities of action, it is important to understand how these individuals learn and perform through these knowledge activities. As the right practice of imitation can be the birthplace of creative work, both knowledge adoption and transformation can enhance individuals' capability to perform better and to contribute to maintaining and evolving organizational knowledge.

Second, we introduce the insight that different types of KMS use can be associated with different knowledge activities. As the types of knowledge stored and retrieved in KMS are becoming more various and thorough and their different characteristics make them suitable for different work, it is important to examine how their usage patterns can be further associated with subsequent knowledge management activities.

In conclusion, we demonstrate that certain types of team climate can enhance the way the knowledge found in KMS is adopted and transformed. We tested this proposition by incorporating two different levels in a single framework. Previous research has tended to test different levels of variables separately due to the difficulties of conducting multilevel studies without sacrificing the integrity of each level. Given that an organization is a system that consists of multiple levels of subsystems, studying interactions across the levels can help us understand how things occur and intertwine within an organization. As our study shows, considering not only technical and social systems but also their interaction across different levels can enlighten and contribute to the body of multilevel interaction studies.

6. References

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