Chapter Five

Statistical Mapping of Internet Globalisation

> Jobs, knowledge use and economic growth will gravitate to those societies that are the most connected, with the most networks and the broadest amount of bandwidth.
>
> -- Thomas L. Friedman, *The Lexus and the Olive Tree*, 1999.

> Almost the whole world, it seems from a casual inspection of this map, has turned Internet-coloured. The sun never sets on the Internet; it appears to reach everywhere except some war-torn corners of the world.
>
> -- Mike Holderness, *Who are the World's Information Poor?*, 1998.

5.1 Introduction

In this chapter I consider maps that provide a synoptic picture of the evolving geographical structure of the Internet at the global scale using various kinds of area-based statistical map designs. The analysis focuses, in part, on the recent history of the Internet in the 1990s as the period of mainstream 'take-off' of the Internet in most developed nations and subsequent widespread diffusion of network connectivity across the world. I consider the ways these differently designed maps serve politically to produce particular imaginative geography of the Internet, either masking or exposing the extent of 'digital divides' across the world. These maps are valuable as they highlight the multiple ways that a statistical understanding of social phenomena can be represented, particularly when seen in contrasting cartographic designs deployed (choropleth, cartogram, dasymetric, stepped surface and diagram mapping techniques).

The chapter begins with an outline discussion of the discourses of development and digital divides that underpin the use of statistical maps of Internet globalisation, and then sets out a fourfold conceptual model of connotative meanings based dimensions of difference and complexity that is used to inform the empirical analysis. This is followed by a brief contextual history of the emergence of statistical mapping as a politically powerful representation before moving onto an interpretation of a range of empirical material.

5.2 Connecting the world: Tales of Internet diffusion and digital divides

The Internet grew tremendously during the 1990s. One of the most impressive elements in this growth was the speed by which countries across the world became connected (Figure 5.1). The first half of the 1990s, in particular, can be conceptualised as the 'globalisation' of the Internet, starting from a U.S core, spreading throughout the reminder of the developed world and then linking to poorer, peripheral nations, so that by the end of decade most countries had at least some form of connection to Internet. The rapid globalisation of the Internet was facilitated by a number of technological developments, as well as wider political and economic factors which benefited new forms of low-cost international computer networking.

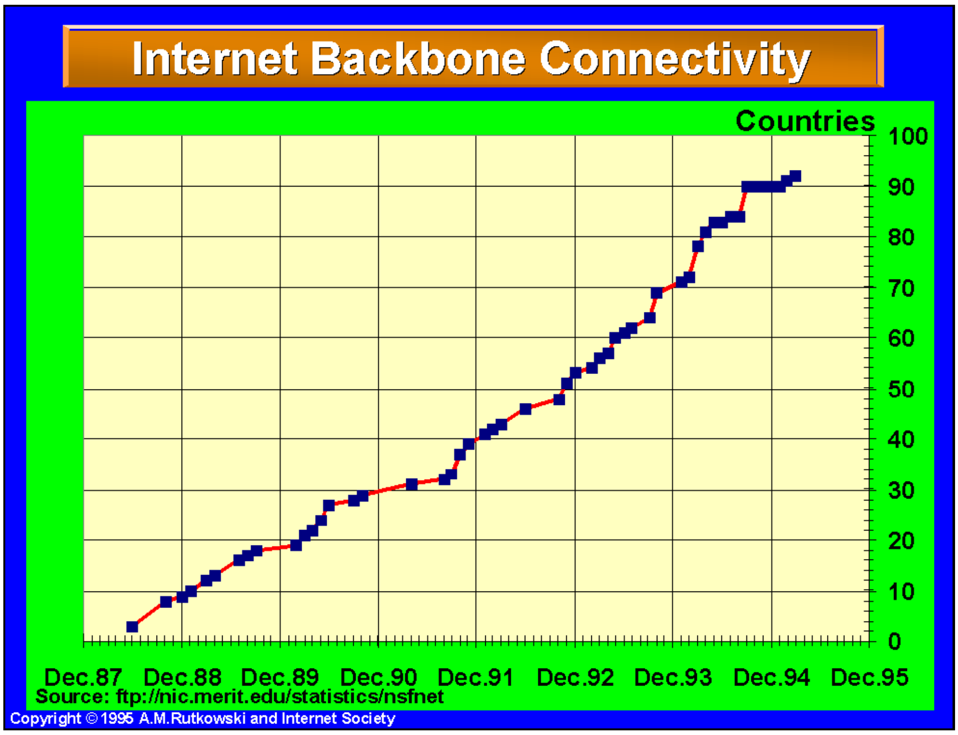

Figure 5.1: A typical growth chart demonstrating the rapid pace of Internet expansion from the late 1980s through the first half of the 1990s as measured by the number of countries connected. The de facto meaning of 'Internet backbone connectivity' during this period was a direct link to the U.S. to reach the National Science Foundation network. (Source: Rutkowski 1995.)

The most significant technological factor was developments in long-haul fibre-optic transmission systems, particularly undersea cables linking continents, made in the 1980s. This led to an order of magnitude growth in available bandwidth[1] and concomitant decline in circuit costs in the 1990s. (See also chapter six for more discussion of the boom in fibre-optic infrastructures in relation to network marketing maps.) The majority of investment in new undersea cable systems, however, was on a select few routes linking together already well-connected industrialised regions and major cities (Graham 1999), beneficially reinforcing existing transportation routes (Arnum and Conti 1998)[2].

Demand for this new bandwidth was driven by exponential growth in Internet traffic in the early 1990s resulting from many new users, new interfaces to navigate online information spaces and wholly new applications (see analysis by Coffman and Odlyzko 2000). Web traffic growth in the early 1990s exploded, growing at several thousand percent per year and quickly outstripping all other Internet applications (Odlyzko 2000). By helping to make it a mass medium, the Web was also a critical element in the commercialisation of the Internet. Netscape's Navigator browser was commercially released in 1994 and the company's IPO the following year is now commonly regarded as marking the starting point for the 'dotcom' boom that propelled the Internet into the public consciousness as one of the defining technologies at the *fin de siecle*.

The underlying economics and governance structures of the Internet also evolved significantly in the early 1990s to facilitate the global spread of the network. At the end of the 1980s the Internet largely retained its 'research & education' ethos, being run in a co-operative, not-for-profit way based on informal consensus

[1] This growth was reified by technology commentator George Gilder in his 'law of telecosm', which states: "The world's total supply of bandwidth will double roughly every four months - or more than four times faster than the rate of advances in computer horsepower [Moore's law]." (Rivlin 2002, no pagination). See also 'Metcalfe's law' on connectivity states that the value of a telecommunications network is proportional to the square of the number of users on the network (cf. Odlyzko and Tilly 2005 for discussion of the validity of such 'laws of networking').

[2] The current geographical pattern of submarine cables is mapped in Figure 4.1, chapter four.

reached by a small cabal of 'techies'. It was dominated by the quasi-academic[3] U.S. National Science Foundation Network (NSFNET), which was the largest and fastest network and thus formed the effective central 'backbone' of the Internet during the late 1980s and early 1990s. The 1990s saw the transition of the Internet core in the U.S. from a public to a fully privately managed and financed infrastructure. In 1991 commercial traffic was allowed and soon the major proprietary online services - including AOL, CompuServe and Delphi - provided gateways to the Internet to allow exchange of email. An increasing number of commercial ISPs emerged, creating an affordable dial-up Internet access market for domestic users in several developed countries. In 1995 the Internet backbone itself was 'privatised', as NSFNET was decommissioned. One noteworthy symptom of commercialisation and changing management of the Internet was a transformation in online culture, to the chagrin of many long-time users[4].

Beyond the network, so to speak, the world-wide spread of the Internet was facilitated by significant broader geopolitical changes at the start of the 1990s, announced by the fall of the Berlin Wall and the collapse of the Soviet Union. Many states, particularly in Eastern Europe, became more open to external trade, economic investment and media flows, often accompanied by marketisation of industries. The liberalisation of telecommunications monopolies in many developed countries also opened up 'market space' for new businesses to start providing commercial Internet access services. In complex ways, then, the spread of the Internet was greatly *aided* by the wider globalisation 'project' that many see as characterising the 1990s (Dicken 2003). Yet at the same time the Internet was itself playing a key part *enabling* this economic and political globalisation - for example, by easing data flows, flattening hierarchies of communication and,

[3] It was government-funded but run by private corporations under an agreement with the National Science Foundation. It had an operational charter forbidding transmission of commercial traffic for the first five years of its operation.

[4] Feelings about this time are nicely summarised by Guédon's (2002, no pagination) reminiscence: "I remember the dismay of old-time users like myself when the AOL crowd showed up, with no manners, no understanding of the community spirit that had developed quietly in the 80s, no comprehension of the sharing and give-and-take quasi-utopia that had grown somewhat confidentially in their midst."

above all, lowering transaction costs (Cairncross 1997).

Unsurprisingly, interpreting the nature of the Internet's global growth has been the subject of intense and competing analysis through the 1990s, focused in particular on the implications for economic and social development likely to flow from connectivity (cf. Castells 2001; Drori and Jang 2003; Main 2001; Shade 2003; Warf 2001). In binary terms, the debate around the meaning of Internet globalisation can be conflated into two viewpoints: what I label here 'diffusion' and 'division' perspectives[5]. The first discourse sees the world as a relatively orderly matrix of countries, which are broadly *converging* as ICTs, having a beneficial impact (bringing about enhanced knowledge and greater opportunity). In contrast the alternate 'divistionist' perspective conceptualises the world as a more fragmented set of places and social groups, with disorderly processes of change (not solely growth) resulting increasing *divergence* as ICTs have impacts that are often detrimental (bringing about more unequal access and greater scope for exploitation).

The broad 'diffusionist' coalition of scholars, activists, technology commentators and network builders who view the Internet as essentially a progressive tool for social empowerment and development. For example, the then U.S. Vice President, Al Gore (1994) in a utopian call to create a global information infrastructure, asserted: "I see an new Athenian Age of democracy forged in the fora the GII [Global Information Infrastructure] will create." (See chapter four for further discussion of Gore's role in promoting the 'information superhighway'.) Network connectivity in the 1990s was seen as a potent tool to diminish of economic difference between regions of the world. The rapid diffusion of access, particularly of personal email communication, would connect people in the less developed regions directly into the core, and the mutual flows of information, ideas and knowledge engendered would be beneficial to all, fundamentally overturning power differentials. Ultimately development, driven through Internet

[5] Obviously, this characterisation is a simplification for purposes of the current discussion, but it resonates with many other debates about the 'impact' of ICTs which tend to split along broadly utopian or dystopian lines (cf. Graham 1998).

access and ICTs, brings about social and economic convergence at different scales.

The alternative, 'divisionist' discourses, focused on the hegemonic power of technologies, are deeply sceptical of the progressive potential of networking and typically viewed the Internet as simply adding another layer of inequality between nations (cf. Jordan 1999; Main 2001). Far from being economically empowering, the Internet and ICTs are active in *widening* divisions, enabling the developed regions to exploit the less developed more effectively. In the future, the Internet promises, so the argument goes, "the distinction between developed and non-developed countries will be joined by distinctions between fast countries and slow countries, networked nations and isolated ones" (Baranshamaje *et al.* 1995, quoted in Holderness 1998, 37). The winners of world-wide Internet growth - much like other dimensions of globalisation in the 1990s - would be those select few switching points able to direct the flows and extract surplus value. Besides economics, the potential of Internet to level social differentials in power was also questioned: "Despite the assertions of the people at Wired[6] and other end-of-politics theorists, class stratification and oppression have not been eliminated by computers or any other technology" (Surman 1995, no pagination). In this way development that is delivered through infrastructural intervention, such as building Internet access and giving ICT equipment actually brings about social and economic divergence at different scales.

Fundamentally then, the 'diffusionists' and 'divisionists' positions disagree on the extent to which the Internet as agent of social and economic development can make the world a 'better' place. Assessment of the undoubted unevenness of Internet penetration is a key element for both sides, with concerns being most publicly articulated in 'digital divides' discourses. The digital divide emerged as a distinct 'problem' for academic analysis and political action in the late-1990s with major international summits held and the formation of high-profile taskforces to measure the scale of inequality and develop acceptable policy solution (such as

[6] This alluded to the utopian rhetoric espoused by writers in Wired magazine, which was in the 1990s an influential voice in Internet discourses in the U.S. (Jordan 1999).

the G8 Dot.Force[7]). At the global scale, the African continent is often highlighted as needing special attention; for example, a *New York Times* article from this period stated: "From the White House and the World Bank to international business and academic circles, analysts warn that unless Africa gets online quickly, what is already the poorest continent risks greater marginalization" (French 1995, 5). For the advocates of the 'diffusionist' position, the evidence of digital divides was useful for highlighting where extra effort was needed and, anyway, these differentials in access were just a temporary 'blip' that could be relatively quickly ironed out (usually through delivery of better infrastructure to the most disconnected places). The same kind of evidence was used in a more incriminating fashion in 'divisionist' discourses to puncture the utopian hype of the 'diffusionists' and point up the absurdities of the 'global information society' rhetoric when large parts of the world still lack basic infrastructure, including reliable electrical supply to power computers.

Both sides seek to create particular imaginary geographies of the worldwide spread of the Internet to suit their agendas, deploying potent metaphors and tables of statistical data, along with specific case studies of successes in 'wiring' up places or personal stories of continued exclusion from the information age. In terms of spatial metaphors deployed, the most prevalent ones seen in the mid-1990s drew a direct analogy between computer networks and road networks, with the 'diffusionists' proclaiming the Internet as the coming 'information super highway'. This was pointedly countered by the 'divisionists' camp who said it was clear that most of the world would be left to struggle along 'digital dirt tracks' (see discussion in chapter four). Certain kinds of representations of the nature of Internet globalisation are also prevalent and rhetorically significant in the competing truth claims of these discourses, as actors seek to garner support to their point of view through the authority incumbent in certain types of images, particularly the scientific legitimacy connoted by statistical charts and thematic maps. Many official reports, activist documents and scholarly articles tactically

[7] The Digital Opportunities Task force was instigated by the G8 heads of state at a meeting in Okinawa, Japan in July 2000, <www.markle.org/dotforce.html>. It has been criticised for its 'top-down' model of development driven by technology which favours the interests of corporate capital above the needs of citizens (Shade 2003).

deploy bar charts and scattergrams demonstrating obvious statistical trends to aid their case by making complex sets of social phenomena into visible and unified objects of analysis. As Buck-Morss (1994, 440) says in her work on how graphic representations helped to make the 'economy' into an object of analysis early in the twentieth century: "the map shifts the point of view so that viewers can see the whole as if from the outside, in a way that allows them, from a specific position inside, to find their bearings." The potency of scientific looking charts is evident, for example, in latest ITU-published 'information society' report (WISR 2007), a lengthy and well produced policy document, has 40 different statistical charts and diagrams in its 147 pages to assist in picturing what actually constitutes the 'information society' as if viewed from an outside 'objective' position but clearly created from a position inside the discourse.

Given the worldwide scope and inherently geographical nature of the patterns to Internet globalisation it is not surprising the valuable role world maps play in these discourses, as different kinds of statistical mapping are deployed to show the extent to which countries are diverging or converging. The map serves to make the abstract statistical measurement into a visual pattern that is tangible and perhaps more real and *believable* than a large table of numbers or scatter chart of indistinguishable dots. The map can show the statistics in relation to powerful geographical template of continents and the mosaic of nations that is thoroughly engrained into people as the proper mental model of the world.

To make sense of the range of statistical mapping deployed by different institutions to represent the processes of Internet globalisation, a categorisation was developed based on two 'worldviews', conceptualised as two linear dimensions of 'difference' and 'complexity'. The 'difference' dimension is the extent of areal uniformity evident (at both the global and continental scale) and varies by the how the statistical patterns are denoted in the map, which in turn create connotative meanings for readers along a spectrum from universal homogeneity to abrupt and widespread inequalities between nations. The 'complexity' dimension is the degree of entropy evident (at various scales from local to global) which depends on how statistical patterns are denoted in the map by the cartographer and how the explicit representation are interpreted connotatively by readers along a spectrum from simplicity and harmony to wholly discordant and unmanageable variance between national performance. Using a pair of axes, these two dimensions of 'difference' and 'complexity' create four separate quadrants or categories of mapping semiotics (Figure 5.2). Each quadrant represents one kind of map worldview, definable approximately by the strength of its difference and complexity characteristics. The positioning of a map into a particular quadrant depends on the connotative meanings, which in turn depend, in part, on the overt graphic design choices and cartographic symbology employed, as well as the epistemological element in the data classification and normalisation and the units of measurement. Also, less obviously connotations vary depending on the underlying ontological schema of what aspect of Internet globalisation is deemed to be measurable and worthy of representation.

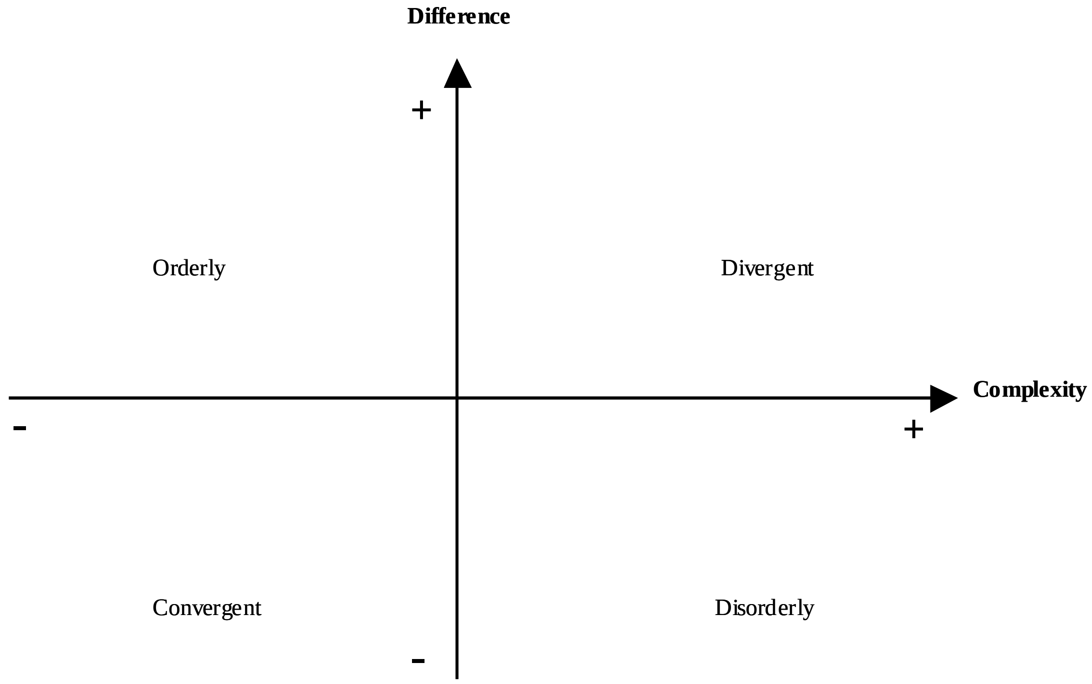

Figure 5.2: A fourfold grid of connotative meanings to categorise maps of Internet globalisation.

The four quadrants of map worldviews are defined as follows:

- **Orderly:** Maps which fall into this category are typified by the visual arrangement of data in a conceptually simple, systematic and logical fashion. The overall design aims to be a 'neat and tidy' display of the data to suggest a world in harmony. Even though nations are likely to be differentiated from each other they are presented in strongly regularised array, ranking or hierarchy that designates a clear order from worse to best. An orderly denotative form also has particular connotations about the underlying organisation of the world in terms of obedience to hierarchy (i.e., 'respectful to those who are better'), accepting the 'natural' order and the inevitability of continual difference in the world. Thus for many a statistical world mapped in an *orderly* manner implies a positive view of the world that is secure and not likely to change radically.

- **Divergent:** This group of maps is characterised by denotation of large differences between nations along with high complexity in the display of variation often at manifold scales. This is a statistical map without a harmonious pattern, exhibiting disunity with many places that deviate from the norm in an unpredictable way. There will be obvious and wide inequalities between the top and bottom classes, perhaps incomplete coverage, with stark contrasts geographically between abundance and barrenness. The connotations that may be drawn from a divergent map are of a fractured, and fracturing, world without equity and widening injustice. Thus for many a statistical world mapped in an *divergent* manner implies a negative view of the world that is insecure, unstable and getting worse.

- **Disorderly:** Typified by a highly fragmented pattern, yet accompanied with low degree of difference between nations. It is denoted by a muddled and confused display of data which implies a lack of systematic processes at work. Such visual disorganisation connotes a lack of understanding and perhaps control over changes, with wild areas that defy conventions on what should be done. It is a world without a master narrative and with deep disagreement as to the correct solution, and even whether there is a universal solution for uneven geographical development. Thus for many a statistical world mapped in an *disorderly* manner implies a negative view of the world that is ungovernable and resistant to process of economic and cultural globalisation.

- **Convergent:** The attributes of a convergent map are denoted by a simple and self-evident pattern of low inequities between nations. There are few, if any sharp divisions between neighbouring countries and the variation across the world is gradual and within manageable proportions. It is a map that shows countries are much more alike than they are different, and where relative uniformity of development is the norm and within reach for all people. The connotative implications arising from convergent maps are the that countries of the world are coming together, with a unity of purpose. It is implies common causes for the patterns and that universal solutions can be rolled out across a largely 'flat' world. Thus for many a statistical world mapped in an *convergent* manner implies a positive view of the world that is becoming more similar as countries assimilate upwards in terms of social and economic development.

The effectiveness of the maps as authoritative evidence in particular discourses, one could argue, depends on the extremity of their positioning in the opposite quadrants. For 'diffusionists' the more deeply located in convergent quadrant the better, with its stress on minimal difference between nations and low complexity imply a coherent world. For those advancing 'divisionists' agenda then an ideal map will be positioned in the top-right quadrant because it most advantageously connotes complexity and difference, a world of separate nations moving apart.

5.3 The emergence of statistical mapping

Robinson (1982, 16) defines the thematic map essentially as one that "focuses on the differences from place to place of one class of feature, that class being the subject or 'theme' of the map". The communicative goal of thematic maps is to make apparent to the reader the *spatial* distribution or structure of the theme itself and the underlying geographical base map is the backcloth to support this. The spatial description of data revealed by the thematic map can be a useful aid in determining underlying causal processes and then demonstrating the plausibility of an explanation to others (e.g., spatial diffusion patterns in epidemiological studies). An almost infinite range of possible themes can be mapped, using a wide range of representational techniques (cf. Dent 1995; Slocum *et al.* 2005). Thematic maps displaying statistical data commonly use choropleth techniques which shade areal units of enumeration to represent classified interval data, although several other approaches, such as isopleth and proportional symbol maps, are also widely deployed.

Thematic maps are one of the most widely-seen forms of cartography, being deployed in all manner of discourses and distributed in all media, the ubiquitous weather map being the most obvious. Yet, attempts at understanding the nature of the human world in terms of the nomothetic mapping of environmental, social and economic phenomena came quite late in the history of cartography. Until the late seventeenth century, cartography had focused solely on representing idiographic knowledge, with maps used predominantly as a topographic reference recording the location of unique features in the landscape, for delineating property boundaries and as tools for navigation. The development of a distinctive new mode of cartographic representation - the thematic map - focused on the *generalised* description of a single aspect of place or human activity came to the fore in the beginning of the eighteenth century and became firmly established as an outcome of dramatic changes of the Enlightenment era and later industrialised modernity (Robinson 1982).

It is now widely acknowledged that the Enlightenment and the shift into a modern society gave rise to more systematic means of managing and governing populations. People became increasingly viewed as components in larger systems: as labour commodities, as problems to be solved (e.g., ill-health, illiteracy), and as citizens. The development of ‘population thinking’ by centralised State institutions depended, crucially, on generating both a depth and a breadth of new statistical knowledge about society as a whole. This period saw the creation of systems of universal civil registration, standardised observational methods in morbidity, the enactment of large-scale social surveys (on education, poverty and other aspects of 'moral' status) and, ultimately, the total enumeration of the population through censuses. The concern was to gain a uniform understanding of the human resources available to the State and also to create "unitary national identities via the production of statistical measures that levelled differences, and suppressed local and ethnic identities" (Higgs 2004, 20).

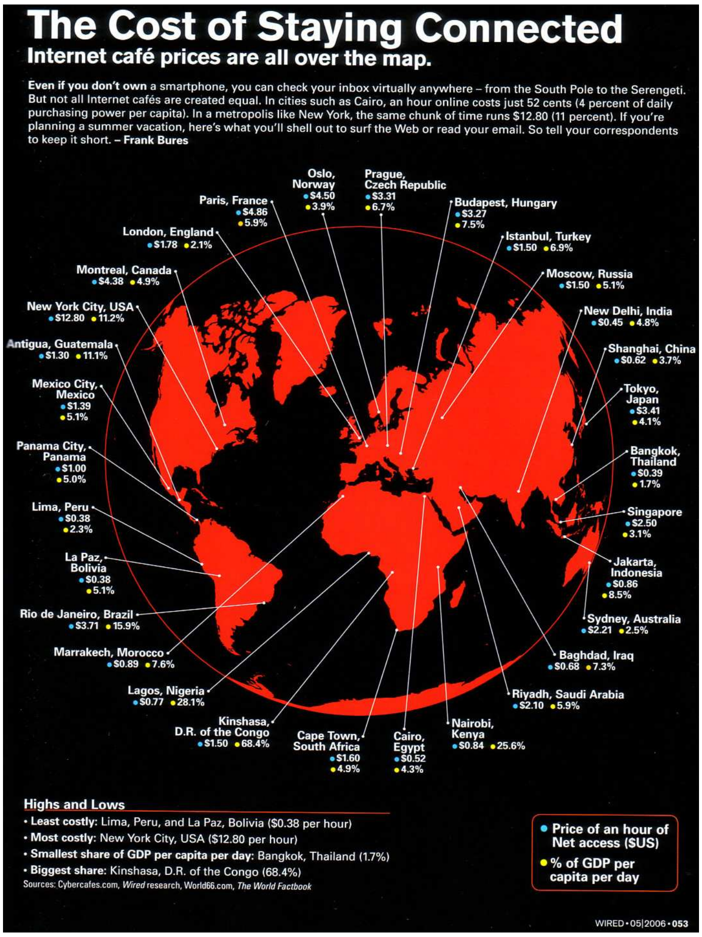

Figure 5.3: A literal mapping of Internet statistics onto place. The actual design of the data presentation means it is hard to make comparisons on how costs of Internet access varies between cities; this failing is tacitly acknowledged by the need to include the 'highs and lows' bullet point list in addition to the map. (Source: Bures 2006, 53. A larger version is reproduced in appendix two, Figure A2.1.)

This wholesale 'quantification' of society required new kinds of representation to make sense of wholly new classes of economic and demographic data being generated. Indeed, Cosgrove (2003, 133) argues that “statistics had their greatest social impact through graphic expression - graphs, charts and maps”. A range of thematic maps, along with many other chart types, such as Playfair’s pie charts, were invented at the start of the nineteenth century in a burst of graphic creativity (cf. Friendly and Denis 2003). William Smith produced his geological map of England and Wales in 1815 and two years later the pioneering geographer Alexander von Humboldt produced the first known isoline map showing temperature patterns. The origination of the choropleth map itself has been traced back to 1823 and work of the political economist, Charles Dupin, who was concerned with mapping the demographic capacity of the French nation (Robinson 1982, 156-57). In representational terms, choropleth maps were a significant advance in visually communicating complex socio-spatial patterns, as they replaced the accepted practice of simply writing numeric values onto the map (see Figure 5.3 above for a contemporary example) which aided the interpretation of raw data in order to discover and explain otherwise hidden spatial patterns, relations and trends.

The emergence of thematic mapping also had political implications (Crampton 2004). Statistical maps, particular of classified data, in their visual form and application tend to dehumanise the spaces they purport to represent. They are intimately involved in the production of a particular kind of governmentality, in which their instrumental rationality aggregates unique places and generalises individual human experience into easily mappable averages, rates and scores. The orderly representation of statistical knowledges offered by thematic maps are powerful, I would argue, not because of what they show, but because they can mask so well the complex, contingent social reality. The social worlds viewed through statistical mapping are thus de-socialised and rendered more easily governed by powerful institutions, as the human effects of policy decisions remain safely opaque, hidden behind the neat tables of numbers and uniformly shaded enumeration areas. (This line of argument is a key element in critical cartography paradigm on the power of maps to do work in the world; see chapter two.)

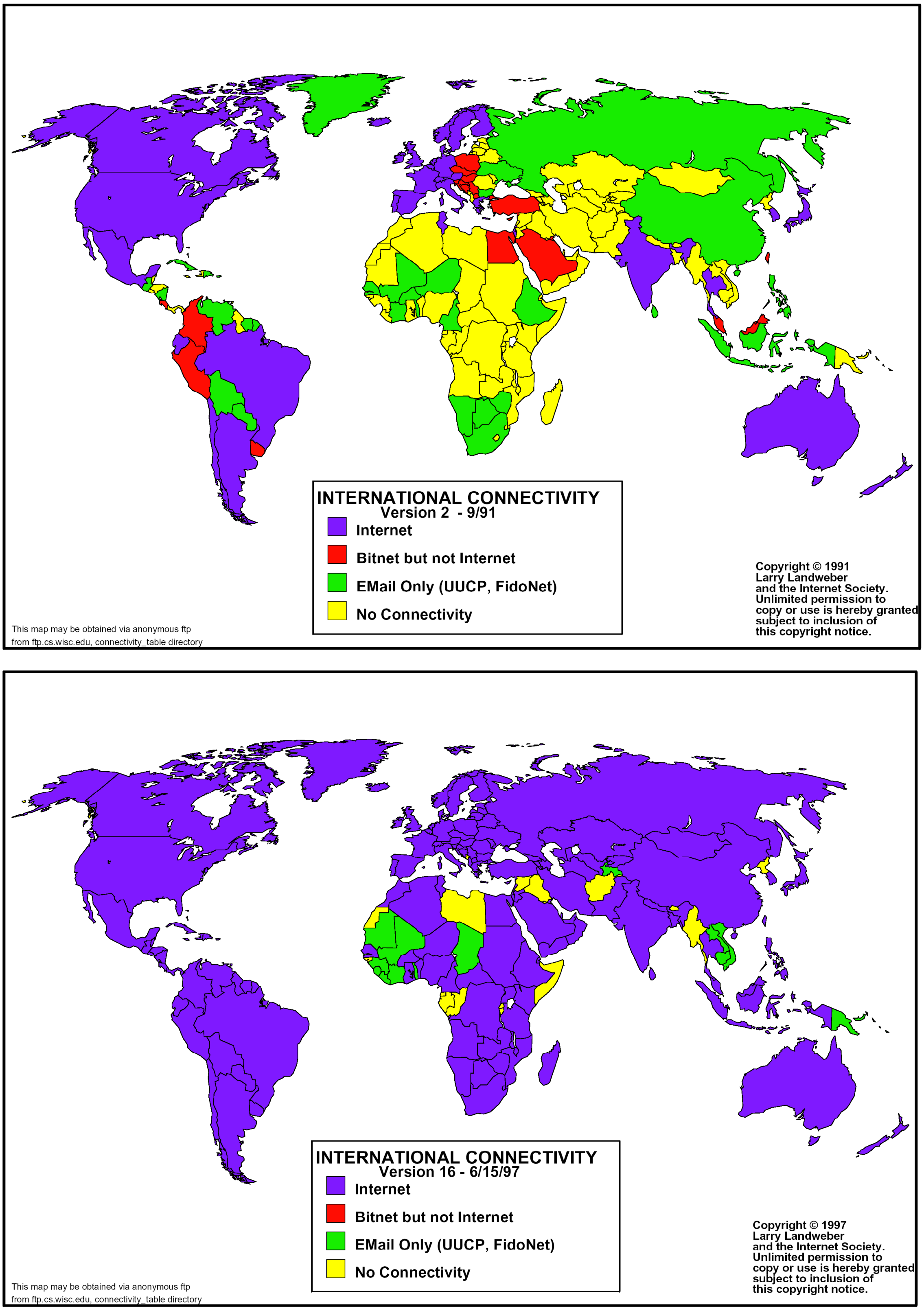

Figure 5.4: The first and last maps in the ‘International Connectivity’ series charting national-level Internet access. (Source: <ftp://ftp.cs.wisc.edu/connectivity_table>.)

5.4 Area-based mapping of Internet globalisation

> In a way cyberspace's spread would become iconized through displays such as the country-by-country Internet world connectivity maps which … adopted the visual language of geopolitics in framing cyberspace's spread as national question.
>
> -- Greg Elmer, *Critical Perspectives on the Internet*, 2002.

In this section I examine in depth two examples of choropleth mapping of national-level statistics on Internet globalisation. The first is the 'Internet Connectivity' maps from the 1990s and the second is a contemporary example called the 'Digital Opportunity 2005/2006' map published in 2007. The analysis considers how the maps work semiotically, utilising the connotative dimensions of 'difference' and 'complexity', and also the wider cultural milieu in which they are embedded and the work they do in the world.

5.4.1 'International Connectivity' map series, 1991-97

The world-wide spread of the Internet during the 1990s was tracked by the U.S. based computer scientist, Lawrence Landweber, and charted in a series of statistical maps. In total, Landweber produced twelve maps over a period of six years, providing a visual census of the spread of international connectivity via a range of different computer networks, including the Internet (for convenience all the maps are reproduced in full pages in appendix two, figures A2.2). The first 'International Connectivity' map produced displayed the diffusion of network connectivity in September 1991 and the last one in the series was created in June 1997 (Figure 5.4). The first 'International Connectivity' map produced (which is labelled version 2; there is no version 1) is the earliest known published map that attempted to represent the worldwide geography of the Internet in a nomothetic fashion[8].

---

[8] A quite similar survey and mapping effort known as the 'FAQ: International E-Mail Accessibility Survey' was undertaken by Olivier MJ Crepin-Leblond (<www.nsrc.org/codes/bymap/ntlgy/>), but began in November 1993 and ran through eight updates until May 1997. For reference, examples of Crepin-Leblond's maps are given in appendix two, Figure 2.3, however his project is not examined here because it does not add substantively to the arguments made regarding the 'International Connectivity' maps.

By making a simple visual comparison of 'International Connectivity' maps through time, it becomes clear that a large swathe of the world's nations *appeared* to have become connected to the Internet in the first half of the 1990s. As such, these maps, and the associated data tables (see Figure 5.6 below), became established one of the most accessible and well-used sources of longitudinal data on Internet globalisation during a crucial period of growth in the middle of the 1990s.

5.4.1.1 Design of the 'International Connectivity' maps

In terms of design semiotics, the 'International Connectivity' maps are firmly embedded in the conventions of statistical cartography. They use a choropleth approach, based on a fourfold nominal classification, to denote network connectivity at the national level (Figure 5.4). The first class, 'No Connectivity', is represented by yellow shading; the two intermediate categories of connectivity - 'EMail Only' and 'BITNET but not Internet' - are symbolised by green and red shading respectively; and the 'top' category of 'Internet' connectivity is represented by a purple colour. The world base map of countries is wholly conventional, taking a familiar Robinson-type projection centred on the prime meridian. Countries are rendered as black outlines, easily filled with bright, solid colour. No countries, oceans or other features are labelled; there is no geographic context shown beyond the country outline acting as a vessel for the statistic. Clearly, it is assumed that the readership will know the conventions of world maps and be able to interpret the statistic appropriately as showing worldwide convergence to complete Internet connectivity.

The classification scheme is set out in the large legend box that dominates the centre of the map layout. The legend box also gives the title of the map, 'International Connectivity', along with revision details. The title itself is somewhat ambiguous if the maps are read out of context. Connectivity to what? The word 'international' in the title must also be noted so the reader understands what is being shown and what is *not* shown (see discussion below regarding data collection methodology related to the survey on which the maps are based). The labels for classes in the legend are also cryptic for readers without prior knowledge of computer networking. What, for example, are BITNET and UUCP? (Where these maps are employed intertextually the legend text is often simplified to aid comprehension.) It is also not explained what the significance is of the difference between the classes of connectivity. How is BITNET different from Internet? What does it denote for a country to be shaded red rather than green in terms of online access for people living there? There is no explanation on the map artefacts themselves, although some further details are given in associated data tables (Figure 5.5; see discussion below).

Besides the legend box, there are two other textual elements in the map layout. These denote background information on the map in terms of authorship and distribution. They also work in a connotative sense to grant additional authority to the statistics on the map. On the right hand side is a formal sounding copyright statement that says of the work: ‘this map is formally published’. *De facto* credibility is also bestowed on the map’s validity by citing the Internet Society (ISOC)[9]. The left hand text ‘opens up’ the map to the world in a sense, by proclaiming it to be freely and anonymously available online. This text also subtly exudes technocratic power by the statement of the ftp access method and the URL; particularly so as the first of the maps were published in 1991-93, pre-Web mainstream, when only the cyber-*cognoscenti* would have been able to meaningfully decode this text.

Taken as a whole, the textual elements of the map promote the work as a quasi-official statement on Internet globalisation. A techno-scientific aesthetic can also been seen in the overall map composition: the unadorned, sparse and perfunctory style of scientific representation, drawn on ascetic white space. This outward ‘matter-of-fact’ simplicity in design results mainly from expediency in production. However, the effect - I would argue - is the production of an *authoritative* looking map and one that epitomises the *authoritarian* imposition of the ‘statistical’ vision *onto* the world, *ordering* Internet globalisation by country

[9] This is a significant U.S.-based lobby group working to support the ‘progressive’ development agenda for the Internet. In the mid 1990s it enjoyed considerable influence as the ‘voice of the Internet’ in policy debates with the U.S. government and international forums. Today, its influence in shaping the structure of the Internet has diminished considerably.

and by classes. The ‘International Connectivity’ maps display the prevailing de-socialising *modus operandi* of most thematic mapping.

5.4.1.2 Patterns of Internet globalisation in the ‘International Connectivity’ maps

How, then, do Landweber maps denote the geography of global Internet diffusion through the 1990s? A casual inspection of the first map from 1991 presents a world where pretty much all developed countries were connected to the Internet (most had been linked to NSFNET during previous three years), but at the same time a large number of the world’s nations were shaded yellow, indicating that they had no international network connectivity. In fact, this category included about half of the world’s countries, though these were clearly concentrated in the less developed regions of Africa and central Asia. The connotation is of a complicated and fragmented pattern with significant differences between parts of the world, including wide divisions in connectivity between neighbouring countries (e.g., the purple shaded India in the highest category bordering the yellow coloured Pakistani and Bangladesh in the bottom class of ‘no connectivity’).

Jumping forward in time to the final ‘International Connectivity’ map produced for June 1997, the vast majority of the nations of the world were shaded purple. The Internet, measured according to Landweber's survey methodology and classification scheme, was so widespread that by 1997 the exceptions really stand out on the map. The connotations are markedly different to the 1991 with a much more uniform pattern across the world and much reduced difference evident. The 1997 map is a representation of convergence and implies that the globalisation of the Internet will be imminently complete. It was at this point that tracking diffusion at this scale became largely redundant and, hence, this was the last map in the series produced by Landweber. (An amended map was created later in 1997 by activists Mike Jensen, with slightly adapted classification, to show the updated networking situation in Africa; map reproduced in appendix two, Figure A2.4.)

By 1997, then, this mapping of Internet globalisation showed a pristine purple-coloured world, pockmarked with bright yellow spots. These remaining ‘unwired’ spots were nations suffering from extreme poverty, war and civil conflicts (such as Afghanistan, Bhutan and Somalia) or from geopolitical isolation (e.g., Libya, North Korea, Burma, Iraq and Syria). More than ten years after this map was produced, many of these yellow 'No Connectivity' countries are still marginal to the Internet world[10]. Indeed, in some globalisation discourses they are stigmatised as 'failed' states, with a number being actively demonised as part of an (illusory) 'axis of evil'. These 'unwired' places are being shifted, in certain geopolitical circles, from a moral *problem* of underdevelopment to a security *threat* to globalised peace[11].

A particularly pernicious example of such a construction of new threats of the 'unwired' is set out in the 'Pentagon's New Maps', a provocative template of twenty-first century U.S. geopolitics produced by defence analyst, Thomas Barnett (map is reproduced in appendix two, Figure A2.5). In his mapping, he asserts that "disconnectedness defines danger" as the "new security paradigm that shapes this age" (Barnett 2003, no pagination). Unsurprisingly, Saddam Hussein's Iraqi regime was cited as the prime example of a nation that was seen as "dangerously disconnected from the globalizing world, from its rule sets, its norms, and all the ties that bind countries together in mutually assured dependence" (Barnett 2003, no pagination). This new security challenge for U.S., therefore, *justifies* pre-emptive action to re-connect the disconnected nations, by military means if necessary. As Roberts' *et al.* (2003, 895), in their trenchant critique of Barnett's neoliberal re-mapping of the world, argue it justifies "intervention in the cause of forcibly removing obstacles to globalisation."

5.4.1.3 Authorship of the 'International Connectivity' maps

Unlike most statistical maps, the 'International Connectivity' series has a clearly identified human author. The maps were solely the work of Lawrence Landweber,

[10] As note above in the discussion of the 'DOI' map, Afghanistan,, Iraq, North Korea and Somalia appear to be in a strange category of having no digital opportunity ranking but being denoted cartographically.

[11] Although as pointed out by Vujakovic (notes on thesis draft, October 2006) this is a narrow and extreme perspective even in geopolitical circles, yet even with limited support it still has some influence on wider development and diplomatic discourses.

whilst a professor in the computer science department at the University of Wisconsin-Madison, where he worked for over thirty years. Initially, Landweber's research interests lay in theoretical computer science but from the late 1970s he become one of the pioneers in the development of academic networking in the U.S., being the prime mover in the building of TheoryNet in 1977 and CSNET at the start of the 1980s (for details, see Cromer 1983). These networks complemented developments then taking place with ARPANET (cf. Abbate 1996; Hafner and Lyon 1996) and were themselves significant milestones along the road towards the modern Internet. The success of CSNET, in particular, was an important factor in securing government funding for NSFNET (Randall 1997). Landweber's breadth of professional work over two decades clearly demonstrates his commitment to spreading the benefits of computer networking as widely as possible: "Starting in 1982", Landweber notes, "we made contact with CS [computer science] groups in other countries and held workshops with people from around the world who were building national networks. The networking idea was awakening everywhere in the world" (quoted in Randall 1997, 120). He was involved in founding the Internet Society and he served as the society's President for two years. He was instrumental in founding the society's Developing Country Workshops, beginning in 1993 – cited as a vital element in Internet 'bootstrapping' (Guédon 2002).

Why did Landweber track and map the global diffusion of network? Given his academic background, the desire to inform and educate the wider community of interest through the free, timely dissemination of accurate information was important; and given his commitment to the 'diffusionist' cause, the maps were likely not purely academic productions, they were created as tools of persuasion to encourage greater efforts to connect up the 'unwired' nations. This last motivation is articulated in a revealing comment Landweber made in a 1995 *New York Times* article: "Everyone realizes that Africa is lagging .... you look at the map of Africa and you see huge gaps all over that will prevent this continent from participating in so many aspects of life on this planet as it is developing" (quoted in French 1995, 5). His efforts in this regard, should be read as altruistic rather than commercially-driven promotion for personal gain.

While the Internet has grown tremendously in the last ten years Africa remains the least connected region in the world, and the digital gap between it and the developed world is, arguably, widening not narrowing. In illustration of this, Landweber was again quote as a authority figure in network developing in a New York Times over twelve year later but echoing similar 'diffusionist' sentiments: " 'Unless you can offer Internet access that is the same as the rest of the world, Africa can't be part of the global economy or academic environment," said Lawrence H. Landweber, professor emeritus of computer science at the University of Wisconsin in Madison, who was also part of an early effort to bring the Web to Africa in the mid-1990s. "The benefits of the Internet age will bypass the continent." (Nixon 2007, no pagination). Empirical evidence to support the widening gap thesis put forward in this news story was provided by two choropleth maps of Africa showing national-level per capita penetration of Internet and mobile telephones.

5.4.1.4 Methodology of the 'International Connectivity' maps

To understand the 'International Connectivity' maps and the perspective on Internet globalisation they produce, it is important to have a sense of what they are measuring and how the measurement was undertaken. Essentially, Landweber was enumerating the availability of computer networks according to two key characteristics: that connections were international in nature and that they were publicly accessible. 'International' chiefly meant connected to the U.S. and 'public' effectively meant that some institutions (most often universities) were reachable to general users outside the country. (The degree to which connectivity and public reachability in *both* directions was verified by Landweber is not clear.) Landweber was solely concerned with the *presence* of an international link, with no recording of the capacity, cost or reliability of the links (which would have clearly been prohibitively time consuming to attempt to gather at worldwide scale). Furthermore, measurement did not enumerate the extent of internal networking provision and intentionally did not register private networks (such as military links or proprietary business networks like the airline reservation system).

The data was collated and presented in summary form at the country level at regular intervals (shown Figure 5.5). Like any survey methodology, Landweber's was a compromise; as Press (2000, no pagination) points out: "[k]eeping track of only one easily defined variable allowed [Landweber] to maintain a global perspective at a reasonable cost, but this system was limited by the fact that differences among and within nations were hidden."

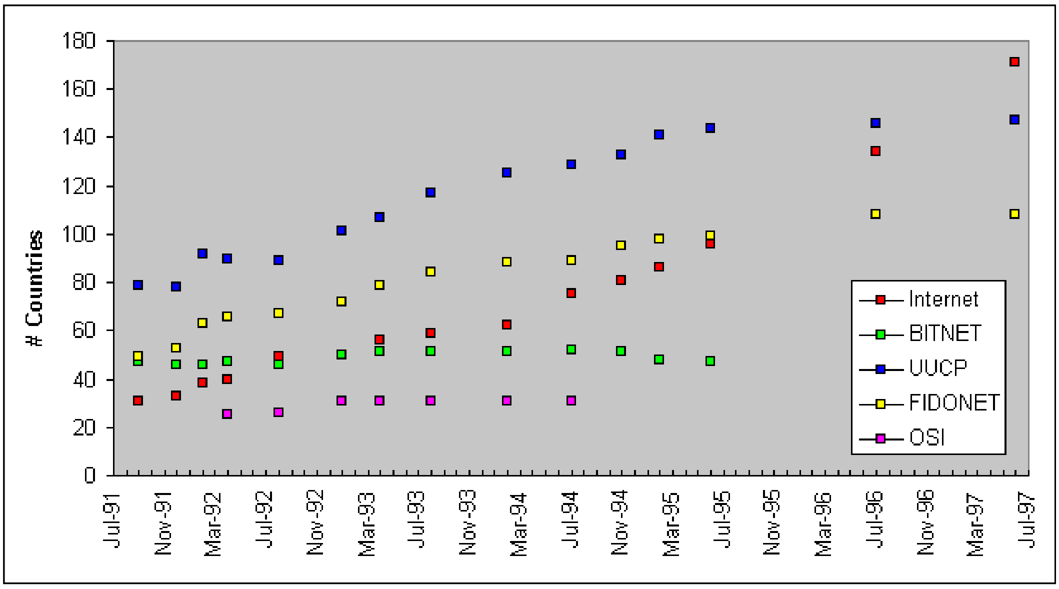

Figure 5.5: A longitudinal chart of "worldwide network growth" showing the range of network types covered by the 'International Connectivity' survey and the periodicity of their publication. Note, not all surveys were accompanied by a map. (Source: Zakon 2004.)

Details on the changing state of network connectivity in different countries were returned to Landweber's 'centre of calculation' (Latour 1987) at the University of Wisconsin-Madison, from a human network of knowledgeable 'locals' across the world. The maps were, therefore, in some senses built by many hands from voluntarily submitted data (explicitly acknowledged in the data tables, see Figure 5.6). Besides collecting data from the field, Landweber was also an 'insider', with intimate knowledge of ongoing networking activities, particularly those related to NSFNET's international connection scheme (see Goldstein 1995). He was also knowledgeable to be able to exploit technical information and statistics published by the consortium that ran the NSFNET backbone. Once the early 'International Connectivity' surveys began to circulate he also received feedback from readers (again, this was explicitly encouraged in the header of the data tables, see Figure

5.6 below). Overall, it is evidently a pragmatic way of assembling such global information at a low cost (remembering this project was very much a 'one man' effort), although others tried direct technical measurement methods, using the Internet as measurement tool to scan computer connected to different networks (cf. Dodge 1999b, 2000d; Quarterman *et al.* 1993, 1994).

As noted the actual network data that underlies each 'International Connectivity' map was also published in tabular form. Figure 5.6 presents an illustrative portion of the December 1991 (version 3) table. The table of data is another representational form that deliberately exudes orderliness, objectivity and an air of authoritative accuracy. The 'International Connectivity' survey tables list all countries as 'present and correct' - the ideological "fiction of the census is that everyone is in it, and that everyone has one - and only one - ... place. No fractions." (Anderson 1991, 166). The tables themselves are of direct relevance to the discussion here, primarily, because they reveal a more sophisticated classification system for connectivity than was represented in the maps themselves, as they contain a basic 'intensity of use' measure[12]. Besides the data classification, the table headers also contain some useful information for contextualising Landweber's project, including acknowledgement of sources and often succinct remarks on the precision (or otherwise) of the data (e.g., 'Information on Slovenia/Croatia/Yugoslavia and former Soviet Republics may be incomplete', from the April 1992 survey table). The admission of potential faults in the data (in the mode of a 'modest witness', see chapter four) can contrasted with the cartographic certainty of denotation by the maps. An orderly visual presentation on the choropleth maps does not only reveal, it can most effectively hide a multitude of sins in the underlying data[13].

[12] Countries were categorised into the 'minimal' use class if they had fewer than five known sites publicly connected and this was indicated with a lower case letter. Countries with more than five sites were classed as having 'widespread' connectivity and this was denoted by a capital letter.

[13] The capacity to show statistical uncertainty in a useful and meaningful way is a largely unresolved area of cartographic research (cf. Dietrick and Edsall 2008; MacEachren *et al.* 2005).

```
INTERNATIONAL CONNECTIVITY
Version 3 - December 2, 1991

Please send corrections, information and/or comments to:

Larry Landweber
Computer Sciences Dept.
University of Wisconsin - Madison
1210 W. Dayton St.
Madison, WI 53706
lhl@cs.wisc.edu
FAX 1-608-265-2635

Include details, e.g., on connections, sites, contacts, protocols,
etc.

Thanks to the many people from around the world who have provided
information.
-----------------------------------
In the following, BITNET is used generically to refer to BITNET
plus similar networks around the world (e.g., EARN, NETNORTH,
GULFNET, etc.).
---------------------------------
SUMMARY

NUMBER OF ENTITIES WITH INTERNATIONAL NETWORK CONNECTIVITY = 89

BITNET Col. 2  (Entities with international BITNET links.)
      b = minimal < 5 domestic sites =  18
      B = widespread >= 5 domestic sites = 28
      x = uncertain = 2
INTERNET Col. 3  (Entities with international IP links.)
      I = operational = 33
      i = soon available = 3
UUCP Col. 4  (Entities with international UUCP links.)
      u = minimal  < 5 domestic sites = 40
      U = widespread >= 5 domestic sites = 38
FIDONET Col. 5  (Entities with international FIDONET links.)
      f = minimal  < 5 domestic sites =  10
      F = widespread >= 5 domestic sites =  43
Col 6 = * = New connections expected in near future.

 ----  AF   Afghanistan (Republic of Afghanistan)
 ----  AL   Albania (Republic of Albania)
  [……records deleted……]
 ----  CK   Cook Islands
 b-u-  CR   Costa Rica (Republic of Costa Rica)
 --u-  CU   Cuba (Republic of Cuba)
 b-U-  CY   Cyprus (Republic of Cyprus)
 BiUF  CS   Czechoslovakia (Czech and Slovak Federal Republic)
 BIUF  DK   Denmark (Kingdom of Denmark)
```

Figure 5.6: Part of the ‘International Connectivity’ data table produced by Landweber, December 1991. (Source: <ftp.cs.wisc.edu/connectivity_table>.). Full data table is reproduced in appendix two, Figure A2.6.

5.4.1.5 Distribution of the 'International Connectivity' maps

In the 1990s the 'International Connectivity' maps are some of the most widely seen geographic maps of the Internet. They are still cited and used several years later (see examples below). There are several factors that can be advanced to explain why they have enjoyed such wide distribution:

- Easy to get: All of the 'International Connectivity' materials were and remain publicly accessible online via anonymous ftp (and now through the web) from his department at the University of Wisconsin-Madison. The online location is widely disseminated and cited. Further, the address has remained active since the project started in 1991.
- Easy to read: The file formats used by Landweber for the maps and data tables mean that they are still all readable today on common computing platforms without the need for specialised software. The avoidance of proprietary formats (e.g., particular spreadsheet formats for the tables or GIS package for the maps) has been important for long-term accessibility. The file sizes for the materials are also small, making downloading possible for people with slow Internet connections (a significant issue for many people when the survey began back in 1991).
- Easy to understand: The materials are clearly named and quite straightforward to understand in a normative sense. As stated earlier, the choice of choropleth mapping provides an ostensibly familiar and comprehensible cartographic design. The materials are all labelled with dates and it is easy to work out which is the most up-to-date version.
- Free to use: Explicit permission is granted for unlimited reproduction of the materials in the copyright statement on the maps and tables. This is a small but important factor. By removing the burden in obtaining formal copyright release, Landweber was encouraging the widest possible dissemination of his maps. Free access and dissemination clearly stems directly from Landweber's academic position, founded as it is on the open publishing model with results distributed non-commercially, in marked contrast to other valuable Internet statistics and maps, which are available only in expensive reports for the corporate market (e.g., those produced by IDC and TeleGeography).

- Authoritative source: There are several interlocking factors that work to promote the trustworthiness of the 'International Connectivity' materials, such that people are confident in using them as factually accurate representations. Firstly, the authorship of the materials is clearly stated and this lends considerable weight to their probity. The author, Landweber, is a respected professor, well known in the field of research and education networking, and affiliated with a major U.S. university. As noted above, the endorsement of the Internet Society was also overtly employed.
- 'Scarcity breeds success': A last reason for the success of the 'International Connectivity' maps is that there was little in the way of competition, especially in the early 1990s. There were few other maps produced which offered as synoptic and simple - and perhaps one might say seductively simple - view of the Internet on a single map. Most other maps tended to be more technical in nature, showing specific networks or specific countries using link-node graphs. Even today, very few 'high-level' statistical maps of the 'whole' Internet are produced to match the effectiveness of the 'International Connectivity' maps, which are easily accessible and have consistent presentation over time[14].

5.4.1.6 Influence of the 'International Connectivity' maps

Considered in combination, the semiotics of the images, their authorship and the mode of distribution, mean that the 'International Connectivity' maps are apposite examples of what Latour (1987) called 'immutable mobiles'. Truthful, scientific knowledge on the extent of networking across the globe was constituted at a 'centre of calculation' from various pieces of survey data. This knowledge was purposefully inscribed into maps and tables to stabilise the knowledge in fixed, conventional forms. The maps and tables are said to be 'immutable', remaining the same wherever and whenever they are read. The maps and tables as readable files, distributed on the Internet, were easily 'mobile', freely circulating online and in print and being usable in a wide range of contexts, including translation

[14] The maps of the Digital Opportunity Index discussed in section 5.4.2 suffer because of a change of colour ramp from one version to the next making like-for-like comparisons harder.

into other languages (see Figure 5.8 below). Lastly, the maps were combinable in many ways and many discourses.

Regarding the 'International Connectivity' maps as 'immutable mobiles' is useful because it starts to unravel the underlying truth claims they are working to establish. As Cosgrove (2003, 136) asserts, maps work because they "permit scientific discourse to sustain its claims of empirical warranty and repeatable truth in the absence of eye-witness evidence." Most people have no means of assessing first hand the globalising of the Internet. They had to rely on the 'International Connectivity' maps to establish the *truth* of the Internet diffusionists' viewpoint by showing that country x was connected. The maps are powerful 'immutable mobiles' because so many people are willing to accept them as truth, as can be seen in the extent to which they have been cited and re-used intertextually. If Landweber had failed to secure immutability, then the maps would not be able claims to be anything "more than an imaginative picture" (Cosgrove 2003, 137).

The 'International Connectivity' maps have been cited and reproduced numerous times in newspapers, popular books, academic papers and policy-related reports in the last decade, contributing as pictorial evidence to a range of discourses on the 'state of the net'. Apparently, they were "displayed triumphantly at the various Inets [ISOC conferences] to mark the fact that the Internet was gallantly going global; this was exciting!" according to Guédon (2002, no pagination). The data tables were widely posted to mailing lists and Usenet newsgroups throughout the 1990s. Long after the end of Landweber's updating of the maps (in June 1997), they still continue to attract interest[15].

[15] For example, a search of the Web, as indexed by the Google search engine, in January 2008 returned 315 pages containing hyperlink citations to the 'International Connectivity' maps, quite an impressive measure considering the material has not be updated for over ten years now.

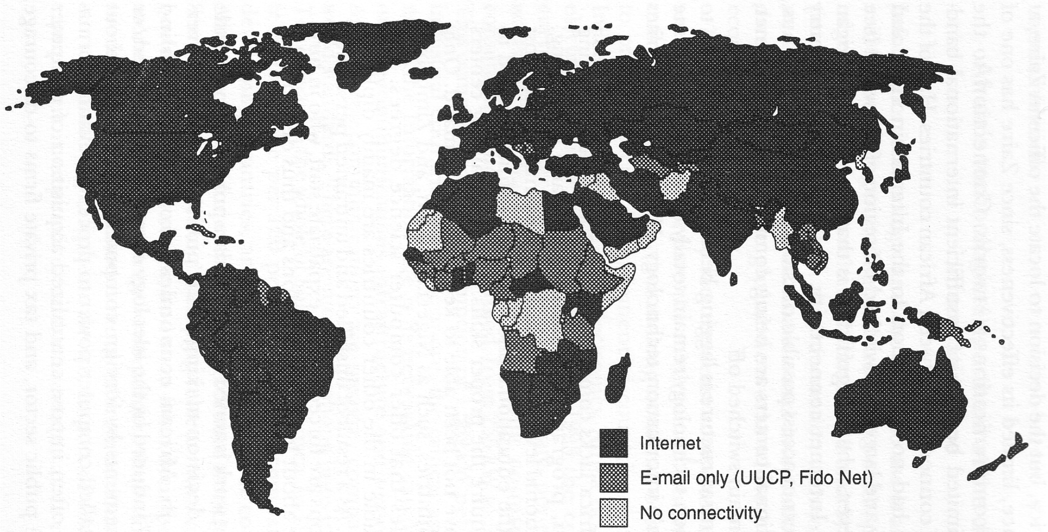

Figure 2.2 International connectivity
Source: copyright © 1995 Larry Landweber and the Internet Society

Figure 5.7: Intertextual example of the deployment of a simplified 'International Connectivity' map in a narrative about development in an academic monograph. (Source: author scan from Castells 1998, 94.)

In the majority of cases Landweber's maps and data tables have been intertextually deployed as unproblematic and objective evidentiary material, which supports the 'truthfulness' of rapid Internet diffusion - simple maps of a successful Internet, successfully spreading across the world. In terms of more scholarly works, the 'International Connectivity' materials have been deployed by several academic authors as matter of fact evidence (e.g., Choucri 2000; Crampton 1999; Grundy 1997; Leiner 1993). A typical example was the use of a connectivity map by Manuel Castells in the third book in his 'network society' trilogy, *End of Millennium* (1998). The map was the sole illustration for the section titled 'Africa's technological apartheid at the dawn of the Information Age' (Figure 5.7). The discourse expounded by Castells' is a broadly 'diffusionist' one about 'failing Africa' and the need to quickly counteract technological underdevelopment. The citation to the map in the text follows this clear articulation of the infrastructure 'failure': "Connection to the Internet is very limited because of insufficient international bandwidth, and lack of connectivity between African countries. Half of the African countries had no connection to the Internet in 1995, and Africa remains, by and large, the switched-off region of the world" (Castells 1998, 93). The map itself is presented in landscape orientation, filling a whole page; it is reproduced in black and white and has been edited (simplified classification into three categorises, removal of copyright notice and distribution text). There is no commentary about the map or the statistical patterns it displays in the text. The reader is assumed to accept it as 'truthful' and to be able to decode it sufficiently to support Castells' line of argument. In this way Landweber's map is a 'factual' representation, able to demonstrate with the aid of cartographic authority, how badly-off Africa is in relation to rest of the world.

Diffusion studies are an enduring topic of interest to academics in a range of disciplines, with many focused on explaining the temporal and/or geographic waves of innovations in technologies. Unsurprisingly, describing and explaining the global spread of the Internet through the 1990s sparked a number of studies (e.g., Arnum and Conti 1998; Batty and Barr 1994; Elie 1998). These studies commonly used country-level analysis of per capita measures of Internet availability in some form of regression modelling to find explanatory 'independent' variables and to fit a growth curve. A number of these studies have utilised the 'International Connectivity' data as a 'truthful' source for the dependent variable in their analysis. For example, Hollis (1996) used Landweber's data tables from 1991 and 1995 to produce a binary indicator of network connectivity and chart how this improved over time in relation to the UN Human Development Indicator (HDI) groupings of nations. Drori and Jang's (2003) analysis used the 'International Connectivity' data to construct an eight-level 'Net Sophistication Score' with change between 1991 and 1995 compared and then explained in a regression model. The 'International Connectivity' data are used essentially to show that things are getting better, and getting better quickly - which in a sense they are. For example, Goodman *et al.* (1994, 31, emphasis added) note: "Landweber maintains an *extensive* and *verified* 'International Connectivity Table' ... regularly updated and published in the Internet Society News". However, as explained above, these data are a very limited sampling, only accounting for the presence of connectivity and taking no account of the capacity of Internet connections, their availability or how widely they are used.

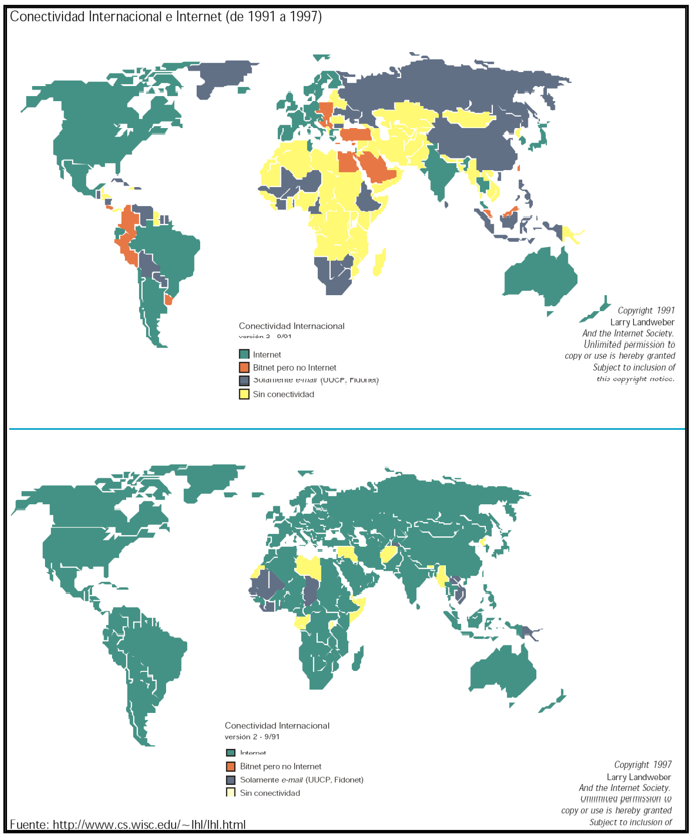

Figure 5.8: A creative adaptation of two 'International Connectivity' maps. The bottom map is wrongly labelled as 'version 2 – 9/91' when it is actually 'version 16 – 6/15/97'. (Source: Ministerio de Ciencia y Tecnología 2001, 4.)

'International Connectivity' maps and data have also been utilised in national and international policy documents, particularly in relation to the 'problem' of the digital divide and development. Illustrative examples include the 1995 UNESCO report titled *The Right to Communicate - At what Price?* which features an 'International Connectivity' map captioned as 'Research network connectivity as of February 1995', in a section discussing the problems of access for scholars in Africa. No interpretation was deemed necessary, again because of its self-evident claim to 'truth'. In another example from a Brazilian 'information society' policy document two maps are translated and employed in sequence to provide a simple narrative of 'progress' (Figure 5.8). The maps are redrawn on a much generalised country outlines and somewhat modified different colours.

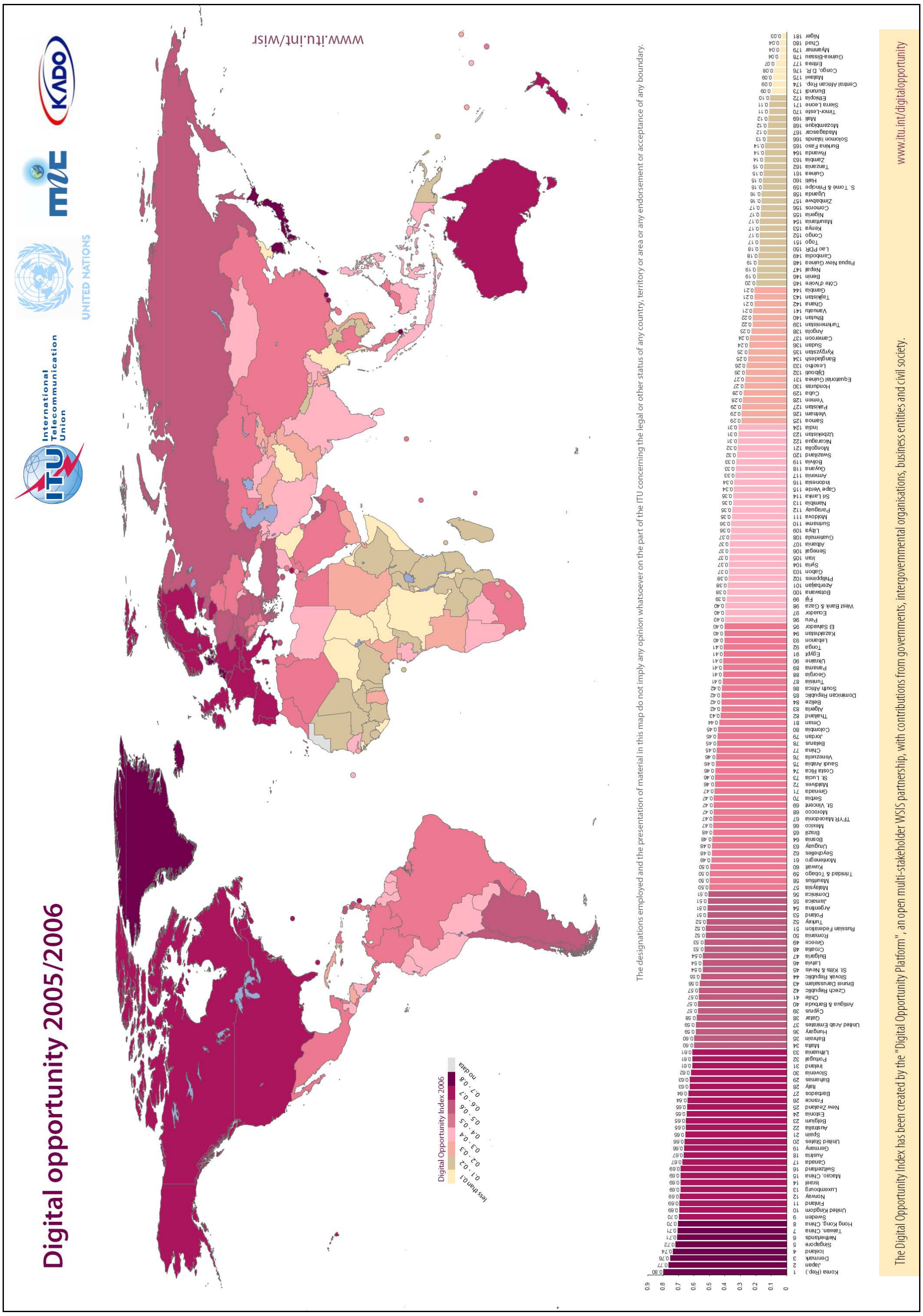

Figure 5.9: The ‘Digital Opportunity 2005/2006’ map created the International Telecommunication Union. (Source: WISR 2007, 150-51.)

5.4.2 'Digital Opportunity 2005/2006' map

As a comparison to the 'Internet Connectivity' maps produced in the 1990s, it is worthwhile to consider a contemporary geopolitical mapping of worldwide network diffusion. This mapping, based on a self-espoused 'convergent' agenda of the International Telecommunication Union (ITU), uses a multidimensional statistic called the 'Digital Opportunity Index' (DOI), a ranking of the majority of countries according to their capacity to fully participate in the 'Information Society'.

Such composite indicators of technological development and national infrastructure capability are fashionable in the last few years, being constructed and promulgated by various organisations hoping to capture policy agendas. For example, the Network Readiness Index published by the World Economic Forum, the Index of Knowledge Societies by the World Bank, the E-Readiness Rankings published by the Economist Intelligence Unit and the Connectivity Scorecard created by London Business School and Nokia-Siemens (see Mahan 2007 for review). The DOI is noteworthy amongst this pack of indicators of 'progress' for several reasons, firstly its ambition to more accurately capture 'reality' across all nations through comprehensive statistical aggregation. Secondly, it enjoys the endorsement of key international institutions as the 'definitive' index. Thirdly, the commitment of resources to distribute it widely and in a credible form, including authoritative presentation of the index using statistical maps.

Two iterations of the DOI ranking, and accompany world and regional maps, have been published and widely disseminated online for free and in printed reports[16]. The latest version of the world map using 2005/2006 DOI data was published in May 2007 and displays scores for 181 countries (Figure 5.9; the earlier version published in 2006 and using a different colour scheme is reproduced in appendix

[16] The map is distributed freely online, in high resolution PDF format. The map is afforded a significant visual presence on the main ITU web page promulgating the DOI, serving as a singular sign of technocratic authority ('look we have measured the whole world'). The map is also distributed in various ITU publications, including the DOI executive summary where it is located in the middle of the document on double page spread; in the large policy reports the map is somewhat hidden away at the end in the statistical annexes (WISR 2007).

two, Figure A2.9). As is evident, the cartographic design choice for the map is wholly conventional choropleth representation.

The construction of the DOI is one of the most sophisticated and well planned attempts to rigorously measure the global extent of ICT development, coming with high-profile endorsement of authoritative UN bodies and distributed in substantial, well produced reports (e.g., WISR 2007). The self-stated goal for the DOI, with its clearly implied political stance, is stated as follows: "a valuable tool for benchmarking … that governments, operators, development agencies, researchers and others can use to measure the digital divide and compare ICT performance within and across countries" (ITU 2008, no pagination); "it provides a powerful policy tool for exploring the global and regional trends in infrastructure, opportunity and usage that are shaping the Information Society" (WISR 2007, 35).

In the outline descriptions of the DOI and its potential usefulness as a tool to inform policy, the nature of the 'Information Society' (always capitalised) is taken as given, it is a singular model ('Society' not 'societies') and one that by implication defaults to a Western-centric market model of consumer capitalism made, ultra competitive with computers and networks. There is no real definition of what constitutes the 'Information Society', although again implicitly one should take the characteristics of the leading nations in the index as archetypes (the role model of South Korea in particular, given the influence of its government institutions in the conceptualisation and design of the DOI[17]). The ITU perspective views the realization of the 'Information Society' as an epochal change with past socio-economic organisations[18]. It is a top-down, technocratic view of a particular kind of social relations imagined by elite bureaucrats in their

[17] Highlighted on the 'DOI' map are the logos of Korean Ministry of Information and Communication (MIC) and the Korea Agency for Digital Opportunity Promotion (KADO), see Figure 5.9 above.

[18] Some scholars have argued there is actually the emergence of different types of networked informational societies (e.g., Castells 1996). There are also sceptics who maintain that there is no such thing as the information society, and that changes in employment and industrial structures cited as prima-facie evidence simply reflect continuity with the past trends (e.g., Webster 1995).

offices in Geneva and Seoul. Yet, the 'Information Society' in the context of the ITU, and its view of the world, is accepted as a real achievable goal, that progress to this goal is inevitable and that reaching the goal is universally desirable. It is a strongly 'diffusionist' agenda where all countries are essentially journeying towards a single endpoint. The DOI is then a sophisticated statistical 'navigation' instrument to guide nations along a this linear and one-way path to the 'Information Society'.

The DOI is viewed as a particularly useful yardstick for lagging nation, because "developing countries are being left behind in the emerging Information Society – not just in basic infrastructure, but in their abilities to compete in service industries, experience and skilled labour" (ITU 2008, no pagination). The DOI's 'objective' statistical criteria do not just monitor but can be seen almost as an enforcement tool because of the individualised and consumption-orientated meanings embedded in very definition of 'digital opportunity'. According to the DOI overview web page (ITU 2008, no pagination) in an "ideal world" digital opportunity means:

- the whole population having easy access to ICTs at affordable prices,
- all homes equipped with ICT devices,
- all citizens having mobile ICT devices,
- everyone using broadband.

The agenda implicit in these objectives is clearly focused on neoliberal development through of market-based solutions and individualized actions. This kind of 'digital opportunity' is also clearly desirable and likely to be profitable for corporations making equipment and providing services.

5.4.2.1 Design of the 'Digital Opportunity 2005/2006' map

The 'Digital Opportunity 2005/2006' map is a world scale choropleth mapping of 181 countries classified into one of eight categories (Figure 5.9 above). The classification of the index values range between 1 and 0 (with 1 being the 'ideal' country with complete digital opportunity) and uses an equal sized intervals. Countries are shaded according to their class with a subdued pink-based colour ramp, running from beige to dark pink-purple. There is also a special category for 'no data' that shades countries grey and this seems to apply, noticeably, only to Western Sahara (the territories of Northern Cyprus and Puerto Rico are also in this category but this is only evident through close-up inspection using the zoom in the PDF document). The classification is denoted in a small legend left floating in the Pacific. The legend runs horizontally from 'low' to 'high' rather than the more typical vertical alignment. One could speculate whether the vertical arrangement was avoided because it denotes a hierarchy from 'bad' at the bottom to the 'best' performers at the top that connotes a value judgement from the institution behind the map.

The map is likely in Plate Carrée projection, with the conventional Atlantic centred orientation which places Western Europe in the focal point of the representation and splits the Pacific Ocean. This projection tends to be 'default' generated in GIS packages for world maps. (Indeed, Figure 5.9 has, subjectively, the feel of a GIS-generated map, being somewhat clinical in execution with overly detailed boundaries and distracting smattering of tiny island; it is lacks the subtleties and polish of a hand-finished map.) No countries are identified and no geographical features are labelled, the cartography is a purely functional graphic to display the DOI statistic. (Note, the regional-level DOI maps do label countries, see section 5.5.2 below.) The only prominent natural geographical feature evident are the large lakes which stand out from the background surround because of their silver-blue colouring. There is no overt cartographic paraphernalia such as a scale or graticule – it is a simplified image of the world that that seems to merely denote the statistics, it is striving to be as conventional as possible so it artifice and constructed nature disappears from view. The bureaucratic origins and supposed mundane nature of its viewpoint is subtly reinforced by the literal small print running under the map which denotes explicitly in writing that the map does not show precisely what it does connote - that of nation state boundaries. The map, stamped with the UN logo clearly does signify as a powerful visual 'endorsement' and 'acceptance' of all the boundaries drawn in spite of the disclaimer. As such, the caveat is legalise and typical on the documents of such global institutions that connote a great deal of meaning but can not denotatively admit to it.

The map elements themselves are floating on a empty white background and are surrounded by supporting graphical material that denote its origins and work connotatively to establish its authority as an reliable representation of the state of the world. Although this somewhat undermined because the title is rather ambiguous in itself – what does ‘digital opportunity’ mean and what does the split date of ‘2005/2006’ indicate? The dual date is explained in the technical notes in the accompanying report that the part of the input data for the DOI comes from 2005 and the other from 2006. Conceptually, this is a somewhat problematic issue that makes it hard to place the map at a definite point in time (and different from the temporal precision indicated on the ‘International Connectivity’ maps, Figure 5.4 above). Most statistical maps seek to denote their point of reference in time exactly so as not to connote uncertainty in the reader. Beside the title, the top of the map is stamped with four corporate logos of the institutions involved in the production of the index statistics and the map. These are stamps of approval from institutions with global credentials and connote integrity on the representation below. The logos are also denotative marks the ownership rights over the map and, by implication, the world, much like heraldic signs surrounding Renaissance maps denoted the patronage of the map and also connoted forcefully their power over the territory represented in the map. Given the internationalist agenda of these organisation, it is not surprising that they all have a logo premised to some degree on the iconicity of globe. The ITU’s logo is a state-less globe formed of the graticule alone, the famous UN logo shows the whole continents in unity from a polar projection, the MIC (Ministry of Information and Communication, Korea) logo has a small globe forming the dot over the ‘i’ and, lastly, KADO (Korea Agency for Digital Opportunity Promotion) with the most abstract globe symbolism hinted at through the oval swirl.

The bottom third of the whole map page is dominated by an elongated bar chart that runs the full width of the world and shows all 181 countries rank according to their DOI score. This ranking from high to low creates a very even slope from the best to the worst performers. The bars are colour coded to match the classification and shading of the map and the subtle colour ramp combined with the smoothness of the slope connotes a systematic, almost natural, ordering of the nations of the world. It would be interesting to speculate how the bar chart would connote if ordered differently (e.g., alphabetical order or by population) and the degree to which it would give a discordant impression of the world's digital opportunity. The bar chart acts as a visual support, holding the world aloft (a role often taken by a distorted Antarctic continent in this projection) and has utility for the reader as a index to aid identification of countries by matching with the colour categories on the map. Although, the order of classes in the bar chart runs in the opposite direction to the small legend above it which is somewhat poorly thought through design. Denotatively the bar chart scale only goes up to 0.9 and not to 1.0. This is a somewhat sly design practice that makes the countries seem to be better performing that they are, and in particular it connotes positively for the top performers making them appear to have achieved near complete digital opportunity.

The final component to consider in the overall presentation of map is a text box running along the bottom of the page that seeks to explain, and in some senses justify and legitimate, the data displayed in the chart and map above. The text stresses, in the currently in-vogue language, that it results from an 'open multi-stakeholder WSIS[19] partnership' with a list of organisational types contributing – governments, international agencies, corporation and civil society. (Connotatively one assumes the order of organisations indicates their signification in the partnership.) Denotatively, the tag line is stating this is not the usual 'top-down' developmentalist[20] attempt to measure the world into orderly existence but rather an inclusive and participatory process. However, by feeling the need to state their

[19] WSIS acronym is not explained, it is assumed to be important and well known. It stands for 'World Summit on the Information Society'.

[20] Developmentalism is a critical description of the agenda and working practices of international agencies, Western governments, some large NGOs and aid charities that have become a self-sustaining industry with a set of top-down models of modernisation and economic growth that get rolled out regardless of local contexts. It is particularly associated with one-size-fits-all structural adjustment and marketization policies promulgated from the air-conditioned offices of institutions such as the IMF and World Bank that critics argue work to advantage of Western interests above improving the welfare of people in impoverished countries. Easterly (2007, 1) argues that developmentalism operates ideologically because it "promises a comprehensive final answer to all of society's problems, …. and it tolerates little dissent.". Statistical indicators, 'explanatory' scattergrams and simple shaded maps are instrumental tools of the intelligentsia of developmentalism, helping to manage the delivery of modernisation and inevitable progress out of poverty.

'openness' credentials explicitly, arguably, connotes the opposite view and making one question quite how inclusive the process actually was. The inclusion of the web address at the end of the text box is a denotative aid to locating further information, but also work connotatively as a citation for credibility – by willingness to show your sources of the material represented (see also discussion of the techniques of virtual witnessing and constructing signs of authority in chapter four). Overall, many of the established techniques for connoting integrity and veracity of a map supposedly without a point of view are in play in the 'Digital Opportunity 2005/2006' map. It is effective at connoting the impression of being unbiased and straightforward presentation of the world that can be trusted.

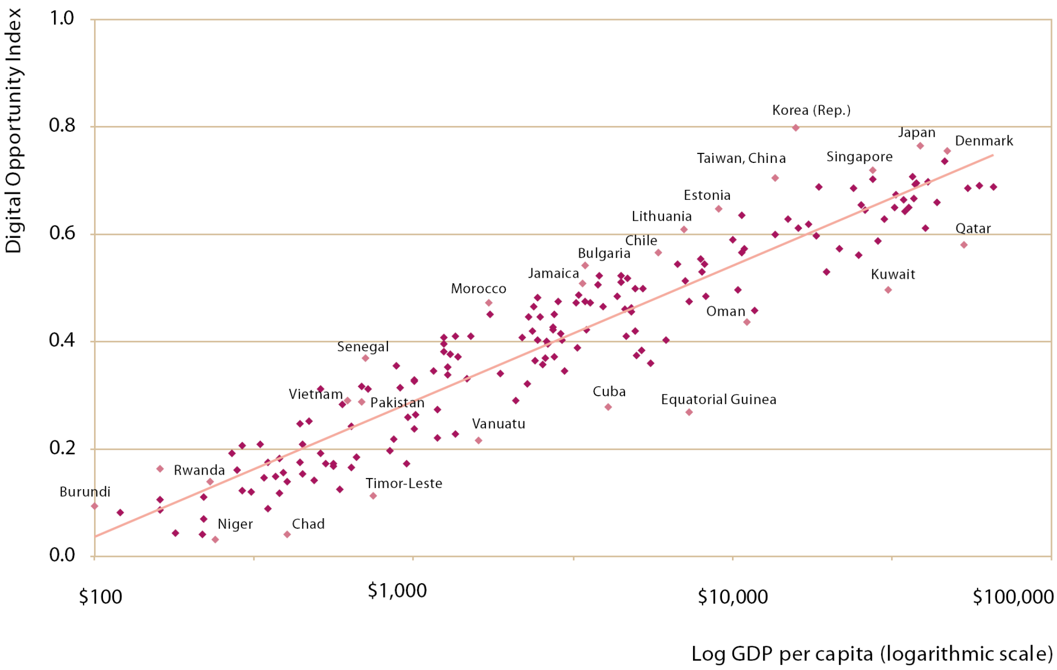

Figure 5.10: The relationship between national wealth and DOI. Countries above trend line could been seen to be performing better than predicted for their GDP, those below the trend line could be said to be under performers. (Source: author scan from WISR 2007, 39.)

5.4.2.2 Patterns of Internet globalisation in the DOI map

What does the 'Digital Opportunity 2005/2006' map denote about the state of the world? The overall geographic pattern of the DOI score represented is quite predictable, with no real surprises about the places in world that are classed as the 'best' and the clusters of nations that perform poorly at the opposite end of the classification. The distribution is denoted clearly from dark to light shading of countries (connotatively from ‘healthy’ and ‘full’ to a ‘pallid and ‘empty’ appearance) and follows, broadly, established North – South global divides, with the large Australian landmass standing out in (‘healthy’) pink as the usual odd-one-out in uniform pattern across the southern hemisphere nations. The predictability of the overall pattern, for anyone who has some sense of global socio-economic performance, points to the fact that the DOI is essentially a statistical proxy for national wealth. Despite it being a sophisticated index measure, combining eleven ICT variables, DOI correlates strongly against GDP with an unsurprisingly positive linear relationship (Figure 5.10).

As is the way with such summary statistical plots, most of the interest lies in the places located significant off the trend line. Some of the outliers may have interesting stories but they corralled into a globally applied composite index, so impossible to unpick the local contextual effects from the map. Much of the variance on this chart is not discernibly on the DOI map because the choropleth classification tends to mask the difference.

Besides the spatial distribution of DOI denoted on the choropleth map, the large accompanying bar chart allows one to see the statistical distribution of countries in relation to the eight categories in the classification. It is apparent that the chosen equal intervals applied to the indicator generates a pleasingly even distribution of countries. Unpicking details in the distribution pattern is perhaps somewhat less important than seeing the overall regularity to it – again this has a sense of a ‘natural order’ about it. This is particularly so with the anodyne classification intervals that do not relate meaningfully to human experience, so there is no valuative connotative meanings from that fact that El Salvador, for example, is in the ‘higher’ class 0.4-0.5, than Peru, which is adjacent with a near identical DOI score but, in a lower class. As with these kinds of world rankings, most prurient interest lies in the membership of the top and bottom classes. These two privileged categories have slightly fewer countries than the middle classes but their membership is as expected. In common with many other country-based Internet and technology ranking schemes produced over the last decade or so, the 'best' performing nations are always the southeast Asian and Nordic nations, and the 'worst' are, as ever, the impoverished states in central Africa. The actual relative ranking of countries to each other in the top and bottom classes is somewhat arbitrary (dependent on the particular vagaries of statistical calculation) and only really matters in terms of national pride and regional rivalries (e.g., the competition between Japan and Korea for top spot, or the enmity between Hong Kong and Singapore as the leading small Asian 'tiger' economy). The relatively poor performance of the USA, ranked only twentieth in terms of DOI, may surprise some readers unfamiliar with technology rankings but it is not out of the ordinary and reflects in large part the socio-economic polarisation of the country which tends to 'drag' it down such lists. There are no countries scoring at the very top of the DOI indicator (South Korea is ranked first with 0.80 out of a possible 1.0 (the top two classes are not denoted on the map legend and the top class is missing from bar chart scales). Equally, no country scores zero, although Niger comes close.

In terms of the classification of countries according to their DOI score and subsequent representation on the map there is an unexplained issue around a handful of 'problem' nations (derogatorily labelled by commentators as 'rogue states') of Afghanistan, Iraq, North Korea and Somalia. These countries do not have a DOI score and are not in the 181 ranked nations on the bar chart, yet from inspection of the map it is apparent that they have all been shading according to membership of the lowest class (light beige). Interestingly, they are not in the special 'no data' category but seem to occupy an unidentified position outside of the normal parameters of calculation. The lengthy report in which the map is published runs to 175 pages, including five pages of technical notes on the DOI calculation and data sources, makes no mention of the fate of these four countries in calculating DOI rankings. Connotatively, does this mean their scores were so low as to be too embarrassing to admit to?

An overall reading of the mapped pattern of digital opportunity in connotative terms is one of considerably order and harmony. Most geographically adjacent nations are in the same or similar classes. This fact, combined with the well chosen colour ramp, connotes a smooth transition from place to place across continents, a continuous, almost 'natural', spatial gradations in DOI which is reminiscent of the subtly changing patterns of vegetation between biomes on global landcover maps. (The orderliness of the geographic pattern is also reinforced connotatively by the almost perfectly even slope on the bar chart.) The 'natural' harmony amongst nations across the map only breaks down slightly with the more disorderly patchwork of nations in central/southern Africa and a small portion of southeast Asia. But even here there are few sharp divides between next-door neighbours (i.e. differences of two classes or more) that would seriously dent the convergent impression. Indeed, there are no chasms of difference where countries in the top class border directly to nations at the bottom of the ranking, unlike the disruptive clashes between top and bottom denoted in the 'International Connectivity' maps. The one exception to this is the digital opportunity 'fault line' running along the DMZ on the Korean peninsula, however, this is not visually prominent or intrusive to an overall orderly pattern across the rest of the mapped world and it can be easily explained away as an aberration from an earlier era of geopolitics.

The overall connotative meaning emerging from the 'Digitial Opportunity 2005/2006' map and bar chart is of a convergent world, with nations having much more in common than separating them. This notion of the world coming together is assisted by the faint, almost porous denotation of boundaries between countries. The result is an impression of large continuous blocks of the equal colour (e.g., North America, Western Europe, parts of South America). The connotation is different to that created by the 'International Connectivity' maps with their definite black line-work imply hard boundaries between nations. The choice of distinct and boldly differentiated colour to denote the four classes on the 'International Connectivity' map (suggesting marked difference between countries) also contrast with the progressive eight class colour ramp for the DOI map (suggesting only gradual variation between countries).

Overall, what does the DOI map reveal about the extent of digital opportunity? It is already extensively diffused across the world and most places are participating.

Even though there is some uneven progress to the ideal of the Information Society, virtually all nations are safely on route. In terms of the fourfold classification of meanings, it can be argued that the DOI map connotes a powerful convergent message about the world.

5.4.2.3 Authorship of the 'Digital Opportunity 2005/2006' map

The Digital Opportunity Index (DOI), underlying the map, is primarily a product of the International Telecommunication Union. The DOI was launched in May 2006 and is intended to track progress towards bridging the digital divide and implementing the outcomes of the World Summit on the Information Society (WSIS), a major UN conference held in two phases in Geneva in December 2003 and in Tunis in November 2005. Two iterations of DOI have been published so far. In authorship terms the DOI was conceived by technocrats and statisticians at ITU headquarters in Geneva, with collaboration from the Korea Agency for Digital Opportunity and Promotion (KADO) and the United Nations Conference on Trade and Development (UNCTAD).

The ITU is a long established although relatively little know specialised UN agency that facilitates global telecommunications through important but behind the scenes work in technical standards, setting tariffs and managing the allocation of radio spectrum. It has an explicit agenda seeking to promote "peaceful relations, international cooperation among people and economic and social development by means of efficient telecommunications services." (source: <www.itu.int/about>). It is headquartered in Geneva, one of the favoured world cities for such international organisations, and draws its main funding from member states and large corporations. As with many such international agencies it espouses transparency of operations, budgets and decision-making but remains remote from many of the constituencies and people it notionally serves. The ITU has also been criticised as being part of the developmentalist industry, in league with the interests of large telecommunications companies to sell more equipment and gain preferential access to new markets, and not working in the interests of consumers (Jordan 1999). In operational ethos it is focused on technical solutions with a preponderance for opaque and officious working practices (labyrinthine documents, myriad committees and 'high-level' meetings) with little delivered beyond perpetuating its own existence.

A core element in how ITU the influences industry and government is through gathering comprehensive range of data on the worldwide status of telecommunications and publishing select statistical analysis from these. Like many UN agencies, the ITU's published statistics enjoy significant legitimacy for being reliable and unbiased. They are widely utilised in studies by other organisations and academics as the 'gold standard' benchmark to measure against. They also have a powerful bureaucratic aura of authority because of their worldwide scale and year-on-year consistency. As such they are seductive in appearance, offering one of few means to quantitatively compare many countries across space and through time. Yet, like all large institutions what gets collected and published reflect as much the agenda of the organisation as they do the underlying social reality purportedly being represented (cf. Cornford 1999).

The ethos at the core of ITU agenda is based on the fundamental belief in positive interplay between ICTs and social and economic development. This is clearly articulated in the following text from November, 2005: "[t]he digital revolution, fired by the engines of Information and Communication Technologies, has fundamentally changed the way people think, behave, communicate, work and earn their livelihood. It has forged new ways to create knowledge, educate people and disseminate information. It has restructured the way the world conducts economic and business practices, runs governments and engages politically. It has provided for the speedy delivery of humanitarian aid and healthcare, and a new vision for environmental protection. It has even created new avenues for entertainment and leisure" (source: <www.itu.int/wsis/basic/why.html>). Yet, through much of the 1980s and 1990s the development of the Internet, at the vanguard of the 'digital revolution', occurred almost completely outside the orbit of the ITU and its standards, statistics and committees. In danger of becoming irrelevant in a changing market landscape, over the last few years the ITU has made conscious efforts to embrace the Internet 'revolution' and move away from narrow focus on telecommunications as an industrial sector to be managed. It wants to be seen to be representing, and setting agendas, for a much broader notion of the 'Information Society'. The creation and promulgation of the DOI, can therefore, be seen as a component in this institutional refocusing exercise, it is tool not merely for measuring the information society, but an active instrument (including colourful world maps) that proves how seriously and proactively the ITU is working to bring about the 'Information Society'.

5.4.2.4 Methodology of the 'Digital Opportunity 2005/2006' map

The DOI is a complex statistical index created by aggregating eleven separate indicators related to measurable aspects of ICT consumption, including cost, household access and market penetration. Six of the eleven indicators relate to fixed line telecommunications and five are geared to mobile infrastructure. The DOI documentation stresses that these eleven input indicators can be usefully categorises into three component parts of 'digital opportunity'. The average of the three components are combined with equal weights into an overall score. The indicators for 2006 DOI are as follows.

- Indicators that provide an *opportunity* for the country's citizen to use ICTs:
  - Percentage of population covered by mobile cellular telephony,
  - Internet access tariffs as a percentage of per capita income,
  - Mobile cellular tariffs as a percentage of per capita income.
- Indicators that represent the *infrastructure* needed by any country to use ICTs:
  - Proportion of households with a fixed line telephone,
  - Proportion of households with a computer,
  - Proportion of households with Internet access at home,
  - Mobile cellular subscribers per 100 inhabitants,
  - Mobile Internet subscribers per 100 inhabitants.
- Indicators show the extent of ICTs *utilization* within the country:
  - Proportion of individuals that used the Internet,
  - Ratio of fixed broadband subscribers to total Internet subscribers,
  - Ratio of mobile broadband subscribers to total mobile subscribers.

The documentation around the DOI also continually stresses that this selection of indicators is 'internationally agreed upon', arising from consultation and deliberation with multiple stakeholders (WISR 2007). However, one might be tempted to see it more like a hotchpotch of measures that will often overlap and confound each other. Rather than being driven by theory on what constitutes ‘digital opportunity’ it is arguable that expediency played the major part in what is included – it can only be an indicator if it can be easily measured across the world. As with many of these supposedly ‘objective’ and technical rankings of what are complex social phenomena, the old accounting adage should be born in mind, that ‘they only value what is measurable instead of measuring what is valuable.’

The superficial orderly appearance of the resulting DOI classification with each country neatly assigned a single score and put into a class, of course, helps to deflect the many questions related to data validity and statistical robustness that could be asked of its construction. Furthermore, each of the eleven indicators going into the DOI is itself a complex statistic that requires careful scrutiny, particularly in terms of how the multiple base data sources are gathered by different countries. In the 2007 World Information Society Report a table sets out some of the underlying intricacy of what goes into each indicator; for example for the ‘proportion of individuals that used the Internet’ variable: “The base year is 2005. A growing number of countries have carried out surveys. In the absence of survey data, national estimates are used. If these are lacking, then estimates are derived from the number of subscribers” (WISR 2007, 55). There are 181 countries ranked in the DOI and one wonders how the validity of these variables stacks up across that sample size.

Given the potential influence of the DOI to act as universal benchmarking tool, it is not surprising that it has come in for methodological criticism, including what it chooses to measures and how it is put together, especially the weighting of indicators. In terms of the choice of what to measure Peña-López (2007) asks ‘where are the people?’ in the DOI with its focus on infrastructure potential above digital literacy (the capability to exploit opportunities); 91% of the DOI is effectively based on infrastructure. James (2008, 790-791) has argued that the choice of indicator types is ill-considered, meaning that the DOI rankings are “deeply flawed and potentially misleading because they confuse ends and means or inputs and outputs"; the result he goes onto argue "blurs rather than sharpens divergences between means and ends of progress towards the information society."

5.5 Deconstructing area-based mapping of Internet globalisation

The 'International Connectivity' maps enjoyed an influential position as 'immutable mobiles', securing particular connotative impressions of the geography of Internet globalisation in the 1990s through their superficially simple and clear visual narrative. It is apparent that the ITU's 'Digital Opportunity Index' maps are quite likely to take on this role over the coming years.

However, in several respects they are both problematic and partial representations of world-wide network diffusion. The surface 'truthfulness' and authority of this kind statistical mapping as comprehensible representations of social phenomena is open to question in terms of the efficacy of cartographic design and in terms of political critiques of the ways they shape perception in the service of particular interests and agendas (cf. Crampton 2003 & 2004; Monmonier 1996). Both the technical weaknesses and the ideological concerns in statistical mapping typically remain unacknowledged by the institutions publishing them, as such an admission, it is feared, would undermine cartography's authority in representing the world. The maps must be presented as 'matters of fact' that speak for themselves.

Many map readers approach statistical maps assuming them to be straightforward and essentially accurate geographical presentations of social reality. Yet, the degree of generalisation necessary for successful cartographic design means that social reality is inevitably simplified, often to a gross extent, in statistical mapping. This simplification is pronounced in the widely-used choropleth approach and it is all too easy to draw naive and unsound conclusions as to the actual spatial distribution of the phenomena being represented from an orderly-looking world map. Therefore, in critiquing the representational effectiveness of the 'International Connectivity' and DOI maps, I seek to highlight the practical and political degrees to which they grant partial views of Internet globalisation.

In this section I discuss the key methodological problems, common to all choropleth mapping, and draw out the resulting political implications relevant to the 'International Connectivity' and DOI maps. These problems concern: the choice of scale of presentation and the design of the zones for aggregation; the invisibility of small areas and the denial of temporality; the nature of the classification scheme applied to the zones, and the resulting issues of ecological fallacy and grouping bias.

5.5.1 Zoning scheme design

The size of the zones in choropleth maps has a direct impact on the level of generalisation of the social phenomena being mapped. Larger zones average over more people to give a much less detailed presentation of the population. The definition of the boundaries for areal zones can also have significant impacts on the nature of the representation; perhaps most evident in terms of gerrymandering possibilities in drawing up electoral constituencies (cf. Johnston 2002; Monmonier 2001). Often people producing choropleth maps - using secondary data from the census, for example - are constrained to use a predefined set of zones in which the data has been published. For many social phenomena this is problematic as the zone definitions are arbitrary, not having been drawn up to take account of the 'real' distribution of the social phenomena; as Crampton (2004, 47) puts it: "Where human life is lived continuously, the map (especially the choropleth) chops up and divides." The possible ways the 'chopping' can be done are manifold - as Openshaw (1984) and others have demonstrated under the rubric of modifiable area unit problems (MAUP) - it also ineluctably has political ramifications because they alter the denotative visual properties of the map in favour of certain interests. In essence, zoning decisions can work connotatively to increase the perception of social difference or help to mask the extent of inequalities.

In the case of the 'International Connectivity' and DOI maps, the zoning scheme is the national state, as defined by the international standard ISO3166. Clearly, this is the most obvious scheme for world-scale statistical mapping. Indeed, world maps using countries as graphical containers for statistical data are so common and conventional that they are easily perceived as the 'natural' way of seeing the world, especially in atlases[21]. Yet, at the world scale, how efficient, let alone 'accurate', is it to aggregate 6.4 billion people into 192 pre-given country units - units that have been drawn-up arbitrarily in many cases? Many national borders are maliciously arbitrary in relation to the underlying social reality (the infamous colonial 'cartographic' partitioning of Africa being the archetypal case). The result is a set of mapping units with a huge range in terms of land surface and population size. Countries as units of analysis and mapping are a highly political metageography (Lewis and Wigen 1997). The definition of countries as stable, unitary objects, as we see them neatly drawn on world maps, masks contentious processes of territorial formation and ongoing maintenance - including some of the most bitter, bloody contemporary conflicts (e.g., the Balkans, Israel-Palestine, Kashmir). Notwithstanding this, countries as units of analysis are undeniably *convenient* analogues because, firstly, of their engrained familiarity with map readers and, secondly, their effectiveness for delineating the distribution of nation-state power as it currently operates (which remains pivotal for understanding many global socio-economic processes). And, of course, cartographic knowledge has played, and continues to play, a significant role in the *creation* of the nation-states they supposedly only represent (see Anderson 1991; Biggs 1999; Vujakovic 1995 and 1999b).

The question then, is how effective and appropriate are countries as units of analysis for describing Internet globalisation? In many respects it seems illogical to create maps that demarcate the Internet into the arbitrary territorial jigsaw pieces of nation-states. After all, the network technologies of the Internet are

[21] Although, this dominance is being partially usurped by the growing use of 'earth from space' satellite imagery which often do not show nation states. This is exemplified by Google Earth which, in its default setting, presents a 'natural' looking world free of geopolitical boundaries.

creating new online space and virtual groups that, according to some commentators, subvert the primacy of nation states and their boundaries. Border lines are less meaningful in the era of the 'death of distance' (Cairncross 1997), so the argument goes[22]. The use of countries in mapping the Internet is not only idiosyncratic; it has the visual effect of granting undue territorial authority over the 'space of flows'. Choropleth mapping 'chops' up what should be viewed as a continuous network flows linking people together into rhizomatic structures that cut across political frontiers. "The tracing of political borders in these maps of putatively virtual domains", Harpold (1999, 15, original emphasis) argues, "naturalizes specific relations between nation-state and network identities -- and, as a result, *obscures the global political forms of the Internet with a mosaic of individual national forms.*" These maps, like much of statistical cartography, work to constrain the inherent disorderliness of the social worlds and reinforcing uniformity of the status quo. As such, their connotations of little difference and low complexity mean they are positioned in the convergent quadrant in the fourfold conception (Figure 5.2 above)

Despite disputing the 'end of geography' thesis, I would nonetheless agree with Harpold that there is a *need* to loosen the metageographical shackles of the nation-state as a unit of analysis in the Internet and try to show some of the more local, contingent forces that affect the patterning of digital access and use by different people. Concurring with Harpold (1999, 18), I would argue that progressive analysis of the Internet "must look beyond the limited (and limiting) visual vocabularies of national-political identity, and base its investigations on new schemes for representing the archipelagic landscapes of the emerging political and technological world orders". Some interesting points of exploration in terms of cartographic design include the use of dot mapping showing the distribution of data at sub-national level, a chorochromatic thematic map which at world scale would represented data without boundaries (see Figure 5.19 below for partial

[22] This rhetoric proclaiming the decline of nation state power, in face of technological change, can be traced back, at least, to the telegraph era and the utopian hopes spurred by wiring continents with undersea cables (cf. Standage 1998).

example of this), and also flow mapping that represents data as point-to-point transfers (as done by Board *et al.* (1970) for South African telecommunications flows, see Figure 3.3 in chapter three). The pragmatics of making such alternative representations for the whole world are significant, as the necessary data are simply not available at this scale.

The counter-argument is that the notion of the fading away of nation-state power has been overplayed in much of the globalisation talk on deterritorialisation. The transcendence rhetoric surrounding telecommunications and computer networking, especially redolent in the 'dotcom' boom in the late 1990s, has been exposed as essentially hollow. The nation-state has been, and will likely remain, crucially important in the determination of people's actual experience of the Internet (setting legal parameters, regulatory structures, taxation, censorship, and so on; see Everard 2000; Jordan 1999, for cogent analysis). Most of the Internet, in terms of transmission infrastructures as well as content and services, is produced by large companies, and as Morgan (2004, 14) tellingly notes: "Contrary to fashionable notions of 'techno-globalism' and 'borderless worlds' the national environment remains a highly significant operating milieu for firms, even for so-called multinational firms." Moreover, many global firms are beneficiaries (and thus supporters) of current nation state based metageography of consumer modernity - for example, exploiting differential regulatory systems in production and segmenting markets in profitable ways. Consequently, it can be argued that, in many respects, the most *appropriate* way to analyse and visualise the global geography of connectivity is in the form of country-based units, as Landweber did through the start of the 1990s and that the ITU continues to do for 'digital opportunity' today.

In many respects, Landweber's and ITU's choice of units of analysis was down to map-making expediency; as Vujakovic (1999a) notes, in relation to maps produced in the news media, one should be alert to the dangers of looking for 'hidden agendas' for what are in actuality pragmatic decisions made under resource and time constraints. Moreover, in terms of the practicability of the 'International Connectivity' and DOI maps, country boundaries are undoubtedly convenient for many readers because they render abstract notions of 'internet' and 'information society' into easily understandable visual forms (at least for majority who are acquainted with the cartographic conventions of thematic maps). This factor above all was particularly important at the beginning of the 1990s when the prospect of global networking was strange and unfamiliar to most people and, arguably, remains so for institutions like the ITU that seek to influence mainstream discourses around appropriate development policies that require conventional representations.

5.5.2 Hiding small places and silencing temporal variability

The use of a map projection based on geographic area to represent statistical data at the global scale inevitably creates a distortion that visually favours territorially large countries and renders small, but populous, nations effectively invisible. Much of the 'data-ink' on statistical maps is, therefore, wasted in showing land where few people live. This technical weakness has obvious political repercussions in trying to understand the social processes taking place. This problem is a taken-for-granted, largely irresolvable artefact of world scale mapping and usually ignored. However, it has been purposefully highlighted by a number of socially-conscious cartographers and geographers, leading some to advocate counter-mappings based on cartograms (e.g., Dorling 1998; Vujakovic 1989; see section 5.7 below for further discussion and analysis of several apposite examples). On the 'International Connectivity' world maps, a number of countries are simply not drawn at the given scale and pixel resolution of the image. Many islands are indiscernible, including much of the Caribbean. A number of city-states, including the Asian technology 'hotspots' Hong Kong and Singapore, have such small geographic footprints that they do a cartographic 'disappearing trick'. Yet, these places are not unimportant in understanding Internet globalisation - several Caribbean nations, for example, have become important nodes in e-commerce and online gambling because of their offshore status (see Wilson 2003). This is ironic, as many of these nations are consciously trying to exploit the Internet to project a global image and overcome the inherent limits due to their small territorial size (see Brunn and Cottle 1997). The result, then, is a capricious map of Internet globalisation that excludes significant countries from consideration on the sole criterion of their land surface.

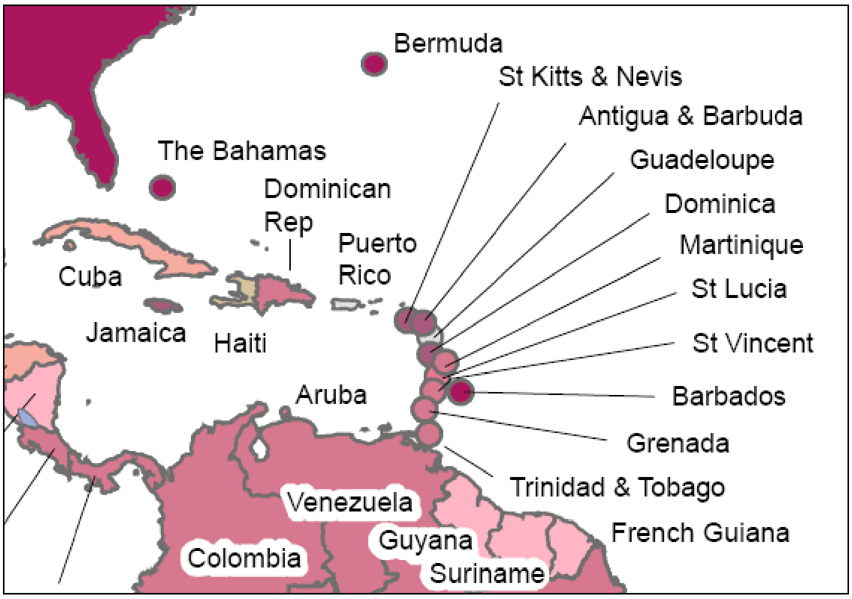

Figure 5.11: A subset image of the Americas regional DOI 2006 map showing the use of circle symbols as artificial graphic enhancement for small nations. (Source: author screenshot from original map, WISR 2007, 158.)

The DOI maps perform somewhat better than the 'International Connectivity' maps in representing nations with small territorial extents. This is achieved, in part, technically through the media of map distribution (vector graphics in PDF allow readers to zoom to see greater detail) and through the application of design device of circle symbols as surrogates for otherwise invisible countries (Figure 5.11). These circles are relatively effective denotatively but inelegant connotatively as it tends to mark out these place as somehow unusual. Furthermore, the provision of regional breakdowns (for Africa, Americas, Asia-Pacific, Europe) in the WSIS report and on the DOI website allows for larger maps that show more detail (these maps are also labelled to highlight countries, as can also be seen in Figure 5.11). More radical alternative methods of displaying classified data that denote small areas are possible, such as projecting the data into three-dimensions (an example of which is examined below, see section 5.6.1) but these are often unsatisfactory compromises.

Statistical maps like the 'International Connectivity' and DOI examples also necessarily distort dynamic processes by arbitrarily freezing them at a *single* point in time. The processes of Internet globalisation are shown fixed in time - credited to the actual day of publication in Landweber's case - with no way to convey the underlying temporal dynamics of the diffusion of connectivity, such as the sequencing or rate of change. The denial of temporality in conventional cartography is only partially solved by the use of a series of surveys and maps that build up over time (an example of this approach is deployed by Batty and Barr 1994, in their analysis of Internet diffusion where they present readers with a Tufte-style 'small multiples' set of five choropleth world maps from 1991-1994; reproduced in appendix two, Figure A2.10). However, the periodicity of compilation and publishing of statistical maps rarely have any meaningful relation to the temporality of the social phenomena being represented (it is commonly just a function of administrative convenience, e.g., the decennial cycle of censuses). Consequently, the handling of the temporality of events in thematic cartography remains a largely unresolved problem[23]. Even animation and interactively offered, for example, via online mapping toolboxes like GapMinder (<www.gapminder.org>) can not overcome the episodic nature of the collection and publication of most global scale socio-economic datasets This failure has ideological implications, as the inability to represent dynamic phenomena over space *and* through time means much of the subtlety of social life is simply unmappable (Dorling 1998).

5.5.3 Implications of classification

The final - and most significant - methodological problem with statistical maps concerns the process of data classification. The selection of the number of classes, and their intervals, for grouping data on choropleth maps is crucially important in denotative term to the appearance of spatial patterns and, thus, the connotative

[23] Developments in map animation and multimedia, and more recently in geovisualisation environments, are opening up interactive avenues for mapping phenomena spatio-temporally (see Cartwright *et al.* 1999; Harrower and Fabrikant 2008; MacEachren and Kraak 2001), but have not yet delivered any generally applicable solutions.

impressions that readers receive on the phenomena being represented. Producing practicable and meaningful classifications is a real challenge, as a balance must be struck each time a choropleth map is made, since, “[r]educing the number of classes achieves simplification at the expense of loss of useful detail, especially local contrasts” (Evans 1977, 99). In the days of manual cartography, cartographers typically used a small number of classes as a matter of convenience rather than because of any deeper philosophical or perceptual concerns. In recent decades, there has been considerable investigation by cartographic scholars into the specification of ‘optimal’ classification schemes from both the statistical point of view (e.g., Jenks and Caspall 1971; Evans 1977) and from the perspectives of aesthetics and map usability (e.g., MacEachren 1982; Slocum and Egbert 1993). Computer mapping and GIS has made it much easier to experiment with different classification schemes for a given data set, but have given little help to users in choosing a workable one; and Jenks and Caspall’s (1971, 221) perceptive comment still holds true: “[w]e are certain, however, that many maps result from an almost accidental setting of class limits”. This is significant because the use of an inappropriate classification scheme can, at a stroke, render a choropleth map unworkable.

However, beyond technical concerns on performance, it is clear that the nature of the classification scheme in statistical mapping has political ramifications because of the connotations that readers may draw about the underlying social reality denotatively being ‘accurately’ represented. The design of the classification, either deliberately or unintentionally, serves a purpose in highlighting the ‘right’ spatial pattern for the map-maker’s agenda. Active manipulation of classifications, as Monmonier (1996) has demonstrated, opens up a rich array of ways to ‘lie with maps’.

The level of simplification implied in fourfold classification on the ‘International Connectivity’ maps, for example, as it is applied to the complexity of world-wide patterns of Internet diffusion, is problematic. The distinction between the four classes in the map is important, and corresponds roughly to the increasing sophistication of services possible, the persistence of the connection, the bandwidth of links, and also the likely cost. Only full internet connectivity allowed interactive services, including telnet and ftp, that require persistent synchronous links. In a sense, the middle two classes are intermediary levels of sophistication in terms of possible services. ‘Bitnet’ and ‘EMail only’ connectivity only supported asynchronous interaction and did not provide persistent connectivity. ‘Bitnet’ was a formally constituted network, with fulltime operational managers and users had to pay for access[24] (cf. Kellerman 1986). In contrast, the ‘EMail only’ type networks of Fidonet and UUCP[25] were informal (low cost/no cost) networks relying on volunteers to operate nodes for ‘store and forward’ email transmission (cf. Bush 1993). (The issue of classificatory collapse of reality, is even more problematic on the adapted version of the ‘International Connectivity’ map used in Castells’ book (Figure 5.7 above) conflates the middle two classes into one.) The bottom class of ‘No Connectivity’ seems quite straightforward, although this will also have included ‘no data’ countries - the maxim, ‘absence of evidence is not evidence of absence’, always needs to be borne in mind when reading statistical maps. (This issue reappears in a similar vein with the ambiguous classificatory status of the ‘rogue states’ of Afghanistan, Iraq, North Korea and Somalia in the DOI map.)

The DOI is a much more sophisticated measurement of ‘reality’ and has categories (and the bar chart under the map allows alert readers to see the distribution of countries in the classes). Yet there are deeper conceptual problems with the DOI and similar kinds of indexes. One can argue that they are less meaningful, in important commonsense terms, than simple measures because their classification have no direct, intuitive relation to the real-world they purport to represent. (In this sense the four levels of the ‘International Connectivity’, whilst a gross simplification, are at least more intuitively meaningful than the DOI.) The composite nature of the DOI, made up of eleven different indicators, means that

[24] Bitnet had ‘gateway’ connections to the Internet to enable exchange of email. However, it was distinct from the Internet as it did not use the TCP/IP protocol for data transmission.

[25] For half of the maps - versions 6 to 11 - the ‘`EMail Only`’ category was expanded to encompass OSI networks in addition to UUCP and Fidonet. Reproduced in appendix two, Figure A2.2. See Salus 1995 for discussion of significance of the OSI challenge to TCP/IP in the early 1990s.

overall score for each country does not stand for anything specific or tangible, it is just a number representing ‘digital opportunity’. Yet no one know what this is, as it does not exist – it is a statistical construct. Furthermore, this DOI construct is literally ‘made-up’ and varies from place to place, so a similar DOI score in two countries does not mean they have comparable social and technological characteristics. This is counter intuitive in many respects. The classification of DOI into ten equal classes also has no inherent real-world meaning (what is the *real* difference between a score in the range of 0.4-0.5 and one in 0.5-0.6?). In this fashion, the DOI is a statistical ‘black-box’, which readers must take on faith to it represents some aspect of reality. However, in important ways, I would argue, the map has no relation to the world it represents, it merely reifies the DOI score as a reality. Much the same kinds of criticism were levelled at sophisticated factor analysis in the 1970s that produced statistical values that were not intuitively meaningfully to social experience; and some argue this applies today with evermore sophisticated deprivation models and geodemographic profiles (cf. Burrows and Gane 2006; Curry 1997).

Additionally, the process of data classification in statistical mapping usually implies, either explicitly or implicitly, a ranking of areas. When people are being represented on maps, the visual ranking has social meanings, with the map-maker exercising disciplinary power to produce an ordering of areas (and thus people) from ‘good’ to ‘bad’ or sorting out the ‘successful’ from the ‘failures’, according to particular criteria. Depending on the interests served, statistical maps can be deployed as instrumental tools of discrimination, operating as elements in larger systems of modern governmentality (Harley 1988a; Crampton 2004); for example in much ‘top-down’ analysis of poverty, choropleth type maps are used as a visual instrument for identifying areas suffering ‘problems’ - and implicitly the ‘problem’ people who need help - and enabling the spatial targeting of ‘solutions’ (cf. Yapa 1992). The judicious manipulation of data classification means it is possible to produce the ‘right’ ranking to identify the desired type of areas (and people) to target. The issue of power over people created through social order and instrumental targeting is at the heart of ‘Ground Truth’ critique of GIS and geodemographics (Curry 1997; Goss 1995; Pickles 1995).

In the cases of the 'International Connectivity' and DOI maps, the ranking serves the purpose of expounding a normative ranking of technological prowess. It has an explicit political ordering of countries based on their 'worth' to the so-called information society. For the 'International Connectivity' maps it runs from *Good* ('Internet') to *Getting there* ('Bitnet but not Internet') to *Unacceptable* ('EMail only') and bottom of the list, are the *Failures* ('No Connectivity). This last group of excluded nations are ripe for 'targeting' with (Western) networking know-how to 'solve' *their* problem of underdevelopment. With the DOI map countries become progressive more 'healthier' coloured, connotatively, the higher you climb up the 'ladder of progress' to the ideal state 1.0, complete 'digital opportunity'. Most of the rich world is already comfortably ('naturally') classed atop the 'International Connectivity' ranking and 'in the pink' with a high DOI score, and with each passing map, it is possible to see how well the other straggling nations are doing to 'improve themselves' and climb their way up the list. Such quantifying and ranking approaches can be seen as indicative of developmentalist view of inequality that locates the 'problem' solely within the boundary of the impoverished countries and exhorts them to follow set pathway out of poverty. For example, Yapa (1992, 507) in his critique of the pernicious use of maps of GNP as unproblematic 'facts' about the worldwide distribution of poverty notes: "[w]hat do we really communicate when we use this map?: that it is reasonable to compare whole nations to each other according to the exchange value of commodities; that developed countries are advanced because they have a higher GNP per capita; that underdeveloped countries need to expand their GNP rapidly if they hope to solve the problems of hunger and poverty, and catch up with the rest of the advanced world. But growth in GNP has no necessary relation to the eradication of hunger."

The connotative impact of the ranking of areas is frequently enhanced on choropleth mapping through the particular choice of colours and shadings and their sequence. Understanding colour perception related to the visual classification of areas on choropleth maps combine aspects of psychological comprehension, physiological processing and subjective interpretation in complex ways. The meanings taken up by readers are unstable and perhaps inconsistent (Dent 1995, 295). Although Keates (1996, 234) argues that colour in this context works in a "fundamentally metaphorical" way, where "fully saturated and dark is equivalent to either more of, or more important than; and less saturated and lighter is equivalent to either less of, or less important than." So where the choropleth map colours sequence run from dark to light colour, it can be argued, that the dark colours and heavy shadings reinforce notions that these are the 'darkest' areas, with shadowy people and endemic failure - what Cosgrove (2003, 134) calls "cartographic gloom" - while light colours give off the impression of progress, success and the 'light of reason'. Charles Booth's poverty map of London is a 'classic' in this regard. The streets at the bottom of his ranking, 'lowest class. vicious, semi-criminal', are shaded black, while the top category, the 'upper-middle and upper classes. wealthy', are coloured a light golden yellow.

It is interesting, however, that on the 'International Connectivity' and DOI maps the choice of colours are in reverse of this, with the darkest hues, being applied to the top category and the lightest colour to lowest category. The eight stage colour ramp on the DOI map, in particular, is open to connotative interpretation running as it does from light beige up to dark purple. One could argue that the saturated purple gives the impression of solidity, surety and, perhaps, superiority of Western Europe / North America in 'digital opportunity', in marked contrast to the pale and anaemic colours used to portray many nations at the bottom end of the ranking. Purple has historical connotations with royalty and richness (Dent 1995, 295). Many of these low scoring (under performing) countries lie in the global South, which in the Western imagination are stereotypically seen as poverty stricken places that are arid and dun-brown. In some senses, then, the DOI map resonates with Vujakovic's (2002b, 372) observation that the choice of colour can often "play on culturally embedded connotations; for instance, maps of the British empire were traditionally coloured pale red/pink, with connotations of 'health/vigour'."

5.5.4 Ecological fallacy and grouping bias

In addition to the issue of ranking, there are two more fundamental problems associated with the imposition of a constricting classification scheme on data in choropleth mapping. While classification is useful (often vital) to denote complex patterns of variability in a clearer fashion, and thus more easily comprehended, it also induces the problems of grouping bias and ecological fallacy. These are visual-cognitive effects on the map reader which work to diminish the apparent difference *between* areas and overstate the level of homogeneity *within* areas. These problems are not tractable from a map efficiency point of view, but must be embraced to begin to comprehend the ideological implications of statistical mapping. The later ‘International Connectivity’ maps and DOI map are an apposite example of both problems and create convergent connotations by reducing the apparent complexity of the pattern of Internet globalisation and the extent to which difference between nations is visible.

The ecological fallacy as a general statistical problem occurs when a relationship observed at one scale of aggregation is assumed to hold true when looking at a more detailed scale, without proof or testing. More specifically, in the case of statistical maps of social phenomena, it is the ‘natural’ tendency, in graphical connotations, to assume that the residents in an area *match* the average conditions of the area as indicated through the uniform shading on the map. This notion is commonly expounded in media reporting on social issues such as crime, health, and education (cf. Vujakovic 1998). This is problematic when demeaning social stereotyping based on the area’s characteristics come to taint individual lives.

In the case of the ‘International Connectivity’ and DOI maps, each country is assigned to one class and wholly shaded accordingly. The result is an easily-conferred visual impression that every location within the country has equivalent levels of network connectivity or digital opportunity and all citizens enjoy comparable access, which is clearly not the case. Uniformity in the shading of spaces on the map is all too easily connoted into uniformity of places on the ground[26]. Therefore, the ideology of ecological fallacy in these maps instinctively promotes an artificial sense of homogeneity, masking socially-significant variation and inequality within countries. This denial of differences in terms of reader connotations, one might argue, serves the interests of diffusionists because the results is a more orderly and convergent representation of social reality.

The reality of network access is far from uniform, particularly so in the early 1990s as many empirical studies have demonstrated (e.g., Miller and Slater 2000; Press 2000; Warf 2001). The effect of the ecological fallacy in the 'International Connectivity' and DOI maps are most evident, and significant, in the poorest places. In many least developed countries (LDCs), international network connectivity, especially in the early 1990s when Landweber created his maps, was likely to be very restricted, available only at certain elite institutions in primary urban centres. As Holderness (1998, 40) pointedly comments: "[t]here may be a full Internet connection at the university in Ulan Bator, but ten kilometres away there are no telephones." Despite very rapid growth in mobile phone use, significant basic access inequality issues remain in many LDCs today, which Castells (1998, 82) memorably characterised for Africa as "technological apartheid".

The ecological fallacy also has insidious effects for rich nations, imposing unrealistic visual homogeneity. In well-'wired' nations, including the U.S. and Britain, there were significant variations in take-up at in different regions throughout the 1990s[27] (e.g., see NTIA 1995; Office of e-Envoy 2002), often the focus for 'digital divide' policy initiatives. Although these differences in basic Internet access have closed markedly since the last 'International Connectivity'

---

26 I would argue this is exacerbated because areal units in choropleth maps are drawn for simplicity, using a so-called 'space-filling' approach - that is, no part of the territory can be left blank as unclassified. This contrasts with dasymetric approaches, described in section 5.6.3 below, which fades sparsely populated regions and greys out uninhabited area. Although, it acknowledged that the dasymetric is not a panacea for all problems of ecological fallacy; they are still scale dependent, so on world maps do not distinguish at the local level (Vujakovic, notes on thesis draft, October 2006).

27 There are, of course, also inequalities along other important social dimensions such as age, gender, class and race (cf. Shade 2003; Warf 2001).

map was drawn in 1997, socio-spatial differentials in networking capability are being replicated, in a quite similar fashion to the early 1990s, with the deployment of newer (faster, and more flexible) technologies like fibre-to-the-home and municipal public wi-fi coverage (Townsend 2003). So 'digital opportunities' are not evenly distributed, socially or geographically, with in developed nations but the connotation arising from ecological bias is that everywhere is uniformly 'in the pink'.

Due to the nature of the choropleth mapping, with its inherent visual dominance by geographically extensive areas, the ecological fallacy also contains an in-built rural-urban bias. As the average rate, determined predominantly by densely populated urban areas, must be 'painted' across the whole country, this can mean a significant overestimate of networking potential of rural areas. This is certainly the case with the 'International Connectivity' maps (extreme cases, in Figure 5.4, being Russia, Canada and Australia). Whilst network access has diffused to many rural areas over the last decade, the economic reality is that Internet *production*, despite the 'spaceless' rhetoric, is to a large extent an urban phenomenon, dominated by hubs in a few large cities[28]. Is it likely that 'digital opportunity' is the same across the whole of Brazil or China as it connotes to be or concentrated in a few major cities, mostly along the coast.

The second cartographic 'error', with political ramifications, caused by classification in statistical mapping is grouping bias, which is the prejudicial contraction of the differences *between* units of enumeration. Because of the limited number of categories, coupled to the selection of their class limits, it is often the case that really quite dissimilar countries end up being assigned, and visually labelled, to the same group. In conventional choropleth maps there is no scope for ambiguity or fuzziness, each zone must be classified completely - it can only exist in a single group. In the case of the 'International Connectivity' maps,

[28] According to Zook's (2005) empirical analysis of January 2002 data, the top 100 cities across the world, with only six percent of the global population, contained fifty percent of the Internet domain names.

all the diverse countries of the world have to fit into just four groups. The lack of discrimination in the top Internet class is especially problematic. Only a minority of countries shaded Internet purple actually had comparable nation-wide infrastructures to support genuinely comprehensive network access, especially so in the first 'International Connectivity' map from 1991 (Figure 5.4 above). The amount of international network connectivity could vary from a single (expensive, low bandwidth) satellite link in the capital city along a spectrum of capacity, up to countries with dense networks of high-capacity fibre-optic cables linking many parts of the country to the Internet. For example, on the 1991 map, the three nations that constitute North America are all shaded purple, denoting they are in the same group because they all have Internet connectivity, yet it is an inappropriate connotation if readers believe that Mexico's Internet capability was in any way equivalent to that in the USA and Canada at that time.

In the final 'International Connectivity' map produced by Landweber in June, 1997, a large proportion of the nations are classified as having full Internet connectivity. "Almost the whole world, it seems from a casual inspection of this map, has turned Internet-coloured" Holderness (1998, 39) sardonically commented[29]. Yet, this connotation of Internet hegemony through graphic homogeneity is map fiction. Despite their belonging to the same category, Petrazzini and Kibati (1999) demonstrate that the USA, Argentina and Kenya, for example, have fundamentally different Internet statuses, noting that end-user access costs (adjusted for purchasing power) were nine-times higher in Argentina than the U.S., and 413 times more expensive in Kenya. It is not just in the consumption of the Internet that inequalities are masked: arguably even wider and politically more significant variations are hidden in terms of Internet production (again, demonstrated by Zook's (2005) analysis of the geography of the Internet industry). The result, then, for an unwary reader of the 'International Connectivity' maps, is that countries coloured the same are easily assumed to

[29] Interestingly, he went on to construct his own version of the 'International Connectivity' map, which tried to remove some of the grossest distortions of the ecological fallacy and grouping bias, effectively by using dasymetric mapping techniques (discussed in section 5.6.3 below).

have equivalent levels of connectivity in reality. Reducing the connotations of difference between neighbours and across continents is powerfully convergent.

Grouping bias still applies for the DOI map as 181 different countries must be grouped into eight classes[30]. Although the extent of grouping bias is lessened somewhat as there are twice as many categories than in the 'International Connectivity' maps and the ranking of countries by their DOI score on the bar chart under the maps provides useful information on the class distribution and the degree of variance in their score. A much more radical representational strategy to overcome grouping bias would be classless choropleth techniques (cf. Peterson 1979; Tobler 1973), where all countries are uniquely shaded. Such mapping is now easily produce by mapping software and studies show readers can interpret them, but not widely seen as too unconventional and the resultant patterns are too complex.

In combination, then, the ecological fallacy and grouping bias result in the graphical imposition of homogeneity, diminishing diversity and the erosion of difference between places. The deeper question, then, is who benefits from the cartographic concealment of true inequality in the distribution of networking across the world in the 1990s? Making the situation *look* much better than the underlying social reality supports the 'diffusionist' viewpoint.

5.6 Design extensions to area-based mapping of Internet globalisation

There are various design options that can be applied to represent area-based statistical data to overcome some the methodological issues with conventional choropleth maps. While these can generate different denotative meanings about statistics of Internet globalisation, it is not always so easy to change the connotative impressions of the mapped world. In this section consideration is given to three extensions that have been used to represent Internet globalisation differently from standard choropleth mapping: pseudo three-dimensional stepped surface mapping, hybrid diagram mapping, and, lastly, dasymetric mapping.

[30] Plus the two special classes for 'no data' and for the 'rogue states'.

5.6.1 Stepped surface mapping of Internet globalisation

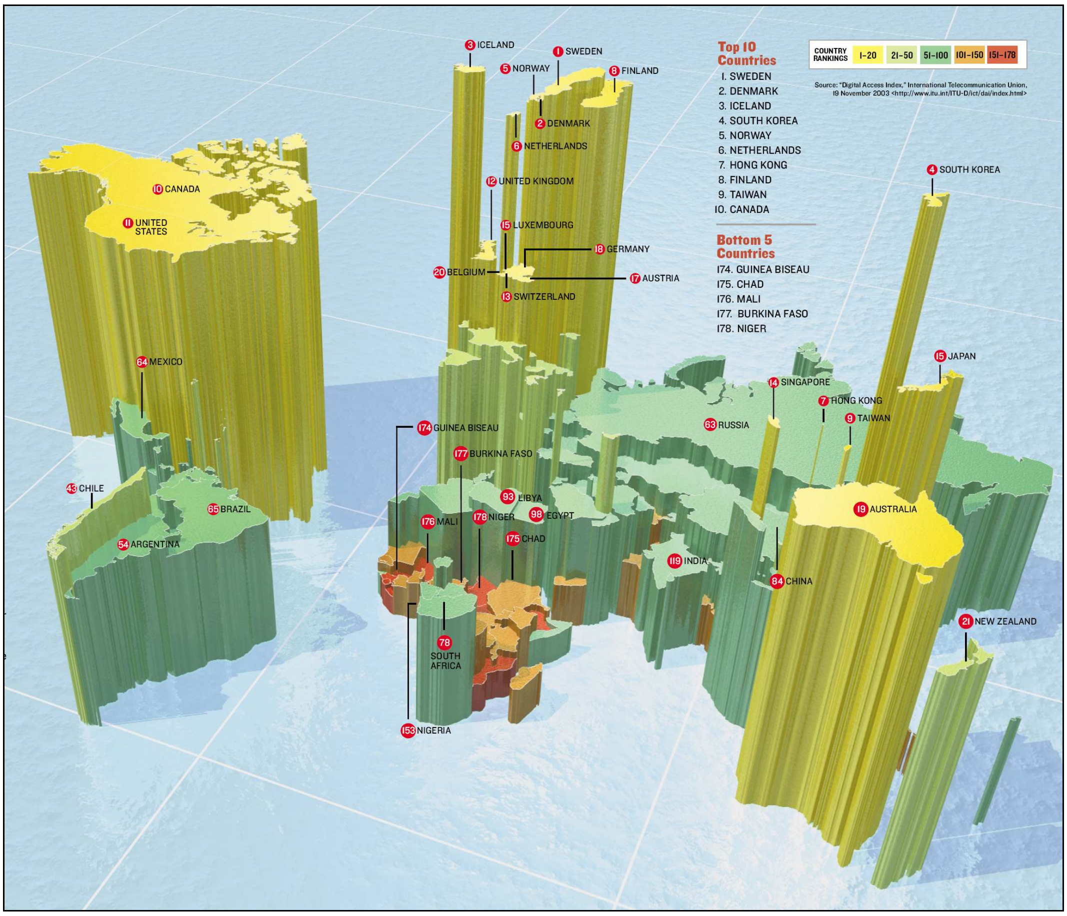

Figure 5.12: The 'Bit Map', a pseudo three-dimensional stepped surface map representation of the ITU's Digital Access Index. (Source: Cherry 2004, 54-55.)

Projecting data into the space above the x-y plane of conventional cartography is one possible way to display more levels of attribute information in statistical maps. The use of the z-dimension for representing density values and trend surfaces is relatively common and now quite easily generated with GIS software from point sample data. It is also possible to represent area-based data volumetrically as a stepped surface map where height above the ground of each enumeration unit denotes a statistical aspect of the data. Such stepped surface maps have some novelty as 'alternative' representations and do offer the potential to display more of the variance within data than may be possible with shading of the enumeration units according to a limited classification (i.e., z-dimension is unclassified). However, they also suffer from problems of visual occlusion when presented statically on a flat sheet of paper or display screen, rather than as a fully three-dimension model that can be used interactively and visually interrogated from different angles.

The ‘Bit Map’ is an example of a pseudo three-dimensional stepped surface map representing national-level data related to Internet globalisation (Figure 5.12). It was published on a double-page spread in an article entitled, ‘a world divided by a common Internet’ in *IEEE Spectrum* (flagship journal of the U.S. Institute of Electrical and Electronic Engineers). The accompanying text claims it “show[s] who’s bit-rich and who’s bit-poor, and why” (Cherry 2004, 56). The data underlying the map was from an ITU calculated ‘digital access index’ created in 2003, and a statistical forerunner to their DOI national ranking discussed above.

From initial inspection it is a visually intriguing representation of the world, however in a lot of ways it is premised on a conventional choropleth approach, with five colour-coded classes with unequal intervals. All that is different is the countries are extruded vertically according to their index score, in addition to being shaded. Indeed, one can seriously question the benefits to legibility in employing the stepped surface mapping technique as the scaling factor for the extrusion means particularly tall counties mask other parts of the map. The vertical bulk of Australia blocks out much of Southeast Asia, for example, and the relatively well-wired South Africa obscures a good portion of central Africa. In denotative terms it is also difficult to compare reliably the heights of countries from different regions (is Brazil higher than South Africa?). Given the viewing angle for map, some countries also have an unfamiliar shape to them making identification more difficult. The one noticeable benefit of projecting up off the surface of the map is that territorially small nations that score highly – and therefore stand tallest – can be much more easily discerned than on a ‘flat’ choropleth map (e.g., Hong Kong, Singapore).

Besides the denotative issues with information legibility, the ‘Bit Map’ does, however, connote powerfully an *overall* sense of the patterns of sharp divisions across the world. The countries in the global North metaphorically and graphically appears to stand over the world and dominate the map. This is enhanced for some countries because of the viewing angle at which the map is drawn. The overall tilting of the map diminishes the apparent size of the nations in the southern hemisphere. The bottom scoring - denotatively lower - countries are all found across the middle of the continent of Africa. Statistical ‘cliffs’ seem to rear up to separate the ‘mountainous’ networked core of Europe from the flat under-wired periphery. Inequalities between some neighbouring countries appear to be sheer and physically insurmountable because of how they are drawn, quite a different connotation in comparison to how disparity between classes in a ‘flat’ choropleth map is read. In connotative terms the difference between high and low have clear social significance to readers, creating valuative connotations; Harpold (1999, 17) observed of such three-dimensional statistical mapping: “[a]cross its peaks and valleys emerges an archipelagic, virtual landmass that traverses the conventional boundaries of continents and nations. Viewed from on high, the vast, flat surface of the network’s digital plains seem far removed, alien and obscure.”

Geographically contiguous nations at the same level of distribution tend to merge into one another, supporting the impression of large politically unmarked terrains free of significant activity at lower level, and others, politically-differentiated but also uniformly towering over the rest of the world. (The towering nations are all signalled as important connotatively by the selective denotative labelling.) Yet, it is not just about height alone, the use of the z-dimension creates much greater visual differences, enhancing the presence of already territorially large countries that score well, by granting them voluminous amounts of space on the map display (e.g. Australia, the U.S./Canada are not just taller, they appear to be very much bigger than other nations). Along with the effect of the bright yellow colour, for the countries in the top category, the connotative meaning of their bulk is clear - bigger is better.

The selective labelling strategy highlights that this is not a map of the whole world as it purports to be, but actually a map of an American viewpoint on parts of the world that are deemed to be significant. (The top 10 countries are listed against only the bottom 5, for example) Many nations outside the core economies are left unmarked; the 'middle' ranked countries, of average height, are undifferentiated and unnamed. Special treatment is reserved for the bottom five countries in central Africa which are purposefully identified by text even though they barely register as volumes in space.

The selective labelling, combined with the widely differentiated heights applied across the world (rather than classifying the z-values) means that the patterns revealed are too complex and disorderly to connote convergence. And despite the muted colour ramp that hints at convergence, the connotative effects of such uneven heights and variations in volumes between adjacent nations and across continents is to imply an excess of difference in the world. As such the 'Bit Map' is firmly located in the divergent quadrant of the fourfold conceptual model of connotative meanings.

The 'Bit Map' read semiotically in its totality is also clearly projecting a forcefully valuative connotation, it is "intended to aid in preferential selection" (MacEachren 1995, 227). A more challenging way to re-map the 'world divided by a common Internet' would be to reverse the logic of the extrusion so the lower the statistical score, the taller the projection of the country. This would, perhaps, contest stereotypes by highlighting the divergent of the world seen from the perspective of those nations usually at the bottom of worldwide ranking schemes.

5.6.2 Hybrid diagram mapping of Internet globalisation

Another thematic mapping method to display statistical data is using multiple small charts or diagrams drawn within country boundaries. The advantage is that the diagrams can display several different statistical values at the same time rather than the single value denoted through shading the enumeration unit. The notion is that the reader can make comparative inferences between areas according to multiple statistical dimensions, giving a more nuanced understand of the spatial distribution and the underlying social processes. Although the results are not necessarily effective because, as Board and Taylor 1977 31) note, attempts "to show both the total volume and proportional sub-divisions of a phenomenon in an area by complex symbols such as pie-charts sets up mutual interference or 'visual jamming' that could be severe enough to reduce the information communicated by both sets of information."

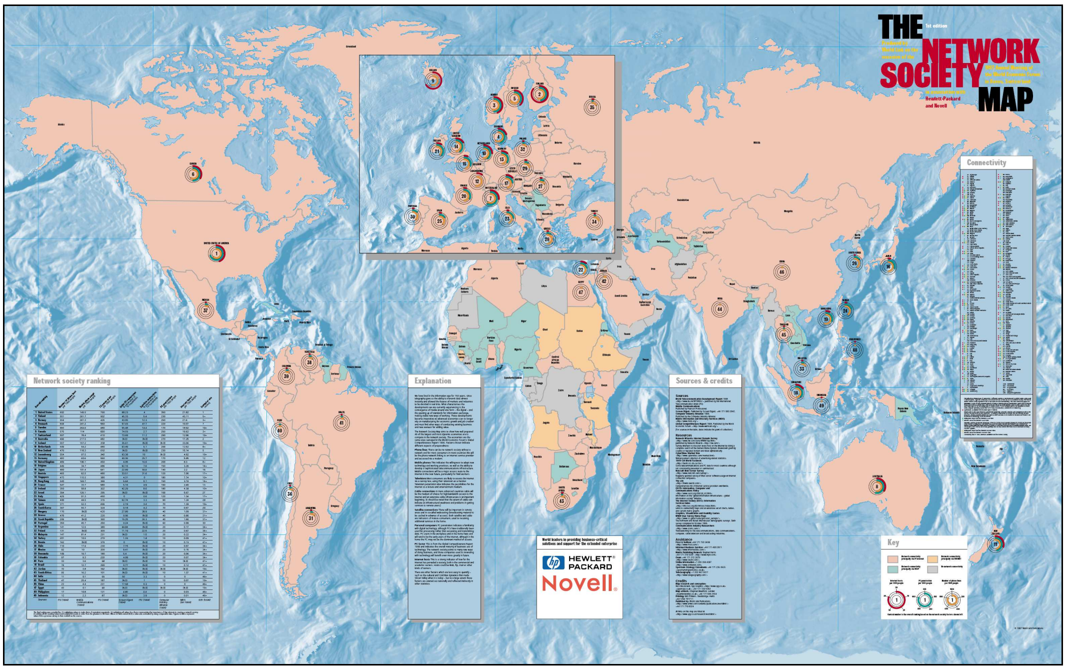

Figure 5.13: The 'Network Society Map', published by World Link, 1997. Map research and conception by Nico Macdonald; cartography by Chapman Bounford. (Source: Spy Graphics, <www.spy.co.uk/research/worldlink/>.)

An example of diagram mapping applied to the theme of Internet globalisation is the 'Network Society Map'[31], published in 1997 by World Link magazine (Figure 5.13; a larger version is also reproduced in appendix two, Figure A2.11.) The 'Network Society Map' was originally designed to be distributed as a large poster (measuring 32" x 54") for "the occasion of the 1997 Annual Meeting of the World Economic Forum in Davos, Switzerland", according to subtitle. The overt business-focus of the map is denoted explicitly in the text in the 'explanation' box, the being to "show how well prepared 49 of the largest and most dynamic

[31] Another conceptually similar but graphically more complex diagram map entitled 'Wired Countries of the World' was produced in 2007 by the World Information Access Project. It is not analysed here as it does not add anything substantive to the arguments but is reproduced for information in appendix two, Figure A2.12. This map suffers severely from what Board and Taylor (1977) term 'visual jamming'.

economies are to compete in the network society." The map's support for global capital is reinforced through its visible sponsorship by Hewlett Packard and Novell, two major multinational IT companies with the prominent presence of their logos in middle of the page. The connotations from these texts and logos signals the world as represented in the map is ripe for capitalist exploitation, it is a dehumanised view of national markets with differing opportunities for investment and profits.

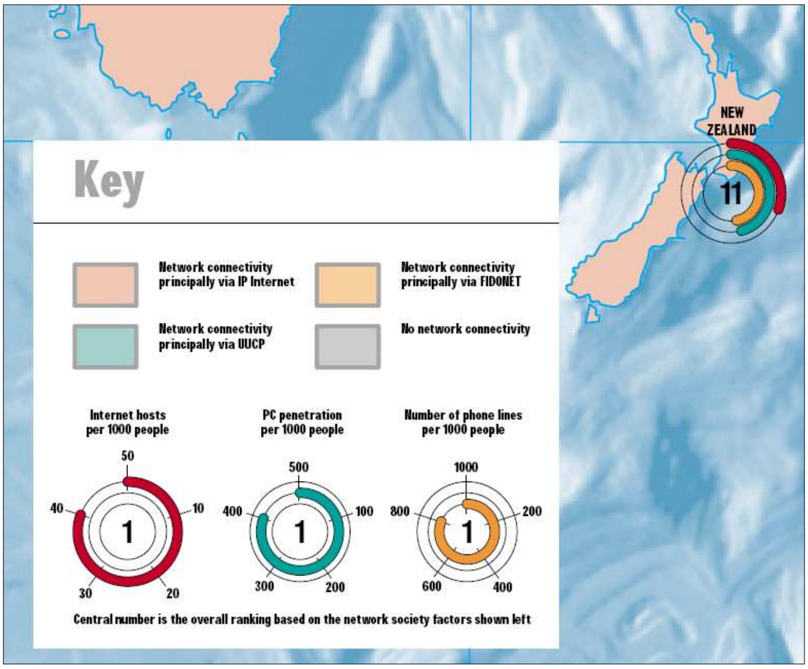

Figure 5.14: A subset image of the 'Network Society Map' showing the key showing the choropleth shading scheme and doughnut symbol. (Source: author scan from original.)

The map is well constructed cartographically with has production values as befitting its target audience; it is rather more aesthetic than purely scientific. For example, the design uses a graticule and shaded ocean floor terrain to frame the countries which creates a more realistic feel to the background, rather than the unadorned white frame more typical of statistical maps. All countries are identified and have name labels.

The map visually denotes five different statistical variables (see legend detail in Figure 5.14), although it is demanding to make meaningful comparative inferences between them and across multiple countries. At the base level, all counties are assigned into one of four classes and shaded accordingly. This classification is actually Landweber's 1996 'International Connectivity' survey (acknowledged in the notes at the bottom of the Connectivity text box). Most of the world is in the top class (full Internet connectivity) and shaded a warm pastel pink, except for the mosaic of colours across central and southern Africa indicating much greater difference. Doughnut-type symbols located within a select number of countries denote another four data variables (Figure 5.14). Three ICT measures, phone lines, PCs and Internet hosts per capita are denoted by colour coded rings and the overall network society ranking is denoted by the number at the centre of the doughnut. Much additional 'technical' data and detail is also presented to readers in four text boxes which work connotatively as credible evidence to enhance the credibility of the map itself.

The 'Network Society Map' is a discriminatory representation, denotative ranking only 49 nations, thus connotatively signally these are the nations that matter most in the network society. The prime focus of the map is Europe with its denotative enhancement through the enlargement of scale and the graphical highlighting in the drop shadow box. (The box connotes, perhaps, as a protective wall around 'fortress Europe'.) The Eurocentric connotative meaning is clear - the network society is principally enjoyed by markets of European nations[32]. The rest of the world is relatively sparely covered, except for a slight cluster in Southeast Asia economies; large swathes of the world and hundreds of millions of people are, by implication, excluded from the network society. The 'empty' African continent languishes, connotatively, below spatially enhanced and graphically enclosed Europe, only receiving doughnut symbols at the top and tail and nothing worthy of network society status in between. Indeed, much of the equatorial zone of the world seems to be beyond the network society with no doughnut symbols found in the Caribbean or Central America. The large expanse of Russia (heading east beyond the safe confines of the European citadel) and central Asia is also a

[32] Although even in the European heartland of the network society, there is powerful and judgemental selectivity on what nations matter. Many 'emerging markets' in the eastern half of Europe obviously do not quality for network society status. Russia does get targeted but all its former colonial territories are consciously left out.

denotatively empty and connotatively unimportant void.

Yet as noted earlier, many of these ‘excluded’ economies in Africa, the Caribbean and Central America are actively involved in the production and development of the information economy, albeit in a different capacity to those in developed nations (i.e., as manual labour providing raw materials or manufacturing, low-paid back office function rather than high-order information processing).

The connotative power of Europe, at the centre of the network society, is assisted denotatively because the territorially compact countries are well filled with the large doughnut symbols. For other countries, with larger territorial extents, these symbols look much less impressive and a stuck somewhat awkwardly in the middle, signify a relatively empty zone of activity, with network society concentrated only at this one point (e.g., the USA, Canada, China). Europe also gains in status by the denotative North-South division in the map layout by placing nearly all text boxes and ancillary material in bottom of the map, connotatively in regions that do not matter so much to the network society, which is securely located in the region above.

Besides their geographical distribution, the doughnut symbols themselves are open to interpretation. At one level they are not effective denotatively for statistical comparison between countries and their interpretation is made harder as the three colour-coded rings have widely different scales (e.g., why does the USA score better than Finland?). Connotatively, they imply complexity and show excessive difference, with too many rings empty for countries outside the West. Even the emerging BRIC economies barely register any colours on their doughnut rings. The extent of bareness is confusing connotatively, how can they be ranked in the network society if they denotatively don’t have any PCs or Internet hosts? Also, what is the connotative meaning of the doughnut symbol design itself? It has a quasi-militaristic appeal of a target on a firing range. Does these signify the value of countries as different business ‘targets’, their worth denoted directly by the large number in the bull’s-eye for business in the network society. The number ‘1’ target of USA is worth more than Indonesia at number ‘49’. No target symbol on a country connotes that it is not worth targeting by corporations.

In conclusions, the 'Network Society Map' leaves much of the world unmeasured and unmapped. The selection of criteria measured and mapped to denote 'preparedness' of the countries for competition with each other are wholly concerned with technological superiority, with no wider social or cultural dimensions. A great deal of variation and inequality is evident in the 'Network Society Map', which in its desire to show technological progress and prowess, only targets the best 49 countries with attention. The map is a divergent view of the world.

5.6.3 Dasymetric-based mapping of Internet globalisation

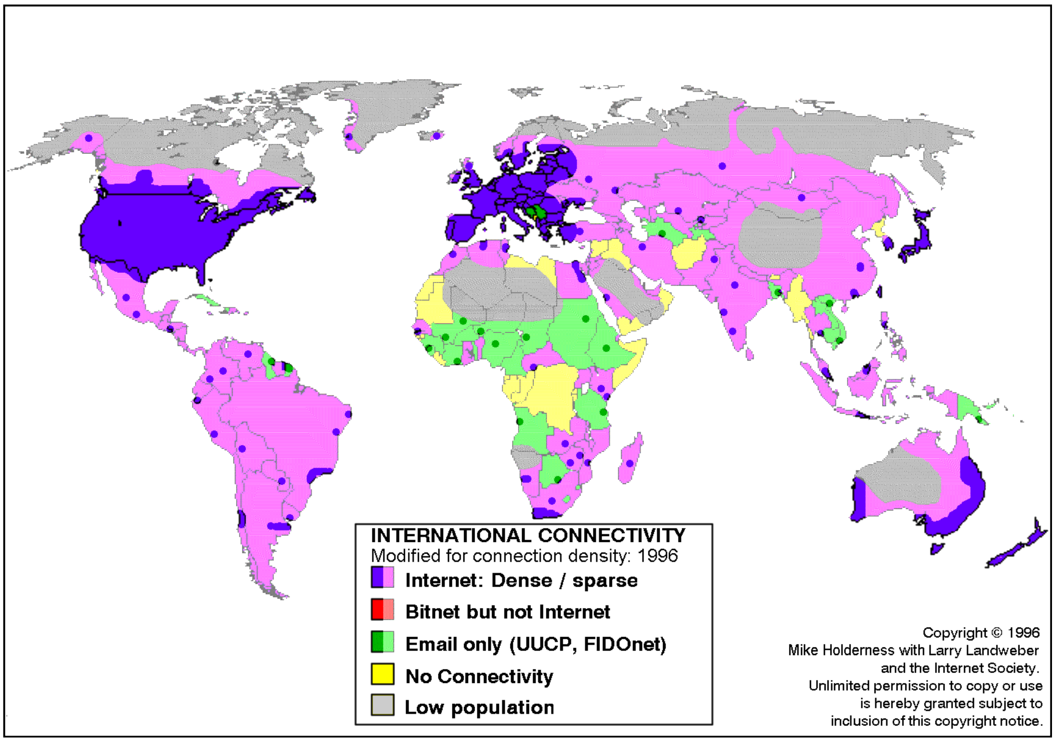

Figure 5.15: A hand-drawn dasymetric style map of 'International Connectivity' produced by Mike Holderness. It is a consciously political 'adjustment' of Landweber's original map that seeks to undermine the myth of rapid Internet diffusion. (Source: Holderness's website, <www.poptel.org.uk/nuj/mike/cyberdiv.htm>.)

The dasymetric technique for cartographic representation seeks to ameliorate the gross areal averaging inherent in choropleth maps by explicitly recognising the internal spatial distribution of the phenomena being represented to create a new set of zones to display the data. The goal is, therefore, to map the statistics, as far as possible, to their 'natural' zones rather than to arbitrary, prescribed units of publication (mostly based on administrative convenience). The primary application of the technique has been in mapping social phenomena, particularly population distributions. It can be argued that the dasymetric mapping methods give a more denotatively 'accurate' (i.e., spatially realistic) - and hence a more connotatively persuasive - visual representation. The dasymetric method can "help us to escape from the spatially bounded conceptions of human life produced by the choropleth map" (Crampton 2004, 50). Robinson (1982) traces the lineage of the dasymetric approach back to the 1830s, with the Harness population map of Ireland cited as the first published example.

Yet dasymetric mapping has been only sporadically deployed, despite its potentially significant benefits for mapping area-bases social statistics. This lack of use is because it requires considerable amounts of ancillary geospatial data[33] and additional cartographic processing to produce them, compared to the standard choropleth mapping techniques[34]. Also, like cartograms (discussed in section 5.7 below), dasymetric maps can suffer from the 'unfamiliarity' problem, as new the boundaries generated to display the data are more complex and less uniform than the administrative units people are used to seeing.

Despite this lack of general use, dasymetric ideas have been applied to the mapping of Internet globalisation by journalist and activist, Mike Holderness

[33] In terms of social mapping, necessarily detailed, small-scale, data on population distributions have traditionally been unavailable - although technical developments in urban remote sensing and household level geodemographics are changing this, at least in the UK (cf. Longley and Harris 1999). In many ways, Martin's (1996) extensive work on surface-based population representations from the census provides one of the best routes to generating data needed for dasymetric mapping.

[34] The availability of GIS, enabling greater flexibility in the manipulation and aggregation of spatial data, has made it potentially easier to create dasymetric maps (e.g., Mennis' 2003, work using ArcView). However, as far as I am aware, no major GIS package yet provides a 'point-and-click' function to generate dasymetric maps. Indeed, the help system for the market leader, ESRI's ArcGIS, contains no reference to them.

(1998). He states he was troubled by the level of abstraction in the 'International Connectivity' maps, how they portrayed an unrealistic viewpoint on the extent of world-wide network diffusion, and decided to produce his own approximate, hand-drawn reconfiguration as a political counter-map (Figure 5.15; it is also reproduced as a full page image in appendix two, Figure A2.13). Although he does not recognise it as such, his map has many elements of dasymetric design.

Holderness' adjusted map removes some of the most significant elements of distortion from the 'International Connectivity' map (he used the second to last map from 1996 as his starting point, reproduced in appendix two, Figure A2.2) by fading non-metropolitan regions outside of the OECD core nations to account for their likely much lower 'connection density' and also greying out the uninhabited deserts and arctic tundra. Holderness has effectively doubled the complexity of the classification, so as to make "a first approximation at a realistic map" (Holderness 1998, 40), by introducing the notion of dense and sparsely networked regions (in many ways mirroring the more complex division in the original 'International Connectivity' data tables; see Figure 5.6 above). Although the representation of dense and sparse areas was acknowledged as cartographic guesswork on Holderness' part, the result is a view of the world with a very much more constricted degree of Internet globalisation, and with network connectivity significantly more spatially concentrated, than implied by the homogenising choropleth display of the last few of the 'International Connectivity' maps. (For example, Russia, China and Australia seem to be much less completely networked in dasymetric form compared to the choropleth representation in the 'International Connectivity' map.) The rich, dark purple shading of full Internet connectivity is very much more constrained to the core regions of the developed world in Holderness' presentation. It is also interesting to see that Holderness is willing to create his zoning scheme by curving the boundaries of different connectivity levels across national borders (e.g., between the U.S. and Mexico) which is arguably more realistic that the complete cut-off at the frontier implied by the solid black lines on the 'International Connectivity' map. In this fashion Holderness is by implication breaking down the primacy of the nation state metageography, where countries as sovereign units must be denoted as completely separate and self-contained on conventional world maps.

In connotative terms Holderness (1998, 40) says of his map, “it is not dissimilar to a map of per capita income - or, for that matter, one of where the white folks are”. The global south is clearly rendered connotatively as markedly unequal periphery through the use of faded colours, while the distinctive ‘spotty’ appearance highlights to the map reader the tight concentration of the best connectivity in very few principal cities (e.g., India goes from full purple in the ‘International Connectivity’ map to only three dark city spots). And one could argue denotatively that many of the spots are actually exaggerated and if drawn to scale would actually be dots of connectivity. In many ways then, Holderness’ dasymetric mapping of the Internet highlights effectively the extent of continuing unevenness in network access and the complexity of patterns within countries and across regions, countervailing the more harmonious picture painted in the ‘International Connectivity’ and DOI maps. As such, on the fourfold connotative schema for maps of Internet globalisation, this dasymetric view of the world should be placed in the quadrant for map with disorderly meanings.

5.7 Cartogram-based mapping of Internet globalisation

Cartograms are a hybrid of map and diagram in which a scale manipulation of distance or area is deliberately employed to highlight the structure of the thematic data at the expense of geographic accuracy. The most common technique is the ‘value-by-area’ cartogram where the units of enumeration are drawn scaled according the statistical data and not their customary territorial extents.

Even though there is a relatively long history of cartograms production, dating back to innovations in the 1860s in statistically representing data for European countries (see Tobler 2004 for review), they have not been commonly deployed, particularly compared to choropleth maps. This is due, in part, to the fact that they are perceived as being more demanding to produce, and in an era of automated cartography, most software packages still do not provide cartogram drawing functions[35]. When cartograms are deployed, it tends to be for consciously political reasons and a case is often made that they offer a more socially progressive way of mapping people, particularly at the global scale (Vujakovic 1989). For example, the political case for cartograms for radically re-presenting global social geography is explicit within the work of the Worldmapper project at Sheffield University, as they claim their eye-catching cartogram design "enables a more democratic representation of the population of the world, where people are treated as equals regardless of where they live" (Barford and Dorling 2008, 68). Cartograms are said to be rhetorically powerful because they eliminate the "fundamental distortion of much past thematic cartography in (literally) drawing our attention to the patterns in places where the fewest people live" (Dorling 1994, 85) and thus offer a connotatively 'fairer' scheme of visual representation, particularly at the world scale (e.g., small, densely populated states can be easily seen and sparsely populated territory shrinks). The goal in their use is, therefore, to stimulate new ways of thinking about social patterns represented by denoting them in a way that goes against convention (e.g., cartograms used in Kidron and Segal 1995).

The major disadvantage of cartograms is their unfamiliar denotative appearance to readers. Cartogram algorithms, particularly contiguous ones that attempt to preserve boundary adjacency, can produce very warped country outlines, eliminating conventional shapes and shifting well-known landmarks, such that people, who have been imprinted from a lifetime's exposure to the 'normal' visual geometry of world maps, find them confusing and difficult to read. (The extent of distortion to conventional shape is a very evident issue, for example, in the Worldmapper cartograms; selected examples shown in appendix two, Figures A2.15–A2.18). Such denotative unfamiliarity can, of course, be viewed as a connotative benefit as it can spark interest and help to challenge complacent viewpoints - "[t]he appeal of cartograms no doubt results from their attention-getting attributes" (Dent 1995, 208). However, it can also reduce the effectiveness

[35] Various custom scripts and programs have been developed to create cartograms (e.g., Dykes' (1997) 'cdv' system), but the extra effort required is usually not justifiable, compared to the ease of producing a choropleth map.

of the map because people focus their attention more on the mapping technique than on the actual data being represented, thereby breaking one of Tufte's (1983) maxims for good information design.

Cartograms are potentially interesting semiotically as a representational technique to change the conventional denotation of statistical views of the world that has connotative impacts beyond just 'shocking' the audience out of complacency – they can connote a uncluttered and more lucid world picture. Such a smooth, simpler and more straightforward appearance of nations for example, unencumbered by the complex twists and turns of borders and coastlines, implies a greater clarity of understanding of the statistical trends and highlights differences not noticed before. In the context of representing Internet globalisation under examination here, the interesting question is whether the connotative meanings in cartograms suggest a more divergent pattern in comparison to the tendency of choropleth maps to present a convergent view of the world coming together.

A number of cartogram techniques have been applied by several different individuals and groups to represent the extent of networking across the world. It should be acknowledged that the distribution of most of these cartograms of Internet globalisation has been limited, especially in comparison to the two main choropleth-based examples considered above ('International Connectivity' and the DOI maps) and they should perhaps be viewed as rather experimental interventions into the discourses of network development. As such they have likely had little impact on reshaping the wider discourses about the worldwide extent of Internet globalisation, but do offer alternative connotations that are worth considering, particularly if an organisation with influence, such as the ITU, were to decide to deploy cartograms rather than choropleth-based world maps in the future.

Distance-based cartograms using a linear scale distortion according to cost, time or speed of travel have been employed to show how communications connectivity is differentially re-scaling relationships between places, for example Arrowsmith and Wilson's (1998) 'telecom tectonic' world maps (example reproduced in appendix two, Figure A2.14). Crude aesthetically, their cartograms denote the distance between countries in terms of the uneven costs of telecommunications, which they claim connote differences between cyberspace and physical, highlighting the “location of electronic ghettos … of the electronic world” (Arrowsmith and Wilson 1998, 8) not apparent on conventional choropleth maps.

Value-by-area cartograms have also been used to show Internet globalisation, including the work of the Worldmapper project, using their novel equal area diffusion algorithm that attempts to preserve boundary shape and adjacency of nations[36]. The Worldmapper team are publishing online hundreds of world cartograms on a myriad of social, demographic and economic themes using public national-level statistics. They have created two cartograms of Internet users per capita, for 1990 and 2002 survey points – the results denote the northern hemisphere nations as greatly enlarged, connoting images of being blown up like balloons and the Global South shrivels almost out of existence (reproduced in appendix two, Figures A2.15-A2.18). Their goal is to highlight scale of inequality by exaggerating the connotation of divergence between regions of the world in the hopes of bringing about changed policies (which would ultimately bring about changes to the patterns denoted, making the world a more harmonious social space). Their 2002 cartogram poster, for example, asserts this agenda through a human voice in the following quote: “we strive to achieve a ‘warm-hearted digital world’ where everybody … enjoys ubiquitous access to communications technologies for the greater good” (reproduced in appendix two, Figure A2.17). The denotative and connotative meanings of their cartograms can, in some senses, be correlated to Barford and Dorling’s (2008, 108-09) dual scientific objectives expressed in their work: “These cartograms are scientifically (in the natural science sense) [and denotatively] interesting as they result from the beauty and elegance of solving an algorithmic problem. These cartograms are also scientifically (in the social science sense) [and connotatively] interesting because they show how we live now – they deliver a clear message about the current state of the world.”

[36] Developed by U.S. academic physicists Michael Gastner and Mark Newman. Further details at <www.worldmapper.org>.

The more easily constructed and thus more commonly drawn cartogram design is the non-continuous one and there are several exemplars that map data relevant to the theme of Internet globalisation, including ExploMap Technologies' cartogram using a relatively simple design of scaled square blocks representing the number of Internet users placed directly on top of world map of country boundaries; Govcom.org's 'digital divide cartogram' has an interesting twist in that country size is drawn inversely proportional to level of Internet usage, so the nations with least become the most visible; and Byte Level Research's cartogram ignores geopolitical boundaries by focusing on the global politics of Internet domain names with nations represented solely by their country codes scaled according to the size of population (these three different cartograms are reproduced in appendix two, Figures A2.19, A2.20, A2.21)[37]. Two further non-continuous cartogram examples will be considered in a little more depth because they have a rather more sophisticated design perspective and significant political agendas – the first is from a U.S. technology magazine and connotes the 'wired world' as a set of business opportunities and under-developed markets, the second is a project by an Italian artist questioning the unequal growth in the Internet in relation to population geography by exploiting the iconicity of nation-state flags.

[37] Original pdf versions of them are currently available from:

- <www.bytelevel.com/map/ccTLD.html>,
- <http://explomap.free.fr/world_map_internet_users_2005.pdf>,
- <www.govcom.org/maps/map_set_wsis/GC0_Maps_set_3.0_digitaldivide_invert.pdf>.

5.7.1 'Wired World Atlas' cartogram

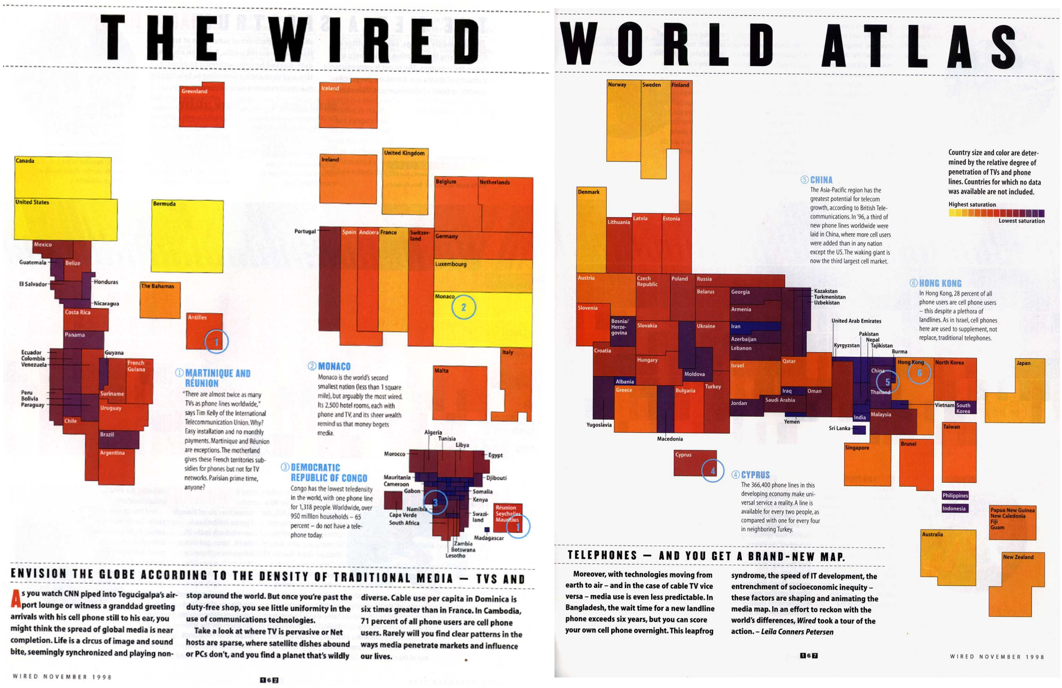

Figure 5.16: The 'Wired World Atlas' displays national-level statistics on telephones and televisions per capita using a non-contiguous cartogram technique. (Source: author scan from Conners-Petersen 1998, 162 and 167.)

In 1998, at the height of the 'dotcom' boom and the hype around the transformative potential of the Internet and worries about those people and places trapped on the wrong side of the digital divide, Wired magazine featured a large non-contiguous value-by-area cartogram, entitled the 'Wired World Atlas' in its November issue. In the cartogram countries are denoted as rectangular blocks, scaled according to telephone lines per capita and shaded by the penetration of television (Figure 5.16; a larger version is reproduced in appendix two, Figures A2.22 and A2.23). Wired magazine is a U.S. technology lifestyle magazine with a strongly libertarian and utopian outlook on the Internet, and in the mid 1990s was considered something of a 'bible' for the true believer in cyberspaces' potential to change the world for the better (Jordan 1999). Their conscious decision to use a visually novel cartogram representation rather than a more conventional choropleth world map is in keeping with the design pretensions of the magazine which often features alternative and colorful info-graphics.

The 'Wired World Atlas' cartogram was printed across a double page of the magazine as part of a six-page special fold out section[38]. This feature was promoted on the magazine's cover with the strap line: 'Globally wired - your foldout guide to every nation's tech wealth' which overtly construes the agenda of the cartogram. It is a technologically centred narrative, viewing computer media and telecommunications as actives agent, existing 'outside' of society, that are capable of directly effecting (positive) changes social behaviour. The text accompanying the map also clearly advocates a developmentalist point of view that technology can solve problems of uneven development: "This leapfrog syndrome, the speed of IT development, the entrenchment of socio-economic inequality – these factors are shaping and animating the media map" (Conners-Petersen 1998, 167). The statistics represented on this 'media map' are wedded to commercially-driven, positivist measures of infrastructure penetration and technological progress, failing to reveal the nuanced role that many developing nations play in supplying and supporting the information economy of developed nations.

[38] The other four pages feature a large summary chart, entitled 'The Media Spectrum', showing countries classified by eight different statistics accompanied by short anecdotal portraits of how technology is improving individual lives in different countries.

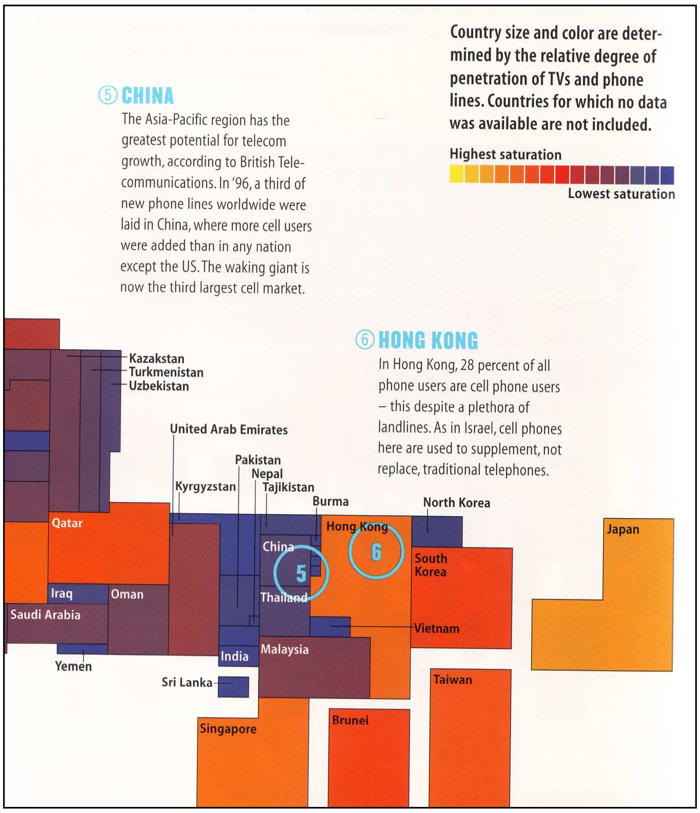

Figure 5.17: A subset image of part of the 'Wired World Atlas' cartogram. (Source: author scan from Conners-Petersen 1998, 167.)

Design wise the cartogram is actually a quite familiar shaped world view, albeit with a strongly rectilinear manifestation, with the established cardinal orientation of north at the top, America to the left and Australia on the right, and the continental groups all in the right places. In denotative terms a major change from world scale choropleth maps, such as the 'International Connectivity' and DOI considered above, is that countries can not be recognised by their familiar outline shape so must all be labelled for identification. Many counties do maintain, approximately, their correct geographical adjacency to each other. Representing nations scaled by the statistical values rather than their territorial extent results, in general terms, in the countries in the Global North being denoted as larger and lighter coloured, compared to the rather undifferentiated mass of nations in the southern hemisphere, which tend to be much smaller and more darkly shaded. The most striking visual feature of this cartogram, in connotative terms, is the shrunken-looking African continent which seems to be overwhelmed by huge, overbearing European country blocks. Although slightly less oppressive, this ‘squeezing down’ from above connotation also applies to a stunted looking Central and South America that seems to capped by the ‘heavy’ golden blocks of the U.S. and Canada. Mexico, in particular, seems to have been squashed flat by their bulk.

In specific denotative terms the representation performs poorly as it is impossible to judge the meaning of the size of countries as no scaling equivalence is given in the legend (shown in close-up in Figure 5.17). In fact, the legend and accompanying text are vague about the mechanics of the classification and denotative meaning of the shading; what is the scale of the saturation meant to indicate? (Whether this vagueness is deliberate or merely oversight is not discernable.) How are readers to reliably decode the meaning of two variables in the cartogram? Perhaps they are not supposed to focus on detail of each country but just appreciate the ‘big picture’. Besides size and colour, the actual shape of different countries varies from exact squares and elongated rectangles, to some with odd blocky protrusions. Again, it is not clear whether this denotes information or is simply artistic license by the designer (the shape of Italy would suggest shape is used arbitrary for decorative purposes alone.)

Even though the denotative meaning of the size and shape of countries is unspecified and therefore uncertain, the potential connotative meanings are interesting to speculate about, particularly how to read the meaning of narrow-vertical nations (do they appear to be ‘skinny’ and rather ‘puny’?) in comparison to the wide-horizontal countries (which seem ‘fatter’). This thin/fat visual dichotomy, arguably, creates subconscious perceptions of the differing potency and worth of nations – in this case square-fatter shaped countries appear superior visually and thus are judged as being superior places. The variations across Western European nations, between wide ones and tall ones, is an interesting case in point; connotatively how do France and Belgium compare, or more dramatically in terms of visual prominence, Monaco and Switzerland?

The case of Monaco's representation in the 'Wired World Atlas' also highlights another key denotative aspect of the cartogram in that it offers clarity of representation in some respects in that many small nations can be seen at the global scale. As noted above, on the 'International Connectivity' and DOI maps many small nations can not be discerned visually, and connotatively they do not exist in the mapped world. In Figure 5.16, the tiny principality of Monaco is actually the most visible nation at the centre of Europe, with the largest graphical extent and a bright yellow shading which makes it stand out from the darker hue colour of its neighbours. Connotatively, Monaco is clearly an important nation in the wired world, a point reinforced denotatively by the addition of a textual citation next to the cartogram informing readers that it may be small in land area but is 'arguably the most wired'. The text goes on to point out the obvious explanation for this 'superpower' status in the wired world – "its sheer wealth remind us that money begets media." This hints at the fact that per capita wealth is actually the real factor determining denotative visual presence of countries on the 'Wired World Atlas'.

As well as highlighting the small and wealthy nations, the cartogram seems to give undue denotative attention to a select few island economies which are most 'plugged' into wired world. Such islands are normally mere specks in expansive seas and oceans on conventional map projections. The 'wired' islands that are most apparent are in the Atlantic with Bermuda, the Bahamas and the Antilles, typically invisible on world maps, shown are hefty-sized blocks in their own right. Indeed, Bermuda seems like some kind of new Atlantis, drawn as large as North America and connotatively inviting favourable comparisons between the two nations. While in the southern hemisphere, the whole African continent (undersized denotatively and connotatively an unwired zone of 'failure') is visually hemmed in by an enlarged Cape Verde island and a combined island block representing Réunion, Seychelles and Mauritius; this bright red block is denotatively bigger than the whole of southern Africa (it also receives additional attention as a 'noteworthy place' via a text citation). The way these islands are mapped is also interesting as it provides clear evidence of selective cherry-picking as many other island nations – one suspects the poorer and much less wired one –

are consciously not represented on the 'Wired World Atlas'. For example, much of the Caribbean seems not to exist.

In terms of visual clarity, the African nations are clearly a denotative design 'problem' on this cartogram. Given their low scores in 'wired' rankings they are drawn as small and indistinct squares, whereas on conventional territorial projection they are easily visible. They are also shaded in dark purple hue that connotatively seems to resonate with Cosgrove's (2003) notion of 'cartographic gloom' and recreates the dark heart of Africa, reminiscent of European maps of the continent from the age of empires. Some of these small and landlocked nation 'squares' do not even get labelled – signally connotatively that they do not need to be named, they are indistinguishable and do not really matter in the wired world.

Another advantageous dimension of cartogram designs in general is that they can often be seen as an improvement over conventional choropleth maps in their capacity to make readers to think anew and undertake qualitative comparisons between places when seen in a different projection. Certainly some of the visual juxtapositions on the 'Wired World Atlas' prompt reconsiderations of relative importance between neighbours and may overturn perceived hierarchies based on unequal territorial size alone. For example, which is best in connotative terms when comparing the UK and Ireland? It is hard to say, and their representation on the cartogram implies near equanimity between what have traditionally been viewed as very asymmetrical neighbours (particularly given the colonial legacy[39]). One might argue that the representation is now more accurately reflecting the changing economic balance as the UK economy has declined in comparison to the boom enjoyed by the 'Celtic tiger' in the last two decades.

Other connotatively intriguing regional power re-configurations include eastern Europe versus Russia. Denotatively, Russia is very small scaled on the cartogram, connotatively a tiny sliver of a nation unlike its usual connotation of a vast territory spanning a third of the world from Europe to the edges of Asia. In the

[39] Interestingly, the denotative simplification of representation in the cartogram allows the territorial ambiguity of Northern Ireland be overlooked.

'Wired World Atlas' its power, accruing from sheer land mass, is lost and it is rendered at a scale comparable to former socialist republics of Belarus and Georgia and appears connotatively to be somewhat less important than its former colonial territories, and now newly vitalised, Baltic states of Estonia, Latvia and Lithuania.

In Asia, there are several potent reversals of normal power relations evident, including the two populous superpowers of India and China which are shrunken significantly. The diminished size of India and China (which can visually dominate population-based cartograms) shows that the geometric calculation of power in the 'Wired World Atlas' depends not on people per se, but on wealthy people. It would be interesting to speculate what this cartogram would look like redrawn with 2008 data, and the degree to which the intervening ten years of double-digit technology-driven economic growth in China has really changed the per capita performance that much. In terms of comparative geopolitical visualities in the cartogram, the contrast between Pakistan being drawn as larger (and above) India is noteworthy given their bitter national rivalries, along with the juxtaposition of Hong Kong drawn much larger and brighter than China proper.

One last theme to consider regarding the meanings given out by this cartogram is the degree to which it does connote the *whole* world, as it denotatively purports to be. The legend texts hints at the ambiguity that the cartogram is not actually a guide to '*every* nation's tech wealth' by admitting that no data, means no representation (Figure 5.17 above). So territories that do not rank statistically, literally do not count - they are made to disappear from the 'Wired World Atlas'. Denotatively the cartogram is made up of a profusion of nation blocks but there is not enough of them to connotatively represent the world effectively. The count of blocks shows about 140 countries represented on the cartogram, which is about forty nations less than mapped by the DOI (which is itself less than 193 sovereign states recognised by the UN). What is missing? Its hard to identify countries left unmapped but it likely to be places that do not count strategically to U.S. interests or do not offer attractive market opportunities (e.g., some small poor Caribbean nations). So while the headline text under the cartogram may claim that it ‘envision[s] the globe’, it is only on a partial viewpoint, and while it might be a ‘brand-new map’ it exhibits many of the old geopolitical devices of silencing, ethnocentrism and visual ordering based on social power found in other world maps.

Given these limitations, how does the ‘Wired World Atlas’ score in terms of the fourfold categorisation of connotative meanings for representations of Internet globalisation? Some denotative elements of design – the saturated colour ramp, the regular shape to the symbols and the spatially contiguous spatial representation of each nation[40] - means it is simplified picture which strongly implies an orderly world. This connotation of relative orderliness is enhanced because the transitions in country block size and shading are, broadly speaking, gradual across the continents, with relatively few sharp divides between adjacent nations. In many ways then this cartogram suggests an ordered and convergent world, however, this is at odds with much of the surrounding text annotations and commentary along the bottom of the page which consciously highlight places of difference and of concern[41] (e.g., a particularly negative comment is associated with Africa by choosing to highlight the Congo as the worst performer in the world.) “Rarely will you find clear patterns in the way media penetrate markets and influence our lives” notes Conners-Petersen (1998, 162), which does not suggest a convergent pattern. (This could be a case of the visuals and the text being authored separately and the editor not being fully aware of the clash of connotations; cf. Vujakovic 1999a.) Furthermore, differences between continents evident in the relative scaling of the blocks, does highlight in an unavoidable fashion the degree of inequality in the world; the shrunken African continent in contrast to Europe is especially powerful connotation of the gulf of difference in the wired world. The extent of order, combined with evident difference exhibited in the ‘Wired World Atlas’ mean it should be positioned in the upper left quadrant on the fourfold grid of connotative meanings.

[40] Avoiding the visual complexity and disharmony of nations with split territories, such as the U.S. or geographically fragmented nations such as the Philippines.

[41] Note, text is more legible on the larger versions in appendix two, Figures A2.22 and A2.23.

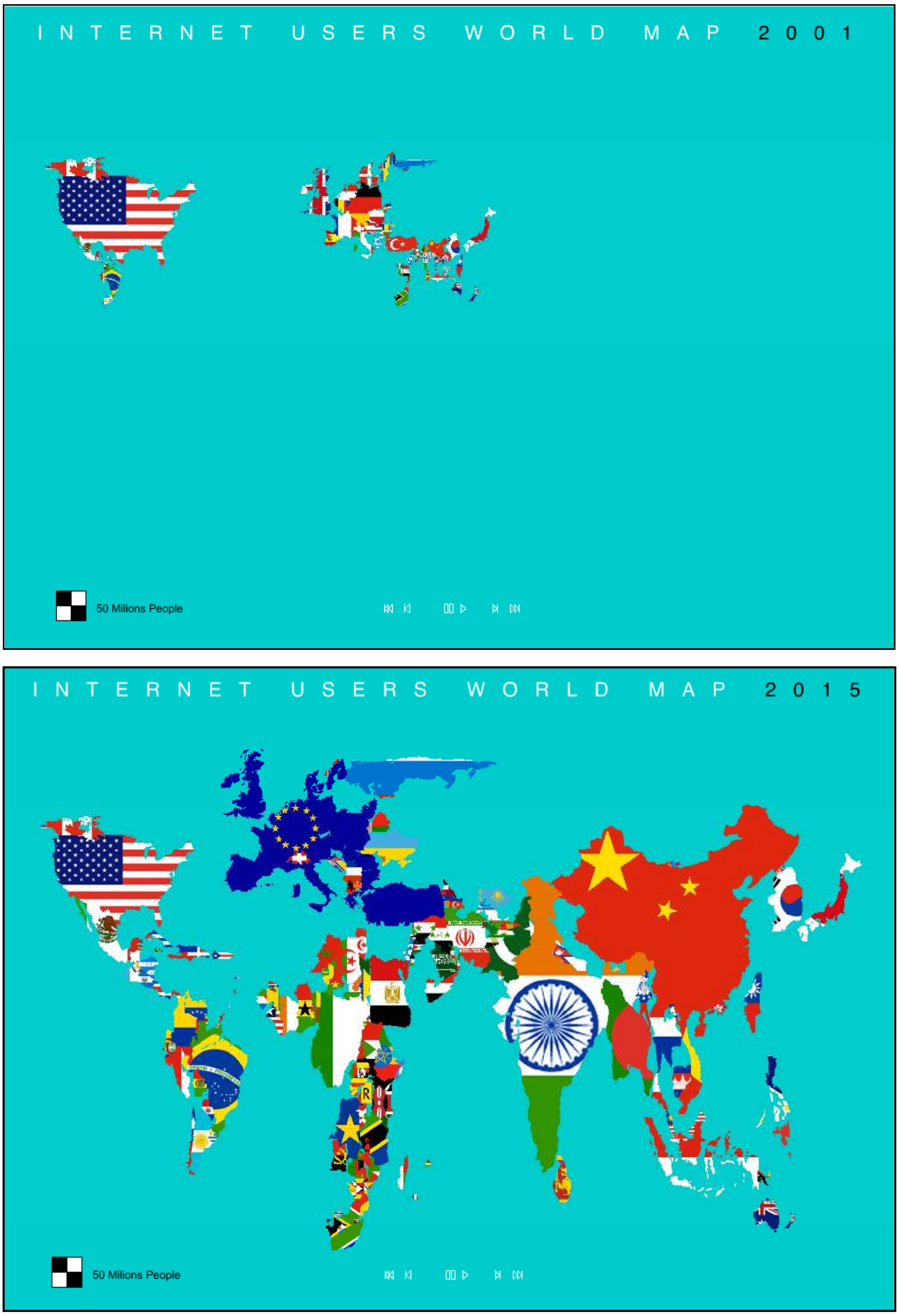

Figure 5.18: Screenshots of two frames from an animated cartogram visualising the growth of Internet users created by Antonio Scarponi. The top image is from the middle of the animation and the bottom image is the last frame. (Source: GlobaLab, <www.globalab.org/eng/>.)

5.7.2 ‘Internet Users World Map’ cartogram

Another noteworthy project exploiting the cartogram approach to try to envision Internet globalisation differently is the ‘Internet Users World Map’ created in 2002 by Italian architect/artist Antonio Scarponi, as part of a larger critical art project he calls ‘Human World’[42] (Figure 5.18). He describes his mapping project as “an atlas that propose a representation of the cultural and political information of our world displayed on a demographic basis. This project uses Boetti's mapping code by flipping the concept of the flag from the territory to its population.”[43]

The design aesthetic Scarponi deploys for representing the world are country outlines filled with their national flag. Denotative this conflates two of the primary visual signifiers of national identity - the territorial outline and the emblem of state. Flags and maps often have overlapping emotive connotations, particularly as they are interwoven with patriotism and nationalistic politics (Vujakovic 1999a). Yet, typically these two icons of the nation are deployed as separate representations; Whyte (2007) reports only one national flag (that of the Republic of Cyprus) features a recognisable country outline, although other flags do make symbolic calls to cartographically related theme and geopolitical narratives.

Scarponi acknowledges his deployment of the cartographic design of the world doubly ‘politicised’ through national flags is a notion copied directly from the work of another Italian artist, Alighiero Boetti (1940-1994). Given this aesthetic relation, the work of Boetti is of relevance to the reading of the conceptual meanings Scarponi’s cartograms. Boetti was fascinated by the relationship between chance and order, systems of classification, and many aspects of culture, particularly non-Western traditions and practices. These interests are reflected in aspects of his most significant art works, a series of large embroidered maps of the world, made in collaboration with Afghani and Pakistani artisans, where the shape of each country is filled with its national flag, described as “vividly illustrating

---

[42] Available online at <www.conceptualdevices.com/ENG/Human%20World/index.html>. The other maps use the same country-flag cartogram design but represent different statistics, such as national rankings for democracy and the use of the death penalty.

[43] Source: <http://point-view.blogspot.com/2007/04/space-in-picture-is-like-property.html>.

our world of fiercely demarcated individual nation states."[44] In contrast to signs of demarcation, others have argued, the interwoven pattern of countries in Boetti's work, resulting denotatively from the embroidery technique in the making of the map, symbolises the interdependence of states (Storr 1994). In some senses, Boetti's world maps also connote that national boundaries are not as fixed as they can appear in conventional cartography, involved as they are in a constant process of flux and negotiation due to geopolitical events (such as the reunification of Germany, or the break-up of Yugoslavia)[45]. The maps, then, have multiple and potentially incompatible connotative readings (just like Scarponi's cartogram, see below). This instability of meaning resonates with Boetti's own creative practice, which he self-effacingly described as follows: "[f]or me, an embroidered map couldn't be more beautiful. I did nothing for this work, chose nothing myself, in the sense that the world is shaped as it is, I did not draw it; the flags are what they are, I did not design them. In short I created absolutely nothing. When a fundamental idea, the concept, emerges, there is no need to decide on anything else."[46] This comment, in its overt naivety that the shape of the world is merely 'given' to him, I think clearly suggests that one needs to think very carefully about why the world is shaped way it is on his maps.

Scarponi's own art work, 'Internet Users World Map' is a short animated non-contiguous value-by-area cartogram (delivered online using Flash) that shows the countries scaled according to the number of Internet users (Figure 5.18 above). To achieve the re-scaling, he claims each pixel represents a thousand people, in what he describes as a 'demographic' projection. The animation of maps runs from 1993 through to a future projection in 2015 and denotes how the configuration and relative scaling of countries changes as differential growth in the Internet user population plays out. In the beginning, the U.S. dominates the field of view, with

[44] Source: <www.tate.org.uk/modern/exhibitions/artepovera/boetti.htm>. A noted example from this series, *Mappa del Mondo, 1989* (140 x 220 cm) is on view in the permanent collection of the New York Museum of Modern Art. Photographs of a range of Boetti maps are presented here, <http://www.orbit.zkm.de/?q=node/357>.

[45] A point made visually in Scarponi's animation through the merging of European nation into an imagined single Euro-land under one flag (discussed below).

[46] Source: <www.orbit.zkm.de/?q=node/357>.

Latin America and the African continents barely visible (except for Brazil and South Africa), yet towards the end of the sequence, North America shrinks from prominence as the maps become visually dominated by the expansion of India, China and the central African states (based on future *projected* online population growth in those countries). Also, some territorially large nations, which tend to dominate conventional geographically projected world maps, shrink away because of their relatively small online presence – the most noticeable being Russia, Canada and Australia. Separate European nations merge overtime to become a single EU super-state in the middle of the world map, the nature of the bright blue flag connotes a dominant monolithic expanse (by the end of the animation sequence only the Swiss flag exists to disrupt European unity).

Overall the cartogram has many denotative problems around the legibly of the information displayed and the difficulties of interpretation for many people with limited awareness of the design of national flags and the shape of nation states. As a mode of identification the rectangular shaped flag designs are often poor choices, particularly when they have had to be tightly cropped to fit irregularly shaped countries. This makes recognition a challenge in many parts of the map and clearly disadvantages those nations without a strongly iconic flag (or with a flag not known to wider readership). Denotatively, then the primary meaning of the map is one of cartographic muddle as a jumble of odd sized bits of pattern and colour grow and jostle around.

Beyond explicit issues with design effectiveness and denotative legibility, there are several important connotative meanings expressed through this cartogram. Firstly, many flags are only recognisable when shown on territorially extensive countries and consequently small countries cannot be identified and are silenced. The outcome is that the citizens in these nations are given no more connotative significance than on the conventionally projected choropleth maps of the world. As a politically motivated cartogram, it does not address the fundamental equalities with territorial delineation. As a result it is very much the same select few countries (those that dominant global discourse and are widely represented in the media as leading the international community) reified in Scarponi's cartogram.

The effect of using flags as land cover can have other disconcerting connotative results. The dominance of China for example, with its large land area and population base is magnified through the simplicity of the Chinese flag design, with it assertive singular red colour. The result is a monolithic area which gives off menacing connotations of ‘threat from the east’. In comparison, the design of India’s flag with its three distinct bands, denotatively splits the nation and this connotes as a divided country, with diminished capacity (and threat to Western interests) compared to China.

Scarponi’s invocation of the cartogram as a supposed ‘demographic’ projection that focuses attention on people, rather than conventional representation dominated by territory, is interesting politically but is not delivered with his chosen design approach. Its emotive connotation to change understandings of the world is undermined precisely because of his choice of the primary semiotic vehicles of the territorial power - the country outline and the nation flag. The implied claim that flags can speak *for* people is problematic at best, they more likely signify state space.

Flags are culturally complex visual symbols in their own right, each one having layers of meaning and imbued with various historical belongings (Whyte 2007). For those outside of a culture, the symbolism embedded in the flags colours and patterns is obscure at best and many citizens probably do not know what their flag means; how many people can decode the meanings of the British flag? The narrative and symbolic meanings of flags are also unstable, varying over time and with contexts – the ‘problematic’ issue of the meaning imparted by displaying the Union Jack, for example, with it connotations of a tarnished colonial past and more recent associations with racist and fascist groups and the violence of football hooligans in the 1980s. This is in marked contrast to the rejuvenated position, for some, of the George Cross with positive connotations of English pride. In the U.S., the national flag has strong patriotic resonance for many, to the point where the protest of burning the flag is criminalized. The flag and map are often combined as political icons, particularly in conservative rhetoric. Edsall (2007, 343) notes the prevalence of ‘flag-filled maps’ in America which “emphasizes the difference between what is ‘‘inside’’ and what is ‘‘outside’’ the borders but, more importantly, implies a unity of spirit, purpose, and resolve. This monotone fill suppresses notions of internal variation (e.g., dissent) and connotes uniformity, a common mission, solidarity, and national pride.”

Crucially, then, the deployment of national flags is not innocent as each of them brings with them all kinds of political connotations. Vujakovic (1999a 11) notes, “[f]lags are highly potent symbols of nationhood, and their importance is demonstrated by the multitude of ways in which they have been revived and incorporated into the iconography of resurgent nationalism in east-central Europe.” So the complex profusion of flags in some areas on the cartogram (central Africa or the Middle East), one could read connotatively as an emergent maze of cultural diversity, political self-determination and the potential rise of nationalism as a powerful force reshaping the geography of states. The flag, in this sense, is an emotive sign producing “incitive connotations”, which MacEachren (1995, 348) says tries to “stimulate action (or at least a desire that someone take action).” The profusion of country filled flags are perhaps a call to resist a globalising, convergent world of uniformity of media access. Yet, at the same point these forces are signified elsewhere on the cartogram by the strength and stability of the flags of powerful nations (the EU, the US and China), which are visually dominant and most legible in denotative terms.

Overall, then Scarponi’s cartogram approach is a conscious attempt to visually restructure the readers understanding of Internet globalisation through a map that focuses on population and not territory but is flawed in many respect because it is fundamentally still premised on nation-state geopolitics and not people as social actors. It is founded on the nation as the basic units of measure and representation (reified, of course, by the iconography of national flags). Despite its intentions it is connotatively analogous to the ‘International Connectivity’ and DOI maps in many respects, with the emphasis on the power of nation-states to visualise and explain the impact of the Internet.

In terms of the fourfold grid of connotative meanings, it is apparent that Scarponi's cartogram defies clear classification into a single quadrant. Semiotically it speaks to global consolidation and growth, but also invokes countervailing notions of nationalism and splintering of world into many separate spaces. It is a picture of a converging world in the sense that countries seem visually to be getting closer, stemming in part from the denotative use of a growing cartogram, and also in the sense that growing Internet use is all about convergent media practices, but it also connotes diverging world because it highlights trends that are locally variable and, in part, nationally regulated, hence the flags.

5.8 Discussion

Given the many issues with how the above maps connote divergent or convergent patterns, is it possible to conceive of more progressive, although not necessarily more 'accurate', approaches to the analysis of Internet globalisation? Maps that overcome the culture of ranking, which tends to encourage competition rather than cooperation, pitting country against country, rather than highlighting common causes of difference. In a neoliberal socio-economic contexts benchmarking tools such as the DOI are seen as beneficial as both a measure of, and also means to encourage, competitive behaviour between economies. Policies are enacted with an eye to the rankings and to improve the score (e.g., Japan and Korea vying for top spot; rivalry between Hong Kong and Singapore as most efficient Asian hub). Focus is on score not necessarily what it means for changing and improving the lived experience of people (as a very different scale, rankings of the world's top universities can be seen to perform in the same way).

Getting beyond the ranking culture may means more than 'tinkering' with alternative representational forms and indicator choices, to think about different conceptions of measurement and, indeed, very different types of questions about the nature of the Internet and so-called information society. In addition to measuring Internet availability and activity, some have argued for an empirical assessment of the Internet focused on *utility* in terms of peoples' capacity to exploit it[47]. For example, Gurstein (2003, no pagination), using ideas from community informatics, has called for the analysis of digital divides to look at 'effective use' of the Internet in local settings that focus on the ability to actively participate in the production as well as consumption of the networks. In relation to the Asian Tsunami and supposed 'failure' of communications in the region, Gurstein (2005, no pagination) notes:

> "From what I can gather most if not all of the communities impacted [by the tsunami] had Internet 'access' in one form or another. What they (and here I would include those with the knowledge who couldn't use it as well as those without knowledge) lacked rather, was the social, organizational, informational, and applications infrastructure which could have turned Internet access into an 'effectively usable' early warning system."

Conceptualising Internet measurement in terms of the ability for individuals and communities to take effective action online is also interesting conceptually because it moves the focus from 'top-down' measurement of infrastructure availability towards a more 'bottom-up' rights-based agenda for understanding Internet globalisation. Some commentators argue that the most socially relevant way to measure Internet globalisation now is as the 'freedom to access'. For example, Guédon (2002, no pagination), noting the 'completion' of the access project charted by the 'International Connectivity' maps through the 1990s, argued in a statement on the future role of the Internet Society that: "I believe a new kind of map ought to be issued each year by ISOC, and it would graphically display how the *rights* of access of cyber-citizens are respected or flouted, as the case may be", a consciously political mapping, meaning that "ISOC would raise a moral voice in the world, a voice that would say: not only do we guarantee the existence of our cyber-citizens, but we also defend their cyber-rights." There have been a number of 'moral mapping' projects with this kind of human rights agenda recently (e.g., mapping of Darfur crisis, cf. Parks 2008).

[47] The DOI has one indicator, out of eleven components, that comes part way to capturing some notion of use but it tends to be lost in crowd of other infrastructure capacity indicators (cf. Peña-López 2007).

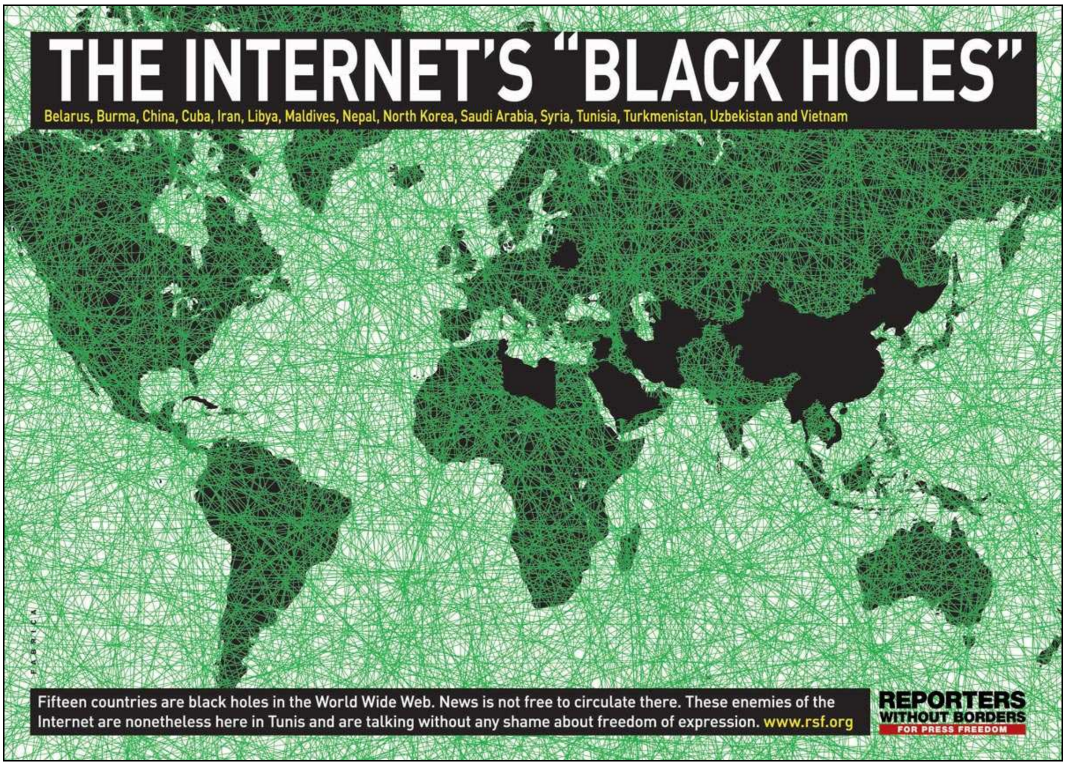

Figure 5.19: An overtly propagandist mapping of Internet globalisation in terms of online freedom, produced by campaigning NGO Reporters without Borders. (Source: <www.rsf.org>.)

In terms of Internet globalisation, Wired magazine produced a world map in 1997 entitled 'Freedom to Connect' (Conners 1997; reproduced in appendix two, Figure A2.31) denoting the extent of government censorship in five classes. Harpold (1999, 14), however, critiques the map's chosen way to measure 'freedom' saying "[t]he crudeness of the map's visual scale - distinguishing free from unfree connections in only five steps that must represent differences across all political-legal, economic, and technological contexts - begs the question: how meaningful is it to compare the 'freedom to connect' in Mexico City, Paris, Brisbane, and Algiers, and come up with the same result?" More recently in-depth annual studies have been produced by the NGO, Reporters without Borders comprehensively auditing inequalities in online access caused by governmental surveillance and censorship. The results are informative in that they show the highly fragmented nature of Internet globalisation, even in many OCED countries.

As part of a campaign to highlight the extent of surveillance to attendees at the

2005 World Summit on the Information Society in Tunis they published an striking and simplistic map of a binary world highlighting almost universal ‘freedom’ except for the ‘black holes’ (Figure 5.19; reproduced as a larger image in appendix two, Figure A2.32). Despite its stress on difference, it is also a convergence with the definite potential to eliminate the ‘black holes’, if only enough political pressure could be brought to bear. Of course the map deliberately hides much of the complexity of online surveillance to make a political point. Online freedoms are, arguably, in reverse - and not just from more intensive government wiretapping spurred by the ‘war on terror’. The right to explore cyberspace anonymously and communicate freely is being undermined by media corporations in their attempts to channel consumers and combat file sharing, along with criminals who are polluting virtual commons with offensive spam, phishing and malicious viruses.

Unsurprisingly, there is tendency in the quantitative analysis of global Internet to focus on technical and economic statistics - seen as solid, knowable data and relatively easily gathered, rather than ‘fuzzy’ human experience. (This has been highlighted by Cornford (1999) as a general problem in the statistical assessment of impacts of ICTs.) The basic epistemological problem in all the above approaches seeking generalisable mappings is that they explain little about people’s real experience. Statistical world maps in this regard have an implicit tendency to dehumanise the world because they work best as simple stories of national averages, per capita scores and the rollout of governmental schemes. To broaden the understanding of the *peopling* of the global Internet, one must try to assess the rich, individual experiences of networking practices best gained through ethnographic case studies.

The work of anthropologists Miller and Slater (2000), examining how the Internet is variously adopted and adapted into everyday life of people in Trinidad, provides an authoritative exemplar of the benefits of exploring the local contingency of networking practice. Accordingly, they claim, “[s]ocial thought has gained little by attempting to generalize about ‘cyberspace’, ‘the Internet’, and ‘virtuality’. It can gain hugely by producing material that will allow us to understand the very different universes of social and technical possibility that have developed around the Internet in, say, Trinidad versus Indonesia, or Britain versus India" (Miller and Slater 2000, 1).

In particular, most existing statistical approaches and mappings completely fail in their representation of the African experience of the Internet. The result, at present, leaves Africa largely as a blank, the 'dark continent' of old. The blankness on Western-centric 'top-down' statistical maps of the network society masks the fascinating richness and diversity of the Internet's percolation through Africa (e.g., see Barlow 1998; Hall 1998 for diverse examinations of the situation 'on the ground'). The need is for analysis not to demarcate the spaces of diffusion but to give voice to the places of adoption.

Given this sophistication is pretty much impossible to capture in conventional cartographic genres, in what ways are the statistical maps of Internet globalisation useful and how should they be interpreted politically? They seem to provide a conceptually simple - one might say simplistic - picture of the global geography of the Internet. Taken together they create a various cartographic stories of the extent of the diffusion of connectivity and access measured at the national scale. The maps, through the use of the most 'obvious' geoplitical form of nation state, make it is easy to assume that they provide a clear and straightforward geographic presentation of the data. This is certainly how they have been used (for example deployment of DOI map by the ITU). Yet, one must also recognise "that these depictions of network activity are embedded in unacknowledged and pernicious metageographies -- sign systems that organize geographical knowledge into visual schemes that seem straightforward, ... but which depend on historically - and politically - inflected misrepresentation of underlying material conditions." Harpold (1999, 5). A critical reading of them as actually revealing something of this metageography, that they actually 'truthful' maps of contemporary global power relations. As world maps and thematic maps from Victorian era can now be read as representations of Britain's imperial vision, so these maps can show the nature of contemporary economic neo-imperialism driven in part by the Internet.

5.9 Conclusion

This chapter has examined a range of different statistical maps of Internet globalisation in some detail and in conclusion I want to think about how they work in terms of positioning them into the four quadrant model of connotations outline in section 5.2. The conception uses to two linear dimensions of meaning ('difference' and 'complexity') to create a simple fourfold grid of possible categorises which best summarise the map, allowing for the fact that the nature of connotative meanings is partial, contextual and unstable so that any placement will always be approximate (Figure 5.20).

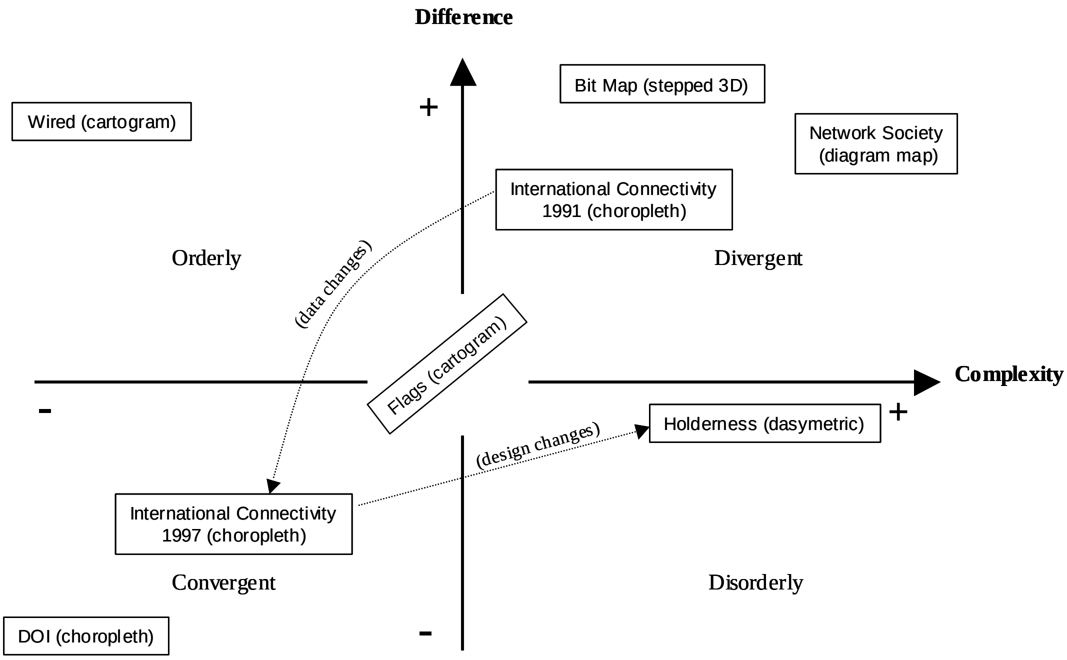

Figure 5.20: Positioning the sample statistical maps analysed in the fourfold grid of connotative meanings.

Despite having varying degree of denotative effectiveness, in the technical sense of intelligibly conveying patterns of variability between nations and difference within nations, it is important to remember that all these maps have important connotative meanings, and they are all products of particular people and institutions who are embedded in particular socio-political milieus and espouse their own agendas. It is also worth reiterating that it not possible politically to produce an unbiased map - they all remain selective and socially-produced representations. In many ways, their connotative messages are ambiguous and open to multiple readings, in that some highlight more strenuously the divisions in some respects, but, at the same time, also speak to the potential for convergence as well.

Given these limits, it is apparent that the eight different statistical maps examined occupy a range of positions in the fourfold grid, with slight majority tending towards convergent meanings in how they represented Internet globalisation. Considering each of the maps in turn, it seems useful to start with Antonio Scarponi's 'Internet Users World Map', which is represented by the box 'Flags (cartogram)' in Figure 5.20 and has been placed precariously balanced across the confluence of the two axis as it exhibits in a dichotomous fashion connotative meanings of both convergence and divergence in roughly equal measure. While the meanings of the flags are complex to interpret, the evident growth in the cartogram and the emergence of dominant national and supranational blocks suggests a consolidation of power, yet other elements are, at the same time, divergent in meaning with the multitude of different flags connoting a countervailing force of cultural diversity and potentially nationalist separatism.

The 'Digital Opportunity 2005/2006' map produced by the ITU is, arguably the most convergent in terms of connotations of difference and complexity. Overall, it projects a view of Internet globalisation that is strongly harmonious with commonalities between nations rather than wide differences. The degree of variance across the world is made to appear as gradual, almost natural, phases of change and there are no sharp breaks or unsettling complexity.

The 'Wired World Atlas' is a rectilinear cartogram which has been positioned high in the orderly quadrant because it presents a compelling vision of Internet globalisation that is at once simple in appearance but also highlights the differences between continents. The connotations of simplicity stem from the block shapes and the even transitions of colours but there is also a very unequal connotation created by the scale differences in block sizes across the world as a whole.

The ‘Bit Map’, with its distinctive pseudo three-dimensional stepped representation of the world, is similar in some respects to the connotative meanings of the ‘Wired World Atlas’ as it emphasises, using height and volume, the differences between regions of the world. The extent of divergence across the world can not be counteracted by the classification and colour scheme that work to reduce the perception of inequality. The overall feel of the pattern is much more intricate and disorganized than the Wired presentation, hence the placement of the ‘Bit Map’ in the divergent quadrant, scoring highly on both dimensions of difference and complexity.

Two versions of the ‘International Connectivity’ maps, one from near the beginning of Internet globalisation (1991) and then another from the height of the Internet boom (1997) were examined. The first map from 1991 suggests a fairly divergent and somewhat disorderly world, with some areas of high difference evident (adjacent countries in polar opposite categorises and obviously wide differences between continents). The sharp inequalities are emphasised by the discordant choice of colours that can not suggest anything but divergence. There is little symmetry to the patterns of highs and lows across the world and the extensive inequalities mean this map, in connotative, terms is located inside the divergent quadrant. At the end of the ‘International Connectivity’ series, the eleventh map produced by Landweber in 1997, arguably, connotes a quite different view of Internet globalisation. This map suggests a much more convergent world due to changes in the underlying data as so many countries reached the top class (full Internet connections), rather than modifications in the design and classification (which remain constant). Given these changes in underlying data mean most of the world is a uniform colour leaving only constrained pockets of ‘failure’, the map scores much lower on difference and complexity dimensions and is positioned firmly in the convergent quadrant. The arrow between the 1991 and 1997 ‘International Connectivity’ maps boxes in Figure 5.20 illustrate the reasoning behind the significant switch in connotations.

The next map is the dasymetric reconfiguration of the 1996 ‘International Connectivity’ map undertaken by Holderness to take account of variance in connection density within countries, particularly in the developing world. The changed design, in terms of doubling the number of classes displayed on the map and the willingness to represent subnational variation in the data, means that it is a much more complex and less certain view of Internet globalisation. The impression is of a world much more divided, with only spots of high connectivity in many parts of the Global South. Given these characteristics this map should be placed connotatively in the opposite quadrant to its originator because it is fundamentally a disorderly representation of the world. The arrow between the two maps in Figure 5.20 illustrates that they map essentially the same data but the impact of classification and design changes has altered the connotative meanings.

The final map to classify into the fourfold grid is the 1997 ‘Network Society Map’ hybrid diagram map, which has a clearly Eurocentric bias and visually emphasises the very partial distribution of ‘network society’ status across the world. The use of the diagrammatic targets plotted onto countries added to the complexity of patterns displayed and suggested multiple processes at work and little coherence in the narrative of network society diffusion. The design of the target graphics themselves also emphasises the incompleteness of the network society ‘project’ for most countries outside the core rather than demonstrating positive fullness. The many empty targets speaks to failure rather than success. Given these characteristics the dominant connotative meaning for the ‘Network Society Map’ is one of divergent world.