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ASSESSING READINESS FOR COLLABORATION IN MILITARY C2 CENTERS

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The present research explored the concept of collaborative readiness within a logistics command and control center which was undergoing an organizational change targeting collaborative processes. A series of collaboration-centric items were piloted during an ongoing organizational assessment which was administered to approximately 240 personnel. The results suggested that collaborative readiness could be conceptualized by four overall dimensions: 1) general effectiveness and attitudes, 2) technology adaptability and external collaboration, 3) collaboration enablers, and 4) job characteristics.

Background

Change is a pervading aspect of organizational life in the modern information age. Organizations are forced to adapt to changing markets, globalization, and new technology (Cascio, 1998). Change is also omnipresent in the military as military organizations are faced with the challenges of the Global War on Terror (GWOT) and the accompanying budget constraints that follow. To meet mission demands and to operate efficiently in the modern information age, the military must adapt by embracing new management paradigms to secure the commitment of personnel to change programs. Organizations can engage in organizational development interventions to support these change initiatives. However, these interventions are no guarantee that personnel will be committed to and fully engaged in change efforts. In fact, many organizational change initiatives fail due to negative climate perceptions (Ruck, Barthelemy, & Barlow, 2001), lack of vision and poor leadership support (Winum, Ryterband, & Stephenson, 1997), and mismatches between the intervention used and the readiness of employees to actively engage in the interventions (Levesque, Prochaska, & Prochaska, 1999).

Change Readiness

In response to the challenges associated with organizational interventions, researchers have begun to consider employees' readiness for change as a way to predict how employees will respond to change initiatives. Change readiness represents the psychological precursor to behaviors that can either support or hinder change management interventions (Armenakis, Harris, & Mossholder, 1993; Eby et al., 2000). This metric can be used to predict whether or not employees will be committed to change initiatives. Research has demonstrated that change readiness is related to employees' commitment and participation in change initiatives (Cunningham et al., 2002). Additionally researchers have suggested that change readiness encompasses both general and specific elements which relate to the exact details of organizational changes at hand (see Eby et al., 2000). Thus, if an organization seeks to increase its ability to collaborate, then a specific index of collaboration readiness will be particularly useful.

Collaboration

A key driver for effective change management involves collaboration between organizational leaders and working personnel (Hattori & Lapidus, 2004). Collaboration is a burgeoning research topic for contemporary researchers, due in part to the proliferation of collaborative tools, also known as groupware. However, the implementation of new technology in organizations is often unsuccessful (Clegg et al., 1997). Surprisingly, the failure to successfully implement new information technology (IT) systems is due in large part to factors independent of the technologies themselves. For example, researchers have suggested that

organizations need to consider personnel issues such training, personal resistance, and motivation to use the new tools as well as organizational issues such leadership and culture for change when trying to introduce new IT (Diamond, 1996). Thus, implementing new IT encompasses similar challenges to conducting organization changes and one must consider how the new IT fits into the complex socio-technical system which resides over the organization. Complicating matters is the fact that the designs for many groupware technologies have lacked theoretical backing and standardization across domains (Briggs, 2006). Additionally, many of these tools are not sufficiently evaluated against valid collaboration criteria, due in part, to the paucity of metrics to assess and evaluate collaboration and collaborative systems.

Collaborative Readiness

Collaboration involves the sharing of information between two or more entities toward a common goal (Hawryszkiewycz, 1997). This can involve several aspects. Ideally, employees in information-centric organizations like command and control (C2) centers should share information, however, they may differ in the extent that they are capable of sharing information, value sharing information, desire to share information, and know who they need to share information with. Further, employees will likely differ in how well they perceive their colleagues share information with them. There are several possible constraints that influence how people share information as well. For example, organizations may have certain policies that prevent collaboration. Individuals may lack the actual tools needed to share information, or the tools they do have may not work effectively. Additionally, employees may lack the training to use their collaborative tools effectively. In essence, collaborative readiness can encompass a variety of dimensions to capture the gamut of influences in the socio-technical system. The readiness of personnel to engage in organizational development interventions targeting collaborative processes or to accept new forms of collaborative technologies may be multidimensional in nature.

The present research explores the feasibility of an organizational metric to assess readiness for collaboration based on a systems-level perspective. A collaborative readiness index can be used to predict how well employees, in this case knowledge workers in logistics command and control (C2) centers, are postured or prepared for organizational change initiatives that aim to introduce new forms of collaborative tools and that seek to enhance collaboration through organizational re-design.

Method

Participants

Two hundred and forty-five personnel from a logistics C2 center participated in this study as part of an ongoing organizational survey conducted by a non-government agency. Thirty-one percent of the personnel were the rank of O4-O5, followed by 28% GS10-14, 11% E7-E9, 10% E5-E6, 8% E1-E4, 4% O1-O3, 3% GS8-GS9, and 2% for each GS15-SES and O6-O10. The personnel sampled were part of large logistics C2 center which was currently undergoing organizational changes to enhance its ability to collaborate internally and externally.

Materials

A series of twenty questions was developed and included as part of an ongoing organizational survey to assess individuals' beliefs about current collaborative relationships, attitudes toward collaboration in general, acceptance and availability of current collaborative tools, training for said tools, acceptance and adaptability toward new tools, and job characteristics pertaining to collaborative behaviors (see Appendix A). The items were presented using a graphic rating scale with low and high anchors separated by a numeric scale of 1 to 9, with higher scores denoting better collaboration.

Procedure

The survey items were embedded into an ongoing organizational survey. Upon completion of the larger survey, the data for the collaboration items were separated and psychometric analyses ensued. Factor analysis involving principle axis factoring was used to explore the dimensionality of the items.

Results

To assess the factor structure of the 20 items, the items were subjected to a principle axis analysis with a varimax rotation. The initial solution suggested a 4 factor solution and accounted for 65% of the variance. The rotated factor loadings for each of the items are presented in Table 1. Only factor loadings of .4 or higher were considered. Item 13 (see Appendix A) was the only item that didn't load onto a factor, and thus it was dropped from further analysis. In the case of cross-loading between two factors, the conceptual meaning of the item was considered and the item was classified based on its logical mapping to the overall dimension (e.g., items 5, 14, and 17). Items 1-4, 6, and 8-10 were labeled *general collaboration effectiveness and attitudes*

(Factor 1) and accounted for 46% of the variance (α = .90). Items 14 and 17-20 were labeled *technology adaptation and external collaboration* (Factor 2) and accounted for an additional 8% of the variance (α = .83). Items 5, 7, and 11-12 were labeled *collaboration enablers* (Factor 3) and accounted for an additional 5% of the variance (α = .85). Items 15-16 were labeled *job characteristics* (Factor 4) and accounted for an additional 5% of the variance (r = .47).

The means, standard deviations, and correlations among the dimensions are shown in Table 2. As shown in Table 2, all of the dimensions were significantly correlated, thus suggesting the presence of a higher order construct such as collaborative readiness.

Table 1. Rotated factor loadings for each item.

Item	Factor			
	1	2	3	4
1	.67	.38	.19	-.05
2	.79	-.03	.36	.23
3	.60	.30	.19	.12
4	.73	.07	.32	.27
5	.55	.25	.43	.17
6	.66	.16	.18	.24
7	.37	.20	.61	.12
8	.47	.32	.17	.26
9	.58	.35	.14	.25
10	.66	.28	.27	.22
11	.33	.33	.61	.08
12	.23	.31	.70	.30
13	.21	.24	.36	.15
14	.35	.50	.41	.11
15	.29	.11	.24	.50
16	.25	.25	.12	.75
17	.10	.60	.37	.40
18	.30	.59	.13	.22
19	.13	.80	.23	.09
20	.25	.52	.33	.12

Table 2. Means, standard deviations, and correlations among the dimensions.

Factor	1	2	3	4	Mean	SD
1.GEN	*.90*				6.48	1.50
2.ADPT	.62*	*.83*			6.17	1.73
3.ENAB	.70*	.67*	*.85*		6.62	1.63
4.JOB	.55*	.49*	.48*	*.47*[1]	7.38	1.52

Notes. * p < .01. GEN = General Collaboration Effectiveness and Attitudes, ADPT = Technology Adaptation and External Collaboration, ENAB = Collaboration Enablers, JOB = Job Characteristics. Reliabilities are presented in the diagonal and are italicized.
[1] The correlation coefficient is listed because this dimension has only two items.

Discussion

The present research explored the feasibility of an organizational metric to assess collaborative readiness among personnel during an organizational change initiative specifically targeting collaborative processes and relationships. The results from the exploratory factor analysis suggested that collaborative readiness may be conceptualized into four dimensions: 1) general collaboration effectiveness and attitudes, 2) adaptability to novel technology and external collaboration, 3) collaboration enablers, and 4) job characteristics.

The first dimension, general effectiveness and attitudes, was the strongest factor to emerge. This dimension involved individuals' perceptions about how well they shared information with their colleagues and how well their colleagues shared information with them. This dimension was represented by individuals' attitudes about the value of sharing information, how effective they perceived their own and their colleagues' ability to share information, and an indication of the usefulness of the information they receive from their colleagues. This dimension appears to overlap with conceptual definitions of collaboration (see Hawryszkiewycz, 1997) and it goes beyond the fundamentals of simply sharing information to assess the value of the information received and one's attitudes toward the process of sharing information. The generality of this dimension may make it useful in a variety of settings.

The second dimension, technology adaptation and external collaboration, was comprised of the ability of the workforce to seamlessly adapt to new technology. Non-technology related influences often drive whether or not a novel IT system will be successfully implemented (Diamond, 1996). Therefore, it is useful to know the extent of the workforces' ability to adapt to new tools. This dimension also captured the ability of the personnel to collaborate with external personnel. Collaboration in information-rich organizations such as command centers must occur internally and externally. This dimension will help to assess employees' perceptions of how effective the external process is.

The third dimension, collaboration enablers, was comprised of items that facilitate collaboration. For example, training for using existing tools was evident. The actual presence of collaborative tools and the usefulness of those tools was apparent. The presence of supporting or hindering organizational policies was also assessed through this dimension. These collaboration enablers likely create the

conditions to facilitate collaboration independent of one's attitudes or history of collaboration.

Finally, the fourth dimension, job characteristics, indexed whether or not the tasks associated with the job require collaboration. Not all jobs will carry the same requirements for collaboration. Furthermore, collaborative tools should be tailored to meet the particular needs of one's job. For example, tasks which are highly complex such as problem-solving and negotiation have a greater need for synchronous communication, whereas less complex tasks may be accomplished effectively using asynchronous tools (Bell & Kozlowski, 2002). This final dimension indexes the extent to which employees perceive their jobs as requiring extensive collaboration. Given the dependence on information and teamwork in command centers it was encouraging to see that this dimension had the highest overall mean among the personnel.

Limitations and Future Research

The results reported in the present paper are exploratory findings and require further research before definitive conclusions can be drawn. One limitation involves the self-report nature of the data. The high inter-correlations between the dimensions suggested the possible presence of common method variance. However, this challenge is not unique to this study but is a risk in most survey research. Further, due to the exploratory nature of this study, little data was available to examine discriminant and convergent validity.

Future studies are needed to confirm the factor structure of the scale and to examine how the dimensions relate to other constructs within the same nomological network. However, even future studies will be limited by the paucity of empirically-sound metrics relating to collaboration. The lack of current metrics is one challenge in this burgeoning literature on collaboration, however this suggests that exploratory studies such as this are required to further the study of collaboration. Future studies can use confirmatory factor analysis procedures such as structural equation modeling to better understand the factor structure of collaborative readiness. Future research should also examine how collaborative readiness influences organizational change parameters and group dynamics.

Conclusion

The present study explored the construct of collaborative readiness in a large C2 organization undergoing organizational changes. The results were encouraging in that several meaningful dimensions surfaced and the complexity of the socio-technical system appeared to emerge. This research is one step toward furthering the development of metrics to be used in collaboration research.

References

Armenakis, A.A., Harris, S.G., & Mossholder, K.W. (1993). Creating readiness for organizational change. *Human Relations, 46*, 681-703.

Bell, B.S., & Kozlowski, S.W.J. (2002). A typology of virtual teams: Implications for effective leadership. *Group and Organizational Management, 27*, 14-49.

Briggs, R.O. (2006). On theory-driven design and deployment of collaborative systems. *International Journal of Human-Computer Studies, 64*, 573-582.

Cascio, W.F. (1998). *Applied psychology in human resource management*. Upper Saddle River, NJ: Prentice Hall.

Clegg, C., Axtell, C., Damodaran, L., Farbey, B., Hull, R., Lloyd-Jones, R., Nicholls, J., Sells, R., & Tomlinson, C. (1997). Information technology: A study pf performance and the role of human and organizational factors. *Ergonomics, 40*(9), 851-871.

Cunningham, C.E., Woodward, C.A., Shannon, H.S., MacIntosh, J., Lendrum, B., Rosenbloom, D., & Brown, J. (2002). Readiness for organizational change: A longitudinal study of workplace, psychological and behavioural correlates. *Journal of Occupational and Organizational Psychology, 75*, 377-392.

Diamond, M.A. (1996). Innovation and diffusion of technology: A human process. *Consulting Psychology Journal: Research and Practice, 48* (4), 221-229.

Eby, L.T., Adams, D.M., Russell, J.E.A., & Gaby, S.H. (2000). Perceptions of organizational readiness for change: Factors related to employees' reactions to the implementation of team-based selling. *Human Relations, 53*, 419-442.

Hattori, R.A., & Lapidus, T. (2004). Collaboration, trust, and innovative change. *Journal of Change Management, 4*, 97-104.

Hawryszkiewycz, I. (1997). *Designing the networked enterprise*. London: Artech House, Inc.

Levesque, D.A., Prochaska, J.M., & Prochaska, J.O. (1999). Stages of change and integrated service delivery. *Consulting Psychology Journal: Practice and Research, 51* (4), 226-241.

Ruck, H.W., Barthelemy, R.R., & Barlow, C.B. (2001). The merger of government organizations: A case study. *The Psychologist-Manager Journal, 5* (2), 171-179.

Winum, P., Ryterband, E., & Stephenson, P. (1997). Helping organizations change: A model for guiding consultation. *Consulting Psychology Journal: Practice and Research, 49* (1), 6-16.

Appendix A

Collaboration items (low and high behavioral anchors).

Item Number	Behavioral Anchors	
	Low	High
1	I have a hard time with my job because I have to wait to get needed information	When I need it, the information I need for my job is readily available
2	I don't get useful information from my colleagues	Interacting with my colleagues helps me accomplish my work
3	I can't communicate with the people I need to in order to perform my job	When I need to, I can communicate with the people I need to
4	My colleagues don't give me the information I need	Communicating with my colleagues helps to generate new ideas
5	I don't have the tools needed to effectively communicate with my colleagues	My co-workers and I have the tools to communicate effectively together
6	I could be a better performer on my job, if I didn't have to talk with so many other people to get the job done	I tend to communicate with others in order to get a better understanding of new situations
7	People in this organization lack the skills to use our tools to communicate	Just about everyone in this organization is proficient in using our systems to communicate effectively
8	I can't always tell what my colleagues need from me	I usually give my colleagues the information they need before they ask for it
9	I often receive information from others that I don't need	I get just the right amount of information from others to complete my tasks
10	The information I receive from others is often incorrect	The quality of information I receive from others is very high
11	The people in my organization lack the training to effectively use our systems to communicate with others	We have been given the appropriate training to use our communication systems effectively
12	Our organization's policies often prevent us from talking with the people whom we need to talk to	Our organization's policies give us the flexibility to communicate with whomever we need to, in order to accomplish our work
13	I do not feel comfortable in communicating up the chain of command	When needed, I would feel comfortable talking with my supervisor's supervisor

14	Efforts to introduce new technology are often unsuccessful in my organization because people can't adapt to the new tools	In just about every case, the people in this organization respond very well to new technology
15	The types of activities that I accomplish at work rarely require input from others	I engage with others on a daily basis to accomplish my work activities
16	I don't get useful information from people outside of my organization	Interacting with people outside of my organization helps me accomplish my work
17	I don't have the tools needed to effectively communicate with people outside of my organization	I have the necessary tools to communicate with people outside of my organization
18	People outside of this organization lack the skills to use their tools to communicate effectively	Most people outside of this organization are proficient in using their systems to communicate effectively
19	The tools that I use to communicate with others outside of my organization do not work well	I rarely ever have a problem using technology to communicate with others outside of my organization
20	If my organization introduced a new form of technology, it would take months before people would actually use it	I feel that most of the people in my organization would use a new form of technology within the first two weeks of being implemented