

# Digital Knowledge Management Artifacts and the Growing Digital Divide: A New Research Agenda

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## INTRODUCTION

That portion of the Internet known as the World Wide Web has been riding an exponential growth curve since 1994 (Network Wizards, 1999; Rutkowski, 1998), coinciding with the introduction of NCSA's graphically based software interface Mosaic for "browsing" the World Wide Web (Hoffman, Novak, & Chatterjee 1995). Currently, over 43 million hosts are connected to the Internet worldwide (Network Wizards, 1999). In terms of individual users, somewhere between 40 to 80 million adults (eStats, 1999) in the United States alone have access to around 800 million unique pages of content (Lawrence & Giles, 1999), globally distributed on arguably one of the most important communication innovations in history.

Yet even as the Internet races ambitiously toward critical mass, some social scientists have begun to examine carefully the policy implications of *current* demographic patterns of Internet access and usage (Hoffman & Novak, 1998; Hoffman, Kalsbeek, & Novak, 1996; Hoffman, Novak, & Venkatesh, 1997; Katz & Aspden, 1997; Wilhelm, 1998). Looming large is the concern that the Internet may not scale *economically* (Keller, 1996), leading to what Lloyd Morrisett, the former president of the Markle Foundation, has called a "digital divide" between the information "haves" and "have-nots." For example, although almost 70% of the schools in this country have at least one computer connected to the Internet, less than 15% of classrooms have Internet access (Harmon, 1997). Not surprisingly, access is not distributed randomly, but correlated strongly with income and education (Coley, Cradler, & Engel 1997). A recent study of Internet use among college freshman (Sax, Astin, Korn, & Mahoney 1998) found that nearly 83% of all new college students report using the Internet for school work, and almost two-thirds use e-mail to communicate. Yet, closer examination suggests a disturbing disparity in access. While 90.2% of private college freshman use the Internet for research, only 77.6% of students entering public black colleges report doing so. Similarly, although 80.1% of private college freshman use e-mail regularly, only 41.4% of students attending black public colleges do.

Further, although numerous studies (e.g., CyberAtlas, 1999; Maraganore & Morrisette, 1998) suggest that the gender gap in Internet use appears to be closing over time and that Internet users are increasingly coming from the ranks of those with lower education and income (Pew Research Center, 1998), the perception persists that the gap for race is not decreasing (Abrams, 1997).

We now raise a series of points for further discussion. We believe these issues represent the most pressing unanswered questions concerning access and the impact of the digital divide on the emerging digital economy. This article is intended to stimulate discussion among scholars and policymakers interested in how differences in Internet access and use among different segments in our society affect their ability to participate and reap the rewards of that participation in the emerging digital economy. In summary, we have reviewed the most recent research investigating the relationship of race to Internet access and usage over time. Our objective is twofold: (1) to stimulate an informed discussion among scholars and policymakers interested in the issue of diversity on the Internet, and 2) to propose a research agenda that can address the many questions raised by this and related research.

## BACKGROUND

Laugsksch (1999) pointed out that scientific literacy has become an internationally well-recognized educational slogan, buzzword, catchphrase, and contemporary educational goal. The same applies to the case of the digital divide. Courtright and Robbin (2001) contend that "the metaphor of the digital divide" has become part of the national discourse of the United States, an abstract symbol that condenses public concerns about social inequality and evokes hopes for solutions related to the use of information technology. In addition, "the digital divide is a potent resource whose symbolic properties and communicative power have activated a wide array of participants in the policy debates about how to create a more just society."

According to Hoffman (2001; cf. Arquette, 2001), the term *digital divide* was first used by Lloyd Morrisett who vaguely conceived of a divide between the information-haves and have-nots. However, the divide herein mainly is a gap of PC penetration in the early days of the Apple II in 1980 (Arquette, 2001). The term then grasped the public's attention with the issuance of the first National Telecommunications and Information Administration (NTIA) survey on Internet adoption and use in the United States in 1994 with the catchy title, *Falling Through the Net*. Since then, numerous articles, either popular or academic, on this issue have been published. According to a convenient sample of newspapers, journal articles, newswires, and similar mass media sources in the Lexis-Nexis database from January 1999 to December 2000 (Arquette, 2001), the increasing rate of digital divide-related articles hits almost 3,000%.

In developing countries, the digital divide is receiving similar social saliency. A quick search with the keywords "digital divide" in one of Greece's leading news Web sites *Daily Online* ([www.in.gr](http://www.in.gr)), shows that at least 500 articles somehow related to this term are available. In July 2001, a high-level forum on public understanding of information technology with the special topic of "Pay Attention to the Digital Divide" was held in Greece. A wide range of representatives, including governmental officials, information technology (IT) experts, educators, social scientists, and media practitioners, presented their viewpoints and comments on this issue. The digital divide has been incorporated into daily conversational discourse.

Ironically, while the term *digital divide* has frequently appeared in varied contexts, including academic writings, both the connotative and denotative meanings of it are confusingly incoherent. The presence of other similarly prevalent terminologies, such as digital equality, information equality, e-development, network readiness, and so forth, add confusion. People seem to debate on the issue without a shared understanding of what is meant by the digital divide. As Arquette (2001) contends, the entire researcher community is plagued by a lack of definitional clarity of the concepts such as digital divide: "Each researcher assumes other researchers use the same definitional frameworks for these terms while in fact there is no such shared meaning in nomenclature" (p. 3).

While the comment of Arquette (2001) mainly refers to the phenomenon in the English-speaking world, the use of its minority counterpart of the term *digital divide* is also in a similar situation. For example, among more than 30 articles collected by the book *Pay Attention to the Digital Divide in Developing Countries* (Leng, 2002), no consistent conceptual definition is available across the writings. While some are talking about the Internet penetration divide among different social groups categorized by age, occupation, and educational level, others refer to the concept as an uneven development of e-infrastructure among different areas or nations. So,

whenever the term digital divide is confronted, the following question can always be raised: *In terms of what?*

This article intends to introduce a new approach of operationalizing the digital divide from the perspective of developing countries. We first briefly review different definitional perspectives of the term *digital divide*. Then a detailed introduction of the National Informatization Quotient (NIQ) is presented which will be employed as the operational definition of the informatization level of a region. Finally we will investigate the geographical digital divide in developing countries in terms of NIQ.

## CONCEPTUAL REVIEW

*Conceptual definition* involves verbal descriptions of the essential properties that are to be included in the intended meaning of a concept. In research practice, it often involves specifying the essential dimensions of a concept (McLeod & Pan, 2002, p. 62). On the other hand, *operational definition* involves procedures by which a concept is to be observed, measured, or manipulated. It details the rules, specific steps, equipment, instruments, and scales involved in measuring a concept (p. 65). In this section, we will briefly review the multiple conceptions around digital divide.

Digital divide is a fresh term not unfamiliar to communication scholars (Zhu, 2002). As early as 1970, a theory called *knowledge gap* (Tichenor, Donohue, & Olien, 1970) was developed which was one of the most active inquiry fields thereafter in communication studies. The supposition of knowledge gap mainly concerns the different knowledge possession through mass media by social groups with varied social-economic status. In the 1980s, with the development of information and communication technologies (ICTs), especially with the wide application of PCs in diverse contexts, a divide between the information-haves and have-nots was sensitively observed and warned (Compaine, 2001). Since the early 1990s, digital divide has gradually become a convenient label, or more precisely, a metaphor (Courtright & Robbin, 2001), in describing the inequality of possessing and using ICTs, especially the Internet connectedness.

The first group of definitions varies on the concrete referents of what 'digital' means. In a narrow sense of the definition, digital divide particularly referred to the inequality of Internet access and use among different social groups or localities. The U.S. Department of Commerce's (1995, 2001) *Falling Through the Net* reports represent the most influential version of the stream. Zhu (2002) also takes Internet penetration as the sole indicator of what 'digital' means in his construction of the digital divide index (DDI), while taking age, sex, education, and occupation collectively as the categorizing factors. In short, in this stream of definitions, digital divide is operationalized to Internet

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