

Factors Affecting Information and Communication Technology (ICT) Development on a National Scale

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Abstract

This research aims to investigate factors influencing in-country ICT development projects, considering decision-making roles within a social and political context to foster consensus, focusing on Small Island Developing States (SIDS) including Samoa. This study argues that such factors can be classified into processes (h1), governance (h2), and sociocultural indicators (h3). The conceptual framework is built on multiple decision-making models including social choice and rational decision-making procedures, as well as the inclusion of the International Telecommunications Union (ITU) ICT Development Index Framework. This research employed semi-structured interviews and Analytical Hierarchy Process (AHP) analysis to uncover key obstacles, including complex processes, financial sustainability, and cultural norms. The study identified barriers such as leadership styles, geography, and policies, emphasising the importance of decision-making roles within a social and political context. Solutions proposed include the integration of ICT policies, cultural values, and local capacity development. The findings underscore the need for stakeholder collaboration and consideration of socio-cultural factors in decision making. Despite limitations in sample size and bias, the study contributes to understanding the intersection of technology, governance, and culture in ICT development. Implications from the study support the existing literature and provide practicality to the information obtained. It provides practical advice for foreign investors to take into account the social and cultural norms of the local community when establishing businesses in foreign countries, particularly in societies where culture significantly influences decision-making processes. The political implications seem to suggest monitoring the progress and impact of local policies on the development of local businesses. Future research should gather diverse perspectives and employ mixed-methods approaches to deepen insights and address similar challenges in other countries.

Key words

ICT, decision making, AHP, process, governance, socio-cultural

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Introduction

Information and Communication Technology (ICT) has become an essential part of our daily lives, integrated in the activities we carry out, processes being implemented, and decisions and opportunities presented for individuals, communities, sectors or nations as a whole. For example, the International Telecommunications Union (ITU) (2021) report on digital development recorded the continuous increase of worldwide Internet access from 16% in 2005 to 66% in 2021. The remaining percentage amounts to a total of 2.7 billion people offline, with the majority residing in Small Island

Developing States (SIDS), Landlocked Developing Countries (LLDCs) and Least Developed Countries (LDCs). In the Pacific Islands, ICT has been recognised as a driver of economic development (ADB, 2003; Chan Mow, 2014). The regional recognition of Internet services and applications for the online exchange of information in academia, business, and for entertainment purposes consequently increased the number of smart phones and personal computers owned by individuals.

Even though ICT has been globally recognised as boosting economies in one way or another, some countries struggle to adapt to such technological changes. Several studies have indicated a multitude of factors as barriers to ICT project execution in the form of leadership styles, business strategies, the implementation of e-governance, geography, policies, regulations, and so forth (Gichoya, 2005; Thabit & Jasim, 2019; Briglauer, 2014; Okoro, 2021). Therefore, it is important to conduct research on how countries can leverage national infrastructure and other technical resources for developing economies. Hence, this research aimed to investigate factors affecting in-country ICT development projects with the influence of decision-making roles in a social and political context to foster consensus. Theoretically, embracing change and adaptation plays a crucial role in technological development, evident across all societal levels and practiced within both private and public sectors. This study argued that these changes are abundant and can be classified into processes (h1), governance (h2), and sociocultural factors (h3). This was achieved by addressing the following issues in our research questions: establishing what influences decision making in local ICT development projects; how cooperation between the private and public sectors contributes towards local ICT project developments; and whether culture plays any role in the promotion and development of local ICT services and setting up new businesses.

The majority of academic literature investigates technological environments on the level of individual firms, an amalgamation of private companies, governments as a whole or a collection of country analyses. Information is either collected from the individual firm employees or extracted from the databases of local and/or international organisations. At the micro level, the investigation of bureaucratic insights in the execution of national ICT development projects with regards to decision making is uncommon. There is very little academic literature in this area from bureaucrats, specifically in the Pacific region. Hence, this research intends to provide contributions to academic literature by providing insights from the perspective of government employees in the Pacific region, focusing on the decision-making process in national ICT development projects.

1. Literature review

The presence of ICT development in the Pacific region has grown significantly since the 1990s, with the establishment of internet connectivity and telecommunications services. Organisations such as the Asian Development Bank (ADB) (2003) and the Lowy Institute for International Policy (Cave, 2012) have documented this progression, noting increased mobile phone access and internet penetration. Studies highlight the impact of ICT on social and political systems, driving calls for transparency and accountability in governance (UN, 2023; Cave, 2012; Caelis International, 2018). However, challenges such as affordability, reliability, and digital skills gaps persist, hindering progress (ADB, 2003; Chan Mow, 2014; OOTR, 2020). Research on ICT development in the Pacific, particularly from government agencies, remains limited. Strategies to address challenges include stakeholder collaboration, policy frameworks, skill development, and infrastructure enhancement. Despite progress in infrastructure

and policy implementation, further improvements are needed in areas such as decision-making processes and cultural interferences to fully leverage the benefits of ICT in the region.

1.1. ICT as an enabler

The impact of technology on decision-making processes is evident worldwide, spanning from developed nations like Japan to developing countries like Indonesia and beyond. Studies on various industries and sectors reveal the critical role of learning, innovation, and public policy in driving economic growth, as seen in Japan's post-World War II industrial development (Odagiri & Goto, 1996). Similarly, developing countries experience challenges and opportunities in leveraging technology for business and government operations. For instance, research on SMEs in developing countries highlights the influence of external technological environments on business sustainability, emphasizing the importance of institutional parameters (Das et al., 2020). Studies also explore the adoption of IT tools like ERP systems for business agility, with attention to organizational factors that affect successful implementation (Zubaedah et al., 2017). In developed nations like Hong Kong, adaptive responses to changes in business environments involve strategic technological investments by firms to enhance performance (Kim & Pae, 2007). Additionally, ICT and e-government initiatives contribute to reducing corruption and improving public services, as evidenced by studies examining the correlation between ICT development, e-government, and corruption levels across different countries (Lee et al., 2018). Moreover, technological advancements such as broadband penetration and mobile telecommunication services have shown positive impacts on academic achievement, social development, and overall economic growth globally (Caldarulo et al., 2023; Loo & Ngan, 2012; Rezki, 2023; Lam & Shiu, 2010). These findings underscore the transformative potential of technology across diverse contexts, highlighting the need for effective policy frameworks and organizational strategies to harness its benefits fully.

1.2. Challenges of adopting ICT in the workforce

Studies on various industries and sectors reveal the critical role of learning, innovation, and public policy in driving economic growth, as seen in Japan's post-World War II industrial development (Odagiri & Goto, 1996). Similarly, developing countries experience challenges and opportunities in leveraging technology for business and government operations (Thabit & Jasim, 2019; Mbarika et al., 2002). For instance, research on SMEs in developing countries highlights the influence of external technological environments on business sustainability, emphasizing the importance of institutional parameters (Okoro, 2021). Studies also explore the adoption of IT tools like ERP systems for business agility, with attention to organizational factors that affect successful implementation (Gichoya, 2005; Zubaedah et al., 2017; Ahuja et al., 2009). In developed nations like Hong Kong, adaptive responses to changes in business environments involve strategic technological investments by firms to enhance performance (Choudrie et al., 2003; Choudrie & Lee, 2004).

A crucial component every so often overlooked in decision making is the social and cultural influence of the nation. The socio-cultural aspect affects all corners of a country whether it is a developed or developing nation. For instance, Yul Kwon's study (2011) examines how Korean Confucian culture affects the country's economy by analyzing transaction costs and innovation. He finds that cultural shifts like declining trust and work ethic worsen transaction costs and reshape the socio-economic landscape, harming Korea's economy. The study emphasizes the need for collaborative efforts from government, business, and society to counteract these challenges and promote sustainable economic growth. Masovic's research (2018) stresses the importance for

multinational corporations to consider socio-cultural factors when assessing the performance of their overseas subsidiaries. Key considerations include understanding cultural nuances, respecting local customs and religions, language proficiency, and developing indigenous capabilities. Language proficiency and religious observances are highlighted as crucial factors, alongside the correlation between regional education levels and local purchasing power. Furthermore, Okoro's (Okoro, 2021) from a developing nation's perspective demonstrates that technological factors, particularly workers' technical skills and their preference for manual versus automated services, significantly influence the adoption of modern technology by 5G telecommunication firms in Kenya.

The predominant focus of academic literature lies in examining technological landscapes at the level of individual firms, encompassing a range from private enterprises to governmental entities or broader country-level analyses. Data sources typically include information gathered directly from employees of these firms or extracted from databases maintained by local and/or international organizations. However, research into bureaucratic perspectives regarding decision-making in the implementation of national ICT development projects at the micro level is relatively scarce. Particularly within the Pacific region, there exists a notable dearth of academic literature addressing this aspect from the viewpoint of bureaucrats.

2. Methodology

This research aims to investigate what influences decision making for the country's development in the ICT sector. The nature of the study leans towards generation of social and political inferences. The interview technique – specifically semi-structured interview- was selected for primary data gathering. The interview was conducted with 10 individuals from government and private businesses in Samoa via online (from 12th to 24th September 2022) and face-to-face (from 10th January to 15th February 2023). The results were analyzed using the Analytical Hierarchy Process (AHP) method. The empirical aspect was drawn on the AHP method which is one of the various methods developed for multi-criteria decision making. The purpose of AHP method was to analyze the hypothesis and results obtained from the interview process. Since this methodology involved assigning weights to the different variables, it would assist in recognizing the criteria and sub-criteria that have more influence or risk. In conjunction with formal interviews, a plethora of informal discussions and dialogues were amassed in casual settings including collaborative work at the office in Samoa, as well as the academic laboratory life in Japan. Engaging in ongoing conversations about my research with fellow colleagues and academic supervisors helped scrutinize and refine concepts and ideas surrounding the study.

2.1. *The semi-structured interview process*

The interview design was constructed with open-ended questions to allow for collecting additional information through follow-up questions based on the interviewee's responses. In stating that, the interviewees were also encouraged to express their views in their own terms inducing additional queries and enabled deep exploration of the participants experiences. Based on keywords of 'decision making' and 'ICT development projects' selecting the research participants leaned heavily towards those within positions that initiate and/or finalize the adoption and implementation of ICT projects. That is, those with managerial level and above from the private and/or public sector. As this research was instigated with the purpose of supporting countries struggling to keep up with the rapid changes in technological trends including Small Island Developing States, the interview was conducted for the country of Samoa. The one-on-one formal discussion was held with a total of ten (10) people, where

eight (8) participants were employed with the Government agencies in the ICT sector; and two (2) were employed with the private telecommunication and broadcasting companies. The eight Government interviewees included two (2) chief executive officers, 2 assistant chief executive officers and 4 principals (also classified as junior managers). Similarly, the representatives from the private telecommunication and broadcasting companies were employed at the managerial levels (Table 1). All participants used bilingual language -both Samoan and English- with a time duration ranging from 30 to 60 minutes.

Table 1. Interviewee's profiles.

Participant number	Management level	Relevant Experience	Sector
Participant 1	Upper level	Over 30 years of work experience in telecommunications and ICT sector at the national, regional, and international levels. Accumulated more than 10 years of top management posts at international organisations including the ITU and Commonwealth Telecommunications Organisation.	Public
Participant 2	Upper level	Over 20 years of work experience as an engineer in the broadcasting, ICT, telecommunications sector and breweries private company. Involved heavily in the implementation of previous ICT projects as the project chief. More than 7 years of work experience in top ICT management posts at the national and regional level.	Public
Participant 3	Middle level	Over 15 years of work experience as a satellite technician and electronic engineer in the private and public sector. Involved heavily in the implementation of national ICT projects including the national transition of analog television to digital television.	Public
Participant 4	Middle level	Over 20 years of work experience in ICT and finance sector, as a computer analyst, project coordinator and cybersecurity expert. Coordinated multiple national development projects in finance and cybersecurity.	Public
Participant 5	Lower level	Over 30 years of work experience in the telecommunication, broadcasting, and postal sector. Involved immensely in the local spectrum planning and management both in the policy and technical aspects. Has extensive knowledge of the history of the country's development in this sector.	Public
Participant 6	Lower level	Over 7 years of work experience in ICT. Mainly involved in project implementation as an assisting officer.	Public
Participant 7	Lower level	Over 9 years of work experience in ICT and financial audit. Main role in current projects as an assisting officer.	Public
Participant 8	Lower level	Over 7 years of work experience as an information scientist and radio spectrum technician. Involvement in ICT project implementation as an assisting officer	Public
Participant 9	Middle level	Over 20 years of work experience in telecommunications and broadcasting private sector, at the top management level. Heavily involved in the growth of the telecommunications sector in the areas of broadband network and infrastructure development.	Private
Participant 10	Middle level	Over 9 years of work experience in IT and broadcasting in the private sector. Currently involved in the implementation of the digital television project.	Private

Source: developed by the authors.

2.2. The Analytical Hierarchy Process (AHP)

The conceptual framework emphasizes decision making as playing a vital role in the successful implementation of ICT projects. Thus, the empirical aspect was drawn on the Analytical Hierarchy Process (AHP) method which is one of the various methods developed for multi-criteria decision making. In this study, the purpose of AHP method was to analyze the hypothesis and results obtained from the interview process. Since this methodology involved assigning weights to the different

variables, it would assist in recognizing the criteria and sub-criteria that have more influence or risk. The AHP was applied in the following manner: define the project goal; identify project criteria and establish hierarchy; pairwise comparison and synthesis of priorities; and evaluation. Focusing on the goal of improving local Internet access a list of relevant criteria and sub-criteria was created after considering the interview outcomes, relevant literature (Table 2), as well as the ITU core list of ICT indicators defined by the Partnership on measuring ICT for development (ITU, 2022).

Table 2. Supporting studies on ICT related investigated factors.

Year	Author	Country	Investigated Factors
2000 to 2005	V. W. Ambrika, T. Byrd & J. Raymond (2002), J. Choudrie, A. Papazafeiropoulou & H. Lee (2003)	LDCs, South Korea	Economic, financial, organizational, managerial, technological, political, and geographical indicators; and government roles.
2005 to 2010	V. Ahuja, J. Yang & R. Shankar (2008)	India	Internal-external collaboration and coordination. managerial issues, technical issues, employees IT capacity, and data security.
2010 to 2015	D. Yates, J. Gulati (2011), J.M. Bauer & W. Shim (2012), W. Briglauer (2014), R.L. Katz, S. Vaterlaus, P. Zenhausern & S. Suter (2010)	Global, EU countries, Germany	Financial investment, regulatory/administrative practices, infrastructure, and financial investment.
2015 to 2023	A.S. Yesuf (2017), S. Howick & J. Whalley (2017), N. Erkhembaatar & O. Bataa (2019), T.H. Thabit & Y.A. Jasim (2019), S.C. Okoro (2021)	Global, UK & Scotland, Mongolia, Iraq, Kenya	Security risks, business performance risks, telecommunication regulations risks, national policies, infrastructure and ICT access, political, economic, technological, and social indicators, technical knowledge, individuals' IT knowledge.

Source: developed by the authors.

Narrowing the individual factors further, the fishbone analysis was applied as shown in Figure 1 reproduced the criteria and sub-criteria chart in Figure 2.

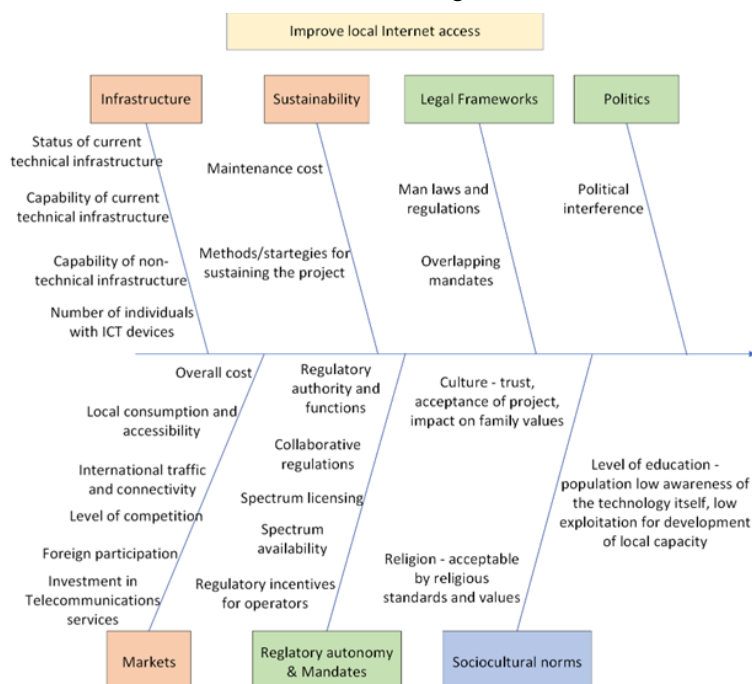


Figure 1. Fishbone analysis for Improving Internet access project.

Source: developed by the authors.

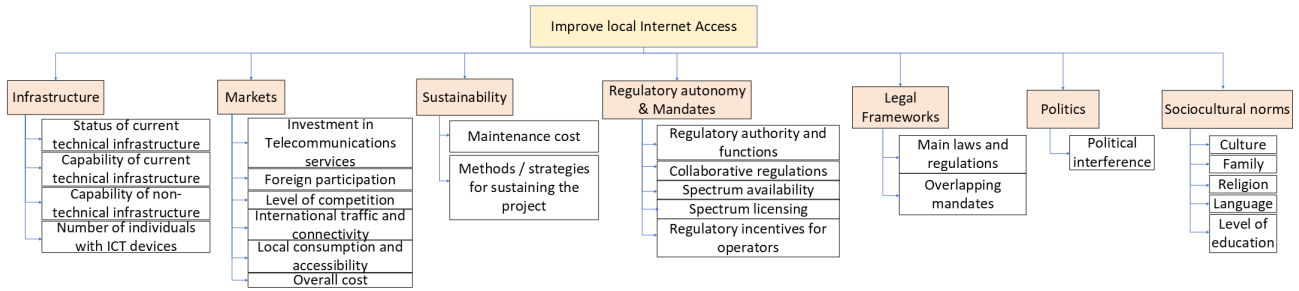


Figure 2. Improve local Internet access AHP chart.

Source: developed by the authors.

The pairwise comparison and synthesis of priorities were achieved using the pairwise comparison matrix and the fundamental scale of AHP which is reproduced in Table 3. After computing the comparison matrix, the priority vector or normalized eigen vector is found by calculating the average of each row.

$$A = (a_{ij})_{n \times n} \quad (1)$$

$$a_{ij} \approx w_i/w_j ; \text{ and } a_{ij} > 0 \quad (2)$$

Using (1) and (2), A matrix is structured as:

$$A = (w_i/w_j)_{n \times n} = \begin{bmatrix} \frac{w_1}{w_1} & \frac{w_1}{w_2} & \frac{w_1}{w_n} \\ \frac{w_2}{w_1} & \frac{w_2}{w_2} & \frac{w_2}{w_n} \\ \frac{w_n}{w_1} & \frac{w_n}{w_2} & \frac{w_n}{w_n} \end{bmatrix} \quad (3)$$

where A – pairwise comparison matrix; a – intensity between criteria/sub-criteria i and j; n – number of criteria/sub-criteria; w – weight.

Table 3. The fundamental scale.

Intensity of importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
3	Moderate importance of one over another	Experience and judgement slightly favor one activity over another
5	Essential or strong importance	Experience and judgement strongly favor one activity over another
7	Very strong importance	An activity is strongly favored, and its dominance demonstrated in practice
9	Extreme importance	The evidence favoring one activity over another is of the highest possible order of affirmation
2,4,6,8	Intermediate values between the two adjacent judgements	When compromise is needed
Reciprocals	If activity <i>i</i> has one of the above numbers assigned to it when compared with activity <i>j</i> , then <i>j</i> has the reciprocal value when compared with <i>i</i> .	
Rational	Ratios arising from the scale	If consistency were to be forced by obtaining <i>n</i> numerical values to span the matrix

Source: Saaty (1987).

To check for consistency of the priority weights the Consistency Ratio (CR) is calculated from comparison between the Consistency Index (CI) and the Random Consistency Index (RI) reproduce in Table 4, where the priority is acceptable if CR is equal to or less than 10%. This process is repeated for the sub-criteria level.

Table 4. The fundamental scale for Random Consistency Index.

n	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49

Source: Saaty (1987).

$$CI(A) = \frac{(\lambda_{\max} - n)}{(n-1)} \quad (4)$$

$$CR(A) = \frac{CI(A)}{RI_n} \quad (5)$$

where $\lambda_{\max}$ is the maximum eigenvalue of matrix A.

The application of AHP in this study focuses on the example of improving Internet access. Thus, the generation of weights for this example were measured against the information gathered from the semi-structured interview. Initially, this seemed like a good direction on a national comparison level for a developing country given the case of Samoa. However, it is important to note that all countries differ in terms of national processes, governance, and sociocultural situations. Therefore, determination of prioritization weights is crucial and likely different amongst nations. For instance, some nations may have strong ICT policies in place but lack pertinent infrastructure. Others may have the technical capability and relevant policies implemented but influence of political or religious leaders might present obstacles. Some countries may have the right resource at hand, support from the private sector moving towards digitization, but government regulations may not be up to date. As a result, the evaluation stage of the AHP method considered those areas.

Evaluation was applied in two ways. Firstly, the criteria and sub-criteria weights were measured according to the semi-structured interview outcomes. The second application involved priority granted per criteria whilst the remaining two have the same weight amount. Specifically, the distribution follows a ratio of 4:3:3 for process, governance, and sociocultural factors, respectively. Therefore, the interview outcomes showed regulatory autonomy and mandates, as well as legal frameworks as the highest priorities at 0.29 with a consistency ration value of 8.8% (Table 5).

Table 5. Interview outcomes priority vector and consistency results.

Criteria	Weights	$\lambda_{\max}$	7.70
Infrastructure	0.13		
Markets	0.08	RI	1.32
Sustainability	0.04		
Regulatory autonomy and mandates	0.29	CI	0.12
Legal frameworks	0.29		
Politics	0.04	CR	0.088
Socio-cultural norms	0.14		

Source: developed by the authors.

The second evaluation was based on the notion that all countries are different in terms of decision making. Therefore, the prioritised factors would most likely be different amongst national decision makers. Consequently, firstly, infrastructure, markets and sustainability criteria having the highest priorities while regulatory autonomy mandates, legal frameworks, politics and sociocultural norms have the same weights. Secondly, regulatory autonomy mandates, legal frameworks, and politics criteria having the highest priority while infrastructure, markets, sustainability and sociocultural norms have the same weights. Lastly, sociocultural norms criteria having the highest priority while infrastructure, markets, sustainability, regulatory autonomy mandates, legal frameworks, and politics have the same weights.

3. Research results

3.1. Interview key results

Qualitative results obtained are detailed as followed: what influence development of ICT in the country, impact of culture on ICT development, impact of ICT on the Samoan culture, the need for change, and enabling local ICT development. Firstly, multiple reasons were stated by the interviewees as factors influencing ICT projects from their profession's experiences. These factors span from local infrastructure to the affordability of ICT services for end-users, the exchange of information between stakeholders, instances of political interference, to cultural values and norms. The summarized key findings are presented in table 6.

Table 6. Barriers to the development of ICT in the country.

Barriers	Details	Interviewee
Complex processes and miscommunication	The process for disbursing funds from the government to other government entities or private companies lacks transparency for the recipients or applicants. Illustratively, a proposal from a ministry underwent five revisions over a two-year period to align with the requirements of the authorizing ministry. Another conspicuous problem in this discourse was the divergence of opinions between the involved parties regarding the utilization of the funds if approved. Likewise, private companies voiced similar apprehensions, particularly regarding the allocation of local projects to overseas firms and consultants, seemingly neglecting the existing local capacity. Establishing a new business poses considerable challenges, with international investors facing even greater obstacles compared to their local counterparts. The process for obtaining a business license is notably more prolonged for overseas companies	[Participants 4&8]
Financial sustainability	Local devices accessing online services have continuously grown, resulting in an increasing demand of broadband coverage and infrastructure. Infrastructure wise, costs are extremely high to develop or even upgrade a site. Currently such costs are on the private companies alone to bear. With the rise in demand for broadband coverage, government subsidies would provide support in the expansion of the network.	[Participants 9&5]
Political interference	Alternatively, with the broadcasting infrastructure, implementing agreements for settling broadcasting fees at the early stages of the project would have been ideal in sustaining the asset itself. Unfortunately, due to political matters, neither issue has been resolved.	[Participants 2,5,8&9]

Source: developed by the authors.

Secondly, according to the interview participants, culture is an important factor that influences ICT projects implementation in the country of Samoa. These vary from traditional resources to customary

practices to indigenous governance framework. Cultural resources can be a hinder throughout the progress of the projects experienced not just in the local ICT sector but in the transport and energy sectors as well. These resources include customary lands which are normally sought after for installation of new towers in the villages to improve mobile or television coverage. The majority of land in the country (more than 80%) are not free-hold land, but customary owned by family's members. Permission to use these lands has been a difficult encounter over the years due to family disputes.

- One thing to look at is providing the services [broadcasting or telecommunication] to rural areas is not an easy task. [...] For example, the leasing of lands for ICT developments. These lands are mostly customary owned, and the discussions to use a piece of the land usually for new site installation takes quite an amount of time to be resolved [Participant 5].
- It [culture] has both a positive and negative impact, and the negative impact is a hinder to the development of ICT. For example, at the community level, if there are new sites required to be installed for extension of coverage [broadcasting or telecommunication], they [family members] always come and fight over the land, and they always ask to give them some time for the families to discuss [...] and by the time they agree to it, or maybe after a few years, there is still no agreement, there will be no installation [as the due date for the project has passed] [Participant 2].

On the non-physical side, the absence of the Samoan language in local ICT devices such as smart phones, and personal laptops (to name a few) contributed to some difficulty in terms of the public usability of such devices. Similarly, the complexity of the formal language to be used in the workplace to address those at a higher position sometimes hinders communications and flow of information in the workforce.

- At the moment, our mobile phones and computers' settings is configured in English, there is no Samoan language [...] for the language, people should understand how to use the language on these devices [Participant 5].
- Another value would be the approach of the process so that the words you speak are in the context of the Samoan culture. Framing your speech, figuring out how to talk so that it is within the workplace speech is sometimes a problem. [Participant 3].
- In Samoa, seniority is very much a part of the culture, and you address that first before you provide your input into the decision making. [...] You have to consider your relationship with your superior and remember that you have people under your guidance that also collaborate with other teams so you don't want to affect [negatively] the other parts of the organization [Participant 3].

Thirdly, impact of ICT on the Samoan culture was recorded as having both positive and negative effects. The negative aspect included the use of derogatory language or online behaviour and mainly stems from the rise in accessibility of social media contents. On the contrary, such technological tools have also provided an efficient mobilization of resources, easy access and exchange of information, and ease of communication. The COVID-19 pandemic contributed to the rate of public's acceptance of the use of the Internet for online meetings and events.

- The norm of physically leaving the house to attend work, has changed to the 'working from home concept', and has created a flexible working environment which majority finds in favor of [...] [Participant 6].

- People are seamlessly informed, and people are quick grasping the concept of technology [...] For example, [during the pandemic period] funeral proceedings were held online, and people accepted it [...] overall we have modernized the culture so that it suits the time we are in [Participant 3].

The fourth key interview result focused on the term 'change'. In this study, the theory stated that change is important in technological development as observed in all levels of society. Hence, the term 'change' was consistently monitored in the participants' responses throughout the interview process. Consequently, the term 'change' surfaced a total of 11 times across all participants, with a notable recurrence among those holding managerial positions within government agencies. Some examples of statements obtained are as followed:

- People need to be aware of what is happening [technological shift] but some people are scared of new things or changes [...] but we need to get used to technology of a whole different kind [...] ICT has changed the way we live [Participant 1].
- Growing up with ICT [using a computer at home], it never changed my values, respect, structure, beliefs, and role in the family. It was just an additional component in part of the household, but it gave the confidence for people [in the family] to use [technology] [...] Our people are prone and very resilient to adapt to changes [Participant 3].
- Even though we have ICT policies in place, we need to look at the changes in technological trends, and make sure that these can be reflected in the regulations. We need to see if there are any alternatives we can include and implement to achieve new technological developments [Participant 5].

The last key result obtained focused on practical solutions to enable technological development in the country. That is how the public and private sector improve existing ICT services, or how to nudge people's way of thinking to accept technological changes. The findings encompass a spectrum of outcomes, spanning modifications in the education curriculum, enhancements to policies and regulations, evaluations of internal processes and procedures, and investments in capacity building.

3.2. The Analytical Hierarchy Process key results

As outlined in the methodology section, the AHP method was employed in two distinct phases. Initially, the weights for criteria and sub-criteria were determined based on the outcomes of semi-structured interviews. The second phase involved assigning priorities to each criterion, with the remaining two holding equal weight. This sub-section focuses on the key results obtained from the two cases.

3.3. Improve local Internet access – Interview outcome synthesis

From the interview information, the AHP analysis has been visualized in the following graphs. The analysis provides insights on criteria or factors that take precedence in decision making for the case of Samoa (Figures 3 & 4). The legal frameworks and regulatory autonomy & mandates criteria carry the highest weights, surpassing other factors. Socio-cultural norms hold roughly half of these weights, while infrastructure exceeds the 0.1 margin. Following these are markets, politics, and sustainability, situated at the lower end of the scale as in Figure 3.

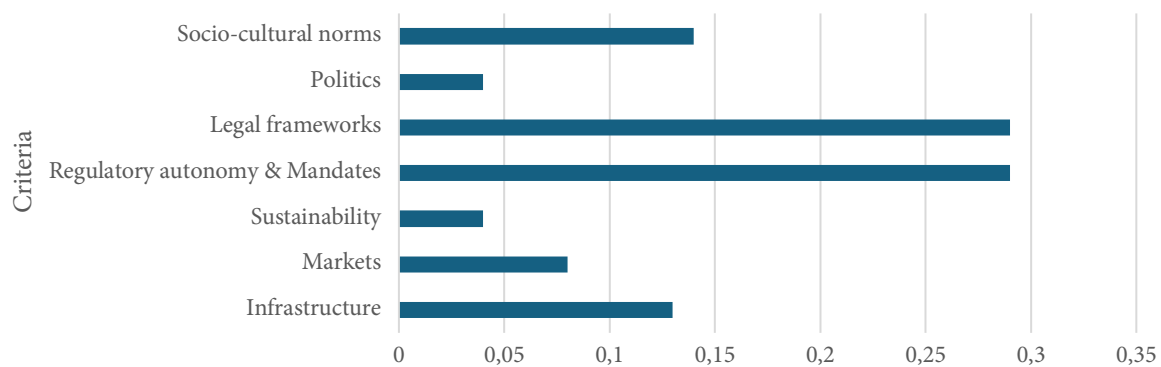


Figure 3. Priority vector results.

Source: developed by the authors.

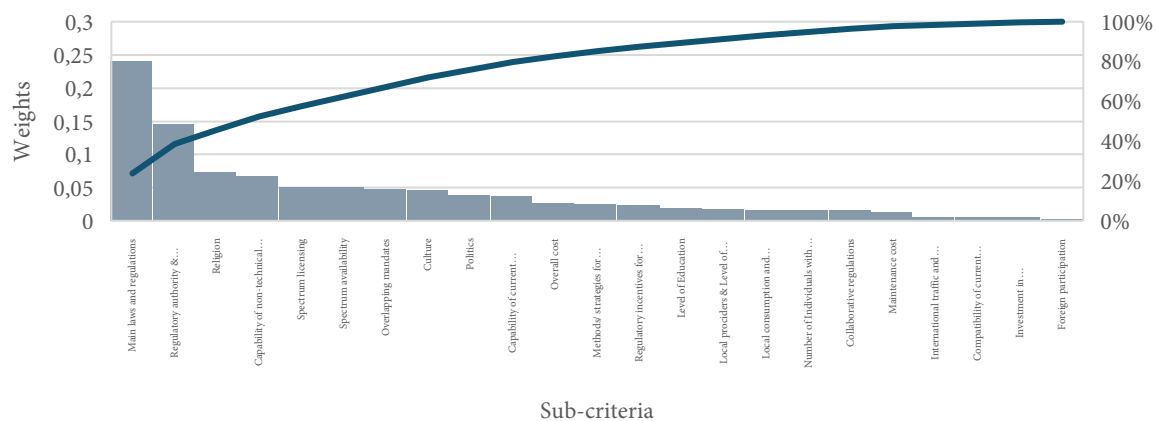


Figure 4. Global priority vector distribution graph.

Source: developed by the authors.

The global priority distribution which articulates the weights comparison between each criterion was computed and plotted as shown in the Figure 4. According to the graphs, the order of priority is: main laws and regulations; regulatory authority and functions; religion; capability of non-technical infrastructure workers; spectrum availability; spectrum licencing; politics; overlapping mandates; culture; capability of current infrastructure; overall cost; methods/strategies for sustaining the project; regulatory incentives for operators; level of education; local providers and level of competition; local consumption and accessibility; number of individuals with ICT devices; collaborative regulations; maintenance cost; international traffic and connectivity; compatibility of current technical infrastructure; investment in telecommunication services; and foreign participation.

3.4. Improve local Internet access – 4:3:3 case ratio

According to prior research, most countries have different situations (or less similar) regarding development in their technological environment. Table 2 summarized studies consulted and include indicators of what impact the growth and improvement of Internet access in certain countries. It showed that nations vary in their decision-making given the diverse ICT factors identified and categorized into process, governance and sociocultural indicators. Another contribution to this can be based on the specific conditions and relationships that exist within the country. Therefore, the scenario of 4:3:3 case ratio was developed where prioritization is assigned to a singular indicator, while

the remaining weights were divided equally amongst the other two criteria. The purpose of dividing the indicators in such a way was to highlight which indicator should be prioritized by decision makers given their level of impact or risk on the outcomes of ICT projects. In addition to the previous studies, relevant economic indicators were sought, compared and analysed between selected economies from the World Bank database. The economies selected for cross country analysis are Australia, Fiji, New Zealand and Samoa (from Oceania), India, Japan and Korea (from Asia), United Kingdom & United States of America. These countries were selected based on the availability of public information and academic studies found during the data gathering stage. Analysis drawn from the World Bank (WB, 2019) development indicators of selected economies showed that:

- Oceania countries exhibited higher percentile (above 80%) of political stability from 2012-2022, including Japan.
- However, government effectiveness showed higher performance (above 80%) from developed nations compared to the developing selected countries.
- All countries displayed increase in GDP growth between 2012 to 2022, except for the year 2020. In terms of ICT good export, Korea showed significant export percentile at above 15% and continuous growth from 2012, which in comparison to its ICT goods import was still greater. Contrast to the rest of the studied nations with ICT goods import percentage higher or like the number of exports.
- Ease of doing business, developed nations showed higher levels of performance (between 75% to 85%) compared to developing nations (between 50% to 60%) (WB, 2019)

This research did not investigate each country in detail to determine the actual reasons for this performance. However, the inclusion of these indicators in this section is to emphasize the fact that countries have different circumstances and may also have unique characteristics. Therefore process, governance and sociocultural factors may have different weights in decision making. As previously stated, the results were generated on the notion of diversity among countries concerning national processes, governance, and sociocultural contexts. Consequently, the decision-making process would vary among decision-makers in each country, contingent upon the specific circumstances and conditions prevalent in that nation. In the graphs, Figure 5 highlights sustainability, market, and infrastructure, emphasizing their elevated weights among the process sub-criteria. Within Figure 6, regulatory mandates, legal frameworks, and politics take precedence, underscoring their prioritization in governance factors. Lastly, in Figure 7, sociocultural norms emerge as the top priority, with process and governance factors sharing equal weight.

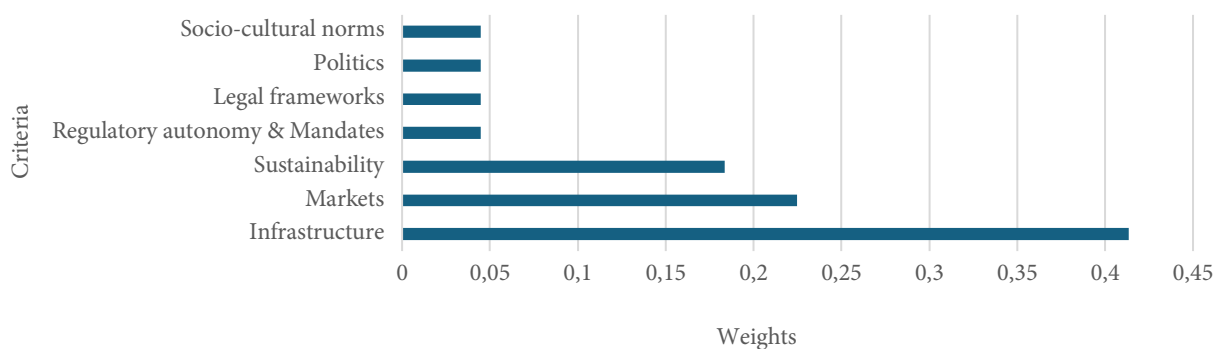


Figure 5. Process prioritization graph for Scenario 1.

Source: developed by the authors.

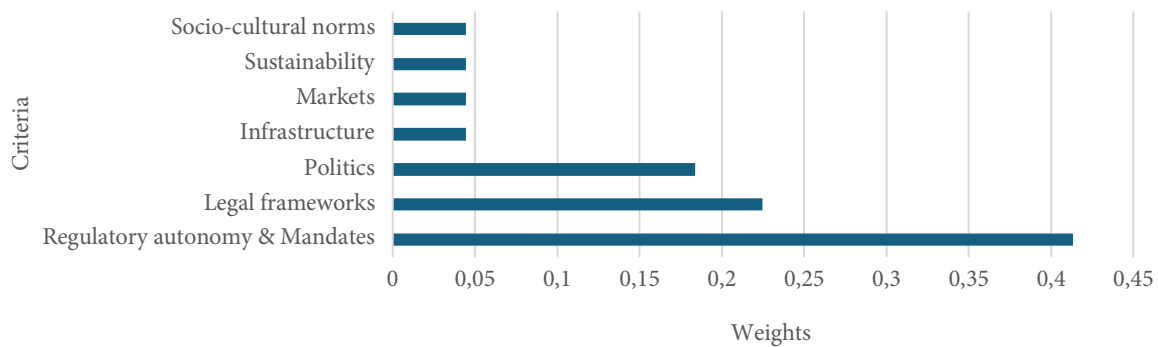


Figure 6. Governance prioritization graph for Scenario 2.

Source: developed by the authors.

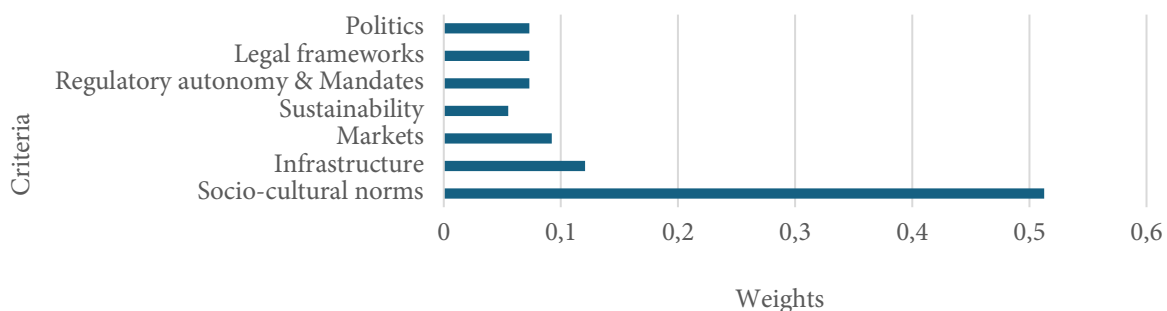


Figure 7. Socio-cultural prioritization graph for Scenario 3.

Source: developed by the authors.

4. Discussion

4.1 Factors that influence decision making in local ICT development projects

To summarize, this research supports the argument that various factors impact ICT development and can be categorized as processes (h1), governance (h2) and sociocultural factors (h3). For instance: complex processes (Choudrie et al., 2003) ; collaboration between stakeholders (Ahuja et al., 2009); financial sustainability (Katz et al., 2010; Gulati & Yates, 2011); political interference; language, family, cultural resources and sociocultural practices (Thabit & Jasim, 2019; Choudrie & Lee, 2004); geographical factors; national policies and regulatory practices (Choudrie et al., 2003; Howick & Whalley, 2007; Yesuf, 2017; Gruber & Koutroumpis, 2013; Gulati & Yates, 2011; Bauer & Shim, 2012); infrastructure security, availability and access (Erkhembaatar & Bataa, 2019; Yesuf, 2017; Bauer & Shim, 2012); household characteristics (Whitacre, 2008); and organizational issues which encompass leadership skills, management skills, IT capacity (Okoro, 2021; Yesuf, 2017; Ahuja et al., 2009). These can be categorized into three factors as shown in the Figure 8.

The interview results indicated the problem of complex criteria and time-consuming processes in securing financial aid for procuring specialized equipment's to monitor the status of the broadband connectivity in the country. The interview noted that numerous discussions were held, and multiple proposal modifications were done over prolonged year however the grant was not successfully released. Similarly, from personal observation, members from the private sector expressed concerns towards the government agencies' complex criteria's regarding projects grants. The members stated that complexity of the procedures result in miscommunication which delays the receipt of either an approval or disapproval of project proposals.



Figure 8. Categorizing ICT factors into process, governance and socio-cultural indices.

Source: developed by the authors.

Other studies have highlighted on the combination of factors which include strong government industry collaboration (Odagiri & Goto, 1996); changes in technological environments contributes to strengthen ties between stakeholders (Das et al., 2020); as well as changes in management frameworks enable firms or organizations to adapt to the changing business environments, which all contribute towards national development (Zubaedah et al., 2017; Kim & Pae, 2007).

Another example is the impact of infrastructure. Interview results noted that a surge in Internet accessible devices require an expansion in infrastructure and coverage which unfortunately is quite costly for the private businesses. This can also be seen in other countries where studies showed that lack of physical technical infrastructure also hinders ICT development (Gichoya, 2005; Thabit & Jasim, 2019), as evident that areas where higher diffusion of mobile phones and elevated signal levels showed higher social development (Rezki, 2023). On the broadcasting side, financial issues were also at play with regards to the local digital television project, caused by non-payment of the monthly tariff, resulting in difficulty of maintaining the digital television platform (Feagaimaali, 2022).

The results from this research support evidence from previous studies elaborated in the prior sections of this document. Majority of the studies focused on investigating individual ICT factors whereas this study represented a combination of several factors which are then re-categorized into three indicators as in Figure 8. The purpose of this is to streamline the process for decision makers in pinpointing the key indicators that exert the most substantial influence on the outcomes of ICT projects. Consequently, when employing decision-making methodologies like AHP, decision makers can allocate weights accordingly and establish a prioritized sequence for indicators, facilitating the development of a neutral position.

4.2. How cooperation between private and public sector contributes towards local ICT project developments

Cooperation in the form of transparency in exchange of information between stakeholders (both public and private) enable better understanding of policy requirements and private resources status for successful ICT project execution. Constant exchange of information take place from seeking non-technical advice in terms of rules and regulations, to technical expertise such as spectrum availability for additional broadband access. Channels of communication occur both in a formal and non-formal setting namely scheduled meetings, email correspondences, or phone call conversations. The interviewees emphasized maintaining these continuous correspondences, enabling the private

companies and ministries to be aware of ongoing projects and plans from both sides with respect to existing regulations, subsequently exerting coordination between sectors.

In terms of policies, the participants from the private sector agreed on full awareness of the local regulations executed regarding ICT services and applications. As a consequence of the rapid technological trends, the government representatives expressed ongoing plans of policy review to reflect international practices. The review would include frequency spectrum planning to cater trends in mobile technology, which is another problem identified by all the interviewees, as the local policies are not up-to-date with the rapid and increasing technological changes.

4.3. The role of culture in the promotion and development of local ICT services

Unfortunately, the majority of how culture impacts local ICT development is provided from the ministry perspectives. Evidence collected from the private sector were not enough to provide a thorough analysis on this question. Therefore, the influence of culture on decision making to enable development from the ministry side is elaborated below.

Firstly, in terms of attitude and beliefs, when addressing superiors, subordinates tend to withhold opinions in meetings and discussions as a form of respect. To add on, the local culture requires the use of formal speech when addressing superiors, which sometimes hinders communication. Also, with respect to attitudes to change, people fear change due to unfamiliarity with the concept. Moreover, with the concept of trust, it is noted that more trust is put in traditional constitutions compared to modernized constitutions (Masovic, 2018; Yul Kwon, 2011; Leach et al., 2022).

Secondly, the installation of additional infrastructure (e.g., cell towers) in rural areas require the use of customary lands. Time taken to acquire permission for these traditional resources range from months to years, depending on the family's decision. The participants raised this as one of the major issues encountered in most project rollouts. Thirdly, people are more comfortable and are able to absorb more information easily when communication is done via native languages. Therefore, some people struggle to use mobile devices and computers devices when the device's language settings are set in a second linguistic. Fourth, with religious beliefs affect decision making given their significance in identity values (Leach et al., 2022). Lastly, the availability of local academic and professional capacity contributes to the growth of the nation (Masovic, 2018).

4.4. The AHP application

The inclusion of the AHP method analyzes the hypothesis from a multi-criteria decision-making perspective providing additional clarity and rationale on the factors identified as impacting ICT development decisions. That is, the AHP can be a very useful tool to determine consensus in a discussion involving decision makers with various opinions (Gupta et al., 2017; Tam & Tummala, 2001). Accordingly, the AHP analysis reflected that Samoan bureaucrats consider governance indicators as the highest impact in decision making, in the form of main laws and regulations, regulatory authority and functions. The presence of religion in the higher end of priority indicated a strong influence, which is the case given the country's status a religious nation with Christianity as the main religion. The analysis also indicated the influence of politics which as one participant stated '...at the end of the day, politics is politics....we as leaders [bureaucrats] provide advice according to the law that we wrote and practice...' [Participant 2]. This indicates that decision making follow policies and regulations whilst acknowledging that political interference is inevitable. Lastly, the influence of culture is evident as significant in the several aspects of development, in the forms of customary approaches and ways of speech in the workplace, prolonged discussions between family members

regarding the lease of traditional lands for installment of new mobile tower sites, as well as the need for integrating the local language in digital devices.

On a global comparison, using the AHP to determine which of process, governance and sociocultural indicators is more likely to influence ICT projects outcomes, would be a very useful tool for decision makers. Analysis drawn from the World Bank development indicators showed that countries are different in their economical characteristics as seen in the different levels of political stability, governance effectiveness, ease of doing business and so forth. For instance, Oceania countries and Japan (Fiji, Samoa, New Zealand) exhibited higher percentile of political stability compared to developed nations (South Korea, UK and USA). However, government effectiveness showed higher performance from developed nations compared to the developing selected countries. Consequently, developed nations showed higher scores of eases of doing business performance compared to the selected developing countries (WB, 2019). Reasons for this can range from the type of political systems in place, to the presence of military, to the effectiveness of current regulations, the rate at which sectors are adapting to technological changes, and so forth. Nevertheless, the main idea is that diversity exist among countries concerning national processes, governance, and sociocultural contexts. Hence, determining prioritization weights becomes essential, and these weights are likely to vary across nations. For example, certain countries may boast robust ICT policies but lack essential infrastructure. In contrast, others may possess technical capabilities and well-implemented policies, yet face obstacles due to the influence of political or religious leaders. Some nations might have the necessary resources, support from the private sector for digitization, but struggle with outdated government regulations.

4.5. Solutions

Despite the numerous challenges outlined, this study also explored possible resolutions. To enable local ICT development, findings encompass a spectrum of outcomes from the modification of education curriculum to the evaluation of internal processes and procedures as well as investment in capacity building. To elaborate, interview results indicated that integrating ICT programs in the curriculum from the lowest level of education up to the tertiary level will aid in building the students' capacity from a young age. Capacity building programs for the older youth and generation, such as how to use ICT for development of local businesses. Awareness is very important for developments as direct communications with the people give both sides the opportunity to voice and address concerns about the project. Investment in infrastructure such as 3G and 4G technologies both from the private and government side, would ensure that services are widely available in the country. Based on previous research, possible solutions include the adoption and execution of relevant ministry processes and business strategies including the use of integrated software (Zubaedah et al., 2017; Kim & Pae, 2007); adoption and implementation of relevant policies and regulations; formation of ICT clusters (Porter, 1998; Maguire, 2003); public awareness and engagement; cultural values consideration or integration in decision making and developments (Kim & Pae, 2007; Masovic, 2018); and capacity development (Gichoya, 2005).

Conclusions

The previous studies majorly investigated technological environments on the level of individual firms or private companies, governments as a whole or collection of country analysis where data is extracted from the individual firm employees or from online databases. There was very little academic literature that concentrated on bureaucratic perspectives in the execution of national ICT

development projects, specifically in the Pacific region. Hence this research intended to provide contributions to academic literature by providing insights from the perspective of government employees in the Pacific region, by focusing on the decision-making process in national ICT development projects. The conceptual framework developed on multiple decision-making models including social choice (Sen, 1977), and rational decision-making procedures (Bazerman & Moore, 2009), as well as the inclusion of the ITU (2009) ICT Development Index Framework. According to the interview results, Samoa decision makers consider legal frameworks and regulatory autonomy & mandates as priorities, followed by socio-cultural norms. The corresponding priority weights obtained are shown in table 5 in the results chapter. A random index of 1.32 produced a consistency ratio of approximately 9% which is below the 10% acceptable threshold.

However, every nation differs in the decision-making process depending upon the specific conditions and relationships that exist within the country. Therefore, the 4:3:3 distribution results were computed and visualized. Decision making in local ICT development projects is affected by process, governance, and socio-cultural factors. Continuous exchange of information between stakeholders enables better understanding of government policies and private company needs. Furthermore, this study has shown that cultural values and traditional customs will one way or another influence the progress of ICT projects therefore decision makers must include social impact in their decision making. Unfortunately, this study also has its limitations in terms of data sample size, diversity of data, availability of people and unintentional bias. Firstly, majority of the interviewees, were only selected from government bodies in the ICT sector of Samoa. Inclusion of participants from non-ICT sector such as the academia, financial support organization, private companies, and other ministries would have provided diversity in data and a larger sample size. Unintentional bias was encountered in the data collection stage, as the interview participants were influenced by the outcomes of the Samoa 2021 general elections. Some of the responses received during the interview may have been swayed by personal emotions. Therefore, it was important to remain in a neutral position throughout the entire research process. An additional limitation recognizes the AHP outcome for the interview results was not re-evaluated with the participants for feedback due to time constraints. Furthermore, the 4:3:3 case ratio is limited in the sense of a single factor (whether, process, governance or socio-cultural) as being prioritized, whereas in some circumstances more than one factor may have the same priority impact. Implications from the study support existing literature and provide practicality to the information obtained. These can be observed as enabling better business environments and ministry operations through the periodic review of internal and external processes through the integration of technological tools, and encouraging foreign investors to consider the social cultural norms when establishing businesses in other countries (Kim & Pae, 2007; Masovic, 2018; Zubaedah et al., 2017). Political implications suggest adoption, and monitoring of relevant policies reflecting changes in the technological environment. Lastly, social implications recommend inclusion of IT subjects in the early stages of student learning, and involvement of public views in decision making through awareness and formal consultations to be integrated in the ICT project implementation phases (Interview results). Implications from this research emphasize the importance of decision-making roles in a social and policy context towards ICT development. It is crucial for both the private and public sector to implement appropriate strategies, technology and laws to enable growth in this industry and keep up with the rapid trends of technology. This study holds significance by providing contributions to both existing research and decision-makers, especially in developing economies. It offers practical solutions

for implementing and deciding on the adoption and execution of ICT projects within their respective countries. To improve knowledge in this area of study, further research is recommended to investigate the ICT development situation in other countries facing similar problems, adopting a methodology that will acquire both quantitative and qualitative data taking into account opinions from all relevant stakeholders, i.e., both the public and private sectors viewpoints.

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