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Revisiting an information infrastructure for development: exploring the cost of information in Pacific Island development

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Information and communication technologies (ICTs) have been associated with development programmes for many decades. A theme of Lamberton's commentary on such initiatives focuses on the lack of attention given to information as a key factor in the development process. His writing reiterated a number of arguments that he saw as being fundamental to the application of an information perspective to development issues. With a focus on agricultural development policy in the Pacific region, the paper uses a number of propositions that are suggested by Lamberton to analyse contemporary development initiatives in Pacific Island agriculture. These propositions focus attention on information costs that can influence the transfer of information and development of knowledge. Document analysis of selected published sources from a Pacific Island development programme are reviewed to illustrate the significance of information costs for development processes. The paper addresses the contention between traditional authority and knowledge and its significance for development.

Introduction

Don Lamberton's work has done much to improve understanding of social development issues (Lamberton, 1996a, 1996b, 1998, 2001). Bringing an information perspective to bear on development was considered critical to a better understanding of not only the sizeable investments in telecommunications being made in low- and middle-income countries, but also of the improvements that ultimately lift people out of poverty. Even though an economist, Lamberton never considered economics an end in itself. His own humble upbringing in rural New South Wales meant that he never lost sight of the impact economics has on the lives of people, including the poorest in society (Macdonald and Nightingale, 1999).

He routinely expressed reservations about the lack of economic scholarship surrounding investments in technology, which was assumed in orthodox theory to be exogenous to the economic system (Lamberton, 1994, 2001). His fundamental proposition was that the root of the technology problem, along with an unquestioning faith in markets, rested with the discipline's poor appreciation of the role that information plays in the economy. Along with the standard preoccupation pertaining to people's preferences and wants, Lamberton (2001) wanted economists to ask the question: What do people know?

Technology has changed significantly since Lamberton wrote his last contributions to development debates. Telecommunications has been disambiguated into sub-areas,

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such as Internet, broadband, mobile, social media and Web 2.0. However, Lamberton's information-based analysis is hardly defined by the technology of the time and, as such, provides analytical constructs that have potential for application today.

The paper is structured in the following way. First, it provides a broad outline of the main theoretical issues that an information perspective brings to development. To establish a context for the analysis, the paper turns its attention to development issues in the Pacific region, with a particular focus on agriculture. The paper uses one of Lamberton's earlier contributions (with Jussawalla and Karunaratne) to the development debate in the Pacific to provide a number of analytical constructs in the form of information costs (Jussawalla *et al.*, 1988). These constructs are subsequently illustrated in the analysis of case material. The paper concludes with a discussion about the significance of information costs in the formulation of development policy.

An information infrastructure for development

In one of his later contributions to the development debate prior to retiring, Lamberton's (2001) paper in *Prometheus* (entitled 'An information infrastructure for development') summarises his thoughts on this topic. He asks the reader to apply an information perspective when considering the role of telecommunications technology in development. He expresses some regret that information economics has not played a greater part in setting an agenda for the 'new economy', which has promoted investments in telecommunications (p.223). He judged the rhetoric that justified these large flows in foreign direct investment (FDI) as a reflection of how this debate had been captured by specific interests rather than academic scholarship (Lamberton, 2001, p.225).

Lamberton's grievances with development policies have their origin in his disappointment with economics as a discipline. The limitations of the market system and acceptance of the notion that technological change is exogenous are the fundamental problems that he identifies (Lamberton, 2001, p.223). Assuming information is a commodity or, worse still, a public good, enables these two articles of faith to be maintained. The market system and technology come under pressure when the economic characteristics of information are scrutinised more deeply. Lamberton summarises these unusual characteristics by pointing out three attributes that shape information use within the economy: its capital-like attributes (as opposed to commodity-like), indivisibilities and complementarities (Lamberton, 2001, p.224). He draws on Schumpeter's explanations of capital to emphasise the structural relations of information.

Lamberton uses this brief explanation to criticise efforts at the time to justify significant investments in telecommunications in the name of development. He singles out the International Telecommunications Union (ITU) and the World Bank as promoting by mere assertion that telecommunications leads to economic growth (Lamberton, 2001, p.225). He notes that telecommunications investments and policy changes in the area suited business, government and some international agencies, and so were vigorously pursued as part of the foreign aid and FDI agenda. While he notes that some attention is given to soft technology, he complains that the treatment of education and training, for example, requires further elaboration (Lamberton, 2001, p.226). Missing are the time dependant changes that an information perspective emphasises, such as individual learning, organisational learning and cultural change.

Lamberton was one of the first to observe that the digital divide is a multi-faceted concept and recommends caution when formulating development strategies (Lamberton, 2001, pp.226–227). The idea that the economic modelling of advanced countries could be applied to low- and middle-income countries revealed a poor appreciation of conditions in low- and middle-income countries. The digital divide is an extremely complex notion that cannot be reduced to a single dimension, be it income or Internet access (Lamberton, 2001, p.227).

Part of the remedy from Lamberton's perspective was a better appreciation of information as an economic resource with specific characteristics. He uses Arrow's description of information being a 'fugitive resource' (Lamberton, 2001, p.227). Lamberton saw the attempts of the time to fit information into the narrow definitions of trade-related intellectual property regimes as not only ignorant of the unusual economic characteristics of information, but as also having significant implications for indigenous knowledge in rich and poor countries alike.

Another important consideration from Lamberton's perspective was the ability of countries to absorb new information and technology (Lamberton, 2001, p.227). He warns that the rapid pace of technological change may not be readily absorbed by some countries because of their existing capabilities to process and use new information. Lamberton asserts that these challenges are far too complex for the invisible hand of the market system to rectify. The implications are more than theoretical because the consequent impacts on both labour and suppliers are significant. He singles out the management profession as being in particular need of the assistance of an information economics perspective.

Lamberton concludes his paper by advising readers to move their attention from information technology to information. The outcomes are dramatic: solution to the productivity paradox and full informatisation of society, leading to a more accurate understanding of the information society. Rather than advocating the standard input–output analysis of telecommunications of the time, he exhorts researchers to look more closely at information processes: 'Attention has to shift to the comprehension of messages, learning processes, and utilization of information in sequential processes of learning, questioning, unlearning, and application' (Lamberton, 2001, p.228). Assumptions had to recognise information as a structured quantity, much like capital. Recognition of indivisibilities and complementarities would make significant improvement to development policy.

Pacific Island development policy – a struggle of knowledge and authority

A new item of plant equipment supplied by an Australian aid programme for the Public Works Department (PWD) in a Pacific Island country had arrived by sea and was waiting at the wharf for transport to its new home in the PWD yards. The transport of the plant equipment from wharf to final resting place was complicated by its height (the prospect of becoming entangled in overhead wires), and its weight (which just exceeded the capacity of the only bridge on route to the PWD yard). Faced with the prospect of damaging the only bridge on the main thoroughfare through the capital, chief engineer Tim Watts decided a safer option was to create a temporary piped-earth bridge on a secondary route further upstream. This option was not welcomed by the minister of works, who saw benefits in having this large piece of new infrastructure paraded down the main street of town in front of Saturday morning shoppers. The less risky route upstream took the plant equipment on a less trafficked route away from the

crowds. Even though the chief engineer was challenged on his decision by the minister, his engineering judgement about risks convinced him that his plan for a temporary earth bridge was professionally correct even though unpopular.

On the morning of the transport, the minister made a last-minute decision to change the route back to the main street, even though preparations had been made for the transport of the equipment upstream. The chief engineer explained to the minister the risks to the bridge, but this reasoning failed to change the minister's mind. The transport of the plant equipment went ahead over the bridge and along the main street without any immediate impact on the bridge's structure. The minister was able to take credit not only for the arrival of the new machinery, but also for his challenge to the judgment of the Australian chief engineer, suggesting greater expertise in such matters. Tim Watts accepted the outcome with a shrug of the shoulders knowing that his first decision was correct and one he would make again given the same circumstances.

The vignette highlights a link between technology and authority. Aid projects can be sites of considerable conflict. Foreign experts on salaries many times the wages of local counterparts often make demands for changes that run contrary to local norms and wants. Sometimes these experts can appear to get it wrong, confirming a perception that they are incompetent as well as overpaid.

The link between knowledge and authority can have profound consequences for development programmes. Arrow's (1974) monograph on the limits of organisation examines information use within organisations where expertise is found to confer authority. He reasons that the prospect of gaining consensus on the myriad of issues that need to be addressed frequently has naturally led to the creation of organisations with authoritative structures in which those with the most expertise should be given authority to process and act on information on behalf of others.

Given the reliance of countries and states in the South Pacific region on foreign aid, development policies have been dominated by foreign government agencies (Australia, New Zealand, USA, France, EU, China, Taiwan and Japan) as well as by inter-governmental agencies (World Bank, Asian Development Bank and several United Nations (UN) agencies (such as the ITU and the United Nations Educational, Scientific and Cultural Organization [UNESCO]) (Kelsey, 2004). When Lamberton (2001) wrote the paper on development described in the previous section, many governments in the South Pacific were encouraged to sell their service arms, such as broadcasting and telecommunications, to the private sector (ADB, 2004). These development policies were heavily influenced by neo-liberal economic policy, which asserts 'the primacy of the [economic] market in social welfare' (Hall and Midgley, 2004, p.31). Reliance on the economic market mirrored changes in social policy around the world, which can be traced to the leadership of Margaret Thatcher and Ronald Reagan during the 1980s (Pusey, 1991; Midgley, 2003).

With this greater focus on economic matters, South Pacific countries were called on to account for the generous per-capita aid flows into the region. Long-run social and economic development indicators had remained static, and in some cases had gone backwards (Hughes, 2003). With population growth of 3% and economic growth running at 1% in these countries, Hughes cites poor governance of aid projects as the root cause. More recent statistics tell a similar story (FAO, 2010).

Key neo-liberal economic tenets of entrepreneurialism, growth and privatisation have nonetheless met with resistance (Firth, 2006). For example, the narrative of the 'Pacific way' seeks to encapsulate Pacific Island values and practices as a model for development (Huffer, 2006). Rather than assuming a selfish individual entrepreneur

as the key generator of worthwhile social activity, Pacific cultures generally subsume the interests of individuals in their emphasis on the extended family (Huffer, 2006). The notion of a distinctive Pacific way was coined during the 1970s by Fiji's former statesman Ratu Sir Kamisese Mara, to describe traditional modes of decision-making in the Pacific where a governing body of chiefs discusses matters with the view of achieving consensus. While those providing the funds and resources for development hold considerable sway over the design of aid and delivery of programmes, it is still possible for resident actors to change aspects of these programmes to suit local interests. This pattern was established during colonial times and is still evident today (Hempenstall, 1978; Huffer, 2006).

The fractious nature of Pacific Island development is underpinned by a number of basic realities. First, models of industrialisation that have traditionally been used to define development are inappropriate for Pacific Island states (Streeten, 1993). Pacific Island economies are characterised by a number of factors that make them different from industrialised countries (Higgins, 1994; FAO, 2010). Some of these countries are distant from markets, have unsuitable natural resources, fragile eco-systems and small domestic markets, and exhibit institutional and cultural resistance to change. Smallness and isolation work against initiatives that rely on large volumes of resource inputs, economies of scale and organisations with suitable expertise. Political upheaval in Fiji and the Solomon Islands over the past decade has created further uncertainties for aid donors and potential investors.

The economies of small Pacific states are characterised by a narrow focus on primary production that makes them vulnerable to natural disasters, such as cyclones and tsunamis (FAO, 2010). Another characteristic is the high proportion of activity in the informal subsistence sector of these economies. For example, in Fiji only 20% of adults work in the formal economy and only 46% are economically active (UNDP, 1999). One area in which the struggle between foreign-imposed development mandates and local culture is revealed is in assistance to agriculture. Agriculture continues to play a very important part in the life of Pacific people, with a majority of the population engaged in this activity (FAO, 2010). The Pacific has two regional organisations playing a significant role in the development and dissemination of scientific and technological knowledge in Pacific agriculture. These are the University of the South Pacific's (USP) school of agriculture and the South Pacific Community (SPC; Tibben and Tielu, 2007). At the national level, diffusion of scientific knowledge and innovation is through the extension services of government departments of agriculture. This reflects a common pattern of research and development where regional agencies rather than individual governments are active. While countries contribute to these regional agencies, the lion's share of support comes from regional and external sources, such as Australia, New Zealand, the US, France and the European Union (EU).

Ultimately, the barriers that constrain dissemination of scientific knowledge are related to an understanding of the structure of agriculture. There are four broad categories of agriculture in the Pacific (Tibben and Tielu, 2007). There are traditional staple root crops, plantation crops, livestock and horticultural production. The last is dominated by fruit and vegetable production. Plantation agriculture, and horticulture which is commercially oriented, are most likely to draw on what science and technology have to offer to improve production, reduce costs and increase profits. The semi-subsistence farmer may express an interest in what science and technology may offer only if someone else pays or significant discounts are offered. The subsistence farmer is likely to challenge any scientific threat to what his or her ancestors have

taught through the ages, and there is little incentive for small semi-subsistence farmers to use modern techniques. Hence, Western experience in the diffusion of science and innovation in agriculture is largely out of touch with many farmers in the Pacific (Schwass, 1983).

Recent developments in agriculture suggest that private-sector development has been responsible for promising commercial initiatives (FAO, 2010). Selected examples of nonu fruit production in Samoa, horticultural products in Fiji, and natural cocoa products in Vanuatu all have their genesis in entrepreneurial activity rather than government mandate. An important component of these developments in Samoa has been the readiness of some communities to accommodate such activity within their traditional land tenure system. While still a far cry from enabling individual ownership by which property rights can be conferred, it is cited as an example where tradition can incorporate modern forms of entrepreneurial activity in agriculture. In seeking to include culture in a development paradigm, Huffer (2006, p.49) defines the research challenge:

> There has been little effort … to understand how communities can utilise their human and cultural resources to enhance livelihoods while participating in the market economy. Advocates of the market economy assume that it will provide answers and that people will adapt to it – they do not envision another more appropriate solution.

The paper proceeds to investigate more appropriate solutions using contemporary approaches to agricultural development in the South Pacific region as its focus. It establishes an analytical framework in the next section that is based on important aspects of an information perspective outlined by Lamberton.

An information perspective on Pacific Island development

In *The Cost of Thinking: Information Economies in Ten Pacific Countries*, Lamberton explores the potential that an information perspective can bring to development policy in Pacific Rim and Pacific Basin countries (Jussawalla *et al*., 1988). Only two countries from the South Pacific (Basin) region are analysed – Fiji and Papua New Guinea. The study is essentially an input–output study, which must have given Lamberton misgivings, though he does not reveal these in the book's preface. Lamberton (1988) explains that the cost of thinking referred to in the book's title is taken from an essay by Marschak (1966, p.152). Marschak defines this as the costs of 'obtaining and processing of information to determine and carry out optimal strategies'. Lamberton saw great potential in Marschak's insight, thinking it would throw light on the problems of development in the Pacific region. Essentially, he saw the role of information economics in terms of minimising these costs to facilitate development. The factors that contribute to information costs are elaborated in the following points he identifies (Lamberton, 1988). For each of these factors I develop propositions. These in turn are related to the case study that follows.

Information as capital

Likening information to capital has implications for a number of aspects in development policy. While information may be a commodity in some circumstances, it is not universally so. One attribute of capital used to justify information-as-capital

relates to sunk investment costs. In order to be able to obtain and process information, a number of costs that cannot be recouped are expended, a characteristic more akin to capital than commodity. For example, time spent on education, training and gaining experience are the kinds of costs that cannot be recouped if one decides to choose a different area of expertise development. Another related feature of information-as-capital is that its cost of production is independent of the scale on which it is used. This essentially means that once efforts are made in acquiring information and developing capabilities to use information, it can be used multiple times at marginal cost.

Another feature of information that likens it to capital is its structural qualities. It is not practical (or even possible in some circumstances) to separate information into its constituent pieces because information is useful only if other pieces of information are available (Lamberton, 1998). The lesson for development strategists is that the transfer of some information is not sufficient to enable development to occur. This has been recognised in studies of tacit knowledge and explicit knowledge, where explicit knowledge is made productive only if requisite stocks of tacit knowledge also exist (Lamberton, 1998). The ease of transfer of the former often means the latter is ignored.

Proposition: Information will display capital-like characteristics, sunk costs impacting on capital, such as risk (investment costs), economies of scale and complementarities.

Costs to the individual

This change in defining information from commodity to capital has significant implications for the individual. Given information's capital-like nature, the time that individuals are required to devote to learning new techniques and concepts incurs opportunity costs which cannot be recouped if things do not work out. Given such uncertainties, the costs that can be incurred by individuals in their use of information can act as disincentives. These uncertainties include the following questions: Will the time taken to learn new ideas lead to improvement? Can new knowledge be put to productive use if the majority of others are ignorant of this knowledge? What if such ideas run contrary to existing conventions? Risk emerges as a significant factor influencing people's choices.

Proposition: Individuals can incur significant costs when adopting new knowledge.

ICT costs

Another important cost that Lamberton highlights is in relation to the information and communication technologies (ICTs) that facilitate the carriage, storage and processing of information. He saw an unholy alliance among politicians, some UN agencies and the private sector which had formed to promote ICT investments that were not in the best interests of recipient populations. The reason why such an alliance can be sustained in a policy sense relates to hype surrounding new ICTs in terms of their ubiquity and functionality (Lamberton, 1996a). Lamberton contends that ICT use should nevertheless be a function of derived demand. Hence, ICTs

should be deployed in response to *bona fide* information needs, rather than created in anticipation on the basis of developments that may be occurring elsewhere.

Proposition: ICT use is most effective when designed to address *bona fide* knowledge needs.

The cost of organisation

Another feature of information use is the organisations created to obtain and process information. Information economists identify organisations as playing a key role in enabling information to be used productively. For example, Arrow (1974) makes the case that organisations ultimately aim to improve the efficiencies in the ways information is obtained and processed by employing people with specialised skills. However, Arrow also points out that there are limits to such efficiency because there is an on-going need to respond to changes in the environment by incorporating new information into organisational processes. Lamberton concurs – capital intensity, information indivisibilities and uncertainty make organisations resistant to change. These limitations are exacerbated in the development context. Both Stiglitz and Rogers point to the innovative challenges that complicate technology transfer (Rogers, 1995; Stiglitz and Greenwald, 2014). The costs of information are correspondingly high because problems are unique and complex. Conventional economics assumes the opposite, believing that all the hard work has been done elsewhere in the design of the hardware. Once organisations have been in operation for a period of time, costs relate to the difficulties they experience learning how to process information differently as the environment changes and new information becomes available.

Proposition: Organisations can limit the pace of development when they require time to develop effective information processing capabilities.

Proposition: Organisations can limit the pace of development if they are unable to respond to changes in the environment.

Information access and equity

Asymmetries in information access and capabilities to use information are a core area of concern in information economics (Lamberton, 1994). Therefore, the question of information differentials and asymmetries within a society in terms of possession, access and capacity to use information has implications for fully utilising a country's human resources for development. An information perspective inevitably raises questions about equality of opportunity because the costs of discrimination, nepotism and corruption may prevent individuals from gaining equitable access to information sources that will enable them to live a better life.

Proposition: Equitable access to information and opportunities to develop capabilities to use information improves development outcomes.

All of these propositions point to areas that a conventional approach to development is likely to overlook. To the extent that new approaches may reveal important insights into the development process, the paper proceeds to use these propositions as key analytical constructs in its investigations.

Methodology

This paper adopts a case study approach to illustrate key concepts drawn from the information costs detailed in the previous section (Yin, 2009). Case study analysis enables exploration of theory to be carried out in ways that both illustrate and inspire new theory (Siggelkow, 2007). The cases are selected from current initiatives in development agriculture in the Pacific called the all-ACP agricultural commodities programme (AAACP), administered by the Secretariat of the Pacific Community (SPC) and funded by the EU. Document analysis is used to review a selection of published primary sources. The information costs elaborated in the previous section are employed as a guide in the search for relevant evidence (Eisenhardt and Graebner, 2007). A series of questions was developed that highlights each of the information costs (see Table 1).

The documents used for the analysis are five policy briefs that were published as part of the SPC's information and communication extension programme.[1] Three further documents were used to provide additional background material (FAO, 2010; CTA, 2014, 2015). It should be noted that the analysis does not aim to undertake a comprehensive review of SPC's programmes. Rather, the purpose is to illustrate the concepts that relate to information costs as defined in Table 1 and as elaborated in the previous section.

Case description and analysis

The focus for the case study analysis is the AAACP in the Pacific – in particular, its information and communication extension (ICE) programme. Funded by the European Union (EU), the AAACP aims to improve the incomes and livelihoods of

Table 1. Guide questions used to analyse document data.

1. Information as capital
What evidence indicates that information displays capital-like qualities? (structural nature, investment costs and risk, economies of scale)
2. Costs to the individual
Are the risks of investments that individuals are required to make in acquiring and using new knowledge acknowledged?
3. ICTs as derived demand
Are ICTs presented as a quick fix? Is there evidence that ICT deployment is in response to rational assessment of needs?
4. Uncertain role of organisations
Are organisations found to limit the pace of development either in initial learning phases or in maintaining practices that are no longer optimal?
5. Equitable access to information and capability development
Is recognition given to equitable access of individuals to appropriate information, and their ability to use this information?

ICTs: information and communication technologies.

agricultural producers, and to reduce income vulnerability at the producer and macroeconomic levels. The SPC's land resources division (LRD) provides regional facilities for the implementation of the programme. Ostensibly, the ICE programme presents itself as a case in which issues of information costs in relation to agriculture in the South Pacific region should be most apparent. No further justification was sought at the outset of the analysis.

1. Information as capital: the consequences of risk

Perhaps the first measure that one should apply to case studies is the extent to which information is recognised for its attributes as capital. Lamberton was a strong critic of initiatives that assumed information as a commodity because experts are led to overlook a number of factors that influence development outcomes. From the list of resources detailed in the Methodology section, the document which most specifically deals with information as a specific entity is the *Policy Brief on Market Information Services*. The document refers to market information which enables producers and other market participants to 'better plan for the demand side of the market' (p.1). The nature of such information relates to explicit quantities, such as price and volume. Weather reports are also indicated as another important example of market information. The role of producing such information has traditionally been left to agricultural extension services using technologies such as newspapers and broadcast radio.

The policy brief's acknowledgement of information's structural qualities is most obvious in its treatment of complementary relationships between buyers and sellers. Awareness of possible complementarities is apparent in the idea that information flows from buyers to producers and this can be reversed through the use of modern ICTs, enabling one-to-one relationships to develop: 'ICTs have … transformed the possibilities for market information systems …. Participants can provide information as well as receive it. Buyers and sellers can communicate directly with each other' (Policy Brief No. 1, p.1).

However, the writers readily acknowledge that their understanding of how market information services work in a Pacific context is deficient: 'Many market information systems in many different countries have failed. To improve chances of success, market information services should be designed to respond to local or regional needs' (Policy Brief No. 2, p.3).

If one assumes a commodity view of information, it is possible that the size of this task will be underestimated. Stiglitz (1987) outlines the scale of this challenge by comparing this kind of problem solving with innovation. While a conventional view assumes that the hard work of developing new technology and techniques occurs in another place, it fails to acknowledge the distinctiveness of local context which presents unique challenges. Stiglitz (1987; Stiglitz and Greenwald, 2014) concludes that the costs of information are high in such circumstances and are generally underestimated in conventional analysis. Given the high costs and the uncertain returns, risk emerges as a live issue. Hence, the size of this challenge is likely to be underestimated without a full appreciation of information costs.

Other features of Pacific Island development can be related to Lamberton's statements about economies of scale. These include low-volume production in a select range of commodities, and remoteness of producers on distant islands. Mention is also made of poor Internet and mobile coverage, which can also be understood in terms of economies of scale. Taken together with the challenges of

unique environments, scarcity of resources is unlikely to work to resolve the problem of information gaps. Hence, acknowledgement of the capital-like nature of information (that is, one-off costs that cannot be easily recouped) and consequent risks is not given sufficient recognition.

2. Information costs to the individual

When new information is made available in a development context by way of education or training, it is necessary to consider costs that may accrue to individuals. If steps are not taken, such costs may become a barrier to the adoption of new practices and technologies. One example of this relates to the train-the-trainer model of capacity building. The assumption of the Technical Centre for Agricultural and Rural Cooperation (CTA) is that resources spent on training can be used more efficiently if one individual is trained who then teaches his peers: 'Training for young people will have a big knock-on effect as each person who attended will go back to their association and report on the potential of the tools' (CTA, 2015, p.14).

This model of training assumes that incentives to share such knowledge exist. Ensuring one's position as a key knowledge holder, however, may encourage individuals to keep this knowledge and other attendant benefits to themselves. With few paid employment opportunities in the Pacific and poor prospects of promotion, generosity in the sharing of information is a virtue that few can afford.

One illustration of the kinds of costs that may accrue to individuals is provided in an historical example of plantation development in the 1800s. The original proposition put to Pacific Islanders by colonists when establishing coconut and sugar cane plantations in the late 1700s was that they should work for 10–12 hours a day to earn money to pay for food and other commodities. In view of the lifestyle of Pacific Islanders at that time, the proposition was nonsensical. There was plenty of food to be had from the ocean and the gardens for a fraction of the effort required to work the colonists' plantations. As a consequence, it was difficult for colonists to convince Pacific Islanders to work for wages in their plantations. The presence of Chinese, Indian, Japanese and other Pacific Islanders throughout the Pacific is testament to this basic lesson about costs as a disincentive to participate in agricultural development.

Since then, various initiatives requiring farmers to deviate from traditional practices are now recognised as having imposed significant costs on the environment and broader community. It is noteworthy that AAACP programmes recognise this:

> Traditional smallholder agriculture predominates in many Pacific island countries, where it plays an important social and cultural role as well as ensuring food security. The farming systems are inherently sustainable, based on an understanding of the need to protect precious natural resources on limited land. A healthy environment is also important to other key economic sectors, for example fisheries and tourism. Public policy should therefore aim to protect the environment, retaining good practices and preserving the social and cultural role of agricultural systems, while helping farmers improve production and access to markets. This is particularly important, as in many parts of the world government policies aimed at increasing production have been shown to work against sustainability, for example by promoting inorganic fertilisers and toxic pesticides. (Policy Brief No. 2, p.2)

While giving legitimacy to indigenous systems of knowledge, the issue of costs to the individual is not actively considered. Pacific literature provides reason to

believe that the costs to individuals can be significant. Albert Wendt's (1979) classic novel *Leaves of the Banyan Tree* provides a vivid account of the changes that occurred within an extended family in the lead-up to Samoa's independence from New Zealand. Incorporation of western values by way of new business practices and over-exploitation of undeveloped forest had unintended consequences for the main character, a village chief and a newly successful businessman farmer. His embrace of western business values alienates his adult son, who eventually dies from tuberculosis. The introduced disease from Europeans is symbolic of a number of impacts on the son, who, after showing promise at school, develops a drinking problem and becomes an atheist. His rejection of his father's success reveals the son's deep attachment to traditional cultural values which have been surrendered by his father in pursuit of individual wealth.

3. ICTs as a function of demand

If any list were made of development issues that annoyed Lamberton, the issue of telecommunications investment would be somewhere near the top (Lamberton, 1996b). It is not that he objected to new technology – just the absence of scholarship to justify the considerable resources required to purchase telecommunications technology. He had similar reservations about unexplained policy changes, such as the dismantling of public ownership of various post telegraph and telecommunications (PTT) departments. He saw a role for information economics in providing the justification necessary for better and more nuanced development. He also saw an agenda driven largely by the ITU with the agreement of aid donors and local politicians interested in a quick fix. With this Lambertonian scrutiny, the analysis looks to the case material to discover to what extent ICTs are presented as a quick fix, and whether ICT deployment is in response to rational assessment of need.

Material published by the AAACP does indeed present ICTs as a quick fix. Mobile technologies and Web 2.0 are to be the means by which improvements in agriculture occur. The assessment of ICT's potential is upbeat: 'It would be hard to exaggerate the speed at which technological innovation is moving. Web 2.0, social media and M-Apps for agriculture play an increasingly important role in agriculture and rural development policy processes and value chain development' (CTA, 2015, p.6).

ICTs are presented as a key change agent to existing agricultural practices. These include development of partnerships; better support for extension services; availability of high quality information; strengthening participation of women and young people; promotion of entrepreneurship and business; tools for advocacy; and promotion of knowledge management. The benefits claimed for ICTs are never challenged: 'ICTs have a transformative influence on farming and food production in countries where governments and policy makers are committed to developing comprehensive e-agriculture strategies' (CTA, 2015, p.7).

Visions for transformation are supported by vignettes that illustrate what success looks like. It seems that ICTs are presented as the easy way to achieve a number of outcomes that would normally be considered quite difficult. Possible information costs are ignored.

The second issue is whether ICT deployment is being guided by demand. The policy briefs produced by AAACP make little mention of demand for ICTs. The most articulated response is in the *Policy Brief on Market Information Services*, which states:

> New information and communication technologies (ICTs), in particular the internet and mobile phones, have transformed the possibilities for market information systems. As well as making information dissemination much easier, these ICTs allow market participants to interact with each other much more easily. Participants can provide information as well as receiving it. Buyers and sellers can communicate directly with each other. (Policy Brief No. 1, p.3)

The policy brief goes on to illustrate two examples of ICT applications which imply improved cost effectiveness in communications: one is a picture of a man using a mobile phone; the second is a graphic of an information service called 'Info Share' using mobile phone technology. The caption states that the service is being adapted from an application developed by the United Nations Conference on Trade and Development (UNCTAD) after extensive consultation with stakeholders. This sounds like the kind of ICT deployment in response to demand of which Lamberton would have approved because there is active consideration of people's information needs. Still, the AAACP policy briefs pay little attention to plotting a policy pathway to ICT adoption. It's likely that the answer lies in the discovery that ICTs are not a 'silver bullet' for development in agriculture. Information sharing emerges as a key factor in minimising information costs, not ICTs per se.

4. Organisations

From the perspective of information theorists, the primary purpose for organisations is to reduce the costs of working with information. However, while organisations aim to generate efficiencies in the ways information is acquired and processed, the downside is that there is a longevity to organisations which normally makes them slow to change and perhaps outlive their usefulness. Hence, organisations represent a double-edged sword: they can make significant contributions to development, but can also complicate and confound development efforts.

The role of organisations in development is most apparent in the reviewed documents when reference is made to the agricultural extension organisations which have played, and continue to play, an important role in agricultural developments in the Pacific. One such organisation in Vanuatu is held responsible for slow growth in cocoa exports, and is considered a threat to the industry's viability:

> In Vanuatu, the cocoa sector development was constrained for two decades by the active involvement of the Vanuatu commodity marketing board (VCMB) which acted as a marketing monopoly and constrained the ability of the sector to take advantage of the price premiums available for organic and single origin cocoa. Deregulation removed some of the constraints, but with the continued existence of the board (albeit with an inactive role) the threat remains that it could again become active in marketing activities. This threat may be enough to reduce levels of investment in the sector. (FAO, 2010, p.39)

On the other hand, a policy brief from the AAACP seems to suggest that such organisations can be created by government writ:

> To be effective, public policy interventions therefore need to be based on an understanding of the specific context and constraints faced by different groups of producers. They also need to take a dynamic perspective in the sense that once a constraint is lifted, a different type of intervention may be required to support producers in meeting their next challenge. (Policy Brief No. 2, p.2)

Such an understanding underestimates the challenges for organisations in developing expertise in one area and then changing focus, requiring new areas of expertise. The lead time required to train individuals (or to acquire expertise from overseas) is likely to be lengthy.

Private-sector organisations are identified as an alternative to conventional government extension services. The reasoning for this change is not fully articulated. Private extension organisations are more likely to attract private-sector investment, but only if there is clear commercial incentive. In a rather confused rationale, the AAACP states that government extension services can help the private sector by spending public funds by way of grants and then – optimistically – suggests a viable market will emerge for investors:

> However, agriculture is inherently risky, and in many cases brings relatively low returns for the private investor. Public policy can promote private sector involvement by reducing the risks or increasing the returns to private sector investors. There are various financial tools to do this, for example subsidising costs of service delivery or providing grants. In many cases, this support will be needed only in the early stages of service delivery until a functioning market has developed. (Policy Brief No. 2, p.2)

The cooperative has re-emerged as an alternative private-sector model for farmers in the Pacific. The advantages of these loosely coupled organisations are that they spread commercial risk, improve lobbying potential and increase economies of scale. For example, access to market information can be paid for once and then shared among members. Similar reasoning can also be applied to training as well as collective contracts with buyers. Semi-subsistence farmers can participate in commercial activities while maintaining the sustainability of their farming operations. All of these advantages can be understood in terms of the reductions in information costs that organisations are potentially able to deliver.

5. Equitable access to information

Understanding the nature of information asymmetries was of central concern to Lamberton as an information economist. Hence, finding ways to overcome such asymmetries in both information access and the expansion of capabilities is a challenge Lamberton associated with development in particular. The extent to which programmes address the nature of these asymmetries becomes the focus for the analysis in this section. The most visible initiatives designed to improve equitable access to information and capability development are those aimed at youth and women:

> All too often, women and young people are disadvantaged, in a variety of ways, in rural areas. ICTs have an important role to play in empowering young people and women. Women are the pillar of the family in terms of smallholder agriculture and they should be provided with the resources and information they need to improve their productivity and gain access to markets. ICTs should also be used to attract young people to agriculture and ensure that they can develop their potential. (CTA, 2014, p.6)

Indeed, the identification of social media as a development tool is partly factored on the popularity of these technologies with younger people, and the prospect that they may be attracted to agriculture as a consequence:

> Agriculture development practitioners, policymakers, the private sector, government agencies and other professionals must articulate a new vision of agriculture that can be attractive to young people. ICTs are essential coordinating mechanisms in the agricultural and rural development field, and hence their integration in the delivery of agricultural information, markets and all the processes across the value chain is significant. (CTA, 2015, p.20)

There are potential pitfalls in the roll-out of ICTs that aim to assist youth and women. These relate to existing social norms, particularly the role of men:

> Men often need to be included in the training process so that they do not feel left out, and to ensure that they do not prevent their wives from participating. … The main conclusion [about] gender [is] that an inclusive family-centred approach is the best way of ensuring project success and improving female farmers' access to ICTs. (CTA, 2015, p.27)

Improving equity by increasing access to information may run counter to social norms. This represents a dilemma in that the desire to build on traditional forms of authority to promote sustainable use of resources may entail the kinds of asymmetries that constrain information access and capability development for such groups as women and youth.

An information perspective provides a unique window on equity by highlighting the links among information access, capability development and authority. The extent to which improvements in information access can be carried out within existing social norms emerges as the next task. While this represents a challenge beyond the scope of this paper, an information perspective fundamentally points to the costs of obtaining and processing information. Given that individuals may be required to operate outside existing social norms and structures, the social costs can be high. Equity programmes that fail to recognise this are likely to fail.

Discussion and conclusion

The paper has investigated documents using the concept of information costs as its analytical framework. The paper seeks to establish the value of this concept in the analysis of development projects, particularly in identifying gaps in development initiatives. Given that the paper's scope is limited to one set of published documents pertaining to initiatives to improve agriculture in the Pacific, the findings are somewhat tentative and aimed mainly at establishing the persuasiveness of information costs as an analytical framework.

The application of the information-as-capital analogy to the case material establishes a number of important principles that have implications for other information costs. Given the one-off nature of investments in information creation, the concept of risk emerges as a key feature that an information perspective provides on development initiatives. For example, the hardware costs of initiatives may be but a small part of the costs of creating an online market information system. Certainly, the appeal of mobile technologies is cost-related. The elimination of hardware costs

reveals in stark clarity the need for additional efforts to define what information is important – beyond weather reports and the latest market prices. Also missing from this information perspective are the costs of getting it wrong. Technology lock-in and switching costs – attributes of capital investment – mean that risks extend far beyond the costs of hardware to the sunk costs in education and training.

Given that the costs of information creation are largely independent of economies of scale, the relative smallness of Pacific Island states emerges as a significant barrier to development. While this fact is generally recognised, its implications may be more significant than already acknowledged. It can be seen that the pooling of research efforts within regional institutions, such as the SPC and USP, makes sense, but this is clearly limited by an inability to account for highly localised problem-solving. Once again, the problem can be understood as a consequence of the high costs of information.

The knowledge needs of local actors relate to highly contextualised understanding of local capabilities and social structure, as well as information gaps. It is notable that broadcast radio plays a mediating role in the provision of technical information to farmers in local languages. Discussion between agricultural expert and presenter enables information to be conveyed in ways that account for contextual knowledge. The neglect of radio in the context of other ICTs in the review documents is curious.

The case for individual costs is circumstantial rather than direct. The examples provided in the analysis indicate that such costs are likely to exist even though not acknowledged in the reviewed documents. Incentives to participate in development initiatives must recognise possible costs to individuals that exceed current costs. This can be achieved through recognition of the role culture plays as a stable body of knowledge that has long contributed to sustainable agricultural practices. Steps to minimise the imposition of such costs on individuals need to recognise the central role that traditional knowledge plays in mediating change.

The justification by which ICT investments are promoted is another area in which costs can accrue. The planning of ICT investments on the basis of derived demand is identified by Lamberton as the kind of thinking that should be used to validate such decisions. The alternative, where ICT investments are justified on the basis of political expediency or utopian visions, has contributed to the poor growth performance of Pacific economies (Hughes, 2003). Without tangible examples of improved economic performance, the productivity paradox observed by Lamberton (2001) may remain a feature of Pacific economies. More attention must be given to discovering the information needs of farmers. This calls for knowledge-creating strategies that draw on the personal and sometimes tacit knowledge of farmers and other key actors, such as those in agricultural extension services.

Given the importance accorded traditional knowledge, the impact of programmes that seek to alter the social order are uncertain. Strategies aimed at improving the participation of women and youth, for example, are laudable even though they may challenge traditional knowledge. It is assumed that traditional knowledge systems do not have their own means of dealing with gender and youth, and are unable to change. However, endogenous change has more chance of success than change imposed from outside, which is what many of the ICT initiatives described in the reviewed documents advocate.

While organisations are ostensibly designed to increase the efficiency of information handling, they are also implicated in increasing information costs when they are unable to respond to changes in the environment. The naïve advice that new organisations be created by government or the private sector reveals poor understanding of how organisations come into being and evolve over time. For example, criticisms of established government extension services for not being able to adapt to these changes is harsh. Organisational change is a complex task because the kinds of expertise required may not be obvious. Arrow (1974) describes this in terms of the limits of organisation, where the goal of achieving informational efficiency is in conflict with the goal of incorporating new information into organisational processes. Criticism should not be directed at staff, but should be seen as a failure of management.

Lamberton argues that the need to address asymmetries in information lies at the heart of information economics. Its application to development raises the possibility that issues of equity are addressed when the question of information asymmetry is addressed. Indeed, an information perspective takes the asymmetry question a step further by looking at the opportunities for people to develop capabilities in their use of information. There is good reason to believe that increased access to information as well as opportunities to develop capabilities in using information could inadvertently increase the costs of information. This has been alluded to in the discussion of ICT initiatives that promote participation of women and youth where there is a danger that disruption to the current social order may create resistance to change. Just as organisations are not naturally disposed to the incorporation of new information and expertise, neither are social systems in general. It seems that programmes that seek to build on the stability of current forms of traditional authority cannot simultaneously invoke significant changes to this authority through the introduction of new technology – including ICTs.

The vignette which opened this paper suggests that knowledge and authority are intertwined. The analysis provides support for this contention. As authority is derived from traditional governance structures in Pacific Island societies, it is likely that the process of development will be a contentious one. Western economic and scientific knowledge tends to lose its exalted status within the context of traditional knowledge systems that have adapted to Pacific Island environments over centuries. While returning to a state of pre-European contact is impractical, it is clear that traditional governance structures provide the means by which new knowledge can be incorporated. To that extent, an information perspective, as outlined by Lamberton, holds considerable promise for understanding these processes.

Limitations

The paper does not provide a comprehensive review of all of SPC's programmes. Rather, it has selected a subset of literature through which the validity of information costs is analysed. On this basis, the paper has been able to provide examples where the application of these concepts to the case material yields insights into the dynamics of information transfer and knowledge development in a Pacific development context. To this extent, further research can be recommended, particularly on incorporating cultural processes into development policy.

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1. All-ACP Agricultural Commodities Programme (2011): *Brief No. 1 – Market Information Services. Brief No. 2 – Public Policy Support for Smallholder Agriculture. Brief No. 3 – Certification – Opportunities and Challenges for Pacific Producers. Brief No. 4 – Supplying the Tourism Market – Opportunities and Challenges for Pacific Producers. Brief No. 5 – 'Whole Nut' Processing of Coconut – Opportunities and Challenges for the Pacific Region. Brief No. 6 – Farmer Organisations in the Pacific Region.* All available at SPC (2011).

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