Old Hierarchies or New Networks of Centrality?

The Global Geography of the Internet Content Market

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Using a combination of domain names and user counts, this article provides an assessment of the global distribution of Internet content creation at the national and urban levels and the structure of the supply and demand for this content at the national level. Theories of export-based development are used to assess the strengths and weaknesses of countries' Internet presence and the ramifications of this for future development.

In the past 30 years, the Internet[1] has evolved from a military communications system into an exponentially growing mass market that is increasingly entrenched throughout the globe. Due to its decentralized nature, designed to remain operational after a nuclear war, locating either the consumption or the creation of its content[2] is extremely difficult. Flows of data and communications speed around the globe with little regard for municipal, regional, or national boundaries. Despite this disregard for borders, information flows simply cannot exist without the people (living in physical space) who create, regulate, distribute, and consume Internet content and services. As the Internet becomes more fully integrated into economic life, the manner in which people and places are organized around it becomes increasingly relevant to social scientists and policy makers. In particular, it is important to understand how existing urban and country hierarchies might be affected by these changes.

This article takes an initial step toward answering this question by analyzing the global system of supply of and demand for Internet content. Using a combination of domain names and user counts, the article assesses (a) the geography of Internet content creation and distribution at the national and urban levels and (b) the structure of the supply and demand for this content at the national level. This analysis builds on theories of export-based development to assess the

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strengths and weaknesses of countries' Internet presence and the ramifications of this for future development. Although it is too early to judge the long-term impact of the Internet on the global economy, it is clear that (a) the supply of and demand for Internet content remains overwhelmingly within countries belonging to the Organization for Economic Cooperation and Development (OECD) and (b) the production and supply of Internet content is primarily concentrated in the world's urban areas.

INFORMATION EXPORTS AND THE NEW ECONOMY

With all the discussion of the "new economy" and the phenomenon of public companies with billion-dollar valuations that have yet to make a profit, it is easy to forget that one of the most important measures of economic development is a country's or city's exports. Codified in Douglas North's (1975) model of internal growth depending on the income derived from largely extractive industries, exports have long been viewed as the engine of economic growth, which pays for and supports other economic sectors through multiplier effects. Although there are conceptual and practical flaws to export-based models, and many economists such as Krugman (1994) have belittled the concept of the competitiveness of a country's exports, analysis of a region's or country's exports has remained a mainstay both in the theoretical and practical applications of regional development.

But how does one think about the role of exports when the product is information and the transmission of it is instantaneous and electronic? Beyers and Alvine (1985) argued that export-based models have become more troublesome as exports from many leading cities and regions increasingly come in the form of highly skilled services such as banking, law, and entertainment, which do not lend themselves easily to measurement. The rise of the commercial Internet has accentuated this trend by making the provision of information itself (in the form of electronic content) a commodity.

Although there remains much thinking to be done on the exact impact of information exports on a country's or city's economy, it is clear that "knowledge industries" such as those supplying Internet content are becoming an increasingly important part of all countries' economies (United Nations Development Program [UNDP], 1999). It is likely that the places that produce and market Internet content will benefit from the multiplier and spin-off effects that exports have generally brought. Moreover, countries and regions that contain the routes on which this information travels benefit from this traffic. Cukier (1999) argued that the United States possesses a distinct advantage over the rest of the world because most of the Internet's traffic is routed through U.S. lines. Despite the highly interconnected nature of the Internet, Cukier demonstrates that a number of factors—lower cost, high-speed, international circuits; advantageous routing

tables; and the availability of interconnection points with the entire world—have created an Internet that "resembles a star with the United States at its center."

Although Cukier's analysis is largely focused on the physical infrastructure of the Internet, his arguments and analysis concerning the control over the Internet enjoyed by the United States are very germane to the discussion of Internet content and information exports. The long history of the Internet within the United States and its first-mover advantage in the production and distribution of Internet content have, in the short term, concentrated these activities within the United States. If, as Castells (1997) argued, the locus of power in society is shifting away from traditional institutions such as the state to "images of representation around which societies organize their institutions, and people build their lives" (p. 364), the origin of information and how broadly its production is distributed will only become more important in the future.

Although it is not the purpose of this article to raise the specter of information trade imbalances or deficits, it is the intention to provide an understanding of how the supply and demand for Internet content is distributed worldwide. In other words, this analysis offers a first step in answering the question of whether the current global Internet system is more akin to a "Hollywood model," where certain countries and cities export their culture and business to the rest of the world, or whether the Internet is facilitating a flourishing of cultures and communities as many of the early Internet pioneers had envisioned. It also explores the question, suggested by some export-based development theory, of whether countries that are consuming more Internet content than they produce may face long-term difficulties in expanding their own production of Internet information and content.

DATA AND CONCEPTS

The first step in this analysis is a discussion about the various measures that are used to gauge the location of the global supply of and demand for Internet content. A standard indicator used by many good studies of the growth and spread of the Internet has been the number of Internet hosts per country (Hargittai, 1999; UNDP, 1999). Although there is a great deal of variation between hosts, which range from a single desktop computer to powerful servers acting as multiple virtual hosts, this measure gives a rough indicator of the minimum size of the Internet.[3] This provides a valuable metric of growth over time; however, it is not a straightforward process to assign these Internet hosts to geographic locations (OECD, 1998). In fact, the main source of these data, the Internet Software Consortium (ISC), is quite upfront about their limitations.

> There is not necessarily any correlation between a host's domain name and where it is actually located. A host with a .NL domain name could easily be located in the U.S. or any other country. In addition, hosts under domains EDU/ORG/NET/

> COM/INT could be located anywhere. There is no way to determine where a host is without asking its administrator. (ISC, 1999)

While recognizing the value of this measure of the growth of the Internet, this article argues that a different indicator, the registration addresses for domain names such as nytimes.com or nokia.fi, is a better measure for determining the location of the production and organization of Internet content. Although registering a domain name has become relatively easy and inexpensive, it nevertheless represents a conscious decision to use the Internet in a more sophisticated manner. Other ways of interacting with the global Internet, for example, surfing the Web, are more akin to the consumption of information, but registering a domain name suggests an effort to organize some body of information to distribute to the rest of the world.[4]

In addition, domain names have the important advantage over host counts of being associated with the unique contact information of the person or entity that registered it. Although there is no guarantee that the registration address for a domain name and the location of Internet content production is the same, an analysis using the CorpTech database shows a strong correlation between the two. The CorpTech database contains accurate and up-to-date contact information on 20,000 high-technology firms in the United States. For 84% of these firms, the zip code obtained from its .com domain-name registration matched the zip code in the CorpTech database at the three-digit level (roughly equivalent to a geographical area the size of a small to mid-size city), and 73% of these firms match at the five-digit zip code level (roughly equivalent to a neighborhood within a city).[5] Although this is a small sample of total domains, it does strongly support the use of domain names for determining the location of Internet content production.

It is important to acknowledge that the content production and distribution associated with particular domain names can vary dramatically. The domain name yahoo.com is certainly a much more important site for content on the Web than petwash.com. This weighing issue is resolved somewhat by the fact that major Internet content firms generally register multiple variations of their domain name, both to protect their Internet brand and to allow differentiation between various products they offer. For example, by July 1998, *Wired* magazine had more than 75 registered .com domain names, and Amazon.com had registered dozens of names, such as amazonfilms.com or amazonkids.com. This gives additional weight to the most important Internet content firms and helps to counterbalance the phenomenon of smaller and less used domains.

An additional difficulty in using domain names as an indicator of global Internet content production is that they come in two different types of top-level domains (TLDs): (a) CONE (.com, .org, .net, and .edu), TLDs originally designed to be used by businesses, nonprofit organizations, computer networks, and educational institutions and (b) country code (CC), TLDs such as .de for

Germany and .jp for Japan, which were for Internet use in their respective countries. Until April 1999, CONE TLDs were centrally administered by a monopoly delegated to Network Solutions by the U.S. National Science Foundation (NSF) and, with the exception of .edu domains, they can be registered by anyone regardless of their location. CC TLDs are generally regulated by a central institution determined by each country; the exact nature of this institution and the rules governing CC TLD registration vary.[6]

Although most CONE domains historically were registered in the United States, the trend over the past several years has been toward dispersal.[7] Quarterman (1997) reported that in January 1997, 83% of all .com domains were located in the United States; the top three countries, the United States, Canada, and the United Kingdom, accounted for more than 90% of the .com domains. In July 1999, according to this author's survey, only 69% of the .com domains were located in the United States; the same top-three countries accounted for just 77% of total .com domains worldwide. It appears that .com domains, outside the context of the United States, indicate a more global focus for the content they contain.[8] Although this is not a hard and fast rule, the case of SAP, the German enterprise software company, is illustrative. SAP's .com Web page (www.sap.com) is in English and offers easy access to information on SAP operations worldwide. In contrast, SAP's .de Web page (www.sap-ag.de) is in German and is solely concentrated on the domestic German market.

This makes it extremely important to ensure that CC TLDs are not the sole measure of a country's domains. In fact, in a few cases, very little geographic meaning can be assigned to a TLD. For example, the Pacific Island nation Tuvalu's country code has emerged, not as a symbol of the country's Internet presence, but as Raskin (2000) reports, a potential battleground for television networks hoping to capture the potentially important and lucrative .tv brand.[9] Therefore, this article uses a combination of data sets, including the number of CC domains available from various sources on the Internet[10] and a database of CONE domains developed according to the methodology set out in Zook (2000).

GLOBAL GEOGRAPHY OF DOMAIN NAMES

Based on this combination of data sets, this analysis presents the distribution of CONE and CC domains worldwide in January 1999.[11] Table 1 lists the 20 countries with the greatest concentrations of domains. Although this list is dominated by North American and European countries, it also contains the top countries from every continent in the world. As Table 1 illustrates, the United States remains the most concentrated location of domain names worldwide and, with the exception of Denmark and Switzerland, has the highest number of domains per capita of any of the top 20 countries.

TABLE 1: Top 20 Countries in Terms of CONE and CC Domains, January 1999

Country	*Code*	*CONE*	*CC*	*Total*	*Per 1,000 Population*	*Percentage of World Domains*
United States[a]	NA	3,001,145		3,001,145	11.3	54.6
Germany	de	80,185	295,289	375,474	4.6	6.8
United Kingdom	uk	121,415	237,281	358,696	6.1	6.5
Canada	ca	210,210	49,155	259,365	8.7	4.7
France	fr	88,200	30,436	118,636	2.0	2.2
Netherlands	nl	31,710	63,138	94,848	6.1	1.7
Denmark	dk	12,705	77,478	90,183	17.1	1.6
Italy	it	44,205	45,076	89,281	1.6	1.6
Japan	jp	25,060	58,610	83,670	0.7	1.5
Switzerland	ch	22,120	57,917	80,037	11.3	1.5
Sweden	se	41,265	37,376	78,641	8.9	1.4
Brazil	br	10,430	59,628	70,058	0.4	1.3
Argentina	ar	5,145	61,730	66,875	1.9	1.2
Australia	au	27,020	32,705	59,725	3.3	1.1
Spain	es	37,905	11,800	49,705	1.3	0.9
Austria	at	10,465	32,705	43,170	5.4	0.8
South Korea	kr	13,335	28,771	42,106	0.9	0.8
China[b]	cn	19,460	19,553	39,013	0.03	0.7
South Africa	za	3,850	29,558	33,408	0.9	0.6
Norway	no	10,045	22,610	32,655	7.5	0.6
World total		4,025,420	1,466,276	5,491,696	0.95	100.0

SOURCE: Author survey and country code domain registries; population figures are from 1996.
NOTE: CC = country codes. CONE = .com, .org, .net, and .edu. The growth rate of domain name registrations remains impressive. By January 2000, there were a total of 10,008,468 CONE and 3,344,305 CC domain names registered worldwide.
a. This analysis has purposively excluded the top-level domains .gov used by the U.S. federal government, .mil used by the U.S. military, and .us largely used by U.S. state and local governments because of data availability problems. Although including these domains would further increase and emphasize the lead of the United States in Internet content production, this point is made sufficiently well just by using CONE domains.
b. If China's domains were also to include Hong Kong (hk and CONE), the total would be 61,623.

The variance in domain name-per-capita figures is quite marked, from a low in China of 0.03 per 1,000 people to a high in Denmark of 17.1 per 1,000. Although this reflects China's large population and relatively low penetration by the Internet, part of these differences has to do with the country code domain registration policies in place in each country (OECD, 1997a). However, one also observes significant variation in per capita CONE domain-name registrations between countries. Because CONE domains are all centrally registered under the same set of rules, intercountry differences can point to significant differences in the Internet environment within countries.

Particularly notable is Japan's per capita figure of 0.7 per 1,000 people, which is the lowest in OECD countries and less than half of this sample's

average of 2.2. Even limiting the analysis to just CONE domains, Japan still has the lowest per capita rate of any of the OECD countries. The exact cause of this relatively small number of domains is unknown; Kogawa Tetsuo, a professor of communications studies at the Tokyo University of Economics, argues that Japan's strong tradition of centralized, bureaucratic power is making Japan's adaptation to the Internet's amorphous structure difficult (cited in Rimmer & Morris-Suzuki, 1999). Aoyama (2000) contended that Japan's relative slowness in adopting the Internet and e-commerce stems from a number of factors, including a relatively low use of credit cards, little tradition of long-distance retailing (i.e., mail order), and a system of corner stores through which consumers can access online resources.

Although country-level statistics give a good overview of a country's participation in Internet content production, it is a very high level of aggregation. As Table 1 suggests, countries with large populations such as China may mask significant concentrations of Internet content production within their major cities. Furthermore, despite the ability of the Internet to transcend space, Kolko (1999) has shown that the Internet acts as complement to rather than substitute for the advantages of cities; domain names remain highly concentrated in urban areas. Table 2 supports this contention by comparing the percentage of the world's population to the percentage of the world's Internet domains (both CONE and CC) in the top 500 cities in the world. Whereas the top 100 cities (46 of which are outside the United States) contain 6.7% of the world's population, they contain more than half of the world's Internet domains.

Therefore, the next step in this analysis is to parse the domain data to the city level. This is accomplished through a procedure that matches the registration addresses of CONE domains to a database of 2,500 cities worldwide. Although matching CONE domains to countries was almost 100% successful, making the final connection to cities within countries was more difficult, with match rates of about 60%, depending on the country. However, this is due in large part to the incomplete nature of the database of global cities. When the same procedure was used with a database of 2,500 British towns and cities, the match rate was more than 95%. This matching technique provides the distribution of CONE domains in every city in the global database. However, as Table 1 indicates, CC domain names are much more important than CONE domains in many countries, such as the United Kingdom and Germany.[12] Therefore, it is important to include them to prevent the underemphasis of cities such as London and Berlin and the inflation of cities such as Toronto where CONE domain usage is higher than CC domain usage. Moreover, because the content contained within any type of domain name is accessible from around the world, the combination of CONE and CC domains is arguably the best measure of a country's or city's total Internet content-producing potential. Although it is certainly possible that the geographical distribution of CC domains differs from CONE domains, it is extremely difficult to obtain this type of data on a global scale. Therefore, this article assumes that the distribution of CC domains mirrors the distribution of CONE domains and

TABLE 2: Percentage of the World's Internet Domains in Cities Ranked in Terms of Number of Domains

City Rank	*Percentage of World Population*	*Percentage of World Domains*
Top 5	1.1	17.5
Top 10	1.6	23.9
Top 50	4.7	43.0
Top 100	6.7	51.4
Top 500	12.9	63.7

SOURCE: Author survey and country code domain registries; population figures are from 1996.

multiplies the number of CONE domains for each city by the appropriate country ratio of CONE to CC domains. Depending on the country, this ratio could be quite high, 6.1 to 1 for Denmark and 3.7 to 1 for Germany, or rather low, 1.2 to 1 for Canada.

To provide a sense of the global distribution of the supply of Internet information, Figures 1 through 3 show CONE and CC domains located in major cities, worldwide and in Europe. Due to the relatively small size of the city database, these maps are biased toward larger cities. Although the United States, with 54.6% of total registered CONE and CC domains in the world, is clearly the dominant supplier of Internet information, this article primarily concentrates on non-U.S. domains. See Zook (2000) for a detailed analysis of the geography of CONE domain names in the United States. Figure 1 clearly illustrates the domination of North American and European countries, as well as the near total absence of Africa on this measure of the use of the Internet.

Although the distribution mirrors the location of major world cities, the size of London, at 125,139 domains—more than 3 times as large as the next city—is particularly remarkable. The next largest cities are Toronto (35,086), Tokyo (34,135), Vancouver (31,513), Paris (31,469), Seoul (28,645), Copenhagen (22,862), Hong Kong (22,610), Berlin (22,277), and Munich (21,130).[13] Given the leading U.S. role in the development of the Internet, it comes as no surprise that the Los Angeles metropolitan statistical area (MSA), with 197,015 domains, and the New York MSA, with 144,200 domains, are the largest concentrations of domains in the world. In fact, with the exceptions of London (4th) and Toronto (24th), the top 25 cities in the world in terms of total domain names are in the United States.

Because as a whole Europe has the largest concentration of domains (27%) next to North America (59.5%), it is useful to examine in closer detail the distribution of domains in the cities of Europe. As illustrated by Figure 2, most major Western European cities are sites of significant domain-name concentrations, whereas eastern and southeastern Europe, with the exception of Istanbul, are mainly devoid of large numbers of domains. This map also illustrates the differing dominance of the principal cities of these countries, with London again

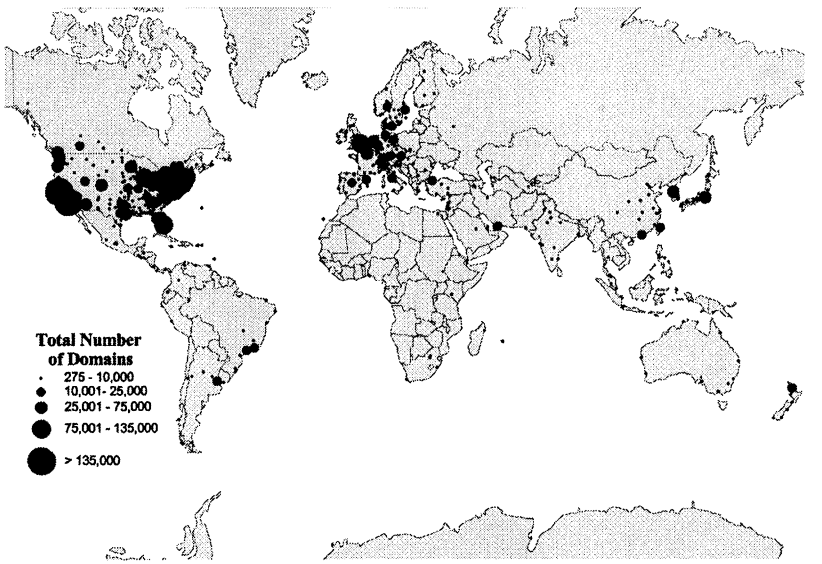

Figure 1: Map, Total Number of CONE (.com, .org, .net, .edu) and CC (country code) Domains by City, Worldwide, for January 1999

topping the list with more than 29% of Britain's domains, compared with 26.5% of France's domains in Paris, 25% of Denmark's in Copenhagen, and 14.5% of the Netherlands' in Amsterdam. Germany displays the most decentralized system of domains in Europe with Berlin, Munich, and Hamburg containing only 5.9%, 5.6%, and 4.9% of Germany's domains, respectively. Interestingly, this pattern mirrors the findings of urban economists in studies examining the variation of urban primacy between countries. Urban primacy is a measure of a country's largest city and reflects the extent to which the principal city dominates a country's urban system. In a cross-national study of 43 countries, Rosen and Resnick (1980) found that the United Kingdom, France, and Denmark had the highest primacy measures in Western Europe, whereas the Netherlands and Germany ranked the lowest. This suggests that at least at this stage, the distribution of Internet content production within European countries is following a similar pattern to established urban hierarchies.

However, the distribution of domain names cannot simply be described in terms of total numbers of domains because in many ways, this is simply a reflection of size. As Figure 3 shows, a different story emerges when the number of domain names is adjusted for population. London remains highly specialized in domain names, with 8.6 per 1,000 people, but other cities such as Zurich (26.8),

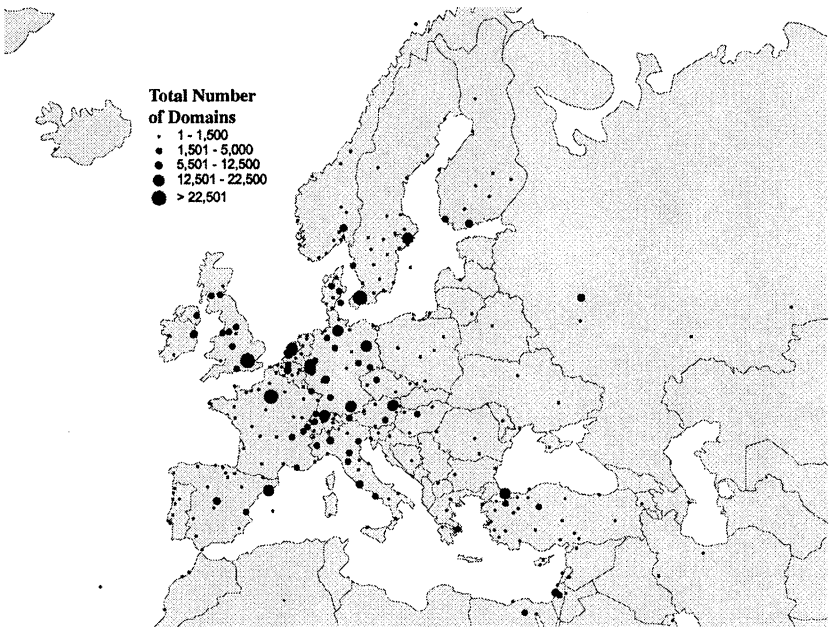

Figure 2: Map, Total Number of CONE (.com, .org, .net, .edu) and CC (country code) Domains by City, Europe, January 1999

Oslo (16.8), and Copenhagen (13.5) have risen to the top of Europe's urban system. Although explaining the exact reasons for the high density of domain names in these cities is beyond the scope of this article, it is interesting to note that many of the CONE domains registered in Zurich are banks and corporations, reflecting the city's role as an international financial center. This variance in per-capita measures is well reflected in the cities with the largest concentrations of domain names, such as Tokyo (1.3), Toronto (7.9), Seoul (1.6), Paris (2.5), Vancouver (17.6), Berlin (4.1), Hong Kong (3.6), and Munich (10.8).[14] It is particularly interesting to observe the clusters of high per-capita cities in certain countries, such as the Netherlands, Switzerland, and the Nordic countries.

Again, it is important to compare these global per-capita measures to U.S. cities. Both Los Angeles, with 21.7 domains per 1,000, and New York, with 16.8 domains per 1,000, are significantly higher than most non-U.S. cities. Moreover, no major cities outside the United States match the high levels found in what still very much remains the heart of Internet content production, Silicon Valley. The three major cities in this region, San Francisco, San Jose, and Oakland, contain 43.0, 32.1, and 19.1 domains per 1,000 population, respectively.

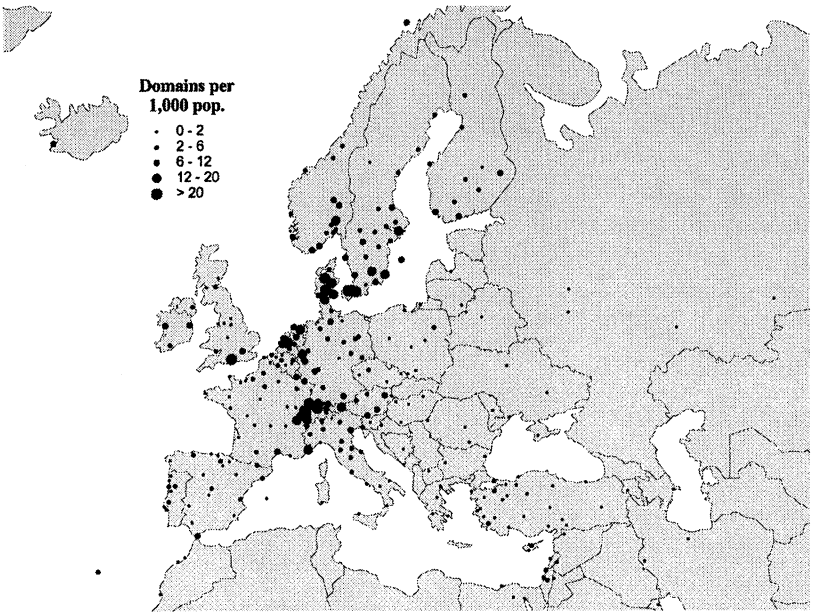

Figure 3: Map, Number of CONE (.com, .org, .net, .edu) and CC (country code) Domains per 1,000 Population by City, Europe, for January 1999

ANALYSIS OF SUPPLY AND DEMAND OF INTERNET INFORMATION GLOBALLY

Thus far, this article has concentrated solely on the supply side of Internet content production, using domain names as an indicator. However, this is but one side of the equation. Equally important is the demand and consumption of this information, which is generated any time someone visits a Web page, downloads a digitized piece of music, or places a purchase at an e-commerce site.[15] It is quite evident that the number of Internet users is growing very quickly, and NUA (1999) estimates that in June 1999, there were close to 179 million people online worldwide.

Estimates at the country level or lower are more difficult to obtain, but using NUA's (1999) compilation of Internet user surveys from around the globe, it is possible to assemble rough estimates of the number of Internet users for 59 countries. Not surprisingly, the United States leads the world with 95.8 million users, followed by Japan with 14 million, the United Kingdom with 10.6 million, Germany with 8.4 million, and Canada with 7.6 million. Although the United States still accounts for 53.5% of Internet users worldwide, this share has

shrunk from the 61% figure cited by eStats (1998) for mid-1998. Because each of these surveys was conducted under a different methodology and at different times (although two thirds were conducted within 4 months of January 1999), it is important not to compare them too closely. Unfortunately, no other source for statistics with comparative global coverage or at a more disaggregated level is available.

These data are useful in examining the dynamics of the creation and consumption of Internet information to compare how countries differ in their production and use of Internet content. For example, do countries have strong domestic Internet content-production capabilities, or is there a lack of indigenous sites, suggesting that users are more likely to go outside their borders for content? Given the nongeographical structure of the Internet, this question is in some ways spurious, but it is asked with the intention of uncovering whether a country is a net importer or exporter of Internet content. A relatively low number of sites within a country's network may be an indication that its users rely more on outside sources of content, and the consumption of content produced within a country by foreign users will be correspondingly lower. Likewise, a large number of domains within a country would indicate a good supply of Internet content available to the global marketplace.

The first step in comparing the number of domains and users across countries is developing a method to standardize the data. The technique advanced in this article is called an Internet Consumption Quotient (ICQ) and provides a standardized measure of the relationship between the supply (number of domains) and demand (number of users) of Internet information in a country. The formula for this measure is as follows:

$$\text{Internet Consumption Quotient} = \frac{\text{Number of domains in a country / Number of Internet users in a country}}{\text{Number of domains in the world / Number of Internet users worldwide}}.$$

Because a useful aspect of this analysis is comparing the variation between a country's domestic and global Internet presence, ICQs were calculated using two different aggregations of domains. The domestic ICQ was calculated using just country code (CC) domains,[16] based on the argument raised earlier that CC domains are likely to be more domestically oriented, that is, using a country's local language rather than English, geared toward a local rather than global audience, and so on. The global ICQ relied on the total number of domains, CONE and CC, in each country rather than just CONE domains because countries with large ratios of CC to CONE domains would otherwise be represented as not having a strong global presence even though Web pages associated with any kind of domain name are accessible worldwide. An ICQ of greater than 1.0 indicates a strong presence in either the domestic or global space. These two ICQs allow the construction of a 2 by 2 matrix in which countries can be placed

according to whether they have a strong or weak presence in Internet content domestically and globally.

Although it is important to remember that the data used in Figure 4 are too rough for making definitive conclusions, the figure does provide an initial division of countries into useful ideal types. Many countries are close to straddling the divide between classifications, but there are enough commonalities among countries that some generalizations can be made. The first category, dubbed Content Consumers, contains countries that have domestic and global ICQs that are both below 1.0. This suggests that these countries are primarily importers of Internet content from the rest of the world and lack a well-developed indigenous system for producing Internet content. This group is largely composed of Eastern European and developing countries but also includes a few unexpected countries, namely Spain, Singapore, and Japan. Although Spain's classification can perhaps be explained by its lower GNP vis-à-vis most of the rest of the European Union, the two others at first appear to have been misclassified. After all, Singapore is often cited for its high density of Internet use, and Japan contains the second-largest population of Internet users in the world. Although it is beyond the scope of this article to prove the accuracy of Japan's classification as a Content Consumer, a recent survey by StatMarket (1999) confirms that Japan is the number one source of non-U.S. Internet use, accounting for 26% of the traffic that originates outside of the United States, which is higher than its share (7.8%) of global Internet users. This suggests that despite language barriers, Japanese are not finding enough quality content within their borders and are consuming content from abroad. This supports Tetsuo's contention that Japan's industrial structure and tradition are slowing the adoption of the Internet by businesses and other institutions (cited in Rimmer & Morris-Suzuki, 1999). However, as Aoyama (2000) argued, any country's adaptation to the Internet and e-commerce is founded on its existing economic institutions and social conditions, and therefore, the emerging pattern of use can look very different than the U.S. model.

The next category, called Internet Islands, comprises countries that have domestic ICQs greater than 1.0 but global ICQs that are less than 1. In other words, countries that appear to have adequate domestic Internet content production for the demands of their users but are net Internet content importers in the global market. This category is largely composed of countries that are more isolated from the emerging cores of the Internet, be it geographically (Australia and Israel), politically (Russia and China), or sociohistorically (Nordic countries). Finland is a good example of this category because although it has enacted a strong public program to create an "Informational Society" domestically, it appears that it has been more difficult to convert this to a global presence than was the case with the U.S. experience, perhaps because of the lower level of demand for Finnish language content outside of Finland.

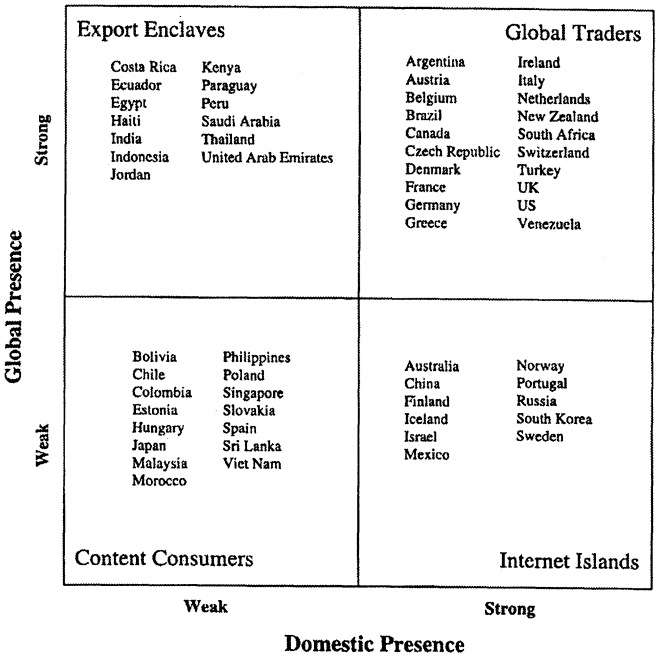

Figure 4: Typology of Countries Based on the Specialization Within Its Country Code and Its Specialization Within All Domains

The third classification of countries is labeled Export Enclaves and consists of countries that appear to be net exporters of Internet content but do not have a well-developed indigenous Internet content-production systems. These nations appear to be more geared toward providing content to the rest of the world than promoting the domestic consumption of content. Although it is impossible to say with certainty what content is available from these countries, some broad categories emerge. Saudi Arabia, the United Arab Emirates, and Indonesia are all major exporters of oil, and Thailand and Costa Rica are important tourist destinations. Both these industries are tightly linked to global markets and have clear needs to provide information to people outside of the country. However, perhaps the most interesting case within the Export Enclave category is India because of its role as an emerging center for software and Internet development. Parthasarathy (1999) argued that the development of the Indian software industry is primarily geared toward coding software on a contract basis for external markets because of a low level of domestic demand for its products. It is therefore not surprising that the structure of its Internet content-production system would appear to be more externally focused.

The final category, dubbed Global Traders, includes countries that have a well-developed indigenous system of content production but are also net exporters of content to the rest of the world. It comes as no surprise that this classification is largely composed of North American and Western European countries, which account for close to 90% of the domain names in the world but only 66% of Internet users. However, it is interesting to note that several Latin American countries—Argentina, Brazil, and Venezuela—are also included. This suggests that despite the relatively low level of Internet users in these countries (less than 0.5% for Argentina and Brazil), these countries are entering into the realm of Internet content production with a well-balanced demand for domestic and global information.

Although the categories presented here are idealized types and the exact placement of countries within them is debatable, this overview is an important theoretical exercise about the dynamics of Internet content production and consumption in the world. It is tempting to conclude that the most advanced countries in Internet content production, the Global Traders, are simply a reflection of major world economies, but there are enough exceptions, such as Japan and Brazil, to suggest that there is not a straightforward correlation between GNP per capita and Internet content production. Moreover, the experience of Scandinavian countries illustrates that having a strong domestic Internet-content system does not guarantee a strong presence in the global system. What is clear is that this is just a snapshot of the current system, and it is highly likely that countries will shift their positions. However, whether this will include India entering the category of a Global Trader or Russia becoming a Content Consumer will be largely determined by microlevel changes within each country and reported in future research.

CONCLUSION—OLD HIERARCHIES OR NEW NETWORKS?

Although this article has outlined the distribution and dynamics of Internet content production and consumption globally, the conclusions that one should draw are not entirely certain. It is clear that the dominance of the United States remains strong, although the Internet is diffusing to other parts of the world. Future research, using time series data on domains per country and city, will be able to provide a further elaboration of the causes behind the Internet's growth and diffusion. Although the Internet's dispersal allows for greater access to the content put forth by anyone, recent research by Adamic and Huberman (1999) suggests that, rather than leveling the playing field for many content sites, the Internet tends toward reinforcing and increasing the gains of leading information creators and providers. Although their findings are preliminary, they do point to the importance of first-mover advantage that encompasses much of

Internet content production. And as the OECD (1997b) reported, much of this content (94 of the top 100 Web sites worldwide) is based in the United States.

It is also evident that the existing urban hierarchy, centered in what Sassen (1991) called global cities such as New York, London, and Tokyo, is playing an important role in Internet content production. At the same time, other cities—San Francisco, San Diego, and Austin in the United States, Zurich, Vancouver, and Oslo globally—are emerging as dense concentrations of Internet content. All this clearly argues against the often cited idea exemplified by Gilder's (1995) contention that "big cities are leftover baggage from the industrial era" (p. 57). This article has shown that cities, far from being redundant, are important sources of Internet content.[17]

However, it is important to acknowledge that although the actual production of Internet content depends on certain cities, the content is also connected to a global informational network. As Castells (1999) argued,

> Since the Internet processes information, Internet hubs are located in the main information systems which are the basis of the economy and institutions of metropolitan regions. However, this does not mean that Internet is a metropolitan phenomenon. Instead, it is a network of metropolitan nodes. There is no centrality, but nodality, based on a networking geometry. (p. 7)

Although the exact configuration of this network remains to be seen, and many countries and cities are just entering the Internet content space, this article demonstrates the highly urban basis of this network and casts some doubts on the decentralized nature of the Internet.

NOTES

1. Although there are technical differences between the terms *Internet* and *World Wide Web*, this article uses the terms interchangeably for stylistic reasons. This article defines the Internet/World Wide Web as the public network of networks using the TCP/IP/HTTP protocols.

2. This article defines *Internet content* as information that has been systematically created, organized, and disseminated via the Internet. Much of this content was originally provided free of charge by governments, universities, and users; increasingly although not entirely, it is becoming oriented toward more commercial uses, that is fee for service or e-commerce.

3. The leading source of data on Internet hosts, Network Wizards, has conducted a complete survey of every host in the Internet domain-name system every 6 months since 1991. Recently, the Network Wizards survey has been sponsored by the Internet Software Consortium. See http://www.isc.org/dsview.cgi?domainsurvey/index.html for more information. The European Internet Registry, RIPE Network Coordination Centre, provides monthly host-count figures for European country codes. See ftp://ftp.ripe.net/ripe/hostcount/History/ for more information.

4. It should be noted that list-servers, e-mail programs designed to distribute messages or newsletters to large groups of people, and Usenet newsgroups are important exceptions that are more akin to this article's definition of Internet content production. See Smith (1999) for his analysis of how these Usenet communities operate. However, because no good geographic measure of these is readily available, they have been excluded from this analysis.

5. This analysis was conducted using domain names from a July 1998 survey.

6. See Organization for Economic Cooperation and Development (1997a) for an overview of domain name allocation policies for various country codes.

7. Reasons for registering under a CONE (.com, .org, .net, .edu) domain rather than a country code top-level domain (CC TLD) include (a) the greater efficiency with which CONE registrations are processed, (b) lower cost for a CONE domain, (c) restrictions by CC domains on the registration of domains by individuals or the multiple registration of domains, and (d) the development of the .com domain into the de facto standard for the World Wide Web (OECD, 1998). Cooper, Dimitrov, and Rau (1999) even documented that the addition of a .com to company names results in positive and lasting increases in the company's valuation.

8. Thanks to Martin Dodge for this insightful observation.

9. Other nongeographic TLDs include Tonga's (.to) used to make memorable URLs such as www.go.to, Turkmenistan (.tm) used for trademarking, the Democratic Republic of the Congo (.cd) used for promoting music, and Niue (.nu).

10. The sources for this CC domain name data were the statistics posted at each country's domain name registry, for example, http://www.nic.uk/domains/index.html. For a complete listing of all country registries around the world, please see Allwhois (http://www.allwhois.com) or the ITU's (http://www.itu.int/net/cctlds/) listings. In addition, Netnames (http://www.netnames.com) regularly posts figures for the number of domains in selected country codes.

11. Rather than being a complete data set of CONE domains, the January 1999 survey was a 2.85% randomly selected sample of all CONE domains in existence. The confidence interval for the CONE domain figures is 0.29%. Updates to this data can be found at http://www.zooknic.com/.

12. For an analysis of intercountry differences in CONE TLD versus CC TLD registrations, see OECD (1998).

13. It is highly likely that the large number of domains for Vancouver is not entirely representative. This is because Vancouver is the location of a company called MailBank, which is attempting to create a business based on renting domain names based on last names, for example, zook.com. The company claims to have more than 12,000 domains from which to choose. See http://www.mailbank.com/. Adjusting for MailBank results in a lower although still respectable count of 19,512 domains.

14. Again, it is likely that this measure is inflated. The adjusted figure for Vancouver would be 10.9 domains per 1,000 population.

15. Although Internet host counts could be and have been used as an indicator of demand, actual counts of users, despite their methodological shortcomings, are a better measure of demand.

16. The .com domain was used for the domestic Internet Consumption Quotient for the United States because it is a better indicator of Internet use than the .us TLD.

17. Although this analysis was only able to place about 60% of CONE domains in cities globally, this is enough to validate the urban nature of Internet content production. Moreover, other analyses for the United States (Zook, 1999) and the United Kingdom that used more complete databases of metropolitan areas confirm the importance of cities.

REFERENCES

Adamic, L. A., & Huberman, B. A. (1999, May). *The nature of markets in the World Wide Web.* Paper presented at the Computing in Economics and Finance Conference, Chestnut Hill, MA. Available: ftp://parcftp.xerox.com/pub/dynamics/webmarkets.ps.gz

Aoyama, Y. (2000). The information society, Japanese style: Corner stores as hubs for E-commerce access. In S. Brunn & T. Leinbach (Eds.), *The wired worlds of E-commerce.* New York: John Wiley.

Beyers, W., & Alvine, M. (1985). Export services in postindustrial society. *Papers of the Regional Science Association, 57*, 33-45.

Castells, M. (1997). *The information age: Vol. 2. The power of identity.* Oxford, UK: Blackwell.

Castells, M. (1999, June 14-18). *The culture of cities in the information age.* Paper presented to the conference, Frontiers of the Mind in the Twenty-First Century, Library of Congress, Washington, DC.

Cooper, M., Dimitrov, O., & Rau, P. R. (1999). *A rose.com by any other name.* Unpublished manuscript, Purdue University, Department of Finance, West Lafayette, IN.

Cukier, K. N. (1999, June 22-25). *Bandwidth colonialism? The implications of Internet infrastructure on international e-commerce.* Paper presented at the INET'99 Conference, San Jose, CA.

eStats. (1998). *Net geography: Overview & projections* [Online]. Available: http://www.emarketer.com/estats/geo_over.html

Gilder, G. (1995, February 27). City vs. country [Interview]. *Forbes ASAP, 155*(5), 56-61.

Hargittai, E. (1999). Weaving the Western Web: Explaining differences in Internet connectivity among OECD countries. *Telecommunications Policy, 23*(10/11), 701-718.

Internet Software Consortium. (1999). *Internet domain survey FAQ* [Online]. Available: http://www.isc.org/dsview.cgi?domainsurvey/faq.html

Kolko, J. (1999, November 22-24). *The death of cities? The death of distance? Evidence from the geography of commercial Internet usage.* Paper presented at the Cities in the Global Information Society: An International Perspective, Newcastle upon Tyne, UK.

Krugman, P. (1994). *Peddling prosperity.* New York and London: Norton.

Moss, M., & Towsend, A. (1997). Tracking the Net: Using domain names to measure the growth of the Internet in U.S. cities. *Journal of Urban Technology, 4*(3), 47-60.

North, D. (1975). Location theory and regional economic growth. In J. Friedmann & W. Alonso (Eds.), *Regional policy: Readings in theory and applications.* Cambridge, MA: MIT Press.

NUA. (1999). *NUA Internet—How many online* [Online]. Available: http://www.nua.ie/surveys/how_many_online/index.html

Organization for Economic Cooperation and Development. (1997a). *Internet domain names: Allocation policies* (OCDE/GD[97]207). Paris: Author.

Organization for Economic Cooperation and Development. (1997b). *Webcasting and convergence: Policy implications* (OCDE/GD[97]221). Paris: Author.

Organization for Economic Cooperation and Development. (1998). *Internet traffic exchange: Developments and policy* (DSTI/ICCP/TISP(98)1/ FINAL). Paris: Author.

Parthasarathy, B. (1999). *Globalization and agglomeration in newly industrializing countries: The state and the information technology industry in Bangalore, India.* Unpublished doctoral dissertation, University of California, Berkeley.

Quarterman, J. (1997, January). Is ".com" primarily U.S. or international? *Matrix News, 7*, 8-10.

Raskin, A. (1998). Buy this domain. *Wired, 6*(9), 106-110.

Rimmer, P. J., & Morris-Suzuki, T. (1999). The Japanese Internet: Visionaries and virtual democracy. *Environment and Planning A, 31*(7), 1189-1206.

Rosen, K., & Resnick, M. (1980). The size distribution of cities: An examination of the pareto law and primacy. *Journal of Urban Economics, 8*(2), 165-186.

Sassen, S. (1991). *The global city: New York, London, Tokyo.* Princeton, NJ: Princeton University Press.

Smith, M. (1999). Invisible crowds in cyberspace: Measuring and mapping the USENET. In M. Smith & P. Kollock (Eds.), *Communities in cyberspace.* London: Routledge.

StatMarket. (1999, July 7). *StatMarket - globalization* [Online]. Available: http://www.statmarket.com/SM?c=Visitor_Countries

United Nations Development Program. (1999). *Human development report, 1999* [Online]. Available: http://www.undp.org/hdro/report.html

Zook, M. A. (2000). The web of production: The economic geography of commercial Internet content production in the United States. *Environment and Planning A, 32*(3), 411-426.