

DIGITAL DIVIDES IN THE PACIFIC ISLANDS

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ABSTRACT

By virtue of their physical make-up, their cultural and linguistic diversity, and the relative isolation and spread of their population, Pacific Island countries are faced with a multitude of challenges in the delivery of information services. This article reviews the nature of the digital divides that exist in the Pacific region, considering divides within countries, between the countries, and between the Pacific region and the rest of the world.

The varied but generally high costs of Internet access (in part brought about by national telecommunication monopolies) are exacerbating the digital divide along socio-economic lines; but they also create regional imbalances, with certain countries effectively isolated. Nonetheless, community-based systems can work to offset this, as shown on Niue. Within these countries at present, no structures are even envisaged that would address digital divides, nor the implications of the technologies on traditional rank, status and power structures, which are fundamental matters in Polynesian and Micronesian societies.

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Note: To access data tables preceded by an A (e.g. A5) go to :
<http://csusap.csu.edu.au/~dspennem/IT&S/PacificDivideTables.pdf>

The issue of whether a gap between the digital 'haves' and the digital 'have-nots' has opened up has been raised in the U.S. (NTIA 2000; Martin 2003), in Australia (MacLaren and Zappala 2002; Gibson 2003), the Netherlands (de Haan 2003); Canada (Looker and Thiessen 2003); New Zealand (Parker 2003); Egypt (Warschauer 2003) and India (Parvathamma 2003) to cite a few examples. This digital divide has been the term to describe various dichotomies *between* countries (as in Norris 2001), but particularly *within* countries – such as metropolitan vs rural (Donnermeyer and Hollifield 2003; Looker and Thiessen 2003; Parvathamma 2003); gender (Losh 2003; Kennedy *et al.* 2003); age (Millward 2003); racial/ethnic composition (Jackson *et al.* 2003; Alvarez 2003; Parker 2003); cultural attitudes (Jackson *et al.* 2003; Warschauer 2003; Turk 2003); level of education (Robinson *et al.* 2003); disabilities (Williamson *et al.* 2001); income (Martin 2003); homelessness (Grogan 2003); and household income (Martin 2003; MacLaren and Zappala 2002).

Different variations of the digital divide theme are emerging as new technologies are being rolled out, as in the broadband and wireless differences between metropolitan and rural locations noted by Zhang & Wolff (2004), and as their performance improves. Similarities with other technologies, like mobile phones (Rice & Katz 2003), exist, indicating that the underlying phenomenon of the digital divide is applicable to a broad spectrum of emergent technologies. Government policy and commercial investment have been found to be influencing factors, both in the U.S. (Nicholas 2003) and non-Western countries, as in Warschauer (2003).

At first sight, some of the findings seem confusing. A recent Australian study, for example, showed that, while there was a direct correlation between the level of household income and Internet access at work (in essence reflecting the nature of paid employment), there was very little difference in Internet access from home (Lloyd & Bill 2004). Yet the level of computer ownership was linked to household income. While some studies found differences across regions in Australia, when looking at a population at the same education level, others found none (as in Spennemann and Atkinson 2002a-b; 2003). Alvarez (2003) has shown that race/ethnicity in the U.S. is a factor influencing the nature of Web usage, even after income levels have been removed as a factor.

In essence, there appears to be no single factor that creates a digital divide, but rather a series of enablers that, when combined with each other, create various incarnations of the divide. These underlying enablers include access to facilities and technology (economic, geographic); the educational capacity to effectively use the technology (education); the cultural attitude about using the technology (ethnic); personal predisposition to technology adoption (educational and psychological) and personal approaches to technology, as an enabler or object in its own right (gender differences). Apart from cultural attitudes, race/ethnicity does not seem to be a variable on its own, both rather a product of ethnic marginalization in education and income (except in Alvarez 2003), both of which are factors in their own right (cf. Jackson *et al.* 2003; Parker 2003).

The concept of the digital divide has also been applied to the dichotomy between developed and developing nations (Norris 2001; Peters 2003; UNDP 2001), both in relation to the availability of technology (UNDP 2003), its costs (PIF 2003) and the skills and knowledge of its users (UNDP 2003). Spennemann *et al.* (1996) earlier discussed the developing nature of the World Wide Web, highlighting the possible imparities that could develop between the economically powerful nations and the economically weak.

They pointed out a serious danger of cultural imperialism, and they posited that electronic colonization of small nation states could develop, both dominating public opinion about them from outside information providers and swamping the countries themselves with English-language content controlled by outsiders. It was further argued that:

....rather than being a leveler, the Web has the potential to create even greater inequalities between the so-called rich and the third-world countries. Since the currency of the twenty-first century is information, the dichotomy between the haves and have-nots will widen. ... information about third world countries will most likely be generated by interested third party groups purporting to be the 'authoritative' or 'comprehensive' site on a particular country. This has the potential for such groups to dominate the information about a country's cultural, economic and political status. More importantly, it allows these interested groups to place an interpretation on the information that suits their own needs. (Spennemann *et al.* 1996).

It was further proposed that languages with a small population were at risk of being marginalized on the developing WWW.

Since then the discussion on a digital divide has been popularized and institutionalized, with Pacific Island governments arguing in United Nations venues for the provision of development aid projects to facilitate countries moving into the new technological age (UNDP 2003), with some making it a basic human rights issue (Hill & Dhanda 2003).

This article now reexamines the situation in the Pacific Islands. It first reviews incarnations of the divide that been recognized and are being addressed, and then follows four aspects of inquiry:

- 1) the existing IT infrastructure and the issue of access to IT services,
- 2) the *level* of Internet publishing that occurs in the Pacific Island countries and how this compares to the level of publishing that occurs *about* the countries in the outside world,
- 3) the *nature* of Internet publishing and to what extent this enables or inhibits sections of the islands' community
- 4) which, if any, *activities* might mitigate against the digital divide that are underway at the national and international level.

METHODOLOGY

One of the major problems in this review is the absence of reliable statistical information. Unlike Australia (cf. ABS 2004) or New Zealand (cf. Statistics New Zealand 2003), Pacific Island countries do not as yet carry out such studies. For example, Fiji is the only Pacific country listed in the UNDP technology achievement Index (UNDP 2001), ranking 67th. The other countries are not included because the statistical data were unavailable or too limited. Some information can be gleaned from the CIA World Fact Book (CIA 2003; 2004), surveys by the International Telecommunications Union (ITU 2002) and limited studies by UNESCO (Zwimpfer Communications 1999; 2002). However, these studies deal solely with the question of availability and access to technology.

Statistics in Internet publishing were collected using the Google™ search engine. At the time of the study (late June 2004), Google™ claimed to have indexed 4.3 billion Web pages. Two sets of searches were carried out: 1) general searches, where the Pacific Island country name was entered with or without an additional keyword (see Table A5), and 2) country domain specific searches, where the same query was repeated but limited to sites with a specific domain (see Table A4).

Nomenclature: For the purposes of this article, all separate entities listed in the tables are termed 'countries,' well cognizant of the fact that, for example, American Samoa, Guam and the Northern Mariana Islands form part of the USA; that Pitcairn is a British colony; that Tokelau is administered by New Zealand; and that Wallis and Futuna, New Caledonia, and French Polynesia are all overseas departments of France. Excluded from the list is Rapa Nui (Easter Island), which forms part of Chile, and which does not have its own WWW domain name. For the same reasons Hawai'i, which forms part of the USA, has also been excluded.

THE IT SETTING

The Pacific Ocean, which covers about one third of the earth's surface, is home to the 22 countries listed in Table 1, along with salient economic and cultural attributes. The small Pacific Island countries have an economic basis reliant on out-migration and returning remittances, foreign bilateral and multilateral aid, small tourism revenue and some cash crop or mineral exports (cf. Odgen 1994). Economically, most of the island countries are poor, with purchasing power parities ranging from as low as \$1.5 million (Tokelau) to \$11.4 billion (Papua New Guinea). In contrast, the purchasing power parity of New Zealand is \$85 billion and that of Australia \$570 billion (CIA 2004). Per capita GDP in the Pacific Islands is very low in most countries, with the exception of Guam, French Polynesia and New Caledonia (see Table 1). With the exception of the single-island entities Guam, Nauru and Niue, the population of the Pacific Island countries is very dispersed, spread over a

TABLE 1. ECONOMIC AND CULTURAL PARAMETERS OF PACIFIC ISLAND COUNTRIES

Country	Estimated Population 2002	Purchasing Power Parity (million)	Per Capita GDP 2002	Main Language	Local Languages	Inhabited Islands/ Atolls
1. American Samoa	70,260	500	~2,600	English	1	4
2. Cook Islands	21,008	105	4,950	English	4	12
3. Fiji	868,531	5007	2,680	English	9	110
4. French Polynesia	262,125	4580	16,973	French	8	77
5. Guam	163,941	3200	~19,000	English	1	1
6. Kiribati	98,549	79	840	English	1	21
7. Marshall Islands	56,429	115	2,210	English	1	29
8. Micronesia, Fed Sts	108,143	277	2,157	English	16	65
9. Nauru	12,570	60	3,900	English	1	1
10. New Caledonia	210,798	3158	14,833	French	37	5
11. Niue	2,145	7.6	3,710	English	1	1
12. Northern Mariana Is	80,006	900	~9,300	English	3	6
13. Palau	19,717	174	8,030	English	3	8
14. Papua New Guinea	5,295,816	11400	1,200	English	822	300+?
15. Pitcairn Islands	47	?	?	English	1	1
16. Samoa (Western)	178,173	1000	~2,000	English	1	4
17. Solomon Islands	509,190	800	1,700	English	68	347
18. Tokelau	1,418	1.5	~1,000	English	1	3
19. Tonga	108,141	236	1,400	English	2	45
20. Tuvalu	11,305	13	1,160	English	3	8
21. Vanuatu	199,414	563	1,230	Engl/French	107	67
22. Wallis & Futuna	15,734	57.5	~2,000	French	2	3

number of islands separated by various distances of water (Table 1).¹ Intra- and inter-Pacific Island distances can be best visualized by observing that the total landmass of all Pacific Island countries combined is just 1.3 million sq. km., which represents only 0.7% of the surface area of the Pacific Ocean. In the case of the atoll nations of Kiribati, Tuvalu, the Marshall Islands, as well as the Federated States of Micronesia, the population on each atoll is spread over a number of islets. Such a fractionated population poses substantial problems for the delivery of any service, whether health, education or IT.

Some data on the IT infrastructure available in the Pacific Islands countries are compiled in Table 2, based on CIA (2003; 2004); ISC (2004); ISP-Asia (2002); ITU (2002); Nationmaster (2004); SISD (2003); and Zwimpfer Communications (2002). Per capita ownership of computers is very low, being the highest in French Polynesia (29%). In the rest of the Pacific the ownership rate is 6% or less. This is not surprising, given the costs of the equipment and the nature of the islands' economies with limited cash flow.

**TABLE 2: ENABLING AND INHIBITING FACTORS BY COUNTRY
(IN PERCENT OF THE HIGHEST VALUE IN EACH CATEGORY)**

	Com- puter Owner	Nº ISP	Nº Hosts	Price /10hrs	Popu- lation	Purch Power	Per capita GDP	Langu -ages*	Nº * Islands	Overall Average	Rank
American Samoa	4	6	3	79	8.1	4	14	99	98.7	35	12
Cook Islands	3	17	3	76	2.4	0.9	26	97	96.0	36	11
Fiji	17	11	11	68	100.0	44	14	93	63.3	47	4
French Polynesia	100	11	15	74	30.2	40	89	93	74.3	59	2
Guam	14	100	6	90	18.9	28	100	99	99.7	62	1
Kiribati	3	6	0.0	39	11.4	0.7	4	99	93.0	28	16
Marshall Islands	19	6	0.1	47	6.5	1.0	12	99	90.3	31	15
Micronesia, Fed Sts	12	6	9	70	12.5	2	11	87	78.3	32	14
Nauru	2	6	0	72	1.5	0.5	21	99	99.7	33	13
New Caledonia	14	22	6	71	24.3	28	78	69	98.3	46	4
Niue	0	6	100	100	0.3	0.1	20	99	99.7	47	3
Northern Mariana Is	31	6	0.8	74	9.2	8	49	98	98.0	42	7
Palau	5	6	0.1	59	2.3	1.5	42	98	20.0	26	18
Papua New Guinea	20	17	6	87	100.0	100	6	0	0.0	37	10
Pitcairn Islands	0	0	0.2	100	0.0	0.0	—	99	99.7	37	9
Samoa (Western)	2	11	0.1	88	20.5	9	11	99	98.7	38	8
Solomon Islands	14	6	1	61	58.6	7	9	43	0.0	22	22
Tokelau	0	6	0	39	0.2	0.0	5	99	99.0	28	17
Tonga	7	11	100	59	12.5	2	7	98	85.0	43	6
Tuvalu	0.1	6	0.1	70	1.3	0.1	6	98	20.0	22	21
Vanuatu	5	6	4	67	23.0	5	7	11	77.7	23	20
Wallis & Futuna	2	6	0	0	1.8	0.5	11	98	99.0	24	19
Overall Average	12	12	12	68	20.2	12.9	26	85	76.7	36	

*) Scored inversely.—To avoid disproportionately large countries dominating in the analysis, the maximum population size (PNG set to Fiji), the number of Internet hosts (set to Tonga) and the number of islands (set to 80) were reduced.—See Tables 1 and A1 for raw data).

With the exception of Guam, where there were 20 Internet Service providers (ISP) in 2000, each Pacific Island country has usually three ISPs or less, with 59% of all countries having only a single ISP. Even where there are multiple ISPs, the underlying communications network is owned by a monopoly carrier (PIF 2002). Given this monopoly, it is not surprising that communications costs are very high, with Internet connection costs ranging between \$13 (Papua New Guinea) and \$568 (Tokelau). Niue, which provides a free Internet service to members, is an exception in Table 2.

Some of the country responses to the UNESCO survey provided data on the number of telephones, computers and networked computers (Zwimpfer Communications 2002). While a country-based plot (Figure A1)

does not show any uniform pattern, the sector-based plot in Figure 1 reveals that the saturation with networked computers is the lowest in homes and, somewhat surprisingly, also in business settings. With the exception of Papua New Guinea, the saturation in the education sector is high. However, the fact that the machines are networked does not translate directly into Internet access for the general population.

Estimates of the number of people having access to the WWW have been based on limited surveys, plagued both by small sample sizes and low response rates (Zwimpfer Communications 1999, 2002). Although only indicative, these studies seem to suggest that less than 25% of the population in each country had access to the Internet from home, via the schools, or via public access centers. Exceptions include access centers on Niue (with 100% access) and in Vanuatu (with approximately 75% access opportunity). Internet access at places of work varies widely, but is limited to the respective office worker population.

A digital divide exists in the Pacific, as evidenced by computer ownership and Internet access, but the pattern is not uniform. Overall, national wealth and per capita GDP are factors in computer ownership, but these seem to be further influenced by the level of dispersion of an island country, ie., the number of islands (and their populations) separated by water. Table 2 expresses a combination of variables in percent of the highest value per variable.

The overall averages of these variables are used to rank order the Pacific Island countries in the last column of Table 2. It is not surprising that the larger, more developed island countries, such as Guam, French Polynesia, Fiji and New Caledonia, come out on top compared to the smaller countries and those with a spatially and linguistically more diverse population. An exception is the island of Niue, which also ranks high because of its nature as a single island with a single language, and its active IT policy with community access centers.

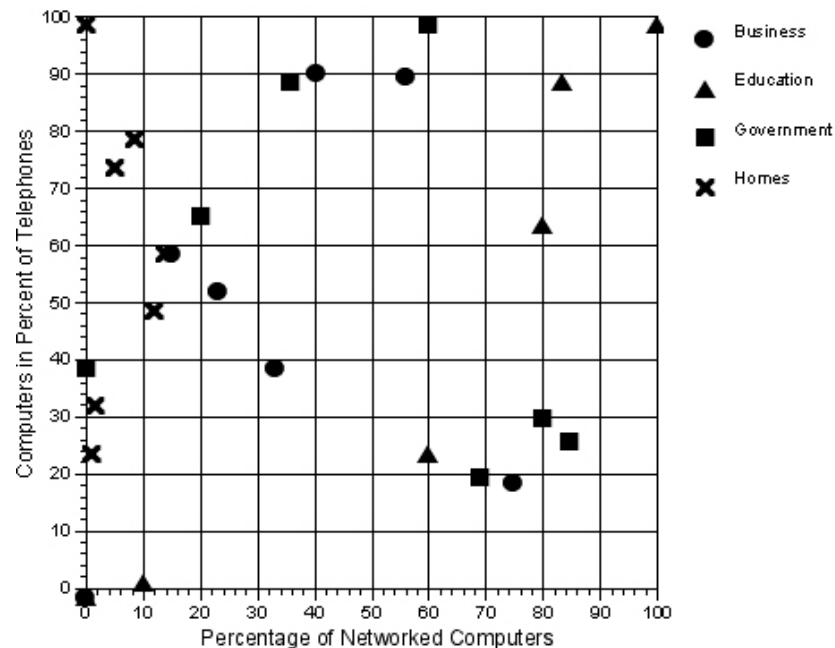
At present no research has occurred that considers a potential digital divide *within* the countries, by looking at aspects of gender or ethnicity/cultural identity. While the former issue cuts across all countries, the latter is likely to be more prevalent in Melanesia, as well as in migration localities such as Guam and Saipan, both of which have a large non-local Micronesian population.

Anecdotal evidence certainly exists: workshops organized by UNDP with the brief of looking at national IT policies mentioned a digital divide in terms of gender as well as in terms of rural vs urban for Fiji (UNDP 2003f). As yet, however, no studies have been carried out.

WEB PRESENCE

Access to technology, however, is only one incarnation of the digital divide. More problematic for developing countries is the question of whether these countries are merely information consumers or also information providers. This incarnation of the digital divide considers the question of

FIGURE 1. UPTAKE OF TECHNOLOGY BY SECTOR
(PLOTTED FOR KIRIBATI, NIUE, PALAU, PNG, SAMOA, TOKELAU AND TONGA)



electronic colonization and cultural imperialism. At present, no content analysis studies have been carried out.

Servers per country: One ready measure to assess the online presence of the Pacific island countries is to calculate the number of servers per Internet domain and to count the quantity of pages mounted. This exercise, however, encounters certain methodological problems. At the time of their conception, domain names were meant to be country-specific top-level domains (ccTld). However, the notion that a domain name indicates the user's country of residence is no longer tenable. The growth of the communications industry has seen .com and .net domains, allocated to US companies, being available to customers of communications carriers in other countries. Furthermore, .com and .net domains are freely available for purchase by anyone, irrespective of country of residence, which complicates the analysis of Website traffic (cf. Spennemann 2004; in press). This has been compounded by the sale of country-specific domain names.

As a matter of equity, each of the Pacific countries had been allocated a top-level country code domain (ccTld) by the International Telecommunications Union (see Table A2), irrespective of whether they were independent nation states, and irrespective of whether they had the technological infrastructure to establish domain servers. It is not surprising that some of the countries soon saw the sale of domain names as a means of supplementing national income. The Kingdom of Tonga 'pioneered' the sale of its satellite spectrum in the mid-1990s and, as a logical extension, offered Internet domains as early as 1997. Some of the domain names are, by nature

of their letter configuration, more appealing to buyers than others. Tuvalu (.tv) and the Federated States of Micronesia (.fm) are in a particularly opportune position to cash in on the communications media. Thus domain-based page searches for countries which sell domain names to non-residents, either directly or via resellers (Table A2), are likely to produce unreliable results. A search for 'Television,' for example, brought about 199,000 pages in the .tv domain, but only 240 of these also included the word 'Tuvalu.'

To overcome these problems, the searches were run with the inclusion of the country name as a required keyword. In the case of the French Territories, these searches were run both in English and French. In the case of the Federated States of Micronesia, both the full country name and the more commonly used acronym (FMS) were used. Table A3 shows both the total number of pages per domain name and number with country names as a keyword.

Usage of Websites Setting up and accessing technology is only one aspect in the equation. The other is to utilize the technology to project one's own presence onto the WWW. As an approximation of the content of the pages, Table A4 provides the frequencies with which pages in each domain contain the country names combined with certain keywords. For the purposes of comparison with non-Pacific countries, New Zealand serves as the benchmark.

Overall, the content of most Pacific Islands Web pages underperforms in all criteria compared to New Zealand. Exceptions are French Polynesia and, to a lesser degree, the Pitcairn Islands. A divide exists between countries where most users (government, business and private) use their pages effectively and comprehensively (Cook Islands, Niue) and those do not do so as yet (American Samoa, French Polynesia, Kiribati, Nauru, Tonga, and Vanuatu). Three countries have no country specific presence at all in the keyword searches (Marshall Islands, Tokelau, and Wallis and Futuna).

It is not possible to accurately assess the Web publishing presence of the individual sectors (such as government, education, business and personal) of all Pacific Island countries, because a number of country domain administrations no longer adhere to the classification of Internet domains into com (co), edu (ac), org, gov (gouv/govt) and net but allow domain names of any wording to end with the ccTld. An attempt is made in Table 3 to compile a sector breakdown in which all Web pages that do not have a sector-specific domain extension are assumed to be commercial in nature. In some countries, such as the FSM, Nauru or American Samoa, the assumption that all non-conforming domain names belong to businesses cannot be upheld, and they were excluded from the analysis.

The breakdown in Table 3 shows substantial variation. If the Web page distribution of Australia, New Zealand or the USA can serve as a guide, then 40-50% of the pages of a country with a developed IT structure stems from businesses, 15-20% from government and the rest from the educational sector and organizations. Only the sector mix of Fiji, Guam and Papua New Guinea shows sufficient spread. In the cases of both Fiji and Guam, however,

TABLE 3. SECTOR BREAKDOWN OF COUNTRY-SPECIFIC WEBPAGES ON PACIFIC ISLAND SERVERS (IN % OF TOTAL)

Country	Govt	Business	Education	Organizations
American Samoa	—	—	—	—
Cook Islands	10%	89%	0%	0.5%
Fiji	31	26	22	21
French Polynesia	7	93	0	0.1
Guam	34	20	36	10
Kiribati	18	81	0	0
Marshall Islands	—	—	—	—
Micronesia, Federated States of	—	—	—	—
Nauru	—	—	—	—
New Caledonia	57	42	0.1	0.9
Niue	1	99	0.	0.1
Northern Mariana Islands	96	4	0	0
Palau	14	86	0	0
Papua New Guinea	19	51	7	23
Pitcairn Islands	60	39	0.7	0
Samoa (Western)	4	92	0.6	4
Solomon Islands	16	79	0	5
Tokelau	0.1	99.	0.1	0.18
Tonga	13	86	0.8	0
Tuvalu	0	100	0	0
Vanuatu	3	96	0.4	0.4
Wallis and Futuna	—	—	—	—
New Zealand	19	50	12	19
Australia	15	52	21	12
USA	18	43	17	23

the business sector is smaller than government or education. In the other countries, business domains tend to predominate.

What can be gleaned from this is the under-representation of the educational sector as a Web publishing entity and an opening divide between business utilization of the Internet and the provision of public information by educational institutions and schools, or by the governments. It is possible that this divide has its historic roots in the fact that, in the developed Western world, the Internet was first widely adopted by universities and researchers, governments and public organizations, with businesses following later. Whereas in the poorer Pacific Island countries, the establishment of Internet facilities lagged behind to such a degree that commercial interests were the driving force of utilization. There is no reason to believe that this divide will not continue to widen.

LANGUAGE OF WEBSITES

Spennemann et al. (1996) also posited that languages spoken by numerically small populations would be swamped on the Internet by English and other languages. The range of local languages in Table 1, as culled from the Ethnologue database, is prominent in Melanesia -- with 37 local languages spoken New Caledonia, 68 in the Solomon Islands and 107 in Vanuatu. Papua New Guinea with 822 local languages is in a class of its own.

Using Google™ zeitgeist data (Google 2004), the language distribution on the WWW was tracked for the period March 2001 to May 2004. Some caution needs to be exercised as the dominance of Google™ as a search engine had not been established in early 2001, and as Google™ may not be the search engine of choice for some languages. What it does seem to indicate, however, is that the percentage of English as a language of Web users has declined from 67% to about 50%, as shown in Figure 2. The big 'winners' were languages other than French, Japanese, German, Spanish and Chinese. As a commercial search engine provider, Google™ is a good indicator of the demand for languages on the Internet, since it offers localized search engines in 33 languages other than English.² Not surprisingly, however, the Pacific Islands languages are absent.

An attempt was made to quantify the distribution of major languages used on a country domain's Web pages. While the Google™ search engine could do so for the major European languages, it did not return reliable results for Chinese or Japanese, misinterpreting characters in pdf files and the like. Even more complicated to assess is the frequency of local language pages on the country servers. Given the specificity of word combinations in each language, it is at present impossible to appropriately assess this. There is certainly room for future research into the online presence of Pacific Islands languages.

WHO CONTROLS THE INFORMATION?

Spennemann et al. (1996) also proposed that the small economic base of the Pacific Islands countries in Table 1 (for 2004 economic data) was an inhibitor to the diffusion of WWW technology, and that outside sources and interests would be dominating the information provision on Pacific Island nations.

Websites on Pacific Island countries are certainly popular. Table A5 provides an overview of the number of pages available on the Internet (in June 2004). With the exception of Pitcairn, each of the Pacific Island countries was mentioned by more than a million pages, with Samoa, Fiji and Guam the most frequently mentioned. Again looking at the keywords, the Cook Islands are the only country that has a better return than the benchmark of New Zealand and this consistently so.

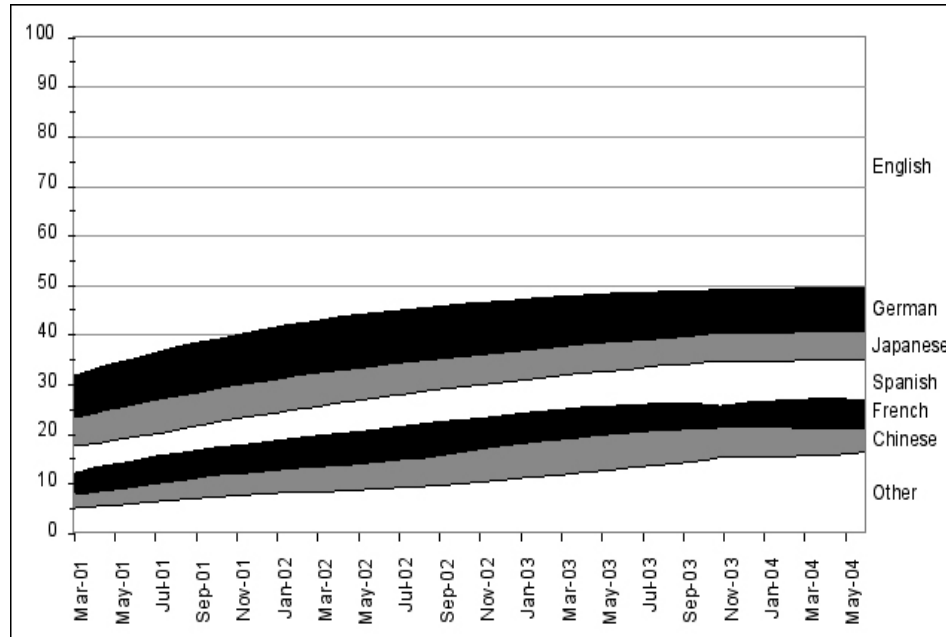
FIGURE 2. LANGUAGE DISTRIBUTION ON THE WWW MARCH 2001 TO MAY 2004

Table 4 shows the discrepancy in volume between pages about each island country hosted on country domain servers compared to non-country servers. Whereas 14% of all pages mentioning New Zealand are hosted on New Zealand domains, and whereas 8% of all pages mentioning Australia are hosted on Australian domains, less than 1% of all pages about Pacific Island countries are hosted on their own domains. The highest was Papua New Guinea (with 0.8%), followed by the Federated States of Micronesia (0.6%). At the bottom end are Palau and the Marshall Islands. In the case of the Marshall Islands even the Government site sits on a commercial.com domain, despite options of domain masking and domain forwarding.

As far as quantity of information provision and cultural domination is concerned, there is no digital divide between the Pacific Islands countries and the outside world. It is a chasm that cannot be bridged with the resources available to the countries at this time.

STRATEGIES FOR BRIDGING THE DIVIDE

Individual Pacific Island countries, as well as the United Nations are trying to address the issue of the digital divide. Their identification of the divide is two-fold: access to reliable and affordable technology and information literacy.

Policy and Access. Regional and international organizations have a long track record of trying to establish IT infrastructure in the Pacific (cf. Ward & Spennemann 2000a-b). In 2002 the United Nations Development

TABLE 4. NUMBER OF PAGES ON PACIFIC ISLANDS SERVERS COMPARED TO PAGES ON THE WWW RELATING TO PACIFIC ISLAND COUNTRIES (IN %)

Country	Keywords												
	No keyword	Tourism	Diving	Travel	History	Political	Geography	Stamps	Fauna	Flora	Culture	Traditional	Economic
Cook Islands	0.09	0.15	0.25	0.26	0.10	0.06	0.03	0.06	0.18	0.03	0.46	0.21	0.14
Fiji	0.38	0.19	0.18	0.14	0.46	0.88	0.41	0.10	0.26	0.11	0.32	0.40	1.10
Frnch Polynesia	0.03	0.01	0.06	0.01	0.08	0.08	0.10	0.22	0.19	0.03	0.08	0.07	0.11
Guam	0.03	0.01	0.03	0.01	0.04	0.01	0.03	0.03	0.01	0.01	0.02	0.02	0.06
Kiribati	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00
Marshall Isles	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Micronesia, FdS	0.62	0.60	3.21	0.55	0.71	1.05	0.76	0.55	0.82	1.02	0.87	1.22	0.00
Nauru	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
New Caledonia	0.26	0.11	0.28	0.12	0.36	0.43	0.18	0.19	1.37	0.15	0.36	0.37	0.68
Niue	0.42	4.44	0.05	1.67	0.05	0.08	0.12	0.06	0.05	0.05	0.04	0.07	0.13
Nrth Mariana Is	0.05	0.03	0.05	0.03	0.06	0.05	0.03	0.01	0.22	0.07	0.04	0.05	0.18
Palau	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Papua NGuinea	0.79	0.10	0.25	0.09	0.15	0.28	0.09	0.07	0.45	0.33	0.17	0.32	0.44
Pitcairn Islands	0.01	0.01	0.45	0.01	0.05	0.01	0.01	0.55	0.06	0.06	0.05	0.04	0.00
Samoa	0.21	0.30	0.10	0.27	0.10	0.11	0.16	0.25	0.33	0.11	0.12	0.25	0.21
Solomon Islands	0.02	0.02	0.05	0.02	0.01	0.02	0.00	0.01	0.01	0.01	0.01	0.02	0.04
Tokelau	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tonga	0.09	0.07	0.08	0.04	0.09	0.06	0.03	0.03	0.03	0.01	0.06	0.08	0.11
Tuvalu	0.25	0.03	0.02	0.42	0.23	0.04	0.02	0.11	0.00	0.02	0.07	0.10	0.05
Vanuatu	0.51	0.25	0.13	0.10	0.12	0.21	0.02	0.02	0.05	0.05	0.39	0.16	0.25
Wallis&Futuna	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Australia	7.9	26.8	7.3	25.5	26.7	11.5	9.6	9.1	27.5	22.0	20.1	12.9	15.9
New Zealand	13.9	11.7	8.6	12.9	14.5	7.7	7.2	15.3	13.0	9.4	9.5	6.5	8.9

Program started an effort to:

...strengthen the understanding of high-level policy makers on IT issues, to assist in the development of national IT development policies and strategies which include concrete action plans in member countries, and to assist member countries in development and implementation of concrete IT programs and projects based on national IT policies and strategies formulated through national IT workshops (UNDP Website).

Much of this is in the early stages of development, and it is geared at the conceptual and higher government level.

These country workshops (UNDP 2003 a-g; Stork 2003) documented the reality of IT in the Pacific, with its high costs of Internet access (Tuvalu,

Tonga, Palau, FSM). Studies undertaken for UNESCO in 1999 and 2002 (Zwimpfer Communications 1999, 2002) also documented the high cost of Internet access in Pacific countries, based on mail surveys. However, the samples and response rates were so low that these findings can only be treated as suggestive. The fact that in some countries a large majority of people have no reliable cash income compounds the problem (Zwimpfer Communications 2002). Given the success of the Niue project, tele-centers were seen by some countries (Tuvalu, Fiji, Tonga) as an adequate solution both for personal and community Internet provision -- but not, for example, in the former American Trust Territory area of the Marshalls, FSM and Palau, where increased competition was seen as a solution. In the former American Trust Territory area of the Marshalls, FSM and Palau, increased competition was seen as a solution.

Potential cultural impacts, perceived by implication to be negative, were noted in Fiji, Tonga, and the FSM. The FSM identified the impact on language as a concern. In addition, IT is not immune from other development factors such as the brain drain (Tuvalu, Fiji) and limited technical skills (various). At a technological level, the harsh environmental conditions, especially on the outer islands (high humidity, high temperatures and high salt content in the air -- as noted in Look & Spennemann 1996), and the absence of reliable continuous power supplies, pose further problems for the reliability and longevity of technological solutions.

Other bodies and organizations are also involved (PECC 2003; SPEC 2003), with the Pacific Forum being a central and vocal body (PIF 2003). Most organizations seem to take their lead from the UNDP and to provide additional commentary. With the exception of the UNESCO sponsored studies (in Zwimpfer Communications 1999, 2002), no serious research seems to have been carried out.

Information literacy: While governments and grant donors seem to focus on the policy framework, active bridging of the digital divides occurs at the grass roots level. Information literacy is seen by regional professionals as the major enabler to bridge the digital divide. At the forefront are local universities, such as the University of the South Pacific, a multi-campus institution with a presence in twelve Pacific Island countries (Mamtora 2001), as well as local library associations appreciative of the fact that the traditional role of librarian has changed to a more general one of information acquisition facilitator (FLA 2003).

CONCLUSIONS

The dispersed and multi-lingual nature of the Pacific Island countries, combined with their environmental conditions, are major physical constraints that cannot be remedied and that will continue to impact on the diffusion of present and future technologies. However, there are cultural/social constraints that must be addressed as well.

This review has identified the presence of three levels of digital divides: 1) between the developed world and the Pacific Island countries; 2)

between the Pacific Islands countries themselves; and 3) within some of the Pacific Island countries. These digital divides exist in various incarnations, including access, under-representation of local languages, sector representation in the publication spectrum, overall Web presence and virtually non-existent information provision by local content providers.

On an international level, the continued domination of outside information providers, as well as the imbalance in the sector representation in the publication spectrum, gives rise to concerns about the long-term viability of Pacific Islands Websites -- particularly in view of the ongoing trend in the development of commercial information warehouses.

On a regional level, disparities between countries continue, brought about by economic and geographic realities. The varied but generally high costs of Internet access (in part brought about by national telecommunication monopolies) are exacerbating the digital divide along socio-economic lines; but they also create regional imbalances, with countries like Tokelau, Nauru or Kiribati effectively isolated. Nonetheless, community-based systems can work to offset this, as shown on Niue.

The current efforts to address some of these digital divides are twofold, both geared at the basic level: addressing the issue of physical access to IT and the problem of information literacy. At the present time, many of the future digital divides are submerged under larger scale divides, i.e. access differentials on a whole-country level and at a sub-regional level (urban vs. outer island communities).

Within these countries at present, no structures are either in place, or envisaged, that would address digital divides beyond the question of mere access in the most general terms. Current efforts are confined at reducing urban-rural and socio-economic divides. No serious consideration appears to have been given to the implications of the technologies on gender, cultural expression/identity, ethnic composition/representation -- or the impact on traditional rank, status and power, a fundamental matter at least in all Polynesian and Micronesian societies. While the present manifestation of 'the' Digital Divide in the Pacific region is already multifaceted, future manifestations will be even more fractured and complex.

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¹ Data tables with numbers preceded by an 'A' can be found at:
<http://csusap.csu.edu.au/~dspennem/IT&S/PacificDivideTables.pdf>

² Arabic, Bulgarian, Catalan, Chinese (Simplified and Traditional), Croatian, Czech, Danish, Dutch, Estonian, Finnish, French, German, Greek, Hebrew, Hungarian, Icelandic, Indonesian, Italian, Japanese, Korean, Latvian, Lithuanian, Norwegian, Polish, Portuguese, Romanian, Russian, Serbian, Slovak, Slovenian, Spanish, Swedish, and Turkish