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An Investigation of the Association between Information Technology's Reach and Range and Organizational Communication Patterns

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Today's organizations are facing environments which are more turbulent than ever before. In light of this, to be more effective, organizations facing these rapidly changing environments should be more *organic*, providing more lateral or horizontal communications (Burns and Stalker, 1961). At the same time, they need to be more IT intensive in order to enhance their information processing capability and to reduce the amount of task-related uncertainties (Galbraith, 1973; Tushman & Nadler, 1978). Thus it is likely that the use of IT will lead to new organizational communication patterns and to changes in the content or quantity of existing kinds of communication. Realizing that little is known about this subject, this study examines the nature of the association between IT intensity and organizational communication patterns.

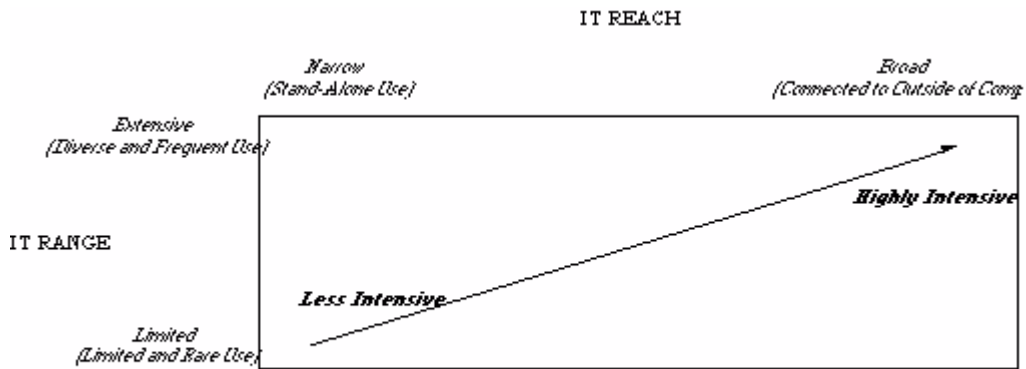
A typical line of research relating to this subject has been to compare traditional modes of communications (e.g., face-to-face, telephone, written memo) with computer-mediated communication (e.g., electronic mail, video-conferencing) in terms of the effectiveness of individual decision-makers' performance under the various conditions. Another line of research has been based on media richness theory and has focused on choosing a communication mode with the appropriate information processing characteristics (Daft et al., 1987). However, both of these lines of research have focused on individual IT applications, and have not addressed the entire spectrum of IT capabilities provided to users. Also, most of these studies have focused only on the mode of the IT applications; however the broadness of these applications may be another aspect affecting organizational communication patterns. More importantly, only a few studies have been done to address the relationship between IT intensity and organizational communication patterns. Among those addressing such a direct relationship, Crawford (1982) found that increased use of electronic mail resulted in decreased face-to-face communication. On the other hand, Forster and Flynn (1984) found that the use of IT lead to more frequent personal contacts.

Another aspect to be considered for this study is that IT or IT intensity has also been conceptualized in different ways in the IT literature. Most of the articles in the literature have defined IT *intensity* as the amount of IT *investment*. Mason (1984), using Thompson's typology of technology, characterized IT by its role: *sequential* (single input, single output); *intensive* (multiple input, single output); *extensive* (single input,

multiple output); and *mediating* (multiple input, multiple output). In a series of MIT studies, Scott Morton (1991) characterized IT by its function: *automating*, *informating*, and *transformating*. Davenport (1993) identified the capabilities of IT: *automational*, *informational*, *sequential*, *tracking*, *analytical*, *geographical*, *integrative*, *intellectual*, and *disintermediating*. However, none of these conceptualizations of IT seem to be appropriate to represent IT intensity for the purpose of this study, which requires it to be more closely related to organizational communication patterns and with a measurable scale.

As a result, this study defines IT intensity using Keen's (1991) idea of "IT reach" and "IT range," which has been proposed as the two major aspects of IT shaping many current organizations. Modifying Keen's original ideas slightly, this study defines IT intensity as the multiplicative combination of *IT reach* (the *locations* that IT can link, from local connection within the same department, to different departments, to different business partners) and *IT range* (the *modes* of information generated with IT and used for decision makers' tasks). Thus IT is said to be more intensive when a broader IT reach is combined with a richer IT range, as shown in Figure 1. This conceptualization of IT, based on reach and range, is considered the most appropriate way to explain IT's association with organizational communication patterns for two reasons: 1) it emphasizes the role of communication technology, and 2) it implies IT's support for individuals' boundary-spanning activities, which are important prerequisites for an organization which needs to evoke changes within its communication patterns.

Organizational communication patterns can be either horizontal (i.e., contacts among peers either directly or indirectly) or vertical (i.e., little direct contact among peers and more communication mediated by superiors) (Smith, 1970). Horizontal communication patterns are felt to support a more efficient use of individuals as problem solvers since these patterns increase the opportunity for feedback and error correction, and for generating and synthesizing different points of view (Ancona & Caldwell, 1992). It is also contended that horizontal communication patterns can deal with task-related uncertainty more effectively than vertical communication patterns (Burns & Stalker, 1961; Van de Ven *et al.*, 1976). In addition, the distinction between horizontal and vertical communication is blurring as organizations become flatter through re-engineering transformations. Therefore, in this study organizational communication patterns were conceptualized in terms of the degree of horizontal communication.



A field survey, using self-administrated questionnaires, was conducted with five leading companies in the Korean computer industry. Also, three American computer manufacturers, operating in Korea, participated in the study. For each of the participating companies, operational managers were randomly selected across a number of different functional roles -- financial management, administration, R&D, planning, production, and marketing. Using self-administrated questionnaires, eight different IT applications -- application software, individual databases, shared databases, job-specific application software, electronic mail, video-conferencing systems, telephone, and facsimile -- were rated by respondents in terms of their reach and range. For each IT application rated, the IT reach score was multiplied by the IT range score to provide an intensity score. Then, an overall Degree of IT intensity was obtained by summing all of the individual intensity scores from the different applications.

Three dimensions, intradepartmental, interdepartmental, and interorganizational, were developed to measure the degree of horizontal communication. Within each dimension, respondents' frequencies of communications were asked in terms of report-based (e.g., written reports, memos, e-mail, or fax), conversation-based (e.g., face-to-face discussions or telephone), or group-meeting-based communications. Finally, Degree of horizontal communication measured how frequently each respondent relied on horizontal communications across these three dimensions, thereby examining the changes in their communication patterns in terms of the quantity as well as the mode of horizontal communications.

Findings of this study suggest that a higher degree of IT intensity is associated with increased horizontal communications ($r=0.2167$; $p=0.0464$). However, further analysis reveals that IT intensity supports interdepartmental communication only. Follow-up interviews with respondents showed that Korean companies and American-owned companies were working under quite different circumstances, resulting in different degrees and patterns of IT utilization. More specifically, even though both groups of companies were utilizing a similar level of IT range (i.e., diversity of information modes used), American-owned companies were utilizing significantly higher degree of IT reach (i.e., broadness of connection; $F=6.23$; $p=0.0145$) than Korean companies, while utilizing a higher degree of overall IT intensity. As a result, it was observed within these

American-owned companies that a higher degree of IT intensity led to increased direct and horizontal contacts with peers within the same department ($r=0.4123$; $p=0.0453$), with others within other departments ($r=0.5441$; $p=0.0060$), and even with others outside of respondents' companies ($r=0.4050$; $p=0.0496$). On the other hand, none of these contacts was found to be significant within the Korean companies. Interestingly, the higher degree of IT intensity within the American-owned companies did not enhance face-to-face communications but did enhance report-based and group-meeting-based horizontal communications.

As a result, it is concluded that a higher degree of IT intensity leads to more horizontal communications -- if a high enough level of reach and range is provided. In addition, it seems that the broadness of the IT connection plays a more important role in changing the nature of the organizational communication patterns than does the diversity of the information modes.

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