

A Framework for Team Sensemaking: Articulation and Measurement of Multidimensionality

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Cite this paper: Talat, A., (2020). A Framework for team sensemaking: Articulation and measurement of multidimensionality. *Paradigms*, 14(2), 153-160.

This paper aims to develop a comprehensive scale to measure team sensemaking in knowledge-intensive firms and in so doing integrate and refine the previous scales. The theoretical model conceived team sensemaking as a third-order variable with three dimensions of team sensemaking: social cognition, communication and reflection such that social cognition has further three sub-dimensions: confirmatory encoding, representation shifting, and team situation models. Relevant items were identified for each dimension of the Team Sensemaking Inventory (TSI). In the first phase, the scale was subject to assessment by academicians and professionals for face validity. TSI was then subjected to exploratory and confirmatory factor analysis and was further tested for convergent, discriminant and nomological validity. Findings suggest that the newly developed scale is a reliable and valid measure of team sensemaking. This scale would help organizations diagnose sensemaking dynamics in teams and develop interventions according to the needs of each team. The scale and three-factor model will provide a framework and a tool to investigate the relationship of team sensemaking with other variables.

Keywords:

team sensemaking; multidimensionality; scale development.

INTRODUCTION

There exists in human beings a powerful motivation to understand our experiences and the world around us (Chater & Loewenstein, 2016; Schindler et al, 2017). It has long been recognized in the field of psychology that human beings have a strong drive to make sense of the world around them. It is through sensemaking that humans arrange the stimuli into meaningful representations (Chater & Loewenstein; 2016). Finding an “elegant” explanation for a hitherto unfathomable phenomenon or refining a previously known explanation in light of new information are sources of pleasure.

There is a growing interest in exploring the concept of collective sensemaking: how do teams develop understanding as a collective unit (Smart & Sycara; 2013). Team sensemaking has been defined as “the process by which a team manages and coordinates its efforts to explain the current situation and to anticipate future situations, typically under uncertain or ambiguous conditions” (Klein, Wiggins & Dominguez, 2010). A breakdown in team sensemaking can lead to costly mistakes (Malakis & Kontogiannis; 2014). Team sensemaking is believed to be more critical and more difficult to accomplish than individual sensemaking (Klein et al., 2010) as it requires additional coordination. Team sensemaking is believed to be an imperative antecedent to individual and organizational learning (Horvath, Callahan, Crosswell & Mukri; 1996).

In this article the study proposes a clear articulation of team-level dimensions that constitute team sensemaking, thus allowing a better understanding of the capability and hence likely to make it easier to investigate empirically team-related outcomes. The paper is important in three respects: firstly, it addresses the concept of sensemaking at the team level for which only sparse literature exists. Secondly, it helps understand what constitutes sensemaking and how it can be measured. Thirdly, it extends the concept of sensemaking to the ordinary organizational life in

contrast to previous literature which focuses heavily on crisis and disasters. While remarkable accomplishments have been made in the field of sensemaking, there exists a notable gap in understanding sensemaking at the team level (Maitlis & Christianson; 2014; Akgun, Keskin, Lynn & Dogan; 2012). It is fair to conjecture that sparse use of team sensemaking, to a certain extent, is because the construct requires further clarity and improvement in its operationalization.

THEORETICAL FRAMEWORK

The need for sensemaking arises under three conditions: when there is a dramatic loss of sense, the loss of sense is mundane but still troublesome, the context is unfamiliar and hence sense is lacking (Weick, 2005). Such conceptualization of sensemaking allows for a stable measure of sensemaking across dramatic, mundane and novel situations. Sensemaking is not restricted to dramatic or unprecedented situations only. Gioia and Mehra (1996) and Weick (2005) have emphasized that much of the organization's life is not routine. However, even routine events are not devoid of sense. People become aware of and assimilate subtle cues. The relevance of sensemaking to organizations is far broader than the empirical quantitative body of literature suggests (Sandberg & Tsoukas; 2015).

It is important to emphasize that sensemaking is distinct from related concepts such as sensegiving and knowledge management. While sensemaking revolves around creating order and making retrospective sense of ongoing events (Maitlis, 2005) and occurs when members face events, issues, and actions that are novel, unprecedented, surprising or confusing (Gioia & Thomas, 1996; Weick, 1993, 1995), sensegiving is influencing other people's meaning-making (Gioia & Chittipeddi, 1991, Weick, Sutcliffe & Obstfeld, 2005) through controlling cues and controlling interaction among individuals (Weick et.al, 2005). Similarly, several authors have drawn a distinction between knowledge management and sensemaking. According to Boland

and Yoo (2004), sensemaking is distinguished from the traditional view of knowledge management in that knowledge management treats the environment as independently knowable and expects managers to prospectively choose courses of action. Sensemaking differs in comparison as situations are viewed as equivocal and managers are expected to retrospectively impose sense.

Team sensemaking

Team sensemaking is defined as “the mechanism by which a team manages and coordinates its efforts to explain the current situation and to anticipate future situations, typically under uncertain or ambiguous conditions” (Klein et al., 2010, p.304). Sensemaking refers to how organization actors structure the unknown to be able to act in it. It involves coming up with a plausible understanding, a map of a shifting world. This map is created in conjunction with relevant others. Team sensemaking enables organization actors to have a better grasp of what is going on in their environments, thus facilitates other activities such as visioning, relating, and inventing. It is considered an important factor in determining a team’s performance (Akgun et al., 2012). Many cases of team failure can also be attributed to the failure in team sensemaking, where critical stimuli are not paid heed to and/or the team fails to synthesize the available information (Klein et al., 2010).

Dimensions of team sensemaking

A key challenge in identifying the dimensions of team sensemaking is that varying streams of literature ascribe different meanings to the notion of “sensemaking.” For instance, there is a stream of research rooted in Social Cognition Theory (SCT), which views sensemaking as a cognitive mechanism (Russel, Stefik, Pirolli & Card, 1993; Qu and Furnas, 2005). In contrast, another stream of research attributes sensemaking as communication. Externalized speech is the primary mechanism through which team members keep up with their team members’ thoughts (Clarke and Cornellison, 2011) and in this manner, the collective interpretations and memory are talked into existence (Brown., Stacey & Nandhakumar; 2008). Yet another stream of research focuses on the “attitude of wisdom” that sense makers must adopt. While the above-mentioned aspects of sensemaking focus on the classification of information and the articulation of information, reflection (the attitude of wisdom) refers to the manner in which the information is held (Weick, 2003).

The lack of consensus as to what constitutes team sensemaking is reflected in the empirical studies, which seek to measure sensemaking. This lack of consensus also indicates the non-existence of a very well-defined instrument to measure team sensemaking in its entirety. The sensemaking literature reflects remarkable inconsistency in defining the subconstructs of team sensemaking. Based on the conceptualization of sensemaking as a social process (a team effort) that deals both with the mundane and the novel and is concerned with discrepancies both big and small, this study proposes a new instrument for measuring “team sensemaking.” This study proposes that team sensemaking is a multidimensional and hierarchal construct. It consists of three subdimensions: social cognition, communication and reflection. Social Cognition is further represented by three subdimensions: confirmatory encoding, representation shifting, and team situation

models. Figure 1 depicts the dimensions of team sensemaking as proposed by the current study.

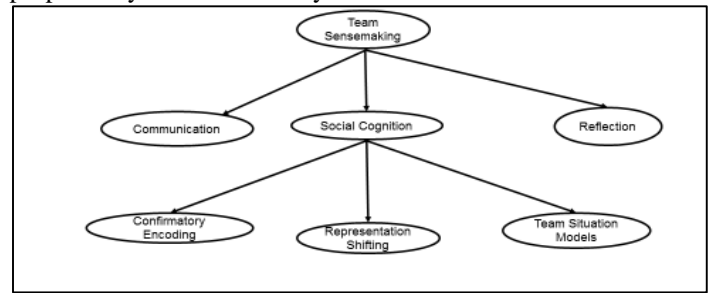


Figure 1: Dimensions of team sensemaking

Teams (organization actors) are surrounded by a flux of events. The information received via the stimuli is sorted into pre-existing classifications via confirmatory encoding or the classification structure is updated through representation shifting. Team members communicate with each other and create a collective mental representation, team situation model. The last component of team sensemaking is reflection. Reflection represents an attitude of wisdom where information is retained but even as information is preserved, a possibility is entertained that the current schema and classification (representation and encoding) might be accurate or might require future refinement and updation. Reflection is a built-in feature of sensemaking. Employing confirmatory encoding, representation shifting, team situation models and articulation and reflection team members develop a plausible story around ongoing events.

In the following section, each of the proposed dimensions of team sensemaking will be discussed in detail. A brief summary of each subdimension of team sensemaking is provided in Table 1.

Confirmatory Encoding

Retrospective attention is primarily driven by the question: same or different? New information that is similar to prior experience is classified into existing schemas. The process is called “confirmatory encoding.” Assigning labels and categories is an important part of sensemaking. It helps stabilize the streaming of experience (Gray, Butler and Sharma, 2015; Johnson et al, 2013; Neil, Mc Kee and Rose 2007).

Representation Shifting

Sensemaking involves searching for a representation. Representations are chosen and changed in response to new stimuli. (Russel et.al; 1993). A novel or disruptive bit of information or accumulation of small pieces of information that cannot be classified in the current schema leads to “representation shifting”. As the sensemaker’s knowledge and

understanding about a situation or a task grows, he might feel that the initial representation was not adequate and hence new information will lead to representation shifting rather than confirmatory encoding (Qu and Hansen;2008)

Team Situation Model

The team situation model is the shared understanding and dynamic mental map concerned exclusively with the present task, environment and the team itself. As individuals develop a perception of the factors in the environment through scanning, the comprehension of their relevance, and its meaning in the future,

they share their individual assessments. The result is a shared cognitive map held by the team (Haar, Li, Segers, Jehn & Bossche; 2015). Cook et al (2004) refer to such dynamic awareness as fleeting shared knowledge. Through these shared team situation models, teams make sense of the situation by assigning meaning to environmental cues. Shared mental models also help the teams condense the influx of data gathered from a complex and environment in a more manageable set of cognitive representations (Akgun et.al, 2012).

Communication

Communication is at the heart of sensemaking. The social process of sensemaking explicit through communication and information sharing. Shared mental models are developed by asking questions and listening carefully. Through reliable patterns of communication, knowledge is integrated and understanding of complex problems is reached (Gardner, Gino and Staats, 2012). Communication is a continuous process of information exchange and allows members to continually engage in the transfer and updation of knowledge (Weick et al, 2005; Arnold, 2010; Gardner, Gino & Staats,2012; Cornelissen, Mantere & Vaara,2014; Mahyar & Tory, 2014).

Table 1: Conceptual Dimensions of Team Sensemaking

Team sensemaking dimensions	Description	Conceptual fit with team sensemaking
Confirmatory encoding	"...process whereby individuals seek to organize task information within an existing cognitive representation." (Gray, Butler & Sharma; 2015, p.2086)	"Sensemaking uses retrospect to make sense of the puzzles observed." (Weick et al., 2005, p.412)
Representation Shifting	"modify their cognitive representations by adding new information categories, splitting categories, or merging categories." (Gray et al., 2015, p.2086)	"Through a series of (...)iterative test-and-modify learning loops, individuals make sense of the tasks they face by refining representations to improve their efficiency." (Gray, Butler & Sharma; 2015, p.2086)
Team Situation Models	"a shared understanding and dynamic mental representation of a team pertaining to a current team functioning situation, including its environment and task, and the team itself" (Haar et al., 2015, p.597)	"Shared mental models are knowledge structures and shared understandings held by team members that enable them to form accurate explanations and expectations for the task, and in turn ... to make sense of a situation."(Akgun et.al, 2012, p.476)
mmunication	"Process by which information is clearly and accurately exchanged among team members." (Salas, Burke and Cannon-Bowers; 2000, p.343)	"Sensemaking is a social process of making sense through communication, of the circumstances in which people collectively find themselves." (Weick et al, 2005, p.412)
Reflection	"is the critical examination of a process, such that it can be subsequently adjusted according to new data and knowledge." (Edmondson, 2002, p.13)	"Because people are always in the middle of things (Weick, 1995; p.43), reflection permits team members to take a step back from an experience and draw mindful inferences (Wiedow & Konradt, 2011).

Reflection

Reflection can be defined as the process by which the reciprocal exchange between actors and environments is preserved. Since people are always in the middle of things (Weick, 1995), sensemaking involves updating and is progressive (Weick et al, 2005). According to Wiedow and Konradt (2011), individual reflection is a process whereby a person steps back from an experience and mindfully draws inferences about the meaning of the experience. At the team level, reflection refers to behavior that encourages team members to develop insights about the processes and performance of a team. Hence, plausible stories are built around events (Hodgson, 2007; Brown et al., 2008) and through

reflection some fall to the wayside while others are carried forward (Rutledge; 2009).

RESEARCH METHODOLOGY

Sampling frame

The ICT industry in Pakistan was the subject of the study. The ICT industry is suitable for the purpose of the study because the work is usually done in teams and there is an ongoing need to make "sense" of the client preferences and to be resilient in face of unforeseen circumstances (Holm & Østergaard, 2015). Pakistan Software Houses Association for Information Technology (IT) and (ITES) (P@SHA), is a leading representative body of Pakistan's software industry. It has 290 members listed in its membership directory. The list of all P@SHA members served as the sampling frame for this research.

Scale development

Team sensemaking was conceptualized as a third-order construct with three subdimensions namely: social cognition; communication; and reflection. Social cognition has further three subdimensions namely: confirmatory encoding; representation shifting; and team situation models. Items to measure each subdimension have been borrowed from existing literature (Neill et al., 2007; Gray et al., 2015; Akgün, Lynn & Dogan, 2012; and Ortel & Antoni, 2014).

Figure 2 provides the overview of the scale development procedure, adapted from Mackenzie, Posakoff and Podsakoff (2011). Following the guidelines outlined by Nunnally (1967), Gerbing and Anderson (1988), and Churchill's (1979) a stepwise procedure is employed to develop the domain of the construct. A brief description of the various steps to develop and test team sensemaking inventory (TSI) is provided in Figure 2.

Three apriori dimensions were specified after exhaustive literature review as discussed earlier. A list of relevant items for the dimensions of team sensemaking was selected from relevant literature. The list of items thus generated were discussed in detail first with three PhD candidates of organization behavior and afterwards two focus group sessions were conducted with individuals who work as teams in ICT firms. Following that Exploratory Factor Analysis, and Confirmatory Factor Analysis were conducted. Finally nomological validity was established.

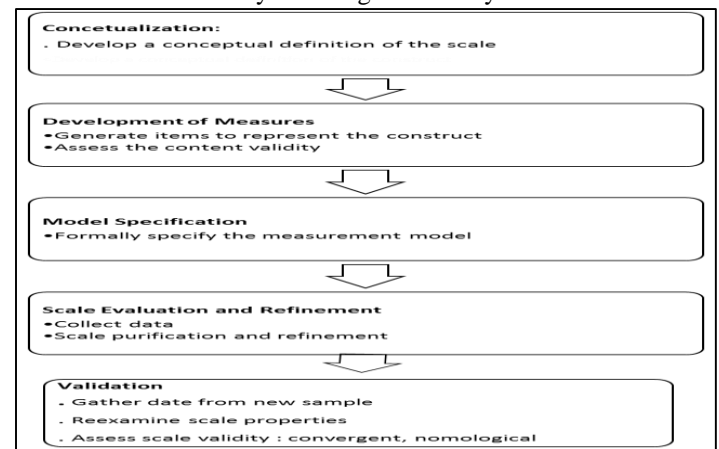


Figure 2: Overview of Scale Development procedure; Adapted from Mackenzie Pdsakoff and Podsakoff (2011)

FINDINGS OF THE STUDY

Item Selection and Content Validity Assessment

Three a priori dimensions were specified after an exhaustive literature review as discussed earlier. A list of relevant items for the dimensions of team sensemaking was selected from relevant literature. The list of items thus generated were discussed in detail first with three Ph.D. candidates of organization behavior and afterwards two focus group sessions were conducted with individuals who work as teams in ICT firms. In each focus group, six participants were invited including two team leaders, two I/S designers, and two domain representatives. A team leader is a person who manages the focal project. Designers are professionals who have expertise in I/S technology, system development, programming, Domain representatives are professionals whose primary responsibility is to act as customer representatives and ensure customers' functional needs are being met. The participants of focus groups were probed as to how a team functions. They were shown the items selected and were asked if any aspect of their teamwork in "making sense" of their task had not been captured. The participants of the focus groups deemed the items adequate in capturing team sensemaking. As a final step, three Ph.D. students performed a Q-Sort procedure. The students were provided with conceptual definitions of each construct and sub-construct. They were also provided a list of items and were requested to match each item to a construct/sub construct. Collectively, the discussions with academicians and the practitioners helped to establish the content validity of the instrument.

Exploratory factor analysis

The initial list comprised of 29 items. After removing 7 items that were either not correctly matched to the definition or were deemed confusing or repetitious, 22 items were retained. The breakdown of these items is as follows: Confirmatory Encoding (4), Representation Shifting (4), Team situation Models (5), Communication (5) and Reflection (4). A sample item of *confirmatory encoding* is "Team members refer to other team members to understand the finer points of a topic"; a sample item of *representation shifting* is "Team members frequently seek out other team members to get a very different point of view on a particular topic"; a sample item of *team situation models* is "The team members have a shared understanding of the customer's needs and wants", a sample item of *communication* is "Team members ask each other questions if something is unclear", and a sample item of *reflection* is "We consider what we can do about things that didn't work out as planned".

Data was collected from 106 professionals working in teams for a pilot study. 5 responses were considered incomplete. The remaining 101 responses were used to conduct exploratory factor analysis (EFA). Initially, the factorability of the 22 items was examined. Several well-recognized criteria for the factorability of a construct were used. First, it was observed that all 22 items were correlated with at least one other item, suggesting reasonable factorability. Second, the Kaiser-Meyer-Olkin measure of sampling adequacy was 0.779, above the commonly recommended value of 0.60 (Kaiser & Rice, 1974). A value greater than 0.6 indicates that the data can factor well.

Furthermore, Bartlett's test of sphericity was significant ($\chi^2(660) = , p < .001$). Finally, the communalities were all above .5, further confirming that each item shared some common variance with other items. Given these overall indicators, factor analysis was deemed to be suitable for all 22 items.

To conduct exploratory factor analysis, principal components analysis was used because the primary purpose was to identify and compute composite scores for the factors underlying the team sensemaking instrument. The rotation method specified was Varimax. A total of 7 items were removed because they did not meet the criterion of minimum 0.4 loading or did not load to the hypothesized sub-construct (Brown, Cloville & Pye; 2015). A five-factor solution was obtained that matched closely to the a priori structure proposed conceptually. The exploratory factor analysis lends support to the model specified. These 15 items were used to measure team sensemaking in the next stage.

Confirmatory Factor Analysis

A new sample was collected to test the psychometric properties of the refined 22-item instrument. Out of the 292 companies contacted, representatives of 87 companies agreed to participate. For each company, we identified a key informant. Every key informant was currently working in an organization in the ICT sector of Pakistan. Multiple teams from within an organization could participate in the survey. Confirmatory Factor Analysis (CFA) was conducted to separately examine the measurement model of second-order construct social cognition. Results are presented in Table 3. Confirmatory factor analysis for social cognition indicated factor loading higher than 0.4 against each item. Composite reliability was found to be greater than 0.7 for each of the three sub-dimensions. The estimates for composite reliability for confirmatory encoding, representation shifting and team situation models were 0.771, 0.774 and 0.834 respectively. Convergent validity was evaluated by average variance extracted (AVE). AVE for each sub-variable was found to be higher than 0.5. The estimates for AVE for confirmatory encoding were 0.530, for representation shifting 0.534 and for team situation models and 0.628. The goodness of fit statistics showed a good fit of the measurement model to the data. In the measurement model for social cognition, the indices are as follows: Normed $\chi^2 = 1.71$; RMSEA = 0.06; CFI=0.97, TLI=0.95.

Table 3: Confirmatory Factor Analysis of Social Cognition

Sub- variable	Items	Factor loading (> 0.40)	AVE (> 0.50)	CR (> 0.70)	Model Fit
Social Cognition					
Confirmatory Encoding	CE1	0.680***	0.530	0.771	Normed $\chi^2 = 1.640$ CFI= 0.984 TLI= 0.976 RMSEA= 0.046
	CE2	0.779***			
	CE3	0.721***			
Representation Shifting	RS1	0.715***	0.534	0.774	
	RS2	0.708***			
	RS3	0.768***			
Team Situation Models	TSM1	0.805***	0.628	0.834	
	TSM2	0.856***			
	TSM3	0.710***			

***p < .001

After testing the measurement models for social cognition, CFA was again performed to assess team sensemaking (refer to Table 3). This attempt at assessing the measurement model in two steps is consistent with an assessment methodology suggested by Neil,

McKee & Rose (2007). A list of fifteen final items representing the dimensions and sub-dimensions and their respective factor loadings are presented in Table 3. The factor loadings for the second-order construct, *social cognition*, range from 0.685 to 0.858. The factor loadings for *communication* range from 0.685 to 0.858 while the factor loadings for reflection range from 0.685 to 0.858. The value of average variance extracted for social cognition was 0.504, for communication 0.546 and for reflection 0.557. Hence, all three sub-dimensions possess convergent validity. The value of composite reliability for social cognition was found to be 0.748. Communication (0.783) and reflection (0.789) also had values of composite reliability above the recommended value of 0.70. The goodness of fit indices show an acceptable fit for the team sensemaking measurement model. The indices are as follows: Normed $\chi^2 = 1.67$; RMSEA = 0.06; CFI=0.92, TLI= 0.91. Based on the factor loadings and fit indices reported in Table 4, social cognition, communication and reflection are dimensions of team sensemaking and confirmatory encoding, representation shifting and team situation models are sub-dimensions of cognition.

Table 4: Confirmatory Factor Analysis of Team Sensemaking

Sub- variable	Items	Factor loading (> 0.40)	AVE (> 0.50)	CR (>0.70)	Model Fit
Social Cognition					Normed $\chi^2 = 2.011$ CFI= 0.951 TLI= 0.938 RMSEA= 0.058
Confirmatory Encoding	CE1	0.685***			
	CE2	0.775***			
	CE3	0.720***			
Representation Shifting	RS1	0.701***			
	RS2	0.703***			
Team Situation Models	RS3	0.786***			
	TSM1	0.801***			
	TSM2	0.858***			
	TSM3	0.714***			
Communication	Com1	0.756***	0.546	0.783	
	Com2	0.769***			
	Com3	0.690***			
Reflection	Ref1	0.730***	0.557	0.789	
	Ref2	0.834***			
	Ref3	0.665***			

***p < .001

Nomological Validity

Nomological validity is established when the correlations between the construct in question and theoretically related constructs are significantly greater than zero (Campbell, 1960). According to Kelly (1939), identifying a latent factor through factor analysis is not sufficient justification to validate a construct. Constructs are at least partially defined by their nomological networks (Campbell, 1960; Cronbach & Meehl, 1955; Lubinski & Dawis, 1992; Vernon, 1950; Le et al, 2010).

The nomological validity of team sensemaking is assessed by examining relationships of team sensemaking to antecedents and consequences. We tested the correlations between important antecedents to team sensemaking such as task interdependence and team potency. Task interdependence was measured using three statements adapted from Campion, Medsker, and Higgs; 1993. A sample statement is “My team cannot accomplish its tasks without information or materials from other members of the team. Team potency was measured using three items adapted from Kirkman, Rosen, Tesluk and Gibson; 2004. A sample statement used to measure team potency is “My team can get a lot done when it works hard”. We also checked for positive correlations

between team sensemaking and positive team outcomes, team continuity. A sample statement to measure team continuity is “Even if I could have left this team and worked with another team, I would not have left”.

Team sensemaking was found to have positive correlations with task interdependence, team potency and team continuity. Therefore, the nomological validity of this instrument was found to be adequate.

DISCUSSION

A variety of theories will benefit from a clearer understanding of the sensemaking capability of teams. According to the Resource-Based View proposed by Barney (1996), resources and capabilities should possess four attributes: value, rareness, imperfect imitability and lack of substitutability to be a source of sustained competitive advantage. Team sensemaking is one such capability; it is hard to discern and hard to replicate. Team sensemaking capability allows organization actors to better handle situations despite uncertainty and flux of information; and make faster and better decisions concerning the adversary; and finally, circumvent fundamental and costly mistakes (Eisenhardt and Santos, 2002; Johnson, Melin & Whittington, 2003; Crowson et al, 2007).

Relatively few studies specifically address how teams adapt to novel and challenging circumstances (Gevers, Uitdewilligen, Passos, 2015; LePine, 2005; Randall, Resick, & DeChurch, 2011). There have been recent calls to focus more on team-based sensemaking (Matilis and Christianson; 2014) and to better understand the behavior and performance of teams beyond crises (Sandberg and Tsoukas, 2015). Similarly, it has been recognized that further explorations are required to explain how individuals engage in inter-subjective meaning-making (Weick and Roberts, 1993; Tsoukas, 1996, Cecez-Kecmanovic, 2003). Based on Weick et al’s model (2005) of sensemaking, this paper proposed a scale for the measurement of team sensemaking capabilities. The bulk of empirical work on sensemaking has been conceptual or qualitative (Weick, 1993; Weick, 2010; Stein 2004). This study is an important quantitative contribution and it is hoped that by proposing an accurate measurement instrument that captures the dynamics of team sensemaking, this study will facilitate future empirical research endeavors.

CONCLUSION

The primary motivation of this research was to conceptualize and measure team sensemaking. Team sensemaking is specially important to the ICT sector where work is usually done in teams and no-routine tasks are an everyday part of such organizations. This study broadens our understanding of team sensemaking as a multidimensional construct by articulating dimensions of sensemaking and developing a psychometrically robust measure of team sensemaking.

A range of methodologies has been employed to construct a theoretically and psychometrically sound construct. Findings indicate that 15 Items represent three interrelated first factors that demonstrate high convergent and discriminant validity.

RECOMMENDATIONS

Sensemaking is fundamentally a social process: organization members interpret their environment in and through their

interactions with others, constructing accounts that allow them to comprehend the world around them and act collectively (Paul & Reddy, 2010). Much of sensemaking research has focused solely on the cognitive aspects of sensemaking (e.g., Hahn, Preuss, Pinkse, & Figge, 2014) or has focused on sensemaking in crises (e.g., Weick, 2010; Takeda, Jones & Helms, 2017). Less attention has been paid to the sensemaking that occurs in less extreme situations (Maitlis, 2005). There are remarkable opportunities in extending our understanding of sensemaking in mundane rather than crisis-led sensemaking” (Brown et al., 2015).

The author hopes future researchers will use the proposed scale of team sensemaking and through replication further refine the scale. It is hoped that the conceptual development of team sensemaking and its operationalization will encourage researchers to build and test models relating to teamwork.

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- Appendix: Questionnaire Items**
- Confirmatory Encoding (Gray, Butler and Sharma; 2015)**
- Team members frequently refer to other team members to understand the finer points of a topic that they already know something about.

- Team members frequently turn to other team members to find the missing piece to a problem that they have a pretty good grasp of.
- Team members often consult other team members to learn more details about something they understand reasonably well.

Representation Shifting (Gray, Butler and Sharma; 2015)

- Team members regularly draw on other team members to reinterpret a problem and make sense of it in a creative way.
- Team members frequently seek out other team members to get a very different point of view on a particular topic.
- Team members frequently refer to other team members to take their understanding of something in a totally new direction.

Team Situation Models (Akgün, Keskin, Lynn, and Dogan; 2012)

- The team have a shared understanding of the target market user.
- The team have a shared understanding of the customer's needs and wants.
- The team has a shared understanding of the required product features.

Communication (Ortel and Antoni; 2015).

- Team members listen carefully to each other
- Team members ask each other questions if something is unclear.
- Team members elaborate on each other's information and ideas.

Reflection (Ortel and Antoni; 2015)

- We evaluate the results of our actions.
- We check what we can learn from our achievements.
- We consider what we can do about things that didn't work out as planned.