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An Adaptive Workforce as the Foundation for E-Collaboration

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14. ABSTRACT E-collaboration, while having its roots in electronic technology such as telephones and other rudimentary electronic devices, has expanded dramatically with today's plethora of computer-supported cooperation and computer-mediated communication. E-collaboration technologies have transformed the "world of work" as we know it today. These technologies are undeniably the predominant factor facilitating the globalization of business, and they have transformed the fundamentals of interpersonal interaction within and across organizations. Given the tremendous changes being imposed by e-collaboration technologies, we must consider the subsequent changes be elicited at the individual (or human) level. In order words, how are the users adapting not only to the technologies themselves, but to the new "world of work" that the technologies have created?					
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An Adaptive Workforce as the Foundation for E-Collaboration

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INTRODUCTION

E-collaboration technologies have transformed the “world of work” as we know it today. These technologies are undeniably the predominant factor facilitating the globalization of business, and they have transformed the fundamentals of interpersonal interaction within and across organizations. Given the tremendous changes being imposed by e-collaboration technologies, we must consider the subsequent changes being elicited at the individual (or human) level. In other words, how are the users adapting not only to the technologies themselves, but to the new world of work the technologies have created?

The changes emanated from technology have been so immense that they have shifted the business world off its traditional axis. Technology has served to fundamentally transform business processes. One of the largest areas affected by technology has been the very core of business: the communication and collaboration practices of organizations. When an area so fundamental to business has been altered drastically, we must consider how this transformation has permeated throughout all areas of the business world. Moreover, understanding the breadth of influence technology has on the nature of work and adapting all levels of business accordingly will allow us to extract the benefits and avoid the hazards associated with technology and the change it has enabled. Unfortunately, such understanding and coordination is a daunting goal. We propose that establishing an adaptive workforce is an essential first step to achieving this goal.

In support of our proposition, the following article will begin with examples of diverse areas of business that have been impacted by e-collaboration and illustrate how adaptability provides the underlying theme uniting the changes that are occurring. Then, focusing on individual adaptability, we will present a relevant performance model to be implemented in organizations. Based on this performance model, we will illustrate how organizations can begin to establish an adaptive workforce that will serve as the foundation for effective e-collaboration.

BACKGROUND

A large majority of collaboration efforts in organizations today are conducted via electronic technology (e.g., video conferencing, Web-based chat tools, e-mail, group decision support systems, etc.). Such technologies are collectively referred to as e-collaboration technologies, and e-collaboration is collaboration among individuals engaged in a common task using electronic technologies (Kock & Nosek, 2005). Many organizations have implemented e-collaboration technologies as part of their standard business practices but have overlooked the impact these technologies can have on the users and on the nature of work itself. For example, many organizations fail to see the changes that occur in collaboration when switching from face-to-face to e-collaborative modalities. They assume similar efforts and results will occur and the collaboration is simply conducted via an alternative medium. However, there

is an abundance of research indicating a substantial affect on collaboration efforts depending on the medium adopted (e.g., Becker-Beck & Borg, 2005; Jarvenpaa & Leidner, 1999; Kock, 2001; Ritter, Lyons, & Swindler, 2006; Straus, 1997).

There are a variety of effects on both perceptions and performance that are associated with the implementation of e-collaboration systems. These effects can be negative, neutral, or positive. For example, the use of e-collaboration can be neutral if the same level of use and similar results occur as with face-to-face collaborations. On the dark side, the use of e-collaboration can negatively affect users' perceptions and ultimately their performance if users are uncomfortable with the medium and avoid its use. Furthermore, researchers (e.g., Ritter et al., 2006) have identified specific performance barriers inherent to e-collaboration technologies, and there must be a concerted effort to address these barriers if e-collaboration is to be effective. However, e-collaborative technologies have the potential to increase productivity in organizations. In order to attain the positive effects associated with the technologies, organizations must anticipate the system-wide influence (e.g., at the organizational, technology, and human levels) the technologies will have.

THE PROLIFERATING IMPACT OF E-COLLABORATION

Adopting a dynamic systems view (Ashby, 1947), we see that nothing in an organization occurs in a vacuum. Innumerable interactions and reciprocal relations characterize all that we do. At the individual level for example, we cannot understand the full impact of technologies if we consider only the direct influence the technologies have on individuals and ignore the indirect influence. Individuals are impacted indirectly through technology-enabled transformations at higher levels of work (e.g., globalization). Essentially, we must consider both the bottom-up and top-down effect of these technologies. Indeed, the impact of communication technologies can reach far beyond the original intent of the designers or of those implementing the technologies (Cameron & Webster, 2005). A systems perspective helps us understand this impact by acknowledging the interrelatedness of levels in an organization. To illustrate, we will discuss three of the paramount, and interrelated, areas of change that have occurred in

connection with e-collaboration technologies, focusing on the impact at the individual level. These three areas of change clearly do not provide an exhaustive list but serve as an overarching descriptive framework.

1. **Globalization:** E-collaboration technologies have enabled an unparalleled degree of connectivity among businesses. This connectivity is a primary contributor to the increased globalization of business (Cheng, Love, Standing, & Gharavi, 2006). As the boundaries of business stretch across continents, the reliance on e-collaboration technologies proliferates to the point of necessity. Individuals within the globalized business world must be flexible and adaptable to changing markets and brutal competition. Again, this creates a reliance on e-collaboration technologies as they are vital to sustain a competitive advantage within the global marketplace (Cheng et al., 2006; Hesketh & Neal, 1999). The individuals employed by these global companies must learn to collaborate with people of different cultures, and do so via e-collaboration technologies in a distributed and highly dynamic environment. Moreover, individuals interacting across the globe are often faced with multilingual challenges and cultural clashes (Sutton, Pierce, Burke, & Salas, 2006).
2. **Interpersonal interaction:** The *type* of connectivity (e.g., computer mediated) afforded by e-collaboration technologies has transformed the rudiments of interpersonal interaction. Researchers have found a plethora of interpersonal processes and outcomes affected (positively and negatively) by the use of various forms of e-collaboration: conflict and affect management, motivation and confidence building (Maruping & Agarwal, 2004); degraded positive collective efficacy, reduction of self-awareness and feelings of anonymity (Cuevas, Fiore, Salas, & Bowers, 2004); equality of influence across status and expertise (Dubrovsky, Kiesler, & Sethna, 1991); delays in formation of interpersonal trust (Jarvenpaa & Leidner, 1999) as well as team cohesion (Straus, 1997); information loss (Becker-Beck & Borg, 2005). See Wainfan and Davis (2004) for an extended review of factors affected by mediated-communication. Many of the aforementioned factors are interrelated and all are based on interpersonal interaction. However, beyond noting the

obvious surface level influences on interpersonal interaction during collaboration, Kock (2004) has identified a possible explanation at the biological level for why many of these factors are affected by mediated communication. Kock's (2004) psychobiological model posits that our biological communication apparatus has evolved in a manner consistent with face-to-face communication and all its richness (e.g., facial cues, body language, etc.). Therefore, we encounter difficulties and obstacles, as described above, in the absence of this rich information. In an effort to adapt to the difficulties associated with this new form of communication, we compensate for the lack of richness via alternative mechanisms or means (e.g., increased cognitive effort resulting in increased quality of contributions; Kock, 2001). However, it is important to note that not all individuals are equally capable of such compensation, which, in turn, creates novel challenges for organizations to ensure they have the right workers for this modern era of e-collaboration.

3. **Knowledge work:** Organizations today are moving toward "knowledge work" and "knowledge workers" (Haeckel, 1999). Knowledge work is best characterized by the intangible products of work (e.g., decision making, information, ideas, know-how, etc.), which has led to a trend in project-based teamwork where members of distributed expertise work together collaboratively to solve a problem (Ployhart & Bliese, 2006). Obviously, such work is inherently linked to and dependent on e-collaboration technologies. E-collaboration technologies not only extend the way knowledge and information is able to be used and disseminated (Hesketh & Neal, 1999), but the technologies often serve as the repositories for the codified knowledge being produced (Gray, 2001). However, as with the previous two areas of change, the shift to knowledge work enabled by collaborative technologies has altered fundamental business processes, which in turn impact individuals. The hierarchical control of information associated with traditional organizations has been flattened, creating a wider band of available knowledge and information and, in turn, empowering the individual employee (Kasper-Fuehrer & Ashkanasy, 2001). Although employees are offered an empowered position with knowledge

work, they may not take advantage of it. That is, participating in knowledge work using collaborative technologies has increased the importance of individual skill and internal motivation, while at the same time depersonalizing ones' knowledge contribution (Gray, 2001). Furthermore, because knowledge work is easily transformed and transmitted, organizations and individuals must contend with rapid changes and consistent unpredictability (Haeckel, 1999). Thus, the newly empowered individuals must learn to act autonomously and respond quickly.

It is obvious from the above examples that e-collaboration technologies can impact (directly or indirectly) every aspect of an organization. There are influences on the breadth of an organization's boundaries, influences on the very nature of our collaborations and interactions, influences on the type of work conducted, and influences on the value of personal attributes associated with such work. Given the overwhelming impact and nested influences of e-collaboration technologies, it is difficult to see all the connections and make all the appropriate and corresponding changes in order to achieve the full potential of e-collaboration technologies. What is needed is the identification of an underlying theme that unites all the areas transformed by e-collaboration technologies. *Adaptability* appears to be that underlying theme. With every change in work associated with e-collaboration, increased flexibility and adaptability (organizational, individual, or technology) continues to emerge as the central issue. With adaptability identified as the central issue, researchers and organizations can proceed with a unified framework and formulate a coherent path to integration with e-collaboration technologies and the new world of work the technologies have helped to create.

ADAPTABILITY

Several sources have created the need for increased adaptability in numerous aspects of business, but technological changes such as e-collaboration are among the most pervasive of all recent changes and have altered the basic nature of work (Pulakos, Dorsey, & White, 2006). The need for increased flexibility and adaptability epitomizes each of the three examples described above. Not only must the organization and

the e-collaboration technologies used be flexible and adaptable, but the people must be adaptable. The unique human ability to respond creatively to new situations is an integral part of an adaptive system (Haeckle, 1999). Although technological innovations to cope with changes in work abound, the implications at the human level have been neglected. However, as humans are at the core of any business, they are an obvious starting point, and changes at the human level will facilitate changes at all other levels. We must ensure that we are not simply retrofitting organizations with technology overlays without a commensurate human-centered effort to improve the performance of the workers utilizing the e-collaboration technologies. As the foundations of work itself are being altered due to the use of e-collaboration technologies, the demands placed on individuals are transforming, and in turn, the value for particular dimensions of performance are shifting (Ilgen & Pulakos, 1999; Pulakos, Arad, Donovan, & Plamondon, 2000). If the new dimensions of performance are identified, organizations will be able to select and train employees to operate more effectively in environments reliant on e-collaboration, which characterize most work settings today.

ADAPTIVE PERFORMANCE

Pulakos et al. (2000) have developed a model of job performance—the adaptive job performance model—that captures performance dimensions more pertinent to the information age. The adaptive job performance (AJP) model provides a theoretical framework for understanding adaptive behavior in jobs. As opposed to approaching adaptability as a vague notion, Pulakos et al.'s validated AJP model eliminates the elusiveness of the concept by clearly identifying adaptive performance behaviors and predictors of such behavior, which can then serve as the basis for selection and training. The behaviorally based dimensions of AJP identified in the Pulakos et al. model were derived from an extensive literature review on adaptability and content analyses on a large number of critical incidences from 21 different jobs. This effort revealed eight relevant dimensions of adaptive performance: handling work stress; solving problems creatively; handling emergencies or crisis situations; dealing with uncertain and unpredictable work situations; learning technologies, work tasks, and procedures; demonstrating interpersonal adaptability;

demonstrating cultural adaptability; demonstrating physically oriented adaptability.

As opposed to assessing absolute performance, the intent of the AJP model is to assess performance in terms of coping ability and responsiveness to changing demands (Hesketh & Neal, 1999). Such aspects of performance are imperative for the trend towards knowledge work and project-based teamwork, both of which are heavily intermingled with e-collaboration technologies. Moreover, the importance of adapting to the technologies themselves has become such an integral aspect of work today that it qualifies as its own dimension of AJP. The dimension of *learning new work tasks and technologies* is defined as demonstrating enthusiasm and effort for learning new technologies and approaches for conducting work, which is an obvious aspect of performance important for successful e-collaboration. Beyond simply *using* the e-collaboration technology, individuals must develop new approaches to collaboration that fit with the technology.

As mentioned previously, Kock's (2001) compensatory adaptation theory is a prime example of how individuals develop new approaches when using e-collaboration technologies. Kock (2001, 2004) has repeatedly found that individuals using e-collaboration technologies (e.g., e-mail) adapt their behavior to compensate for the lack of richness of information (e.g., facial cues) in the technologies. Kock (2001) has suggested that this adaptive behavior is likely attributable to general cognitive patterns. As we move away from the instinctive schemas associated with face-to-face communication, we develop (compensate with) learned schemas that support communication via technologies (Kock, 2004). However, there will be individual differences such that not all individuals will be equally as capable or as successful at developing learned schemas for e-collaboration.

The general cognitive patterns that Kock (2004) alluded to as influencing adaptive behavior in the e-collaboration domain (i.e., the technology dimension of AJP) likely influence adaptive behavior in general. It is general adaptive behavior as captured by the AJP model that serves as the keystone to, not only successful e-collaboration, but successful business today. If we want to select and train individuals to be more successful with e-collaboration technologies, we also must consider the adaptive behavior required to surmount the additional changes in work associated with the use of e-collaboration technologies. For example,

the global business world requires employees that are capable of e-collaborating with individuals of different cultural (ethnic and organizational) backgrounds. The AJP dimension of *demonstrating cultural adaptability* clearly addresses this area of adaptive behavior.

FUTURE TRENDS

We are calling for a broad perspective and a proactive stance in regard to adaptive behavior in organizations, especially organizations heavily reliant on e-collaboration technologies where adaptability is paramount. As opposed to being concerned with adaptive behavior only in relation to interactions with the technologies, organizations should attempt to identify and facilitate the adaptive behavior of individuals. Fortunately, there is a growing body of research (e.g., Griffin & Hesketh, 2003; Kozlowski et al., 2001; Ployhart & Bliese, 2006; Pulakos et al., 2006; Pulakos et al., 2002; Stokes & Faas, 2006) seeking to identify the characteristics (personal and situational) associated with adaptive behavior. With the AJP model serving as a validated criterion measure, several predictors of adaptive behavior have been identified (e.g., cognitive ability, self-efficacy, cognitive flexibility, need for structure, and openness). These predictors could, in turn, be used in a selection-test battery to identify adaptive workers. Following selection, employees could participate in a training program focused on the development of *learned* schemas useful for interacting via e-collaboration technologies. Moreover, a structured training program would serve to develop shared schemas among group members, and shared schemas have been found to facilitate e-collaboration efforts by reducing cognitive load (Cuevas et al., 2004; Kock, 2004).

CONCLUSION

We believe that embracing and developing an adaptive workforce will serve as the foundation for a resolution to the many concerns and issues associated with e-collaboration technologies and the corresponding changes in work that have resulted from their use. As opposed to attacking the issues in a piecemeal fashion, adopting a systems perspective and acknowledging adaptive behavior as an underlying theme allows us to see the connections between the seemingly disparate

issues surrounding e-collaboration. We are not suggesting that adaptive behavior is a panacea, but we are suggesting that with a solid foundation in place (i.e., an adaptive workforce), the issues that remain will be less daunting.

REFERENCES

- Ashby, W. R. (1947). Principles of the self-organizing dynamic system. *Journal of General Psychology*, 37, 125-128.
- Becker-Beck, U., Wintermantel, M., & Borg, A. (2005). Principles of regulating interaction in teams practicing face-to-face communication versus teams practicing computer-mediated communication. *Small Group Research*, 36, 499-536.
- Cameron, A. F., & Webster, J. (2005). Unintended consequences of emerging communication technologies: Instant messaging in the workplace. *Computers in Human Behavior*, 21, 85-103.
- Cheng, E. W. L., Love, P. E. D., Standing, C., & Gharavi, H. (2006). Intention to e-collaborate: propagation of research propositions. *Industrial Management & Data Systems*, 106(1), 139-152.
- Cuevas, H. M., Fiore, S. M., Salas, E., & Bowers, C. A. (2004). Virtual teams as sociotechnical systems. In S. H. Godar & S. P. Ferris (Eds.), *Virtual and collaborative teams: Process, technologies, and practice* (pp. 1-18). London: Idea Group.
- Dubrovsky, V. J., Kiesler, S., & Sethna, B. N. (1991). The equalization phenomenon: Status effects in computer-mediated and face-to-face decision-making groups. *Human-Computer Interaction*, 6, 119-146.
- Gray, P. H. (2001). The impact of knowledge repositories on power and control in the workplace. *Information Technology and People*, 14(4), 368-384.
- Griffin, B., & Hesketh, B. (2003). Adaptable behaviours for successful work and career adjustment. *Australian Journal of Psychology*, 55(2), 65-73.
- Haeckel, S. H. (1999). *Adaptive enterprise: Creating and leading sense and respond organizations*. Cambridge, MA: Harvard Business School.

- Hesketh, B., & Neal, A. (1999). Technology and performance. In D. R. Ilgen, & E. D. Pulakos (Eds.), *The changing nature of performance: Implications for staffing, motivation, and development* (pp. 21-51). San Francisco: Jossey-Boss.
- Ilgen, D. R., & Pulakos, E. D. (Eds.). (1999). *The changing nature of performance: Implications for staffing, motivation, and development*. San Francisco: Jossey-Bass.
- Jarvenpaa, S., & Leidner, D. (1999). Communication and trust in global virtual teams. *Organizational Science*, 10, 791-815.
- Kasper-Fuehrer, E. C., & Ashkanasy, N. M. (2001). Communicating trustworthiness and building trust in interorganizational virtual organizations. *Journal of Management*, 27, 235-254.
- Kock, N. (2001). Compensatory adaptation to lean medium: An action research investigation of electronic communication in process improvement groups. *IEEE Transactions on Professional Communication*, 44(4), 267-285.
- Kock, N. (2004). The psychobiological model: Toward a new theory of computer-mediated communication based on Darwinian evolution. *Organizational Science*, 15(3), 327-348.
- Kock, N., & Nosek, J. (2005). Expanding the boundaries of e-collaboration. *IEEE Transactions on Professional Communication*, 48(1), 1-9.
- Kozlowski, S. W. J., Gully, S. M., Brown, K. G., Salas, E., Smith, E. M., & Nason, E. R. (2001). Effects of training goals and goal orientation traits on multidimensional training outcomes and performance adaptability. *Organizational Behavior and Human Decision Processes*, 85(1), 1-31.
- Maruping, L. M., & Agarwal, R. (2004). Managing team interpersonal processes through technology: A task-technology fit perspective. *Journal of Applied Psychology*, 89(6), 975-990.
- Ployhart, R. E., & Bliese, P. D. (2006). Individual adaptability (I-Adapt) theory: Conceptualizing the antecedents, consequences, and measurement of individual differences in adaptability. In C. S. Burke, L. G. Pierce, & E. Salas (Eds.), *Understanding adaptability: A prerequisite for effective performance within complex environments. advances in human performance and cognitive engineering research* (Vol. 6, pp. 3-40). Oxford, UK: Elsevier.
- Pulakos, E. D., Arad, S., Donovan, M. A., & Plamondon, K. E. (2000). Adaptability in the workplace: Development of a taxonomy of adaptive performance. *Journal of Applied Psychology*, 85(4), 612-624.
- Pulakos, E. D., Dorsey, D. W., & White, S. S. (2006). Adaptability in the workplace: Selecting an adaptive workforce. In C. S. Burke, L. G. Pierce, & E. Salas (Eds.), *Understanding adaptability: A prerequisite for effective performance within complex environments: Vol. 6. Advances in human performance and cognitive engineering research* (pp. 41-72). Oxford, UK: Elsevier.
- Pulakos, E. D., Schmitt, N., Dorsey, D. W., Arad, S., Hedge, J. W., & Borman, W. C. (2002). Predicting adaptive performance: Further tests of a model of adaptability. *Human Performance*, 15(4), 299-323.
- Ritter, J., Lyons, J. B., Swindler, & S. D. (2007). *Large-scale coordination: Developing a framework to evaluate socio-technical and collaborative issues*. Manuscript submitted for publication.
- Stokes, C. K., & Faas, P. (2006). *Adaptive performance: Implications for military logistics*. In B. McQuay & W. Smari (Eds.), *Proceedings of the International Symposium on Collaborative Technologies and Systems* (pp. 248-255). Los Alamitos, CA: IEEE Computer Society Press.
- Straus, S. (1997). Technology, group process, and group outcomes: Testing the connections in computer-mediated and face-to-face groups. *Human Computer Interaction*, 12, 227-266.
- Sutton, J. L., Pierce, L. G., Burke, S., & Salas, E. (2006). Cultural adaptability. In C. S. Burke, L. G. Pierce, & E. Salas (Eds.), *Understanding adaptability: A prerequisite for effective performance within complex environments: Vol. 6. Advances in human performance and cognitive engineering research* (pp. 143-173). Oxford, UK: Elsevier.
- Wainfan, W., & Davis, P. K. (2004). *Challenges in virtual collaboration: Videoconferencing, audioconferencing, and computer-mediated communications*. Santa Monica, CA: RAND Corporation.

KEY TERMS

Adaptive Performance: Altering behavior to meet new demands created by the novel and often ill-defined problems resulting from changing and uncertain work situations.

Compensatory Adaptation Theory: A theory developed by Kock (2001) that accounts for the adaptive behavior displayed by individuals engaged in computer-mediated communication, whereby individuals, applying increased cognitive effort, adapt their communication behavior (consciously and unconsciously) in order to compensate for the obstacles posed by computer mediation.

Dynamic Systems View: A dynamic systems view is based on systems theory, which emphasizes the importance of interdependence of relations.

E-Collaboration: Collaboration among individuals engaged in a common task using electronic technologies.

Knowledge Worker: One who works primarily with information or one who develops and uses knowledge in the workplace.

Psychobiological Model: A model developed by Kock (2001) that posits several propositions stating that there is a positive link between the naturalness of a communication medium and the cognitive effort required to communicate via the medium. This link is counterbalanced by the degree of schema similarity among members and the level of learned schemas (cognitive adaptation) for interacting via the medium.

Schema: A mental structure that represents some aspect of the world and assists in interacting with the world.