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GLOBAL DIFFERENCES IN INTERNET DIFFUSION: An Empirical Investigation into the Effects of Culture on the Diffusion of the Internet.

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Abstract

In a world rapidly moving towards globalization, the understanding of the micro level connections between culture and the diffusion of technology is imperative. Though much scholarly attention has focused on the technology diffusion process, the cultural factors affecting this process has not received substantial attention. Basing her work on schemas developed by Hofstede (1984, 1991), Hall (1975), and Herbig (1994), Miatland (1998) presents a number of theoretical predictions about how an interactive network would diffuse given different cultural variables. The current empirical study builds on propositions presented by Miatland (1998) and examines five hypotheses linking Hofstede's (1980, 1991) cultural variables to the rate of diffusion of the Internet globally. The study found significant support for three hypotheses linking higher levels of individuality or individualistic behavior, lower power distance or decentralized societal structures and higher tolerance for ambiguity and uncertainty to the rate of diffusion of the Internet.

Keywords: Culture, Diffusion of Innovations, Internet, Hofstede, Interactive Networks, Technology Diffusion, Cross-Cultural Differences.

GLOBAL DIFFERENCES IN INTERNET DIFFUSION: An Empirical Investigation into the Effects of Culture on the Diffusion of the Internet.

Diffusion of various network based interactive technologies has occurred at varying rates globally. Though much scholarly attention has focused on the technology diffusion process, the cultural factors affecting this process across nations has not received substantial attention. Given the substantial infrastructure investments required for most network-based technologies such as the Internet and mobile telephony, the differences in diffusion rates are often attributed to economic variations. However, even within economically similar nations, the diffusion rates of various technologies are distinctly different. Figure 1 presents the diffusion of mobile phones across OECD nations.

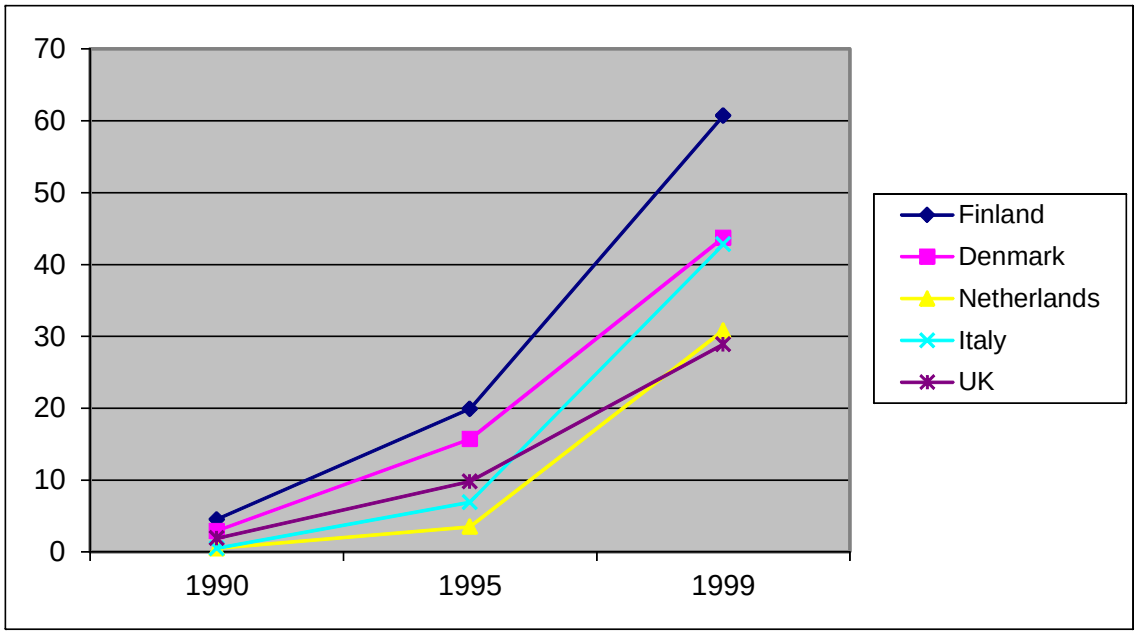

Figure 1. Diffusion of mobile phones across 5 OECD nations between 1990-1999; source: Organization for Economic Cooperation and Development (OECD), 2000.

One explanation for differing adoption rates could be the cultural differences between these nations. The rate of adoption is known to be influenced by variables such as perceived

attributes of the innovation, type of innovation-decision, communication channels, type of social system, and extent of change agent's promotion efforts (Rogers, 1995). Cultural factors such as power distance (Hofstede, 1980, 1991) and post materialism have been shown to affect the communication patterns and communication values such as freedom of speech, expression, subjective well-being, flexibility and tolerance (Inglehart, 1997). Social norms could potentially influence the innovation adoption decision, perceived value of products, consumption rituals, patterns and habits, which could in turn affect the rate of adoption of an innovation.

In a world rapidly moving towards globalization, the understanding of the micro level connections between culture and the diffusion of technology is imperative. Research delineating cultural factors and their effects on diffusion is limited. Maitland (1998) cites two reasons for the lack of rigorous analysis between network diffusion and culture, namely the unquantifiable nature of the construct, culture, and the lack of an explicit relationship between cultural variables and the network diffusion process.

Extant research by Danowski (2001) links societal values on post materialism, personal freedom, subjective well-being, interpersonal trust, friendship, tolerance for diversity and individual sexuality, as measured by Inglehart (1997), to its Internet development. Using societal values observed prior to the main diffusion of the Internet for the period 1990 to 1993, Danowski (2001) predicts nations' Internet development in 1999. From a theoretical perspective, Maitland (1998) presents propositions based on the cultural variables of Hofstede (1980, 1991), Herbig (1994) and Hall (1975), as predictors of network diffusion. While acknowledging the tremendous difficulties in attempting to develop quantitative measures of national cultures, Maitland (1998) presents a number of predictions about how an interactive network will be

diffused given different types of cultures and variables such as status, gender and power (Ess & Sudweeks, 1998).

The current study seeks to build on Hofstede (1980, 1991) and Maitland's (1998) schema of cultural analysis and empirically examine the global diffusion of the Internet.

Literature Review

In their study of culture, communication scientists have often built upon views of culture developed in symbolic anthropology (Geertz, 1973) in which all the cultural artifacts such as rituals, legends, ceremonies, and languages are regarded as symbolic forms that are created, interpreted, and maintained through the process of communication. Hence, culture is the language patterns, values, attitudes, beliefs, customs, and thought patterning (Barnett, 1988).

Two distinct trends characterize the research on globalization and cultural variability: convergence and divergence (Inkeles, 1998). The convergence literature refers to a set of imperatives embedded in the global economy that result in similarities in cultural preferences and practices across nations (Stohl, 2001). The divergence literature, on the other hand focuses primarily on issues of cultural difference. The convergence perspective professes that similar actions, messages, and processes function in similar ways across cultures (e.g. Mcluhan & Powers, 1989); while the divergence perspective assumes that similar communicative actions may arise from differing interpretations and visions. Each theme presents a particular conceptualization of culture and communication. Research attempting to identify and discriminate individual national cultural characteristics is plentiful (e.g. Herbig (1994), Hall (1975), Inglehart (1997) etc.).

One of the most notably and widely used sets of national cultural characteristics are those established by Dutch cultural anthropologist Geert Hofstede (1980, 1991). Hofstede (1980,

1991) attempted to discriminate cultures, designated as nations, from each other on universal dimensions with his emphasis being on the typical members of each culture (Au, 1999). Basing his work on responses to questionnaires about work-related values of over 116,000 IBM employees in 53 countries, Hofstede (1980, 1991) discriminates between cultures on five dimensions: individualism vs. collectivism, femininity vs. masculinity, term orientation, power distance, uncertainty avoidance, and long term vs. short term orientation. Table 1 (Appendix A) presents Hofstede's (1991) scores and index for 53 nations. For four out of the five national dimensions the implications for diffusion of interactive networks are inconclusive (Maitland, 1998).

Individualism in cultures implies loose ties; everyone is expected to look after oneself or immediate family but no one else. Collectivism on the other hand, implies that people are integrated from birth into strong, cohesive groups that protect them in exchange for unquestioning loyalty.

Hofstede (1980, 1991) found that individualistic cultures value personal time, freedom, challenge, and such extrinsic motivators as material rewards at work. In family relations, they value honesty/truth, talking things out, using guilt to achieve behavioral goals, and maintaining self-respect. Their societies and governments place individual social-economic interests over the group, maintain strong rights to privacy, nurture strong private opinions (expected from everyone), restrain the power of the state in the economy, emphasize the political power of voters, maintain strong freedom of the press, and profess the ideologies of self-actualization, self-realization, self-government, and freedom. At work, collectivist cultures value training, physical conditions, skills, and the intrinsic rewards of mastery. In family relations, they value harmony more than honesty/truth (and silence more than speech), use shame to achieve

behavioral goals, and strive to maintain face. Their societies and governments place collective social-economic interests over the individual, may invade private life and regulate opinions, favor laws and rights for groups over individuals, dominate the economy, control the press, and profess the ideologies of harmony, consensus, and equality.

The individualism collectivism dimension is defined by the individualism index. Countries high on individualism (USA, Australia) score high on this index, while countries high on collectivism (Guatemala, Panama) score low on this index. The individualism dimension positively correlates with GNP, such that individuals in nations enjoying higher living standards tend to exhibit more individualistic tendencies. Maitland (1998) notes that conclusions based on Hofstede's descriptions suggest two contradictory hypotheses about the role of individualism in the diffusion of interactive networks. The relationship with GDP, and the high infrastructure costs for communication technology would suggest a positive relationship between individualism and network diffusion. Moreover, decentralized technologies such as the Internet require individual level contributions such as individual web pages to realize positive network externalities. This process of individual expression could be more pronounced in individualistic cultures, as compared to collectivist cultures, where group think and group cohesion would require the process to be initiated by a credible or higher status member of the collective who functions as a 'change agent'. Also, the need to communicate with ones 'in-group' could result in a negative relationship between diffusion and individualism (Maitland, 1998). In that case, collectivist cultures could witness quicker diffusion of communication technologies such as cellular phones and email.

H1: The higher a nation's score on individualism, the greater the rate of diffusion of an interactive network.

Masculinity and femininity refer to gender roles and not physical characteristics. Hofstede (1980, 1991) focuses on the traditional assignment to masculine roles of assertiveness, competition, and toughness, and to feminine roles of orientation to home and children, people, and tenderness. He acknowledges that in different cultures different professions are dominated by different genders. (For example, women dominated the medical profession in the former Soviet Union, while men continue to dominate it in the USA.) But in masculine cultures, the traditional distinctions are strongly maintained; while feminine cultures tend to collapse the distinctions and overlap gender roles (both men and women can exhibit modesty, tenderness, and a concern with both quality of life and material success.)

Traditional masculine work goals include earnings, recognition, advancement, and challenge. Traditional feminine work goals include good relations with supervisors, peers, and subordinates, good living and working conditions and employment security. Lower scores on the masculinity index indicate a feminine culture. Diffusion of innovations theory (Rogers, 1995) recognizes the role that social norms play in the diffusion of innovations. If gender equality is a social norm then diffusion theory connects this norm with the rate at which the innovation diffuses (Maitland, 1998). Using Herbig's (1994) rationale on gender equality as a source of innovations, Maitland (1998) proposes a link between higher gender equality countries and the diffusion of interactive networks. Herbig's (1994) rationale is based on the simple notion that a nation that does not utilize the resources of its female population misses out on over half its potential source for innovations.

Though Hofstede's (1980) masculinity / femininity index is concerned with gender roles rather than gender equality, it could be used to hypothesize a relationship between gender role and role expectations and the diffusion of interactive networks. It could be hypothesized that

feminine cultures would have faster rates of diffusion as they are more likely to provide access to all (Maitland, 1998). Alternatively, the competitive nature of male dominated societies might provide a greater incentive for diffusion of communication networks. Masculine competitive instincts could also result in higher entrepreneurial ventures that could realize faster growth in network-based innovations.

H2: The lower a nation's score on masculinity, the greater the rate of diffusion of an interactive network.

Power distance (PD) refers to the extent to which less powerful members expect and accept unequal power distribution within a culture. Hofstede (1980, 1991) claims that high PD countries tend to have centralized political power and exhibit tall hierarchies in organizations with large differences in salary and status. Subordinates may view the "boss" as a benevolent dictator and are expected to do as they are told. Parents teach obedience, and expect respect. Teachers possess wisdom and are automatically esteemed. Inequalities are expected, and may even be desired. Low PD countries tend to view subordinates and supervisors as closer together and more interchangeable, with flatter hierarchies in organizations and less difference in salaries and status. Parents and children, and teachers and students, may view themselves more as equals (but not necessarily as identical.) Equality is expected and generally desired. There are some interesting correlations for power distance: low PD countries tend to have higher geographic latitude, smaller populations, and/or higher gross domestic product (GDP) per capita than high PD countries. Hofstede (1980) notes that these differences are hundreds or even thousands of years old, and does not believe they will disappear quickly from traditional cultures, even with powerful global telecommunication systems.

According to Maitland (1998) in the autocracy in high power distance countries, could facilitate the quicker diffusion of a network. However, the lower GDPs coupled with autocratic

and often bureaucratic setups could stifle the rate of diffusion. Alternatively, in low power distance countries, the lack of an autocratic power structure could result in faster diffusion for decentralized technologies such as the Internet. Another proposition is concerned with status symbols. Since status symbols are popular in high power distance countries, networks especially the visible hardware components, such as mobile phones, would have symbolic value that could affect the diffusion of such innovations (Maitland, 1998), with users and owners of the hardware being accorded more status or vice-versa. Based on Hofstede (1980, 1991) and Maitland's (1998) propositions we can hypothesize as follows:

H3: The lower a nation's score on power distance, the greater the rate of diffusion of an interactive network.

People vary in the extent that they feel anxiety about uncertain or unknown matters, as opposed to the more universal feeling of fear caused by known or understood threats. Cultures vary in their avoidance of uncertainty, creating different rituals and having different values regarding formality, punctuality, legal-religious-social requirements, and tolerance for ambiguity. Hofstede (1980, 1991) notes that cultures with high uncertainty avoidance tend to have high rates of suicide, alcoholism, and accidental deaths—as well as a high number of prisoners per capita. Businesses may have more formal rules, require longer career commitments, and focus on tactical operations rather than strategy. These cultures tend to be expressive; people talk with their hands, raise their voices, and show emotions. People seem active, emotional, and even aggressive; shun ambiguous situations; and expect structure in organizations, institutions, and relationships to help make events clearly interpretable and predictable. Teachers are expected to be experts who know the answers and may speak in cryptic language that excludes novices.

In high UA cultures, what is different may be viewed as a threat, and what is "dirty" (unconventional) is often equated with what is dangerous. By contrast, low UA cultures tend to have higher caffeine consumption, lower calorie intake, higher heart-disease death rates, and more chronic psychosis per capita. Businesses may be more informal and focus more on long-range strategic matters than day-to-day operations. These cultures tend to be less expressive and less openly anxious; people behave quietly without showing aggression or strong emotions (though their caffeine consumption may be intended to combat depression from their inability to express their feelings.) People seem easy-going, even relaxed. Teachers may not know all the answers (or there may be more than one correct answer), run more open-ended classes, and are expected to speak in plain language. The uncertainty avoidance dimension has applied to varying contexts of network diffusion. The implication of uncertainty avoidance for the diffusion of innovations is clear (Maitland, 1998).

Cultures low of uncertainty avoidance, with their higher tolerance for deviance would more readily accept an innovation. The contrary case would be exhibited in the case of cultures with a low tolerance for ambiguity and change, where new innovations would be considered incompatible or inconsistent with the existing values, past experiences and needs of potential adopters (Rogers, 1995).

Hofstede’s (1980, 1991) uncertainty avoidance index is one of the most widely used dimensions. Straub (1994) explored differences in the diffusion of Email and FAX in Japan and the USA, and related media choice to uncertainty avoidance. Vishwanath (2001) explored the implication of uncertainty avoidance on the use of online information and found significant differences in online auction bidding behavior and a nation’s uncertainty threshold. Based on Hofstede (1980, 1991) and Maitland’s (1998) propositions we can hypothesize as follows:

H4: The lower a nation's score on uncertainty avoidance, the greater the rate of diffusion of an interactive network.

In the early 1980s, shortly after Hofstede (1980) first formulated his cultural dimensions, work by Michael Bond convinced him that a fifth dimension needed to be defined. Long-Term Orientation (added in 1988 by Hofstede & Bond) seemed to play an important role in Asian countries that had been influenced by Confucian philosophy over many thousands of years. The values associated with this dimension are rooted in Confucianism and the principle of stability, status, thrift and shame. Countries scoring high on this index indicate a long-term orientation. Long term oriented countries tend to exhibit higher rates of savings, which could potentially allow for greater investment in network technologies (Maitland, 1998). In contrast, long term oriented countries, could exhibit a 'wait and watch' attitude, in keeping with their principles of stability and sureness. This could affect the rate of diffusion of network technology in these cultures.

H5: The higher a nations' score on long-term orientation, the greater the rate of diffusion of an interactive network.

The next section details the methodological approach for empirically testing these hypotheses.

Methodological Approach

The current study measures the cultural differences in the rate of adoption of a network-based technological innovation over time. The rate of adoption is the relative speed with which an innovation is adopted by members of a social system and is generally measured in terms of the number of individuals who adopt a new innovation in a specified time period (Rogers, 1995). The current study focuses on the diffusion of the Internet within nation states over time. The Internet has diffused very rapidly across the globe. However, the Internet is still considered to be in the early stages of global diffusion (Danowski, 2001). Though the diffusion curve is

essentially a cumulative normal distribution over time, and only after advance 'late majority' diffusion (Rogers, 1995) would the distributions be normal, research related to internet diffusion need not be put on hold until such a time (Danowski, 2001). The Internet is still an evolving innovation and an understanding of the cultural variants in its diffusion would serve as both a scientific and a sociological heuristic for future research.

Next, though typically diffusion studies use the 'network' as the dependent variable and rarely use countries (Maitland, 1998), the current study uses countries as the unit of analysis. Some scholars have argued that the nation state is a decreasingly meaningful construct as globalization increases (Moon, 1996; Martin and Nakayama, 1999). As communication technology diffuses and cultures converge, national cultural boundaries lose shape. However, it is still meaningful to consider nation states, namely because most macro level data are collected by national governments (Maitland, 1998), and the fact that most cross cultural studies such as Hofstede's (1980, 1991) emphasize the typical median members of a nation state. The current study hence focuses on the national level comparison of internet diffusion rates over time.

Procedures

To obtain data on Internet development, nation counts of Internet hosts were used from January 1996 and January 2002 for each domain name as reported by Net Wizards (**http://www.isc.org**). A host is a server on the Internet. The number of actual computers using the Internet is approximately 10 times the number of hosts (Danowski, 2001). Host count is still at an exponential growth curve, and is part of the 'technology cluster' (Rogers, 1995) that comprises the Internet. This cluster could include other related technological hardware and software elements such as personal computers, servers, telephone connections, routers, web pages etc. Next, per capita host counts were computed using the host data, and the respective

population data as reported in the U.S. Central Intelligence Agency World Fact Book (1996, 2002). The epsilon differences in per capita host counts between 1996 and 2002 represent the relative rate of diffusion of Internet hosts within each nation over time. The distributions of diffusion rates revealed a right skew, with a number of cases having values less than 1. A constant (1) was added to each case and a natural log transformation was made to render the distributions normal for statistical procedures. This is a common procedure for treating such distributional abnormalities (Hofstede, 1980; Danowski, 2001). Host data was available for 53 of the 58 nations in Hofesteds (1984) cultural index.

Lastly, since Hofstede's (1980, 1991) dimensions of cultural variability are correlated with economic variables such as GDP and economic development, it is not appropriate to control for economic variables in this study, as it would indirectly remove the variation due to his cultural variables. The only control variable is the population growth rate of each nation, since this has a direct effect on the rate of diffusion of an innovation.

Partial correlations were computed for rate of diffusion, and Hofested's (1991) country scores for power distance, individuality, masculinity, uncertainty avoidance and long term orientation. Only cases with valid data on both the variables were included in the analysis.

Results

The first hypothesis proposed a positive relationship between a nation's individuality score and the rate of diffusion of a network innovation. The partial correlation coefficient for Hofstede's (1980, 1991) individuality scores revealed a positive association with host diffusion rates ($r = 0.73$, $p < .05$) across nations. The first hypothesis is therefore supported.

The second hypothesis proposed a negative relationship between a nation's score on masculinity and the diffusion rate of an interactive network. The partial correlation results for

host diffusion rates was negative ($r = -0.86$) but not significant ($p = .90$). This evidence in support of this hypothesis is therefore inconclusive.

The third hypothesis proposed a negative association between a nation's power distance score and the rate of diffusion of an interactive network. The partial correlations between power distance and host diffusion rates were negative and significant ($r = -0.56$, $p < .05$). The hypothesis is therefore supported.

The fourth hypothesis proposed a negative relationship between a nation's score on uncertainty avoidance and diffusion rates. The partial correlations resulted in a negative correlation between host diffusion and uncertainty avoidance ($r = -0.39$, $p < .05$). This hypothesis is therefore supported.

Lastly, the fifth hypothesis proposed a positive relationship between long-term orientation and diffusion rates. The partial correlation for host data was negative ($r = 0.06$) and not significant ($p = .81$). The findings for this hypothesis are inconclusive.

Discussion

The study attempts to link a nation's culture to the diffusion the Internet. Overall, culture does seem to have a significant impact on the diffusion of the Internet.

The first hypothesis linked a nation's individualism scores to the rate of diffusion of an innovation. The hypothesis predicted a positive relationship between individualism and network-based innovations, such that the more individualistic the culture is, the quicker the rate of diffusion of an innovation. This could be due to two factors, the higher GDP of individualistic cultures wherein the established infrastructure or added capital expenditures for newer technologies such as the internet are already prevalent or abundant and the individualistic values

of self, privacy, personal time and freedom that decentralized communication technologies such as the internet tend to nurture.

The third hypothesis linked power distance scores to diffusion rates. As discussed earlier the 'power distance' dimension also describes a culture's acceptance of status symbols. Power distance essentially confers status relationship to the ownership and utilization of innovations, such that people with ownership are conferred higher status by the non-owners. However, status symbolism are conferred to the visible hardware components of technological innovations such as mobile phone, PDA's and personal computers rather than the software elements of the innovation such as the internet. The negative correlation between Internet diffusion and the power distance scores supports this proposition. Moreover, the decentralized nature of the Internet seems to spur quicker diffusion in cultures that value decentralized approaches to problem solving and organization. The diffusion of Internet hosts requires an additive entrepreneurial streak in individuals within a culture to realize quicker diffusion. Individuals in lower power distance nations, with the lack of centralized control structures, tend to more readily adopt decentralized technologies such as the Internet.

The fourth hypothesis had predicted a negative relationship between the nation's uncertainty avoidance and diffusion rates. Typically, nations with higher tolerance for ambiguity (lower uncertainty avoidance scores) would more readily adopt an innovation. With their higher tolerance for ambiguity and acceptance of deviance, individuals in these cultures are more accepting of innovations such as the Internet.

Lastly, the findings relating a nation's score on masculinity and long-term orientation to network diffusion were inconclusive. Lack of significant correlations could be taken to signify a lack of relationship between the assignment of gender roles and the diffusion of the Internet.

Though gender equality is a social norm, and the rate of diffusion is impacted by social norms (Rogers, 1995), the hypothesized competitive nature of masculine societies seems to not affect the diffusion of the Internet. Likewise, long term orientation was not significantly correlated with the rate of diffusion.

Finally this study has some noteworthy limitations. Firstly, Internet host counts do not necessarily systematically reflect the degree of Internet development of a society (Danowski, 2001). The Internet diffusion is also affected by other technological variants such as network architectures, telecommunication policy, linguistic differences, and national level access both within and across nations. In addition variants such as economic factors are not controlled for in this study. Lastly, Hofstede (1980, 1991) cultural variables were collated in 1975-1978. The last 25 years has witnessed an increased proliferation of communication technologies resulting in cultural homogenization, which limits the apparent viability and generalizability of research based on these scores.

However by focusing on one reliable measure that comprises the technology cluster of the Internet, the study sets the stage for further explorations of culture and technology diffusion, and presents conclusive evidence of the persistence of cultural differences. In an increasingly homogenized world, the cultural heterogeneity seems to persist. Future research could further probe these differences by controlling for the technology variants and explicating the diffusion of the Internet.

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