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Human Evolution, Genes and E-Communication in Organizations

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ABSTRACT

Could our genes influence our behavior toward e-communication tools? This paper argues that they can and illustrates the mechanism underlying their influence. An alternative to the media richness hypothesis, proposed by media richness theory, is developed. This new hypothesis, called media naturalness hypothesis, states that there is a negative causal link between the degree of naturalness of an e-communication medium (or its similarity to the face-to-face medium) and the degree of cognitive effort required from an individual to use the medium in an e-communication interaction. The new hypothesis is based on an analysis of the evolution of the human biological communication apparatus through natural selection, according to the laws proposed by Darwin's theory of evolution by natural selection. Key implications for managers are discussed, particularly for the development of business-to-consumer e-communication tools.

INTRODUCTION

The emergence of the Internet led to an explosion in the number of electronic business-to-consumer interactions. Empirical research on electronic communication (e-communication) behavior also increased considerably (Kock, 1999). Several theories informed this research, including media richness theory (Daft and Lengel, 1986), which has attracted the interest of many researchers (Carlson and Zmud, 1999; Daft et al., 1987 Fulk et al., 1990; Kinney and Dennis, 1994; Lengel and Daft, 1988; Markus, 1994; Rice, 1992; Trevino et al., 2000) even though it was first published in the mid 1980s when the Internet as we know it today was largely unknown.

Media richness theory was built around a central hypothesis, the media richness hypothesis, which states that different communication media possess different degrees of a trait called "richness" (Daft and Lengel, 1986; Lee, 1994; Carlson and Davis, 1998), that make them more or less effective conduits of information and knowledge. The richer the medium the more face-to-face-like it is, being the face-to-face medium the richest of all (Daft and Lengel, 1986). According to the media richness hypothesis, effective workers choose appropriately rich media for tasks that involve communication, and the choice of communication media of low richness (whether accidental or due to accessibility constraints) leads to decreased task outcome quality.

Several studies found general support for the media richness hypothesis (Daft et al., 1987; Rice 1992; Rice and Shook, 1990; Sproull and Kiesler, 1986; Walther, 1996), other studies found weak support (Fulk et al., 1990; Markus, 1990), and yet other studies found little or no support at all for the media richness hypothesis (Kinney and Dennis, 1994; Kinney and Watson, 1992). Empirical findings that were not well aligned with predictions based on the media richness hypothesis were often explained based on the influence of social factors (El-Shinnawy and Markus, 1998; Markus, 1994), such as peer behavior and manager pressure in connection with the use of certain communication media, which social theorists argued had been left out of the media richness hypothesis and could influence media choice and task outcome quality more strongly than richness itself. However, it has been difficult to reconcile the media richness hypothesis with the notion of social influences (Markus and Robey, 1988; Trevino et al., 2000), and thus fully explain empirical findings that supported as well as contradicted the hypothesis. This has led to further problems. Media richness theory can be seen today as a technology-focused theory, since computer technologies can create media with different degrees of richness. However, other theories have been developed that have a strong technological orientation and yet build on theoretical principles that are significantly different from those proposed by media richness theory. These theories have, to a certain extent, also become the target of social theorists by association, since they have often been placed in the same category as media richness theory (Carlson and Davis, 1998). Examples of such technological theories are Nunamaker et al.'s (1991) gains and losses model, and Zigurs and Buckland's (1998) task-technology fit theory.

It is argued in this paper that the theoretical polarization above is due to two problems associated with the media richness hypothesis. The first of these problems is that there is a wealth of empirical evidence that provides direct support to the notion that people in general prefer face-to-face or face-to-face-like media for a variety of business tasks that involve communication (Basdogan et al., 2000; Carlson and Zmud, 1999; Daft et al., 1987; Kock, 1998; Lengel and Daft, 1988; Sallnas et al., 2000) which seems to provide support for the media richness hypothesis. The second problem is that the media richness hypothesis is built on a "vacuum", as no underlying explanation was ever presented for our predisposition toward rich, or face-to-face-like, media. The hypothesis is based on the intuitive, and somewhat circular, assumption that we somehow prefer face-to-face or face-to-face-like media for communication.

The main goal of this paper is to offer a solution to the above problems by providing an alternative to the media richness hypothesis, referred to here as media naturalness hypothesis, developed based on Darwin's theory of evolution by natural selection. Like the media richness hypothesis, the media naturalness hypothesis has important implications for the selection, use and deployment of e-communication tools in organizations. However, unlike the media richness hypothesis, the media naturalness hypothesis is compatible with social theories of behavior toward e-communication tools. The "e" in "e-communication" stands for "electronic", so the term "e-communication" refers to, essentially, any form of computer-mediated communication plus more traditional forms of electronic communication, such as telephone communication (since the telephone is also an electronic device). The term e-communication includes computer-mediated communication over the Internet as well as over other computer network infrastructures, thus also including computer-mediated communication that takes place through group decision support systems and local area network-based communication tools.

THE EVOLUTION OF HUMAN COMMUNICATION

According to the modern version of Darwin's (1859) theory of evolution, the human species evolved through natural selection, a process in which random mutations are introduced in the genetic makeup of offspring, leading to traits that are selected based on their usefulness for survival and mating (Darwin, 1859; Dawkins, 1989; Mayr and Provine, 1998). The evolutionary pace set by natural selection is usually very slow (Boaz and Almquist, 1997; Dobzhansky, 1971; Lorenz,

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1983). Genetic mutations that enhance the changes of survival and mating, in many cases only slightly (Dobzhansky, 1971), slowly accumulate and spread through the members of a species, leading to the development of species-wide physical, behavioral and cognitive traits over long periods of time. These may span thousands or millions of years, and are contingent on breeding speed and mortality rates. In the case of the human species, the evolutionary process is not believed to have led to significant physical and cognitive changes in at least the last 100,000 years (Campbell, 1992; Dozier, 1992; Wilson, 2000). During the vast majority of this process (over 99 percent), human beings and their ancestors communicated primarily in a co-located and synchronous manner through facial expressions, body language, and, initially, discrete sounds, which later evolved into speech (Boaz and Almquist, 1997; Cartwright, 2000).

The human species developed a complex web of facial muscles (22 on each side of the face; more than any other animal) that allow them to generate over 6,000 communicative expressions; very few of these muscles are used for other purposes, such as chewing (Bates and Cleese, 2001; McNeill, 1998). There is a noticeable evolutionary direction towards the development of a biological communication apparatus that supported ever more sophisticated forms of speech, or increased communication complexity, culminating in the development of complex speech by Homo sapiens. The advent of complex speech was enabled by the development of a larynx located relatively low in the neck and an enlarged vocal tract – key morphological traits that differentiate modern humans from their early ancestors and that allow modern humans to generate the large variety of sounds required to speak most modern languages (Laitman, 1984; 1993; Lieberman, 1998). The morphology of the human ear also suggests a specialized design to decode speech (Lieberman, 1998; Pinker, 1994).

With respect to the development of our biological communication apparatus, one could reach an unequivocal conclusion based on the evolutionary principle of "repeated use" (Mayr, 1976; Mayr and Provine, 1998; Wilson, 2000), which argues that there is a correlation between degree of evolutionary optimization of a particular set of organs used to perform a certain task by species and the number of generations (or, generally speaking, the amount of time) in which those organs are repeatedly used to accomplish the task. The conclusion is that, since our biological communication apparatus has been used for co-located and synchronous communication using facial expressions, body language, and sounds over such a long period of time, then it should have been designed for communication interaction modes that present those characteristics. A plausible corollary would be that other communication interaction modes, including e-communication in general, would be matched to different degrees to our biological communication apparatus, some poorly, some not so poorly, depending on the degree to which they approximate face-to-face communication. But, what does this mean? Or, more specifically, what would happen if we used communication interaction modes that are not closely matched to our biological communication apparatus? To answer this question, we need to invoke one key theoretical principle from evolution theory, the brain-body co-evolution principle (Lieberman, 1998; Wills, 1989; 1993).

The brain-body co-evolution principle states that body and brain structures co-evolve in a closely matched way (Lieberman, 1998; Wills, 1989; 1993). Therefore, the gradual evolution of certain characteristics of our body, such as a complex web of facial muscles and vocal communication organs (Laitman, 1984; 1993; Lieberman, 1998; Pinker, 1994), was accompanied by the evolution of specialized brain functions that control those organs' operation. For example, it is known that the development of a larynx located relatively low in the neck (Laitman, 1993; Lieberman, 1998) considerably increased the variety of sounds that we could generate (and, at the same time, significantly increased our chances of choking on ingested food and liquids, which illustrates the key importance of oral communication in our evolutionary history). According to the brain-body co-evolution principle, the development of this "customized" larynx was necessarily accompanied by the development of specialized brain functions designed to control our larynx with great precision in order to generate the large variety of sound combinations used in complex speech. Our inner ear, in turn, has also been optimized for decoding complex speech, and specialized brain functions also evolved to control it. These brain functions are part of what is collectively referred to by Lieberman (1998) as the "neural functional language system". The existence of a large body of empirical evidence supporting the existence of the neural functional language system, discussed by Lieberman (1991; 2000), illustrates the close match between brain functions and body functions associated with communication.

The discussion above suggests that our brain has been to a large extent "hardwired" for co-located and synchronous communication employing facial expressions, body language, and speech. That is, our brain is genetically programmed to excel in communication interactions that incorporate those elements. This provides the basis on which the concept of *media naturalness* can be defined, which is the ability of communication media to support co-located and synchronous communication employing facial expressions, body language, and speech. It follows from the study of our evolutionary past, in light of the brain-body co-evolution principle, that using modes of communication that veer away from "natural" communication is likely to put "extra burden" on the brain (i.e., increase cognitive effort) as our brain too, in addition to our body, has been optimized for that type of communication. Essentially, natural communication is equated with face-to-face communication.

THE MEDIA NATURALNESS HYPOTHESIS

As it can be inferred from the discussion above, the notion of media naturalness is closely tied to the wiring of the human brain. Given the conclusion that such wiring is optimized for face-to-face communication, it is plausible to hypothesize that e-communication media that do not allow for face-to-face-like communication modes will require higher levels of mental activity, or cognitive effort, to be used for communication than e-communication media that do. This leads to the media naturalness hypothesis, whose central tenet can be stated as follows: There is a negative causal link between the degree of naturalness of an e-communication medium and the degree of cognitive effort required from an individual to use the medium in a communication interaction.

Cognitive effort is defined as the amount of "mental activity", or, from a biological perspective, the "amount of brain activity" involved in a communication interaction. Cognitive effort can be assessed directly, with the use of techniques such as magnetic resonance imaging. It can also be measured indirectly, based on perceptions (Schacter, 2001; Todd and Benbasat, 1999), as well as through indirect measures such as "fluency" (Kock, 1998). Fluency is defined as the amount of time taken to convey a certain number of words through different communication media, which correlates (and thus is a surrogate measure of) the amount of time taken to convey a certain number of ideas through different media (Kock, 1998).

The media naturalness hypothesis can be used as a basis for management decisions regarding which new features to add to an e-communication tool depending on resource constraints. For example, let us assume a Web-based application that allows two individuals to communicate through text-based chat in a business-to-consumer type of interaction, such as that involving a customer service representative of an online broker and one of its customers who needs to learn how to purchase a particular investment instrument. According to the media naturalness hypothesis, if a nearly identical application is developed, where the only difference is the ability to convey facial expressions though streamed video (in addition to the text-based chat feature), this latter application will create a communication medium with a higher degree of naturalness than that of the former, text-based chat only, application. A likely consequence will be higher perceive quality by customers in connection with the online interaction, due to the lower cognitive effort required from them in the interaction.

The media naturalness hypothesis also provides the basis for management decisions regarding "partial" incorporation of a naturalness element to an e-communication medium depending on resource constraints. Each of the five naturalness elements – i.e., co-location, synchronicity, and the ability to convey facial expressions, body language, and speech – can be incorporated to an e-communication medium to varying degrees, or partially; *full* incorporation means that the element is identical to what would be available in the face-to-face medium. For example, between two video conferencing applications, the one whose video and sound quality approach most closely what is seen and heard in actual face-to-face communication is the one with the highest degree of naturalness of the two.

IMPLICATIONS FOR MANAGERS

The media naturalness hypothesis argues that cognitive effort increases with decreases in e-communication media naturalness. However, unlike the media richness hypothesis, the media naturalness hypothesis does not state that people always choose natural media for tasks that involve communication, or that the choice of communication media of low naturalness (whether accidental or due to accessibility constraints) leads to decreased task outcome quality. That is, the main dependent variable of the media naturalness hypothesis is cognitive effort, not media choice or task outcome quality.

The change in focus and dependent variable provided by the media naturalness hypothesis has important implications for online businesses. In business-to-consumer interactions conducted online, increased cognitive effort may lead to lower perceived quality and dissatisfaction from the part of customers. Since the Internet makes it much easier for customers to change suppliers, who are literally "a few clicks away", the use of e-communication media of lower naturalness than those provided by the competition can have negative consequences for companies that rely heavily on online interactions with their customers to increase or maintain their revenues. This conclusion is aligned with, and partially explains, the constant calls in the popular business literature for the use of more natural forms of online communications between business and suppliers (Metz, 2000; Mottl, 2000; Wasserman, 2001).

The media naturalness hypothesis provides the basis on which managers with limited resources can decide how to maximize the naturalness of their companies' online communications with their customers. One area in which these decisions have to be made in many businesses, regardless of type and size, is that of online customer support, where customer support representatives interact with customers electronically. The widespread availability of generic video players and instant-messaging technologies allow for the selective incorporation of synchronicity and the ability to convey speech and facial expressions to these Internet-based interactions, which according to the media naturalness hypothesis is likely to lead to a decrease in the amount of cognitive effort required from customers seeking support and a consequent increase in perceive customer service quality. A likely consequence of increased perceived customer service quality is maintenance of or increase in market share, suggested by studies of the impact customer service quality on the bottom-line of companies in financial services sector (Macdonald, 1995; Walkins, 1992), a sector that today relies heavily on e-communication tools to provide customer support of the Internet.

The media naturalness hypothesis also provides the basis on which managers, as well as venture capitalists, can predict the likely evolution of e-communication technologies and thus better target their investments in those types of technologies. It can be concluded, based on this paper, that this evolution will be towards e-communication tools that achieve the maximum naturalness at the lowest cost possible. This explains the relative commercial success of sophisticated text-based chat tools that add synchronicity to online business-to-consumer interactions, making it easier for customers to obtain information about products and services, and, at the same time, reduce costs by allowing one customer support representative or salesperson to interact with multiple customers at a time (Eichler and Halperin, 2000; Gilbert, 1999). It also explains the relative commercial success of virtual news anchors such as "Ananova" (Cracknell, 2000; Orubeondo, 2000), whose cost is a fraction of their human counterparts', since many Internet users prefer to listen to news online rather than the more cognitively demanding option of reading them on a Web page.

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