

## **CHAPTER 72: VIRTUAL TEAMS ADAPT TO SIMPLE E-COLLABORATION TECHNOLOGIES**

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### **INTRODUCTION**

Increased globalization of enterprises combined with widespread adoption of simple, low cost, asynchronous e-collaboration technologies (e.g., bulletin board, e-mail) provides incentive to attempt increasingly complex problem solving with virtual teams. If complex business process improvement activities could be conducted using asynchronous e-collaboration, the potential to reduce competition for resources by reducing travel time and increasing the communication window to 24/7 improves the ability to simultaneously address the multiple priorities of daily business and business process improvement.

The knowledge that virtual process improvement teams have been successful (DeLuca, Gasson, & Kock, 2006; Kock & DeLuca, 2006; DeLuca & Valacich, 2006; Kock, 2006) and lessons learned from those teams may be what is needed to provide confidence to organizations that virtual process improvement efforts would come to fruition. To manage such initiatives effectively, it is important to understand *how* these virtual teams overcame the difficulties of e-collaboration. Existing theories of information processing in organizations do not scale well to the complex forms of knowledge integration required at the boundary between the diverse teams found in virtual organizations. Thus, we based our investigation on a new theory of communication behavior, compensatory adaptation theory (CAT) (Kock, 2005b) and the relationships suggested by it, explained in the next section. We also operationalize a key construct, compensatory adaptations and present the adaptations made by participants in the study (DeLuca et al., 2006).

### **BACKGROUND**

Empirical research results are inconclusive about the effect of e-collaboration and technologies upon communication (Kock, 2005a, Majchrzak, Rice, Malhotra, King, & Ba, 2000; Miranda & Saunders, 2003; Rice, Kraut, Cool, & Fish, 1994; Riva & Galimberti, 1998). This may be because social norms and availability of media may influence media choice significantly more than media or task characteristics, as previously thought.

Asynchronous, electronic, written communication media are generally familiar, sponsored, and conveniently available, yet not commonly used for complex tasks such as business process improvement because of perceived limitations that must be overcome or compensated for in some way in order to effectively communicate (Daft & Lengel, 1986; Kock, 2005b; Majchrzak et al., 2000; Markus, Majchrzak, & Gasser, 2002).

Earlier theories are based on "richness" of a media (Daft & Lengel, 1986) or "social presence" (Short, Williams, & Christie, 1976) and do not provide for making adaptations to use a media. Research on virtual process improvement shows that team members adapt their communication behaviors to compensate for the deficiencies in the "richness" of the communication channel with which they have chosen to work (Kock & DeLuca, 2006; DeLuca et al., 2006; Kock, 2005b). Compensatory adaptation theory (CAT) (Kock, 2005b), posits the processes shown in *Figure 1*.

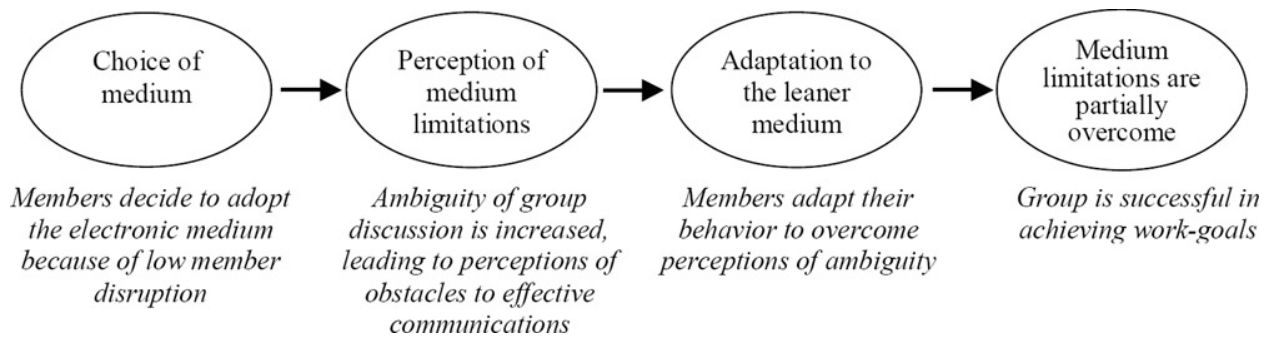


Figure 1: Compensatory adaptation process (Adapted from Kock, 2005b)

CAT is derived from two principles—the media naturalness principle and the compensatory adaptation principle. The naturalness of a media is proportional to its similarity to face-to-face communications (media naturalness principle). When users of the media perceive a lack of media naturalness, they make adaptations to compensate for the perceived obstacles to communication (compensatory adaptation principle). Media that lack many of the features of face-to-face communications (e.g., immediate feedback, presence of visual, auditory, and social cues) are said to be "lean," like e-mail and bulletin boards. E-collaboration using lean media is referred to as "lean e-collaboration." Based on CAT, the central research question (CQ) is:

CQ: Can process improvement teams using lean e-collaboration be successful and, if so, how do the team members adapt their communication behavior to compensate for perceived shortcomings of the media?

In a study by Graetz, Boyle, Kimble, Thompson, and Garloch (1998), mental demand, temporal demand, effort, and frustration were all more than 50% higher for those using e-collaboration than those using face-to-face (FTF) communications. This supports the assessment of "low" naturalness for e-collaboration and consistent with earlier studies (Daft, Lengel, & Travino, 1987; Rice, 1992; Rice & Shook, 1990). Kock (2004) offers that the human species has been biologically designed for FTF communication. E-collaboration is less "natural" because co-location, synchronicity, body language, facial expressions, and hearing and speech are lacking (Kock, 2005b).

The perceived obstacles posed by e-collaboration must be overcome or compensated for in some way in order to communicate effectively. Studies show (Kock & DeLuca, 2006; DeLuca & Valacich (2006); DeLuca et al., (2006); Kock (2005b); Ocker, Fjermestad, Hiltz, & Johnson, 1998) that virtual team members take additional care in composing messages transmitted via e-collaboration and this compensation may lead to better quality individual input and successful

team completion of the process improvement effort by implementing the improvements. Teams that included use of lean electronic media produced outcomes of the same or higher quality than FTF teams. The concept that the adaptations made affect quality and success is unique to CAT (Kock, 2005b) and provides an explanation for virtual team successes with complex tasks that is not offered by earlier theories.

## RESEARCH SITE AND METHOD

This article is derived from a study (DeLuca et al., 2006) that was focused on the communication behavior of four virtual teams from an educational services organization. Virtual teams were studied in their natural environment during one cycle of a larger on-going, traditional (canonical) action research study (see Davison, Martinsons, & Kock, 2004 for principles of canonical action research). All teams chose processes that involved improving the quality of communications among schools, parents, special needs children, and service providers. The teams were cross-functional with from 9 to 11 members. The researcher provided: access to an Internet-based bulletin board and group e-mail to alert virtual team members to check the bulletin board and contribute to it; training on the technology and a typical structured problem-solving process (Kock, 2006); and information on success factors from previous virtual teams and their leadership. The team "outcome" was a re-designed business process.

An analysis of the literature revealed that most discussions related to media naturalness build on some variation of the following three dimensions of media: interactivity, channel capacity, and adaptiveness (Kahai & Cooper, 2003; Kock, 2004; Short et al., 1976). The three dimensions provide a typology for operationalization of "compensatory adaptations:"

- **Interactivity** is the potential to obtain immediate feedback from other communicants. Lean e-collaboration media are therefore predicted to be perceived as providing *low* levels of interactivity.
- **Channel capacity** is the ability to transmit a high variety of language and social cues (both verbal and non-verbal). A lack of body language, facial expressions, volume, and tone leads to ineffective communication. Lean media are therefore predicted to be perceived as supporting a *low variety* of language and social cues.
- **Adaptiveness** is the potential to acknowledge, adapt and personalize messages of a particular communicant. The predictions of adaptiveness and personalizability would be low, however the written aspect of some lean media may enhance acknowledgement of an individual's contribution by providing a historical record of contributions.

At the end of the business process improvement process, each virtual team member was interviewed to explore perceptions about the relationships among obstacles to communication posed by the media, adaptations to communication behavior, and success of outcomes (DeLuca et al., 2006). Data were collected via open-ended and neutral questions (Yin, 1994) and a compensatory adaptations scale of Likert statements (DeLuca et al., 2006; Moore & Benbasat, 1991; Nambisan, Agarwal, & Tanniru, 1999). Data were coded by two "raters" into consistent, semantically equivalent phrases and also analyzed adaptations using a chi square summary statistic (Rosenthal & Rosnow, 1991). The responses were integrated using triangulation, "the combination of methodologies in the study of the same phenomenon" (Denzin, 1978, p. 291). The intent of using mixed methods and triangulation is to ensure the variance "measured" is not due to the method (Campbell & Fisk, 1959).

## RESULTS

Ninety-five percent of participants reported adaptations made (chi square  $p < .001$  with a large effect size). A positive result is also indicated by the Likert response scale average score of 4.6 of 7, which indicates agreement that adaptations were made to compensate for not being FTF.

In response to the open-ended interview question, participants revealed their perceptions about the relationships among obstacles, the adaptive behaviors engaged in to compensate for the perceived obstacles, and the effect the behaviors had on their communications and thus on the success of the business process redesign.

The perceived obstacles to effective communication using e-collaboration are summarized in *Table 1* using the operationalization of adaptations (compensations) into three categories of adaptations. The adaptation(s) made to communication messages to compensate for the perceived obstacle(s) are shown in the right hand column.

Perceived Obstacle to Communication Effectiveness	Adaptation to Communication Behavior (written e-collaboration) to Compensate for Perceived Obstacle to Communication
Interactivity — Lack of immediate feedback (and written accountability)	More clear
Interactivity — Lack of immediate feedback	More complete
Channel Capacity — Lack of non-verbal cues (and less personal/social)	More focused
Channel Capacity — Lack of non-verbal cues	More neutral
Channel Capacity — Lack of non-verbal cues	More considerate
Channel Capacity — Lack of language variety	More concrete language
Adaptiveness — Written accountability	More precise
Adaptiveness — Written accountability (size of input box)	More concise
Adaptiveness — Written accountability	More persuasive

E-collaboration provides less immediate feedback (*lack of interactivity*). Virtual team members perceived that asynchronous, electronic, written communication media reduce interactivity when compared to FTF communication. Virtual team members were unable to argue their point as easily as in person, and are unable to quickly identify the need for a clarification. Although the FTF expectation for "immediate feedback" was modified for e-collaboration "feedback within a few days," the frustration was still evident.

The second category of obstacles to communication is the *limited capacity of a channel* to carry cues, indicated by lack of non-verbal cues. To some extent, virtual team members were unable to find symbols to represent language and social cues, such as eye contact, bodily and social cues ranging from intimidation and annoyance to joking and head shake.

Some of the effects of using a written e-collaboration medium were considered beneficial, such as: being able to access and print any virtual team member's message at any time. This allows a member to acknowledge each individual contribution and spend more time on a message, with more considerate language. The size of the input box was perceived by some as a limit on the length of a contribution. The final category of obstacles to communication effectiveness is *lack of adaptive-ness*, whereby messages or media are personalized or individuals are acknowledged. Social discussion was seen by many as a waste of time, not focused on the task. E-collaboration provided a (positive) obstacle to socializing and incentive to be more neutral.

## CONCLUSION

Four teams in an organization needed to address business process difficulties for their team, but were in a "crunch" time, making a series of face-to-face meetings nearly impossible. Instead of face-to-face communication, the teams used simple asynchronous electronic communication media. All four virtual teams successfully redesigned a business process and successfully implemented all or part of their re-design within six months.

The results cannot be explained by traditional media richness or social presence theories and generally support compensatory adaptation theory. Members of the virtual teams using an asynchronous ECM perceived many obstacles to natural communication when compared to the face-to-face medium. They perceived less interactivity (immediacy of feedback), lower channel capacity (inability to convey non-verbal cues), and less adaptiveness (personalized messages or individual acknowledgements). Some of these were compensated for by the fact that their written messages were posted and printable.

Members of the virtual teams reported making numerous adaptations to their communication behavior in order to effectively collaborate using lean media. *They reported making an effort to change their communications before sending them in order to make them **more focused, clear, precise, neutral, concrete, concise, persuasive, considerate, and complete**, which is the answer to our research question.* They captured language and social cues in writing, requested feedback, reflected more on their own and others' messages, and printed messages for perusal. Somewhat ironically, most of these "adaptations" were also considered "improvements" over the face-to-face environment (Kock & DeLuca, 2006; DeLuca & Valacich, 2006; DeLuca et al., 2006; Robert & Dennis, 2005). These behaviors made the lean media appear to function more richly, and led to better perceived quality.

However, one cannot dismiss the many times participants indicated that they had put forth extra effort to compose messages on a less "natural" medium. It is not clear at what point the extra effort reported to use e-collaboration would be too much of a burden or how long participants could continue the effort on an extended project. It is conceivable that participants would at some point avoid a project knowing the effort required. Studies indicate that largely virtual teams might also choose synchronous media for part of a project. Potential benefits of synchronicity may apply well to: final convergence on a re-design (Dennis & Valacich, 1999; DeLuca & Valacich, 2006); voice mail to support social cohesion; or desire for the lack of a written record for discussion involving political aspects of a project (Gasson & Elrod, 2005).

Improvements achieved when using lean e-collaboration over the FTF environment may be further explained by the media-cognitive-social (MCS) model of creativity as applied in asynchronous creativity theory (ACT) (DeLuca, 2006) and merits further study.

Practitioners are already motivated to attempt virtual teams to save the difficulties and costs of convening face-to-face teams in a global 24/7 enterprise and take advantage of the availability of low-cost Internet-based asynchronous electronic communication media. Yet many organizations have been reluctant to conduct virtual teams for complex tasks, fearing failure. This study shows that adaptations made to use a lean medium may yield effectiveness, efficiency, quality, and success. Practitioners are also cautioned that the price paid in time and effort to make the adaptations listed above may take its toll over time. Yet, for now, the outlook for extending the variety of complex tasks tackled by virtual teams is optimistic.

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