



The importance of social factors in the digital divide in the Pacific

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This paper highlights three factors—money, authority and expertise—that prevent radio station operators in the Pacific islands from gaining access to important information from international sources. Strategies are suggested to help overcome these barriers.¹

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The Internet is now available in most countries of the Pacific, though access is often limited to those who live in urban areas. When one considers the few avenues young people in the Pacific region have for finding employment (UNDP 1999:35), the opportunities for learning through new media technologies are important. The absence of participation in the new telecommunications environment is described by the term 'digital divide'. This paper explores one important aspect of this issue by investigating the barriers to information facing a group of practitioners in government employment.

The paper first explores the notion of the digital divide and situates it within a Pacific context. It is then argued that the social environment is an important factor in understanding the digital divide. The digital divide is more than the lack of the necessary hardware such as telephone connections

and computers. In order to develop an understanding of how the social context can create barriers to information access the paper draws on a case study of the challenges that a group of Pacific island technicians face as they endeavour to maintain radio broadcasts (Tibben 1999). It is demonstrated that the transfer of information to these technicians from overseas experts is constrained not only by distance but also by socially determined factors. The paper concludes with a discussion about how these observations may be used to further understanding of how to overcome the digital divide.

Background

A 1999 communiqué issued by the Pacific Island Forum Ministers for Telecommunications hailed the introduction of the information economy to the Pacific region



(South Pacific Forum Secretariat 1999). The document announced significant changes to the way telecommunications was to be delivered in Pacific island countries. The Ministers agreed that the liberalisation of telecommunication markets was necessary and that they were prepared to open their public monopoly postal, telegraph and telecommunication departments to the winds of change, namely privatisation and competition. Three years on, the transfer of ownership from the public sector to the private sector has begun. An example is Samoa's Post and Telecommunications Department that was split and sold to private investors in 2001, however, some complain that prices remain high (*Samoa Observer* 2002). From some critics' perspective all that has happened is that monopolies have been transferred from the public sector to the private sector. What is really required to reduce prices, some argue, is more competition (*Marianas Variety* 2003).

The expectation that competition will flow from the privatisation of state-owned telecommunication carriers might be too optimistic. On the one hand, the economic realities of small and geographically dispersed markets in the Pacific raise the question whether the conditions for a competitive environment exist or whether a monopoly is still the rational choice. The basic rationale for a monopoly is where the cost to one producer of servicing the market is less than the cost of multiple producers (Petrazzini 1995:12). For example, Ed Carter, from the telecommunications company Palau National Communications Corporation, claims that his organisation is shouldering a considerable public interest burden by servicing small markets (*Marianas Variety* 2003). Understandably, he is not keen to allow the more lucrative sectors of his market to be lost through competition. In addition to this, privatisation and competition do not necessarily go well together if the maximum

value is to be gained from the sale of public assets. The achievement of maximum return on the sale of state-owned telecommunication departments is partly dependent on governments providing an environment free of competitors (Petrazzini 1995). In terms of the value proposition presented to the consumer, lower cost is not guaranteed under this new regime, in turn hampering participation in an information economy.

As complex as these questions are, the liberalisation of telecommunications markets represents just one half of the job of promoting more efficient use of telecommunications services. Newstead (1998:264) claims that the attention given to supply-side issues in telecommunications reform worldwide has tended to overshadow the equally important task of attending to demand-side issues: in particular, the ability of people to use telecommunication services more productively, either in business or more generally at home. So while reduction of cost and greater efficiency represents one important factor in overcoming the digital divide, it is not the only one that must be addressed.

There have been various initiatives to promote a Pacific information economy. The World Bank has been an important facilitator of the change from public to privatised telecommunications regimes globally (Ambrose et al. 1990). It has also funded studies on establishing conditions wherein people are better able to take advantage of telecommunications services. One World Bank-funded study undertook a knowledge assessment in selected Pacific island countries with the view to identifying opportunities for more productive use of information and communication technologies (ICTs) (SMEC 1997; UTS 1997). More recently, a combined study by the Pacific Islands Forum Secretariat and the Pacific Islands Telecommunications Association (PITA) investigated the deployment and use of ICTs in the Pacific region. This study



included complementary aspects of ICT deployment such as human resource capacity, institutional support and regulatory structures.

Both studies are examples of efforts to engage with demand side issues through consultation with stakeholders. The limitations of such an approach are that stakeholders are by necessity unaware of the possibilities of ICTs because they tend to view their application within existing paradigms. Dudley (1999) argues that there is a degree of inertia associated with the early phase of ICT adoption because of the dominance of old techniques. Replacing these techniques with new ideas can be an uncertain process.

Some of the literature on the application of ICTs within social contexts indicates that there are complex and subtle issues that must be addressed if maximum benefit is to be gained from the adoption of ICTs. Kling (2000) speaks about the digital divide as being composed of both physical access and social access—'technological infrastructure' and 'social infrastructure'. Technological infrastructure refers to the provision of telephone lines and equipment. Social infrastructure refers to the provision of training, teachers, instructors and help-desk personnel who can attend to the difficulties end-users have in using new networked services. If one looks to Miller (1996), the notion of the digital divide can be related more to the individual and their involvement in society. Miller uses the related term of 'universal service' to make the point that people's participation in society is being increasingly mediated by information and communication technologies.

Universal service...is the process of eliminating barriers so that everyone has the opportunity to use our evolving telecommunications systems for meaningful and effective participation in all aspects of society (Miller 1996:179).

This paper uses these ideas to explore the barriers to information transfer even though ICTs may be available. It does this by analysing the effect that socially determined factors have on the provision of problem solving information to a group of technicians. The intention is not to suggest that these are cultural factors that are resistant to change but, in the first instance, to identify the subtle nature of barriers to information transfer. Equipped with such knowledge, it is possible to suggest how these barriers may be reduced.

The study

The case study focused on the development of technological capability development in a group of Pacific island technicians (Tibben 1999). The areas of study were the technical personnel, the technologies they used and the organisation in which they worked—a radio station employing 22 staff. A case study methodology was adopted which was oriented towards theory building. Data gathering consisted of participant observation, interviews and content analysis of documentary sources.

Problem solving was identified as an important avenue to knowledge development for these technicians. Two aspects of problem solving were identified. The first was experiential learning where the technicians solved problems by a learning-by-doing approach. The second aspect was communication with other technicians and this came into play when the process of learning-by-doing became too tedious. However, as there were only four technicians, problems would often escalate into crisis situations because their collective knowledge was not sufficient to deal with such situations. The only options were to go back to the learning-by-doing mode and hope that one stumbled on a solution, or contact the equipment manufacturer for guidance. It



was the latter of these forms of problem solving that the study focused on because it was the most promising avenue for resolving equipment faults in a timely manner. But it was the least utilised strategy.

Macdonald's (1998) information perspective provided a surprisingly powerful heuristic for understanding the predicament of the technicians. Macdonald is an innovation researcher who has developed expertise in analysing the role information plays in facilitating or constraining innovation within organisations. The contexts in which he has studied this are diverse, ranging from eighteenth century British agriculture to modern day Silicon Valley. Macdonald's framework was chosen because it responded to two important issues when considering the difficulties of technicians working within small island contexts: first, the importance of problem solving in technological knowledge development and, second, the need for communication with expertise outside the organisation.²

The development of social networks that facilitate the transfer of problem-solving information from overseas experts emerged as an important element in the development of knowledge by the technicians. The identification of social networks is related to the tacit nature of much of the knowledge that has to be transferred. Tacit knowledge refers to knowledge that is bound up in people and their skills, technical know-how, and experience in solving complex problems (Turpin et al. 1995). Tacit knowledge stands in contrast to codified knowledge which is easier to codify into documents, operating instructions, theories and rules (Turpin et al. 1995). Codified knowledge is therefore much easier to transfer because it is much more amenable to formalisation and transfer via paper, electronic networks or through formal education methods. Tacit knowledge transfer, on the other hand, is dependent on less

formal communication mechanisms such as conversations between work colleagues and supervisors, learning by copying, 'war' stories and gossip (Raghuran 1996). It is for this reason that social networks are more important for the transfer of tacit knowledge than codified knowledge.³

Case study example

In order to appreciate the significance of the difference between tacit and explicit knowledge and the relationship of tacit knowledge to social networks it is useful to relate the discussion to a case study example. This example concerns the failure of a broadcast transmitter.

The secondary transmitter was required for parliamentary broadcasts and its failure represented a potentially embarrassing situation for the technicians and the radio station. Parliament was due to begin and the absence of a parliamentary broadcast would contravene the standing orders of Parliament. The fault was a difficult one to solve. The information that was available from the manuals describing the operation of the transmitter was not sufficient to solve the problem. Colleagues in the local telecommunications department visited the transmitter building to lend support. The informal social network among technicians in the radio station and the telephone department provided a possible avenue to overcome the fault. However, these colleagues were not able to resolve the problem and the radio station technicians continued working throughout the night.

The cause of the problem was eventually found to be a blown fuse. This component had been tested previously but had been tested incorrectly. Instead of removing the component for testing, a false reading was recorded because the component was left in circuit. This basic procedure was not detailed



in the manual (that is, remove components before testing) and arguably represents a 'know-how' aspect of being a technician, and can be associated with tacit knowledge. It could also be asserted that contact with the transmitter manufacturer would have assisted in identifying this problem. Interestingly, assistance was never sought from the transmitter manufacturer.

Barriers to information transfer

In analysing the factors that constrain the formation of viable social networks, it is a given that distance represents the most significant impediment. Interest in ICTs is so high because of the possibility that these technologies may overcome the tyranny of distance. Many social networks can be sustained by ICTs. In this case, however, it is apparent that access to a telephone and facsimile with international access was not sufficient for such networks to flourish. While significant use was made of the facsimile machine for requests for quotations it was not used for the acquisition of problem solving information that related to technical faults.

Macdonald's (1998) perspective provides a framework within which to begin to understand why information transfer did not occur in times of crisis. He contends that some form of transaction normally accompanies the transfer of information, be it in the form of tangible goods such as money, or payment in kind such as the exchange of information for information. Macdonald claims that it is not necessary for this 'payment' to occur at the time of information transfer; it is often quite acceptable for individuals to expect that 'payment' may occur some time in the future. Using Macdonald's framework it is possible to identify three factors that constrained the formation of social networks and in turn the transfer of information—money, authority and knowledge.

Money

The idea that money is one of the factors that explains information barriers is not surprising when one considers the limited financial resources that were available to the technicians. The radio station was a small organisation employing just 22 staff with a total budget of US\$125,000. The technical budget that the technicians had access to was just under US\$7,000.

The first factor that was of relevance was the price of telephone calls. At the time of the study, international telephone calls were about US\$1.00 per minute. However, the study found that the price of telephone calls did not present an overt barrier to contacting overseas suppliers. At the time, fax was used to request information from overseas suppliers about the cost of spare parts and new equipment (even though the purchase of new equipment was constrained by the limited technical budget). On the other hand, during the technical emergency described earlier the phone was not used to contact overseas experts for advice even though the technicians had been working on the fault for well over 24 hours. This apparent contradiction was difficult to understand.

Delving deeper it was found that while lack of money was only having a minor impact on the behaviour of the technicians in terms of their use of the telephone, the underlying social dynamics that shaped the technician's relationship with suppliers was influenced by lack of money. The prospect of future commercial benefit on the part of suppliers is one issue that undermined information transfer. Because of its restricted finances, the radio station was perceived by the supplier as being of limited future benefit and this appears to have dissuaded some suppliers from providing information. For example, the former technical coordinator of the Pacific Island Broadcasting Association (PIBA) revealed that he has had difficulty in



acquiring the most basic information from companies. Requests for quotations were often left unanswered. Whether based on commercial acumen or ignorance, perceptions by equipment suppliers about future benefits based on their knowledge of the radio station's limited finances appear important in determining the access that these technicians have to information.

This represents one example of the difficulties that exist in establishing productive information-sharing relationships with overseas suppliers. It needs to be stated that in the example cited above, the manufacturer was never given the opportunity to help during the crisis because they were never contacted.

Authority

One example that suggests that the lack of authority of the technicians undermined the formation of productive information-sharing relationships can be seen in the purchasing procedures that the technicians had to fulfil. At the time of the research the radio station was required to channel all purchases from overseas suppliers (the bulk of equipment purchases) through a central purchasing authority. Ostensibly, the radio station did not engage directly with the supplier beyond obtaining initial quotations. While there was a need to ensure that reciprocal obligations were met in the purchasing process, one could see that in general only limited authority was delegated to middle managers. Delays of five weeks or more between ordering and delivery were common. The person from the central purchasing authority assigned to mediate the transaction had no special interest or knowledge in the goods ordered. This had the effect of preventing the formation of social networks between suppliers and the technicians. The chief engineer complained to me that he was embarrassed to communicate with suppliers because of the time it took for payments to be made.

The inability to command resources and coordinate the supply of equipment indicated to overseas suppliers that the technicians lacked decision-making power. The effect this had on the formation of social networks was similar to that of having insignificant amounts of money. Perceptions of future commercial benefit were shaped by the inability of the technicians to coordinate the purchase and delivery of equipment. It also prevented opportunities for the development of more informal interpersonal relationships because misunderstandings and tensions were common within the triangle of supplier, technician and purchasing authority.

Another example of the way the lack of authority diminished the possibility of interpersonal network formation between the technicians and overseas suppliers related to access to the telephone and the ability to engage in confidential communication. At the time, all telephone numbers, destinations and times were logged for the purpose of the monthly review by the accountant and manager. If one were to use the phone it would eventually become known to others within the organisation (and eventually the broader community) that the technicians needed the assistance of outside help to resolve technical problems. The status of these technicians was determined to a large degree by the qualifications they had received, which, in turn, were assumed to be sufficient to solve difficult technical problems. Even though the technicians found that their formal training did not equip them to solve all problems, they were reluctant to be seen asking for help from overseas experts as it tended to undermine their status in the organisation and local community. This explanation emerges as a plausible reason for the technicians not contacting the manufacturer during the crisis described.



Expertise

The third factor that was found to interfere with the formation of social networks with overseas experts is expertise. The requirement for expertise refers to the way that currently relevant knowledge serves to promote one's participation in social networks in which such knowledge is valued. The radio station's use of outdated equipment meant that the technicians were developing expertise that was largely out of date and of little interest to those working in the industry. For some equipment items, the manufacturer had informed the technicians that the supply of spare parts could no longer be guaranteed.

Sometimes, overseas experts would talk in disparaging terms about their island counterparts. One technician told of his humiliation at a regional training course where he was required to identify to the host engineers the field recording equipment he was familiar with.

From the perspective of forming a viable information network, Macdonald argues that people are most willing to contribute their knowledge if they feel that there will be some reciprocal benefit later on. If overseas experts and overseas suppliers make the assessment that the radio station technicians are unlikely to provide them with useful knowledge, the provision of information by the supplier becomes akin to charity. Conversely, if the radio station technicians were given the opportunity to develop knowledge of the most recent models of equipment, they would arguably be incorporated into the network of experts working with such equipment and where such knowledge is in great demand.

Discussion

It is now possible to consider strategies that are likely to create better information-related outcomes for technicians working in the

Pacific. For example, it is in the power of government departments and private companies to grant their technicians greater authority to make decisions about the use of resources. This would allow them to develop relationships with suppliers that may form the basis for greater information sharing. Benefits would more likely flow if technicians were given greater freedom to travel to overseas trade exhibitions. These face-to-face meetings are important to the formation of information-sharing relationships that must later be mediated by telecommunications technologies.

Use of outdated equipment is not likely to provide information-related benefits. There is also certainly a greater chance that such equipment will fail and there is little inducement for equipment suppliers to assist with repairs. A primary concern of equipment suppliers is the integration of new equipment in the field. Any information that relates to this activity is highly sought after. Equipment suppliers treat the technicians who are in daily contact with the latest equipment favourably so that this valuable information can be elicited from the technician's personal experience. From this perspective, the well-meaning desire to supply Pacific island countries with second-hand equipment is not a preferable strategy.

Some socially determined barriers to information transfer are difficult to overcome. The financial resources of most organisations in the Pacific are very limited and this presents a significant impediment to the formation of viable commercial relationships. It stands to reason that suppliers, in making decisions about how to invest their limited time and what information to share, will favour higher-spending customers.

However, the strategic reorganisation of resources or procedures may serve to improve information-related outcomes. Since this research was conducted, changes have occurred in the ways equipment is procured



from overseas suppliers. One change that resulted from an institutional strengthening program funded by a bilateral donor involved the introduction of computerised technology. This change has required local suppliers to become more active in quoting for the supply of broadcast equipment. While this has had the effect of shifting the risk of the transaction from government to the local supplier, it has also increased the amount of goods local businesses purchase from overseas. The increase in volume has improved information sharing between local suppliers and overseas suppliers. While the radio station technicians miss out on direct contact with overseas suppliers, local suppliers have proved to be better mediators than the purchasing authority. Local suppliers are often ex-technical personnel from either the telecommunications department or the radio station and have an understanding of the technical jargon. The change in the purchasing procedure has removed much of the frustration of the old system, which tended to undermine the formation of good interpersonal relationships. The technicians seem more satisfied with this new arrangement as there is a good supply of information flowing with the local supplier acting as mediator.

Wider implications for theory and policy

If information is seen as an inexhaustible resource, there appears little need to be concerned with its allocation and distribution. The digital divide therefore becomes a technological issue that can be overcome with more communications technologies. This rationale, however, stands in contrast to the case study which reveals that problem-solving information can be difficult to obtain, even if one has access to telecommunications technologies.

However, Antonneli's (1997) argument that information can have the character of both a public good and a private good seems more appropriate. Information derived from codified knowledge appears to be best managed as a public good. Its production is expensive but because it is inexpensive to reproduce and distribute, it should be made as easily accessible as possible. Thus, this kind of information appears to be an inexhaustible and non-excludable resource. However, access to tacit knowledge—the knowledge that is held by people as the result of their experiences—can be controlled far more effectively. Thus, information derived from tacit knowledge can be seen as a private good. Information derived from tacit knowledge can be a scarce and excludable resource and this can lead to asymmetries in its distribution.

Lamberton (2001) states that a major concern within information economics is the task of comprehending the asymmetries that exist not only in the availability of information but also in the ability to use information. Stiglitz (2001) argues that development experts have generally underestimated the impact that information asymmetries have on the actions of economic actors. This position stands in contrast to a common view of information as a relatively cheap and unproblematic resource akin to a 'good all purpose lubricating oil' (Lamberton 1998:209).

Sidorenko and Findlay (2001) contend that the creation of a global information network requires many complimentary components. This paper has identified three socially determined factors that can affect the transfer of information—money, authority and expertise. Each can be understood as complementary to the transfer of problem solving information. The management of these complementary factors in the transfer of tacit knowledge is a challenge to the establishment of a viable information economy in the Pacific region.



A significant policy implication drawn from this discussion is that the existence of telecommunications networks and trained personnel may not be sufficient for overcoming the digital divide without complementary social capital to mediate the transfer of information derived from tacit knowledge. This can be seen in the nature of the organisation of the radio station, as well as in other entities such as the purchasing authority, local suppliers, and overseas suppliers. Each of these entities significantly shaped the way the technicians were able to access important information.

Institutional strengthening appears most in need of policy attention. The benefits generated by the changes in purchasing procedures described above were an unintended consequence of an institutional strengthening project. It appears important to consider strategies on the basis of their information-related benefits. The case study appears to support Lamberton's (1994) call to treat organisations as being an essential part of a developing country's infrastructure and to fund the development of organisations along the same lines as other infrastructure projects such as the provision of roads, water supplies, and buildings.

Being in a position to specify better the conditions that lead to information related benefits has been the subject of reports by bodies such as the OECD (2001) and APEC (2000). These documents highlight the need for human capital development in relation to knowledge-based economies (OECD 2001:15; APEC 2000:xv). The OECD report makes the point that firms have tended to under-invest in formal and informal training of personnel. The APEC report identifies the need for more highly trained knowledge workers. Underpinning both forms of training is formal education, as the ability to absorb new information and transform this into new knowledge is dependent upon education. The note of caution that the case

study gives rise to is that formal education can have limited impact if individuals are not incorporated into essential networks of experts.

Network externalities are a positive feature of a knowledge-based economy (Sidorenko and Findlay 2001:21). As networks grow there are increasing returns to each participant in the network. The case study suggests that more attention needs to be given to the factors that create and sustain networks, particularly where the links have to be maintained across long distances. The existence of sophisticated telecommunication technologies has not completely facilitated the creation of productive interpersonal contacts that enable technicians to solve problems reliably. Being able to specify the optimal conditions under which this should occur is difficult because the topic of tacit knowledge development, especially within the context of the small countries of the Pacific, needs more attention from researchers.

The impact of the introduction of email since this research was undertaken is one area needing further investigation. The senior technicians at the radio station now have email access. In theory, email provides a significant improvement over the use of telephone and fax in that it is both cheaper and more confidential.⁴ In a recent visit to the radio station, the author noted that the chief engineer was in email contact with the supplier of a recently purchased computerised audio replay system. This communication was occurring without the need for faxes and telephone calls that would have attracted the attention of administrative staff.

In contrast, another experience of the author suggests that the benefits of email have not been fully realised. The author was required to conduct a regional training course in information technology strategic management for engineering managers working for commercial radio stations in the



Pacific. One of the agreed outcomes from the course sponsors was the formation of an email network that would facilitate communication between radio station engineering managers after the course. Even though the technical requirements were achieved, the network was not used. While the reasons for this failure need to be studied, the author speculates that the information needs of participants was not being satisfied by the email network and so was politely ignored. The lesson to be learned in better understanding the digital divide is a basic one: the mere existence of a network technology is not sufficient without an understanding of the daily information needs of the participants. As Kling (2000:251) remarks, social networks generally energise electronic networks, not the reverse.

Conclusion

This paper has described the way in which social factors can contribute to the existence of the digital divide. A case study of technicians at a radio station in the Pacific region identified three factors that prevented them from gaining access to information from overseas experts—money, authority and expertise. These factors were generated from a set of existing social conditions. From an understanding of how these factors can contribute to the digital divide, more appropriate strategies may be developed. The digital divide is more than just a technical issue of whether an Internet or telephone connection exists. It is necessary to look beyond the technological infrastructure and create the necessary social infrastructure that enables individuals to make the most productive use of new information and communication technologies.

Notes

- ¹ An earlier version of this paper was presented at the 20th Pacific Science Congress, 'Science and Technology for Healthy Environments', Sofitel Central Plaza Hotel, Bangkok, Thailand, 17–21 March 2003.
- ² Another significant quality of Macdonald's approach is that it does not assume that the organisation is oriented to any particular goal beyond problem solving. A difficulty with much of the relevant development literature is the assumption that organisations in developing countries are oriented to the same goals as their counterparts in Western countries. It was found that the radio station, while appearing to be an analogue to radio stations in the United States or New Zealand, actually was oriented towards fulfilling goals that were localised and unique. An example of this was the radio station's participation in local cultural events that inspired the development of a formidable outside broadcast capability.
- ³ The notion that tacit knowledge is important for engineers is supported by Orr's (1996) study of photocopy technicians. He demonstrated that there was much that had not been documented about overcoming problems with photocopy machines even after they have been tested, installed, and gained commercial acceptance. The resolution of difficult problems was very much a community effort where the experience of more senior technicians helped younger technicians to resolve difficult problems.
- ⁴ This assertion needs qualification. Email is not confidential because network administrators do have the means to read the contents of emails.



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