EMPOWERING PACIFIC WOMEN IN TECH

Research Paper

November 2019

TABLE OF CONTENTS

EXECUTIVE SUMMARY

A thriving digital economy brings higher productivity and labour opportunities, and increased efficiencies and convenience. However some technologies raise important questions about equity in jobs, skills, and wages. Helping people adapt to a fast-changing world and mitigating against negative impacts will be a defining challenge of our time.

The aim of this Research Paper is to analyse the digital economy in Fiji and recommend how women might fully participate in this rapidly growing sector. We will explore opportunities for women to gain exposure to technology careers and assess how we might strengthen the capacity of women interested in Information Communication Technologies (ICTs). The paper also assesses where partnerships can be leveraged with Pacific institutions, development partners and the Fiji government.

Helping people adapt to a fast-changing world and mitigating against negative impacts of technology will be a defining challenge of our time.

As part of this analysis we conducted over 20 interviews, surveyed 43 ICT professionals, and conducted a desktop review of published literature exploring the impact of ICTs on the Pacific. This research allowed us to identify leading indicators and pathways for meaningful impact.

In developing countries, men are 2.7 times more likely to work in the digital sector and 7.6-times more likely to work in ICT occupations (1) - and globally, fewer than a quarter of digital jobs are held by women. There is a growing imperative to include women in the labour market as trillions of dollars are being forfeited because of women's non-participation (2).

When workforces are diverse, they're also more competitive, and "with a more diverse workforce, scientific and technological products, services, and solutions are likely to be better designed and more likely to represent all users." (3) By supporting more women access ICT jobs we can also influence pay equity and contribute to the improvement of the gender wage gap by decreasing occupational segregation.

In developing countries, men are 2.7 times more likely to work in the digital sector and 7.6- times more likely to work in ICT occupations

While schools across Fiji are increasing their enrolment in computer courses (4), more needs to be done to make curriculum relevant for all students, including a strategy for addressing cultural barriers. We found evidence of growing participation of young women learning technology skills in secondary school, but their remained a gap in their enrolment in degree programs.

We also explored the private sector, in particular the outsourcing industry. This is a large and growing employer in Fiji and an area where the government has developed strong incentives for businesses - both foreign and domestic. Interviewed organisations employed healthy percentages of women and had seemingly positive work environments, however there was a clear disconnect between education and opportunity - with many women falling between the gaps post qualification. More can be done to support women in their transition from degree and other tertiary programs to careers.

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1 World Bank Group, World Development Report 2016: Digital Dividends
2 https://www.globalpartnership.org/data-and-results/education-data
3 Hill, C., Corbett, C., Rose, A., 2010 Why So Few? Women in Science, Technology, Engineering, and Mathematics. AAUW
4 Information provided by TEST [check]

Moving to a broad ecosystem approach can ensure organisations and communities support women from school through to meaningful careers.

Our recommendations ultimately centre around the goal of increasing women's labour market participation. The nascent opportunities in the technology sector and its potential for future growth make it an important area of focus. By addressing cultural barriers and fixing the leaky pipeline from education to careers and beyond, we believe women can be supported in making inroads into digital jobs.

The analysis is structured around the following leading indicators for a healthy digital economy:

1)An educated workforce;
2)Supportive policy, rules and regulations; and
3)Engaged industry (private sector, government and NGOs).

We see value in highlighting a larger ecosystem of projects that can support women across the entire pipeline. Below we will unpack each area.

2. BACKGROUND

Understanding the context

Increased connectivity brings both risks and opportunities. Research from the World Bank shows that improved connectivity has the potential of increasing GDP by more than USD 5 billion and adding 300,000 jobs across the Pacific by 2040 (5).

Development partners have made significant investments across the Pacific to provide faster and cheaper access to the internet. Through the Southern Cross Submarine Cable Network, connecting Fiji and Vanuatu, to the Coral Sea Cable System, connecting Papua New Guinea and the Solomon Islands, and a handful of other undersea cable projects over the past decade, hundreds of thousands of people will soon be connected to the internet, many for the first time.

Connectivity is a necessary first step. There are, however, still significant challenges to overcome in terms of Access, Infrastructure, Penetration, Operators and Affordability (6).

- **Access**: Out of the 30 least urbanised countries, 10 are in the Pacific. Those not in urban centres are "island locked" in some of the most remote places on earth.
- **Infrastructure**: The scarcity of fast and reliable internet is a key limiting factor only gradually being addressed as new submarine cables improve connectivity.
- **Mobile Penetration**: Within the region, subscriber penetration rates range from a high of 84% in Fiji to a low of just 11% in the Marshall Islands. Papua New Guinea is the most populous country in the region but has subscriber penetration of 30% — it is home to the majority of the unconnected people in the region.
- **Operators**: Of the region's 23 countries and territories, 13 have only one active mobile operator, while only five have three or more operators. Across the region, there is an average of 1.7 operators per market.
- **Affordability:** Cost of data and downloads in many countries without a submarine sea cable is prohibitive for low income earners and those below the poverty line.

Addressing the gender imbalance

There is a potential for a large social imbalance with a growing digital ecosystem. Historically, computing jobs where women played a leading role were feminised, deskilled, and devalued (7) - which forced women into different careers or out of the labour market completely. When these impacts are coupled with existing labour market conditions and participation rates, it is no surprise that ICT jobs across sectors are dominated by men, the result of which is missed social and economic potential.

As Pacific communities connect to the internet, full engagement of government, NGOs, civil society and the private sector is required to ensure risks are mitigated and opportunities are distributed across gender, socio-economic and other societal dimensions. While this engagement should be informed by past global and regional efforts, it is important that Pacific people are given agency and ownership of the process and drive the future growth of ICTs in the Pacific.

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5 DFAT, The Coral Sea Cable System, Supporting the Future Digital Economies (PNG / Solomon Islands)

6 GSMA', Mobile Economy in the Pacific (2019)

7Hicks, M. Programmed Inequality: How Britain Discarded Women Technologists and Lost Their Edge in Computing, MIT Press, 2018.

Presence of a digital ecosystem

In other developing regions the digital ecosystem is growing exponentially. GSMA estimates there are now over 442 technology hubs throughout the African continent and a further 565 across Asia. African tech start-ups alone raised 53% more funding in 2017 compared to 2016, and in Asia Pacific, the financial capital injected in tech ventures made a 200% leap forward (8). While the prevalence of "hubs" and "start-ups" do not necessarily equate to strong, equitably structured digital economy, they are strong indicators of investment (risk vs return) and a growing labour market. The question remains whether this is a trend we will start seeing in the Pacific as there are a range of unique challenges to overcome.

Why Fiji?

Fiji is the crossroads of the Pacific - a hub for NGOs, education and industry. In recent years, power and telecommunications infrastructure improvements mean it is home to the most reliable access to the internet in the Pacific.

At the time of writing 4G plans for both Digicel and Vodafone were averaging around AUD 0.70 for 1GB. Broadband speeds were advertised on the Digicel website as 100 Mbps, and Vodafone plans cost around AUD $45 per 58 GB. Further, many rural areas in Fiji are connected to the internet, in stark contrast to other parts of the Pacific. Fiji, Suva in particular, is a major employer of digital workers.

Telecommunication Companies (Digicel, Vodafone, Telecom Fiji) and Banks (BSP, ANZ, Bank of Baroda) employ large portions of the ICT economy. There is a growth in outsourcing companies responding to government policies and incentives, many of which were interviewed as part of this analysis. Unemployment Rates in Fiji have averaged around 6.2% over the past 4 years (9) and the ILO estimates that in 2018, youth unemployment was around 14.57%. While still high, youth unemployment in the Pacific is estimated at 23% (10).

For many of the reasons above, Fiji ranks highest in the Pacific on the UN's e-government development index - which measures online services, telecommunication connectivity and human capacity (11). A new government agency, Digital Fiji, has a strong digital transformation and e-government agenda, and there is a growing push to create an increasingly digital friendly policy environment in the private sector which is further articulated in the report. Fiji is a good place for technology interventions due the higher changes to employability, growing private sector; fastest, cheapest and widest connectivity; large numbers of ICT workers (in comparison to other nations); and efforts to stimulate the digital economy.

Table 5. Nation E-government Development Index 2018

Country	E-government Development Index	Rank
Cook Islands	—-	—-
Fiji	0.5348	102
Kiribati	0.3450	153
Marshall Islands	0.3543	149
Palau	0.5024	111
Papua New Guinea	0.2787	171
Samoa	0.4236	128
Solomon Islands	0.2816	169
Tonga	0.5237	109
Tuvalu	0.3779	144
Vanauto	0.3990	137

Table 5 shows the relative position of ILO member PICs in the world rankings in the United Nation E-Government Survey in 2018 (United Nation, 2018). Both this ranking and the findings of this study (Reported in Chapter 3) Suggest that there is a long way to go for PICs to improve their digital capacity and capability .

8GSMA, https://www.gsma.com/mobilefordevelopment/blog/618-active-tech-hubs-the-backbone-of-africas-tech-ecosystem/

9 Trading Economics, https://tradingeconomics.com/fiji/unemployment-rate

10 ILO, https://www.ilo.org/suva/areas-of-work/youth-emp-policy/lang--en/index.htm

11 UN e-Government Survey, https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2018
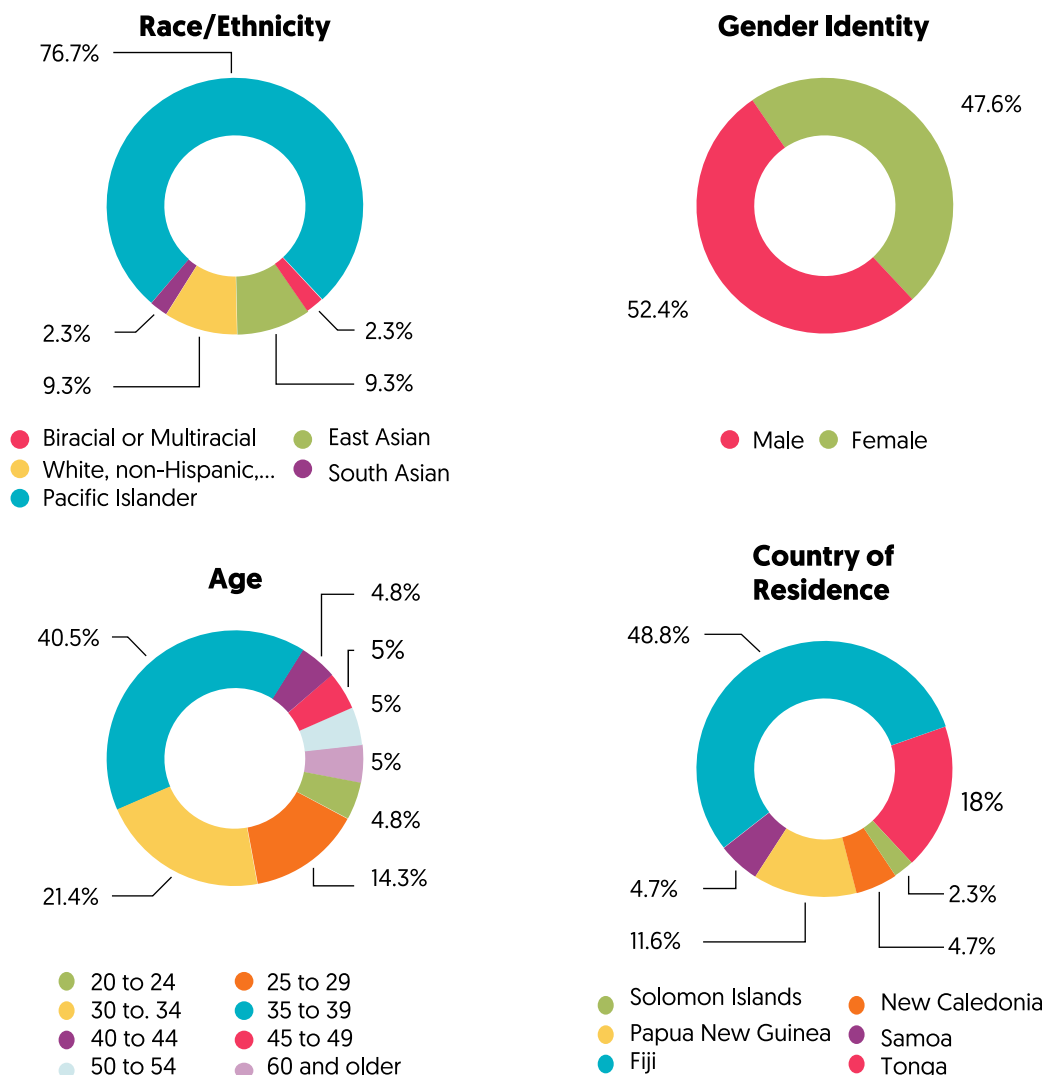
3. PACIFIC ICT SURVEY

To better understand the current state of ICT jobs across sectors, we surveyed 43 technologists from across the Pacific. The survey was inspired by Stack Overflow's annual Developer Survey (12) and developed in close partnership with Secretariat of the Pacific Community (SPC).

Questions included background characteristics, information about jobs and employment, training and experience in ICTs, and their perceptions of the local industry and their interests in supporting its growth. While women's responses sometimes echoed men, by disaggregating the data by gender, we were able to see important differences.

1. Background characteristics

The survey included a diverse range of respondents. Because we targeted technologists in the Pacific, over 76 percent of respondents identified as Pacific Islanders. Women made up a slightly lower percentage of respondents (48 percent), compared to men (52 percent) and the majority of respondents were in the 35-39 age range (41 percent). While the majority of respondents reside in Fiji (49 percent), the next largest group of respondents reside in Tonga (16 percent). Only two respondents reported using assistive devices, but none were technological in nature.

Race/Ethnicity

76.7%
2.3%
9.3%
2.3%
9.3%

- Biracial or Multiracial
- White, non-Hispanic,...
- Pacific Islander
- East Asian
- South Asian

Gender Identity

47.6%
52.4%

- Male
- Female

Age

40.5%
21.4%
14.3%
4.8%
5%
5%
5%
4.8%

- 20 to 24
- 30 to. 34
- 40 to 44
- 50 to 54
- 25 to 29
- 35 to 39
- 45 to 49
- 60 and older

Country of Residence

48.8%
18%
4.7%
11.6%
2.3%
4.7%

- Solomon Islands
- Papua New Guinea
- Fiji
- New Caledonia
- Samoa
- Tonga

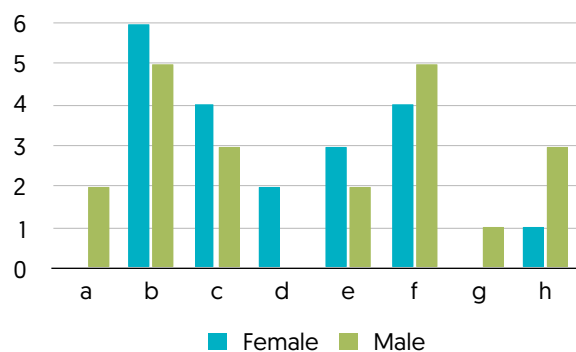12 Stack Overflow, https://insights.stackoverflow.com/survey/2019

2. Job characteristics

Respondents were able to choose one or more ICT roles in which they're employed. The roles with the largest number of respondents included information, communication, and knowledge management professional (36 percent), system administration (19 percent), educator or trainer (26 percent). Over 80 percent of respondents reported being employed full-time, including slightly more women than men. Similarly, more men than women reported actively looking for work but near equal numbers were open to new opportunities.
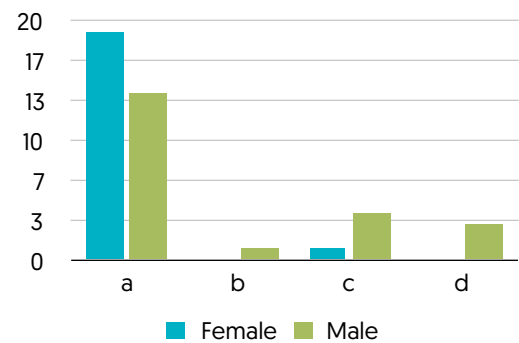
The top sectors of employment included information technology (41 percent), education and training (33 percent), and government or public administration (31 percent). The largest percentage of women work in companies or organisations of 100-499 employees, while men were more dispersed across organisation size, with slightly more men reporting working as freelancers. A large majority (78 percent) of respondents said their business primarily comes from within Pacific Islands Countries and Territories (PICTs).

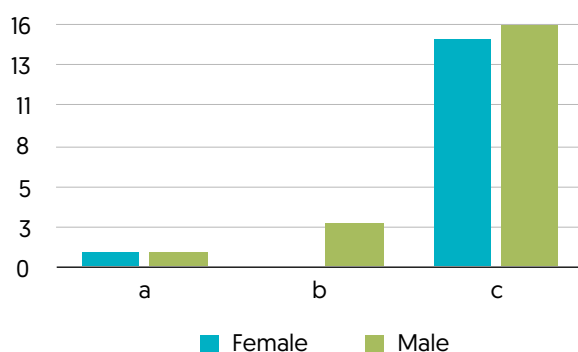### Company or Organisation Size

Female ■ Male ■

a: 10 to 19
b: 100 to 499
c: 1000 to 4999
d: 2 to 9 employees
e: 20 to 99
f: 500 to 999
g: 5000 to 9999
h: Just me, I'm a
   freelancer, etc...

Employment Status

Female ■ Male ■

a: Employed full-time
b: Employed part-time
c: Independent contractor, freelancer, etc...
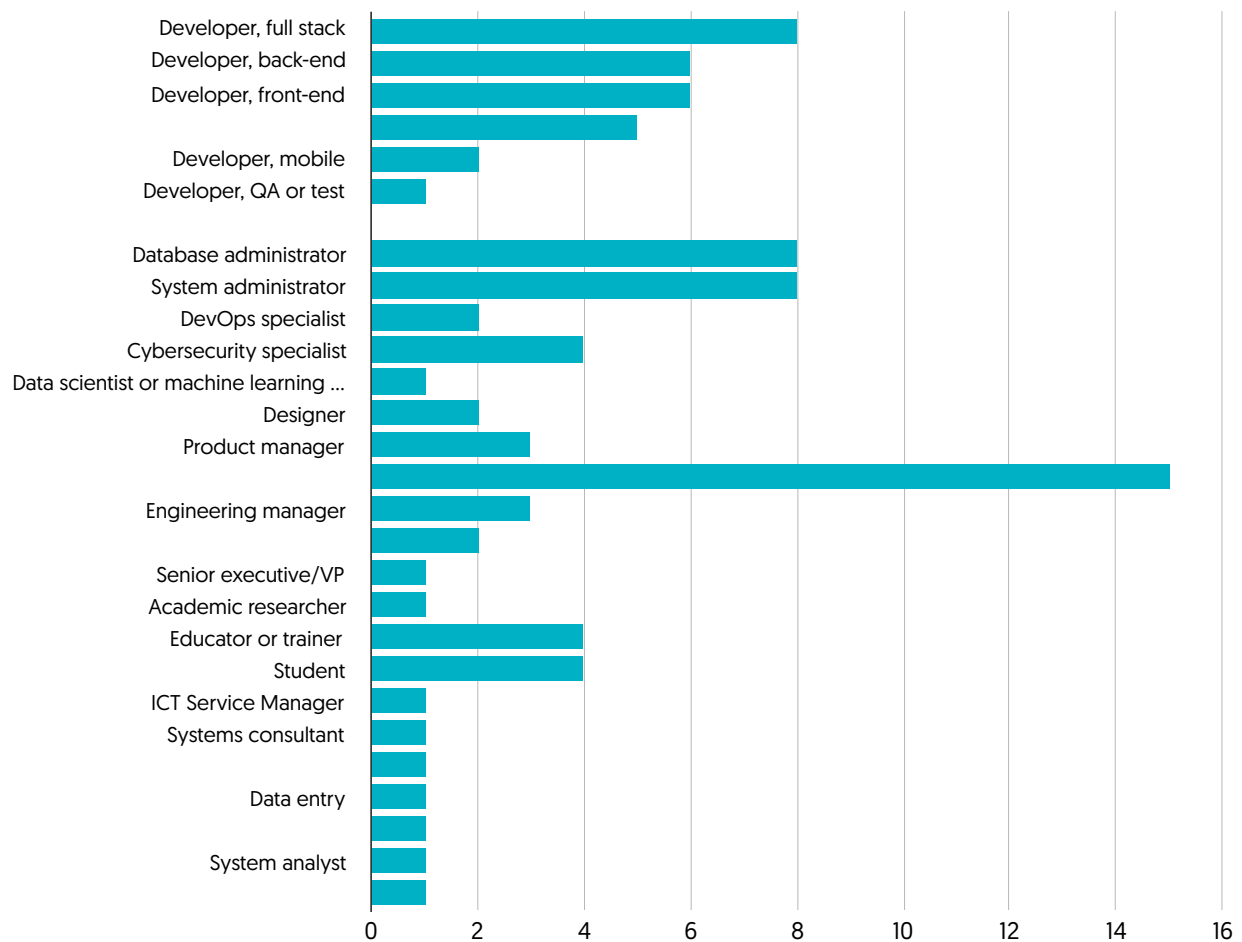d: Not employed, but looking for work

Job Search Status

Female ■ Male ■

a: I'm actively looking for a job
b: I'm not interested in new job opportunities
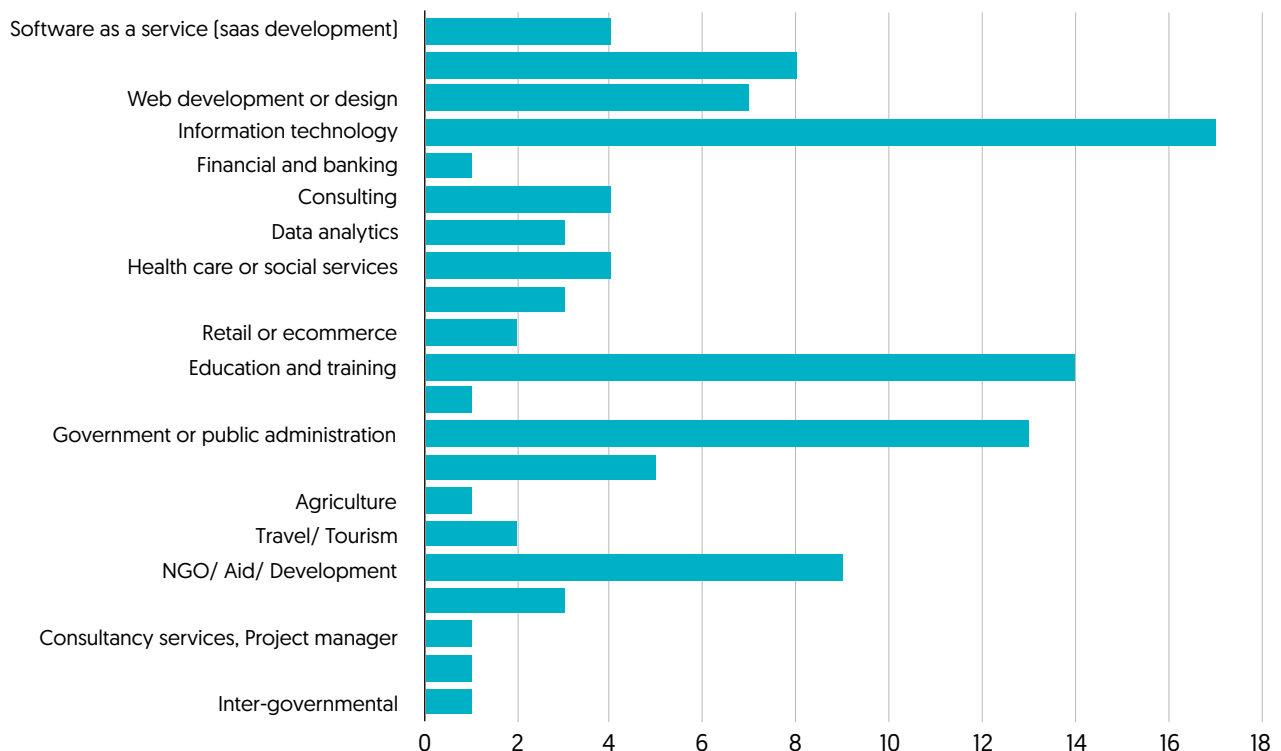c: I'm not actively looking, but I'm open to new opportunities

Company location

78%
12.2%
9.8%

Majority from non-PIC...
50-50 split between Pa...
Majority from Pacific Is...

In what ICT role(s) are you currently employed? 42 responses

Bar chart showing counts by ICT role:
- Developer, full stack: ~9
- Developer, back-end: ~6
- Developer, front-end: ~6
- (unlabeled): ~5
- Developer, mobile: ~2
- Developer, QA or test: ~1
- Database administrator: ~8
- System administrator: ~8
- DevOps specialist: ~2
- Cybersecurity specialist: ~4
- Data scientist or machine learning ...: ~1
- Designer: ~2
- Product manager: ~3
- (unlabeled): ~15
- Engineering manager: ~3
- (unlabeled): ~2
- Senior executive/VP: ~1
- Academic researcher: ~1
- Educator or trainer: ~4
- Student: ~4
- ICT Service Manager: ~1
- Systems consultant: ~1
- (unlabeled): ~1
- Data entry: ~1
- (unlabeled): ~1
- System analyst: ~1
- (unlabeled): ~1

In what sector(r) are you currently employed? 42 responses

Bar chart showing counts by sector:
- Software as a service (saas development): ~4
- (unlabeled): ~8
- Web development or design: ~7
- Information technology: ~17
- Financial and banking: ~1
- Consulting: ~4
- Data analytics: ~3
- Health care or social services: ~4
- (unlabeled): ~3
- Retail or ecommerce: ~2
- Education and training: ~14
- (unlabeled): ~1
- Government or public administration: ~13
- (unlabeled): ~5
- Agriculture: ~1
- Travel/ Tourism: ~2
- NGO/ Aid/ Development: ~9
- (unlabeled): ~3
- Consultancy services, Project manager: ~1
- (unlabeled): ~1
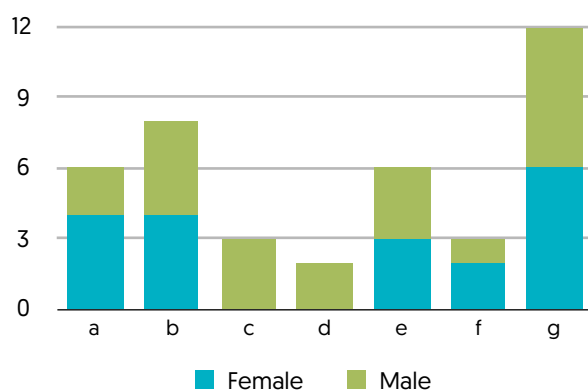- Inter-governmental: ~1

3. Job preferences

We looked at a handful of questions to better understand the preferences Pacific Island technologists have when it comes to their jobs. When looking at the most important factors influencing peoples' chosen jobs, together the most important factors is languages, frameworks, and other technologies I'd be working with. However, when we look at the data broken down by gender, women's top choice remained the same while men cared most about the office environment or company culture. Most men and women reported never working remotely but differences exist in where women and men prefer to work; women reported slightly more interest in working from home, while men reported more interested in working from an office. There were a similar number of responses from men and women who were interested in working from a co-working space or cafe.
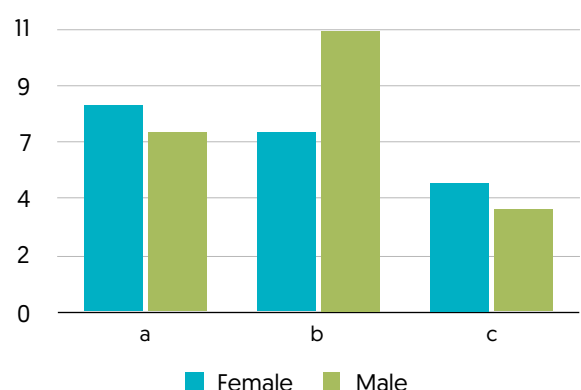
Most Important Factors Influencing Chosen Job

a: Languages, framework, and other technologies I'd be working with

b: Office environment or company culture

c: Opportunities for professionals development

d: How widely used or impactful my work output would be

f: Flex time or a flexible schedule

g: Industry that I'd be working in

h: Diversity of the company or organisation

i: Financial performance or funding status of the company or organisation

j: Specific department or team I'd be working on

K: Remote work options

Working Remotely

Female ■ Male

a: A few days each month

b: About half the time

c: all or almost all the time ('m full-time remote]

d: Less than half the time, but at least one day each week

f: Less than once per month

g: More than half, but not all, the time
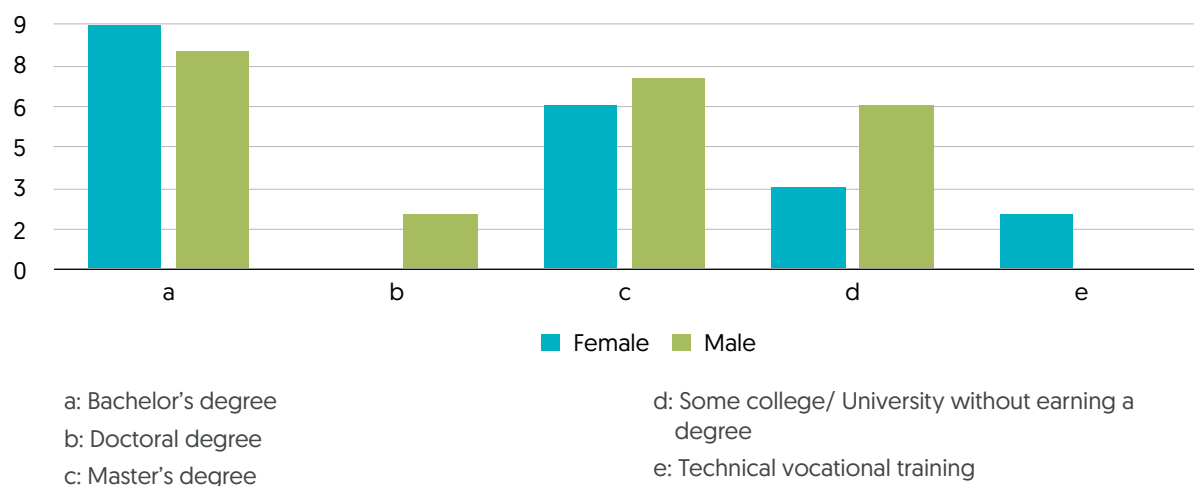
h: Never

Work Location Preferences

Female ■ Male

a: Home

b: Office

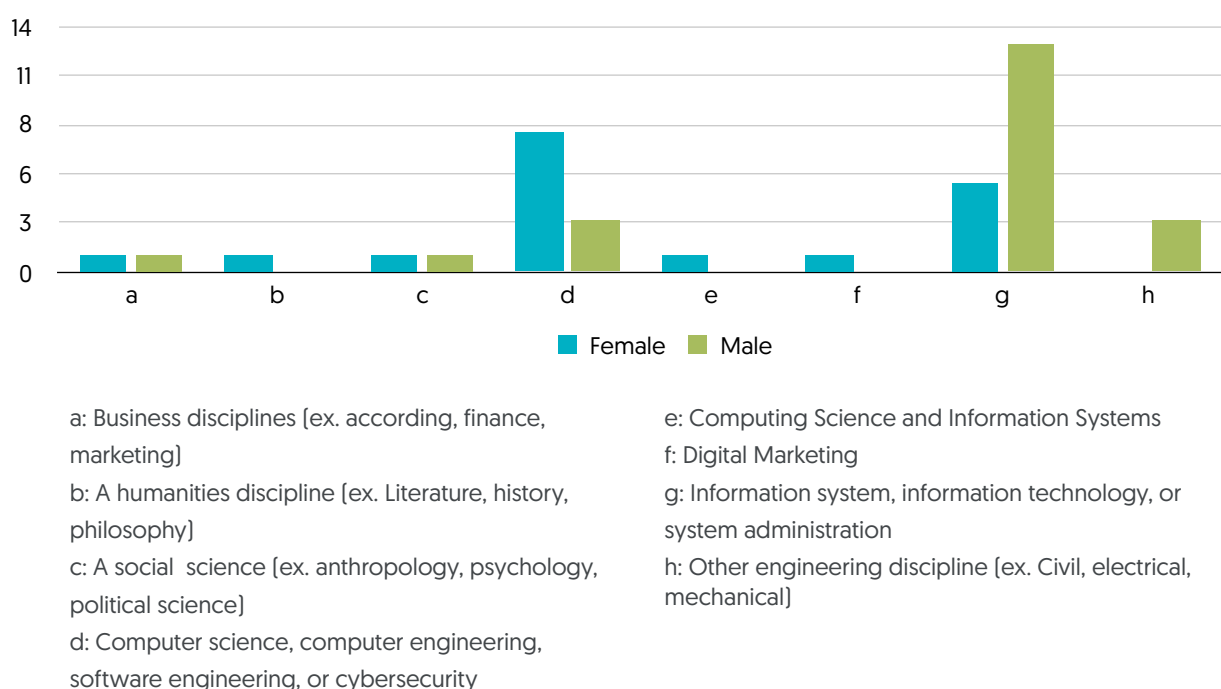c: Other places, such as co-working space or cafe

4. Training, Background, Experience

Men and women had mostly similar levels of education experience, except more men completed technical or vocational training. Most women (44 percent) reported studying computer science, computer engineering, software engineering, or cybersecurity while most men (62 percent) reported studying information systems, information technology, or system administration. The majority of women (35 percent) reported learning to code less than 5 years ago. Amongst men, an equal percent reported not knowing how to code and learning 5 to 9 years ago (23 percent). An equal number of women reported they have been coding for 10 to 14 years (31 percent) or they don't code professionally (31 percent) while most men reported not coding as a professional (50 percent). Respondents could choose as many responses as they wanted and 94 percent reported "Taught yourself a new language, framework, or tool without taking a formal course" while 56 percent received "on-the-job training in software development".
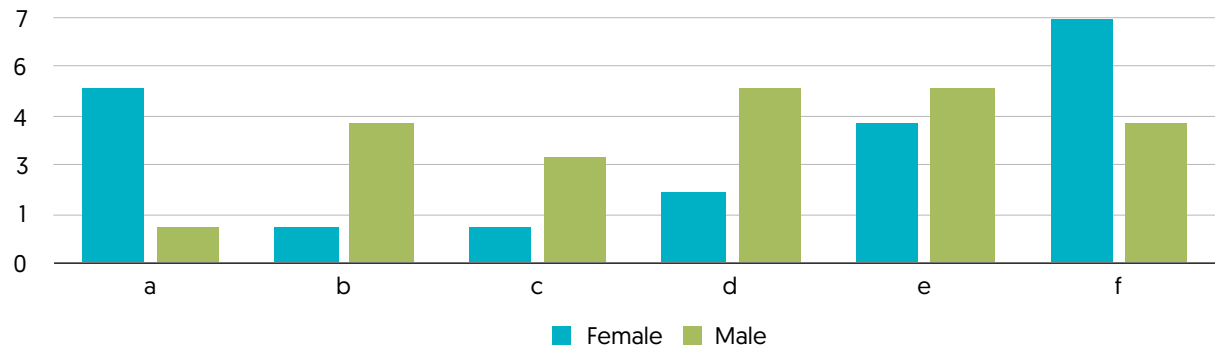
Highlest Level of Education

Female   Male

a: Bachelor's degree

b: Doctoral degree

c: Master's degree

d: Some college/ University without earning a degree

e: Technical vocational training

Undergraduate Major

Female   Male

a: Business disciplines (ex. according, finance, marketing)

b: A humanities discipline (ex. Literature, history, philosophy)

c: A social science (ex. anthropology, psychology, political science)

d: Computer science, computer engineering, software engineering, or cybersecurity

e: Computing Science and Information Systems

f: Digital Marketing

g: Information system, information technology, or system administration

h: Other engineering discipline (ex. Civil, electrical, mechanical)

Year Since Learned How to Code

Female   Male

a: 10 to 14   e: I don't know how to code
b: 15 to 19   f: Less than 5
c: 20+
d: 5 to 9

Years Professionally Coding

Female   Male

What other kinds of education have you engaged in? 18 responses

Taught yourself a new language, framework…

Contributed to open source software

Participated in a hackathon

Participated in online coding competition

Participated in a full-time developer team

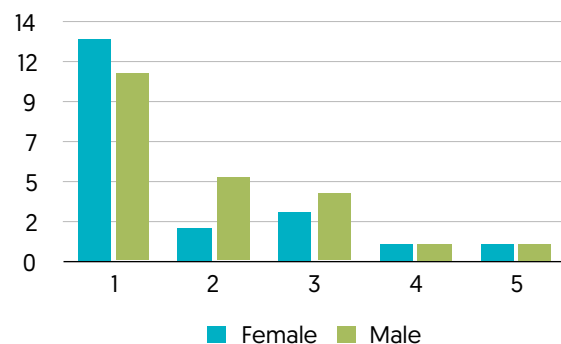## 5. Perceptions of industry & interest

Most women (70 percent) thought there were limited jobs compared to slightly smaller majority of men (55 percent). The majority of both men and women chose #1 on the scale (very likely) when selecting how likely would they be to participate in a program focused on mentoring women in the digital economy - 65 percent of women and 50 percent of men. Both men and women were very interested in mentoring youth with 73 percent of men choosing very likely (#1 on five point scale) and 65 percent of women. We provided respondents with four different activities they might want to participate in and asked them to rank all four from their first favourite through fourth. Women were split in their interest, with slightly more interest in courses. Men were also evenly split, with slightly more interest in tech meetups. We asked respondents to choose their top five values for a Pacific digital economy. While combined, men and women most valued "respect", when broken down by gender, there were some differences. Women valued collectivism and respect equally, and cultural distinctiveness third most. Men valued respect (first), cultural distinctiveness (second), and collectivism (third).
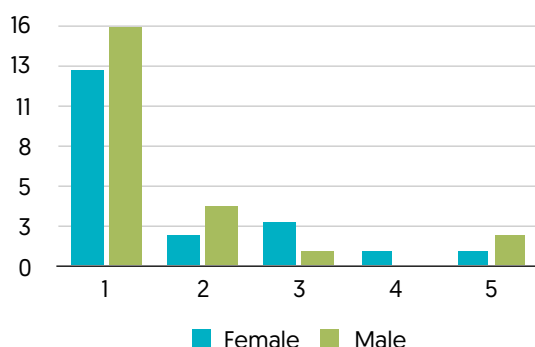
Perception of Job Availability

Female   Male

a: There are limited jobs
b: There are sufficient jobs
c: There is a surplus of jobs

Likelihood of Participating in Women's Mentoring

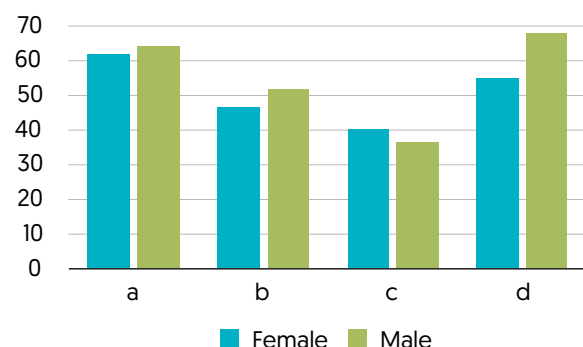Female   Male

How likely would you be to participate in a program focused on mentoring women in the digital economy?

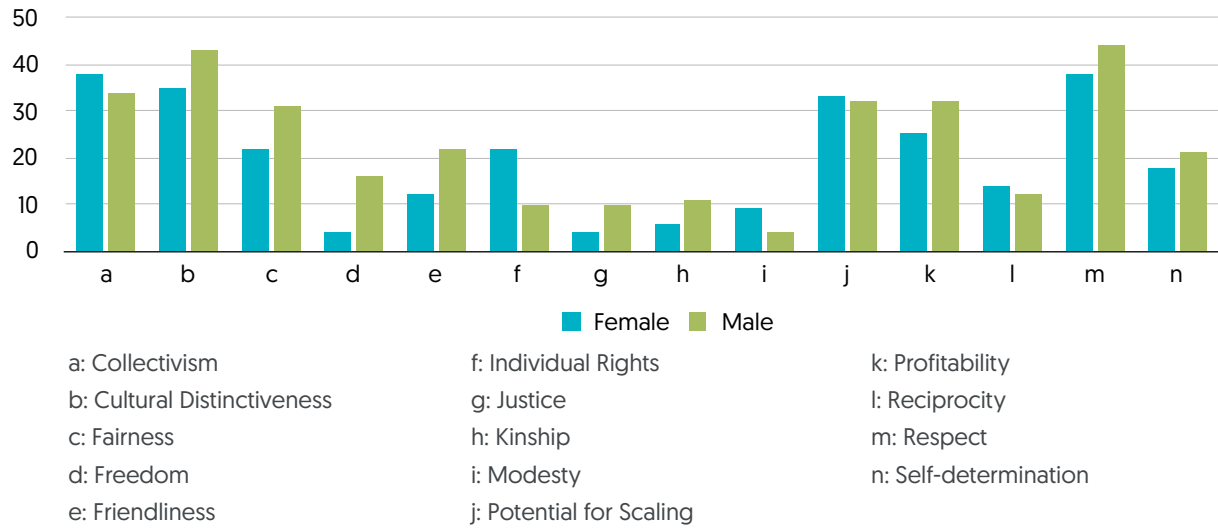**Mentoring Students**

Female   Male

How likely would you be to participate in a program focused on exposing primary or secondary students to career pathways in the economy?

Content & Activities of Interest Ranked

Female   Male

a: Courses on technologies you're interested in
b: Industry news about technologies you're interested in
c: Tech articles written by other developers
d: Tech meetups or events in your area

Core Values Defining a Pacific Digital Economy

a: Collectivism
b: Cultural Distinctiveness
c: Fairness
d: Freedom
e: Friendliness

f: Individual Rights
g: Justice
h: Kinship
i: Modesty
j: Potential for Scaling

k: Profitability
l: Reciprocity
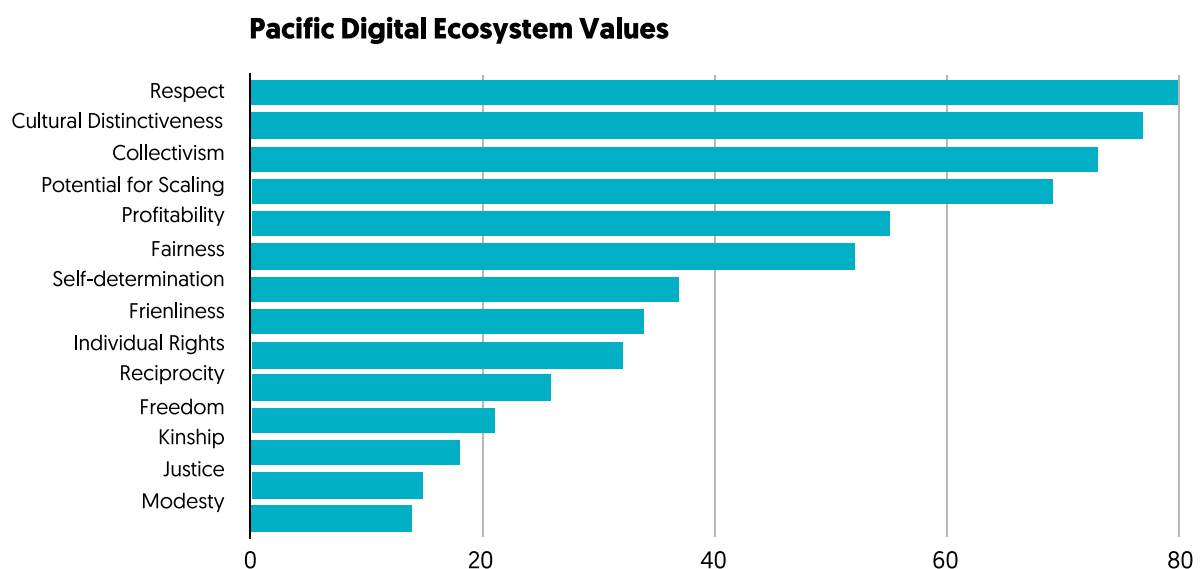m: Respect
n: Self-determination

4. ENABLING CONDITIONS FOR A HEALTHY DIGITAL ECONOMY

To understand the health of the Fijian digital economy we conducted over 20 interviews with development organisations, government, higher education, and industry professionals. Most interviews lasted about an hour and took place across Suva and remotely. Many interviews included multiple participants and ranged from one to fours. Interviewees were asked a series of questions about their organisation and the wider digital ecosystem.

We define a healthy digital economy as one that:

1.Empowers and respects Pacific peoples, cultures, and human rights;
2. Is equitably and ethically distributed across society;
3. Provides localised economic opportunity for business and employment;
4. Is harmonised against a cross-sector strategy that articulates economic, environmental and social impacts; and
5. Is based on respect, cultural distinctiveness, and collectivism and is free from overt negative influences.

A digital economy that respects Pacific peoples, cultures, and human rights set it apart from the global digital economy, dominated by the venture-backed and scale-at-all-cost models of Silicon Valley and China (13) (dispersed across Shenzhen, Shanghai, Beijing). Pacific digital values focus on respect, cultural distinctiveness, which collectivism featured strongly from our research (full results below).

Pacific Digital Ecosystem Values

A healthy digital economy is further supported by a suite of enabling conditions; reliable infrastructure, an educated workforce, supportive policies and regulations, and an engaged industry. Investments in infrastructure mean many potential geographic hubs across the Pacific will soon have reliable access to the internet but many gaps remain in institutional support across the other enabling conditions.

Below we will unpack key takeaways from these interviews across the three enabling conditions:

13 Pichot, J. Tech Tightrope: Europe's Alternative to Silicon Valley 2019
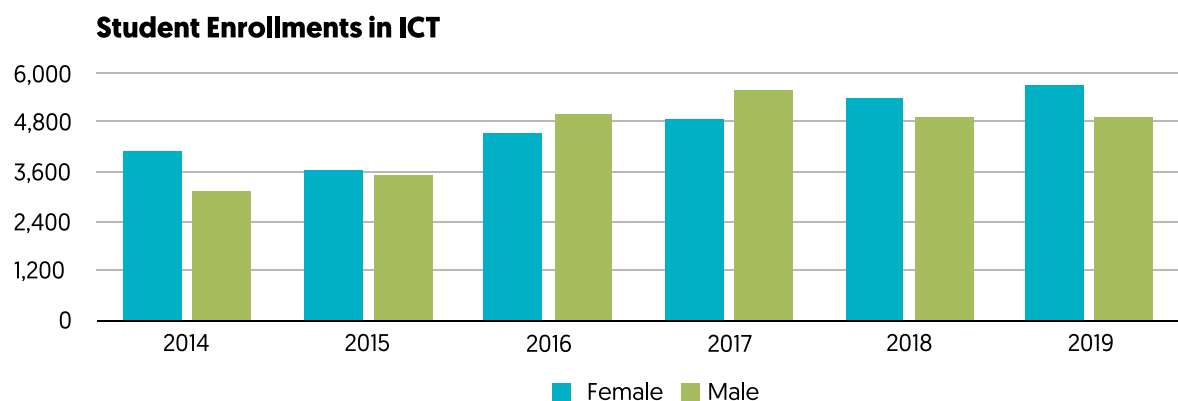https://magazine.areweeurope.com/stories/code-of-conscience/tech-innovation-europe,

1. Educated Workforce
2. Supportive policies, rules, & regulations
3. Engaged Industry (private sector, government, & NGOs)

1. Educated Workforce

Like software, education is not neutral. National educational goals are often defined by large-scale strategic plans, subject to political and socio-cultural influences. Mediated by these influences, governments articulate education goals that span learning, schooling, and training. Learning being defined as something that should be "lifelong", schooling something that's more rigid and ritualised, while training seeks to connect learning with employment. However, as access to education expands and the nature of work evolves, the lines between these differences are being blurred and the what, when, and how of education is changing.

Curriculum Integration in Fiji

The Ministry of Education, Heritage, & Arts (MEHA) Computer Education Department explains Fiji has a long history of teaching technology (14). The current structure of the MEHA has the Computer Education Department sitting under the wider Technology & Employment Skills Training (TEST) Section. The remit of TEST is to "equip students on technological entrepreneurial, adaptability and employability, skills through creativity, innovation, quality, learning and competent vocational training that enhances sustainable development." (15) TEST

is not only responsible for programs, curriculum, and HR, but also technology infrastructure

including the procurement of laptops and desktop computers.

Student Enrollments in ICT

	2014	2015	2016	2017	2018	2019
Female	4122	3615	4512	4853	5382	5730
Male	3120	3540	4991	5591	4899	4939

Based on the same document from the Computer Education Department, Computer Education was introduced through mathematics curriculum in 1984. Over ten years later, in 1996, Computer Studies was included as its own subject in Form 6 and the next year extended to Form 7. From our interview with TEST, we learned a more recent curriculum change has resulted in a reshuffle of when students take Computer Studies, moving it to Years 11 - 13. From 2015-2019 across the 164 secondary schools currently offering Computer Studies, female enrolment shifted and now exceeds that of males. The number of schools remained mostly stable with only 14 secondary schools yet to offer the course, many of which plan to offer the course once their schools begin enrolling students in Year 11 and beyond.

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[14] Information Paper - Computer Education Data Analysis and Interpretation, MEHA [2019]
[15] IBID

While design skills have not yet been considered for inclusion in the curriculum, students do learn a range of concepts and skills including the following:

Strands	Year 11	Year 12	Year 13
	Sub Strands		
Computer and Applications	Structure and Function of the Computer	The Internet and the World Wide Web	Hardware, Software Installation and Basic Networking
	Health and Safety Issues	Careers for Computing Professionals	
	Green Computing	Computers in Society	
		Communication and Network	
Application Packages	Application Software	Visual Basic. Net	Web Design
	Visual Programming (Scratch)		Programing C++
Information Managament	Storing, Managing and Retrieving	Managing and Maintaining Data	Information System
			System Analisys and Design
			Database Management

MEHA has upskilled current teachers through training with Fiji National University (FNU) and University of the South Pacific (USP), to enable the delivery of these courses. Their future plans include a continued focus on training teachers, expanding access, growing the scope of work to include ICTs across subjects, and ensuring the curriculum meets industry and international standards.

ICTs in Schools

We conducted a series of interviews and reviewed syllabi to better understand what technology (both instructional and hardware) has been implemented in primary and secondary schools. While implementation appears mixed, we learned a number of pilots focused on using technology in teaching and learning have been tested. "Smart Classrooms" was a pilot that began in 2014 and upgraded the ways teachers use technology. Other pilots have included Office 365 for education, the Internet Connectivity Project, and pilots focused on improving education statistics and access to school data. While "Smart Classrooms" mostly supported teacher-driven pedagogy, anecdotally, the program was very effective in so far as it increased increased student engagement in the classroom. Even though there is knowledge of these pilots being conducted, there remains a sentiment that suggests a "disconnect between the labour market and schools".

The Role of School Leaders

One interviewee saw potential in training school administrators in digital education leadership. They felt this focus on school leaders might fix some challenges seen in previous pilots such as head (pilot) teachers being transferred (and knowledge not dispersed or maintained in the school), lack of coordination within and between schools, and the absence of funding and planning for scale-up. They felt upskilling the digital literacy of school leaders would also help increase the number of courses in their respective schools that used technology. These digital-savvy school leaders would be in a better position to mobilise their

teachers towards a common goal for ICT integration if they gained the knowledge, vision, and inspiration through training for themselves. This commentary is backed up by research from other developing countries that shows the important role of school leaders play in supporting ICT projects (16).

Career Counselling

We also asked participants in all of our 20+ interviews about the current state of and potential for career counselling. From both inside the education community and from those in other sectors, we heard about the difficulty of combating mentalities at home, mainly, that technology jobs were not a valid career path. We also heard that technology careers are competing against much entrenched views on valuable career paths, and families that relied on students' future potential, encouraged their children into more stable and well-understood careers.

ICTs in Tertiary

Fiji National University (FNU)

The FNU bridges six institutions that together focus on training and upskilling the regional workforce. They work with other international universities to provide training across a range of skills such as agriculture, medical informatics, assistive technologies, and more. They provide corporate training to local companies based on demand and interest. In the College of Engineering, Science, and Technology they offer 96 certificates and degrees including;

- Bachelor of Science (Computer Science and Information Systems)
- Bachelor of Science (Mathematics & Computing Science)
- Bachelor of Information Systems
- Bachelor of Engineering (Honours) (Electronics Engineering) (Telecommunication & Networking)
- Diploma in Electronics Engineering (Telecommunication & Networking)
- Trade Diploma in Information Technology
- CISCO Certified Network Associate
- Certificate IV – Information Technology

Many of these programs have the stated goals of 1) Meet the ICT needs of Fiji and the region, and 2) Enable the IT industry to flourish in Fiji. While they teach courses in Artificial Intelligence and Cyber Security and require students to complete three months "industrial attachment", there are no courses on user experience or human-centred design and more research would be needed to understand how programming languages are aligned to industry demand. We were unable to find specific details on enrolment broken down by gender, but it did not appear as though there were programs or events to encourage women to enroll in these courses.

Program	2013	2014	2015	2016	2017
Certificates	634	711	650	594	572
Diploma	1218	565	380	398	310
Trade Cert. & Dip.	454	471	443	522	544
Higher Ed. Cert. & Dip.	768	698	173	260	157
Bachelors	411	642	969	1211	1273
Postgraduate	144	146	157	248	222
Total Graduates	**3629**	**3233**	**2772**	**3233**	**3018**

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16 Technology- supported professional development for teachers: lessons from developing countries McAleavy, T., Hall-Chen, A., Horrock, S., Riggall, A. (2018)

did not appear as though there were programs or events to encourage women to enroll in these courses.

University of the South Pacific (USP)

School of Computing, Information and Mathematical Sciences (SCIMS)

To learn more about SCIMS, we interviewed faculty members including the Head of School (Acting), Associate Professors, and Senior Lecturers across Computing and Mathematics disciplines. We learned the school offers a range of programs -- the accredited degree and certificate programs include: Bachelor of Networks and Security (Provisional Accreditation) (ACS4, Australia); Bachelor of Software Engineering (ACS, Australia); Certificate IV in Information Technology (Support) (Skills International New Zealand); Diploma in Information Technology (Skills International New Zealand).

When we asked the group of faculty about the specific experience of women in their program the professors explained that a typical undergraduate class might include a ration of 20:2 male to female students, with a ratio of 15:2 in graduate-level courses. Based on their knowledge, there were no scholarships or programs to encourage women's enrollment, participation, or persistence in SCIMS. The only recruitment for any students happened during "open day" which is advertised in the media, television, newspapers, websites, etc. The below shows the gender breakdown of ICT graduates.

ICT Graduates by Level	2012	2013	2014	2015	2016	2017
Certificate	0	0	0	1	1	0
Diploma	2	5	5	3	4	2
Degree	45	57	46	51	51	76
Postgraduate Diploma	26	26	20	21	28	25
Master	13	10	12	14	25	20
Doctorate	0	0	0	0	0	1
Total	**86**	**98**	**83**	**90**	**109**	**124**

By Gender	2012	2013	2014	2015	2016	2017
Females	18	25	19	21	22	34
Male	68	73	64	69	87	90

Given the steady growth in enrollment, we tried to unpack how students might choose these programs and why their persistence through graduation might be low (anecdotally around 30%). One faculty member explained; "If students are not properly counselled they end up in the wrong program" but because of staff shortages, they're unable to do as much as they'd like in this area. We also learned there are no caps for student enrollment and the entry requirements match other accredited programs across USP. Further, the program is fixed, students are not able to switch into the program if they develop an interest after they enter USP. All of these factors likely contribute to the challenges of persistence and gender imbalance.

When we asked specifically about the Software Engineering degree, we learned the curriculum focuses on concepts, not on specific programming languages, and includes topics like user interface design. Students complete an industrial experience project as a

requirement for graduation. For their experience, students receive mentorship and complete a project embedded within a company. The faculty reported that many students receive job offers from the companies with whom they complete their industrial experience. Even with this important link to industry, the faculty felt like there could still be a stronger bridge between industry needs and what students learn.

2. Institutional and Policy Settings

Fiji has made headway in developing an economic transformation strategy in the technology sector, however it is unclear whether there is any overt focus on the participation of women or other marginalised groups. Anecdotally the strategy is focussed on macro-and-micro economic reforms (tax incentives) and not increasing the participation of women to raise both social and economic outcomes.

Thinking regionally - SPC digital transformation

The Pacific Community (SPC) is the principal scientific and technical organisation in the Pacific region. Our interviews with SPC indicated a strong desire for a regional Digital Transformation Agency, similar to that in Australia.

There was a broad sentiment that development partner investments need to be far better aligned with regional and bi-lateral strategies, or should initially focus on the development of those strategies. This study noted the rise in un-harmonised, short term projects throughout the Pacific - or "technology pilots" - designed without a long-term sustainability lens necessary in all development programming. These initiatives are creating a cynicism in digital development and a general "pilot fatigue".

SPC acknowledge that digital transformation has the potential to contribute to or undermine the competitiveness of Pacific countries and territories in an increasingly connected world. Ensuring the digital transformation ecosystem in the Pacific generates new jobs demands careful consideration, substantial investments and advanced planning. It also needs to be deliberate in its focus to bring women into the labour market.

Fiji Government incentives and budget priorities

To support expansion of businesses and entice new investments, the Fiji 2019-2020 Budget has introduced a number of new taxation and customs incentives to support growth in ICT. These measures are generous and include tax exemptions for ICT businesses for 13 years (17) (among other incentives).

ICT start-ups receive a 150% deduction on all start-up costs made available with no employment conditions / requirements attached (18). However, all business licences are only provided upon inspection of a business premises which negates the lean way in which these businesses often have their genesis. While there are loop-holes by registering in certain investment zones - this in an impediment to growth in major urban centres.

There were talks in various interviews of a Fijian e-government / digital transformation strategy, however it was unclear at what stage of development this was under. More research and conversations with Fijian Government need to take place to better understand this process and the broader strategy, and whether there is consideration for a gender lens to be applied when growing the sector.

Our industry interviews viewed these incentives and strategies in a positive light, however a few considered them overly focussed on outsourcing and trade while not targeting domestic markets.

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17 Much of the above taken from the 2020 Budget Paper and Inland Revenue Investment Guide

18 ibid

Labour Laws

Fiji's recent National Employment Policy (2018) has taken positive steps forward to create a more equitable workplace for women and other traditionally marginalised groups. The Policy itself was not ICT focussed, however many of the key recommendations were similar to the findings in this study - Priority Policies 1 and 7 in-particular:

Policy Priority 1: (19) Create more opportunities for young people aged 15 to 24 years to follow clear pathways from education to productive employment.

The Policy's first acknowledgement is that better coordination between education providers and the private sector is needed. This includes strengthening the career pathway process from senior secondary schools, universities, Higher Education Institutions, technical colleges and post-secondary TVET providers to specific employers. These pathways should be forged with employers who are able to provide work placements and job offers and who want to shape what and how relevant training is provided. There are opportunities to support women specifically as part of this process due to the overrepresentation of women choosing tangental careers when transitioning from ICT education to employment.

Policy Priority 7:20 Promote greater gender equality in employment and working conditions

The Policy aims to address statistics provided by Fiji's 2017 Census by the Bureau of Statistics, which showed that the labour force participation rate showed a significant differential in gender. The labour force participation rate for males was 76.4 per cent compared to females at 37.4 per cent. In the unemployment rates there is also a significant differential in gender which is 2.9 per cent for males and 7.8 per cent for females.

1. Identify ways for more women with post-school qualifications to stay in or return to formal employment.
2. Reducing segregation in employment for women
3. Women need equal access to public sector jobs and promotions
4. These principles underpinning the Recruitment and Selection Guidelines in Government should be the basis for implementing and monitoring Equal Employment Opportunities (EEO) policy in all workplaces.
5. Making it easier for more women with children to enter the paid workforce requires specific policies
6. Investigating and producing gender de-segregated data on women's labour force participation
7. Addressing the gender pay gap in Fiji
8. Greater enforcement of sexual harassment policies in public and private sector
9. Addressing the limitations of Maternity Provisions under the Employment Relations Act (ERA) 2007

The Policy recommends a review of the Maternity Provision within the Employment Relations Act to promote "breastfeeding friendly" work environment, paternal leave and marketing of quality and affordable care for working mothers including the provision of day care facilities and family-friendly work-time arrangements.

3. Fijian Private Sector.

The private sector in Fiji supports a range of digital roles and appears to be in transition to meet the increasing demand for services. Connectivity costs have been dramatically reduced and the outsourcing sector in particular is a clear government focus.

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[19] Ministry of Employment, Productivity and Industrial Relations (Fiji), Fiji National Employment Policy, 2018
[20] *Ibid*

For the first time in recent history technology development has enabled resource poor small island states a tremendous opportunity to be internationally competitive. The World Bank posits that the Pacific, Fiji and Samoa in particular, even have a comparative advantage (21).

Our observation from interviews was that the ICT private sector was reasonably progressive in their support of women in the workplace. It was recognised that gender positive workplace conditions are needed to retain and support women – often beyond that mandated by law. Our sample size was too small to come to any definitive conclusions however we were pleased with the policies that many of our interviewees had.

Outsourcing Sector

A growing and socially minded ICT sector will be better positioned to absorb the skills of talented women. With the right gender policies in place (education / labour laws), organisations will naturally seek to create a positive work environment to hold talent. While there are ample opportunities to create a more positive reformist agenda in favour of women, we largely applaud the Fiji government's desire to stimulate the outsourcing sector.

In 2013 it was estimated that the outsourcing sector was valued globally at USD950 billion, with expected growth rates between 4.7 and 6.0 perfect. Important for PICTs are Australia and New Zealand, estimated at 31 billion per annum and currently a major outsourcing market (22). Interesting correlations exist with small island economies Mauritius and Jamaica recognised among the offshoring leaders in their respective regions.

Fiji already hosts major offshoring operations for ANZ and Mindpearl, both in the Kalabu Tax Free Zone operated and administered by the Fiji Trade and Investment Bureau (Investment Fiji). ANZ Pacific currently has an estimated 400 workers, while Mindpearl has 660 workers. Fiji also won the European Outsourcing Association's Offshoring Destination of the Year Award in 2014 (Lewis 2014; Mindpearl 2014), which acknowledges destinations and operators that have most successfully serviced the UK and other European outsourcing markets (23).

This rapid growth trend for outsourcing to the Pacific represents a tremendous opportunities to create the right conditions for women to enter the workforce at a greater rate. More needs to be done to educate and support the next generation of female ICT specialists in Fiji to respond to the inevitable demand.

Case Studies

Our analysis included interviews with three emerging outsourcing companies benefiting from the current enabling environment.

GO2 Solutions

GO2 Solutions manage communications technology services in converged voice and data networks. They focus predominantly on Australia and New Zealand and support small to medium enterprises. GO2 employ 50 staff in telecoms and ICT infrastructure support. Approximately 30% of their personnel are women – including having the first certified female Mitel engineer in the Pacific. GO2 noted that key to the more recent success in attracting women was the creation of a more suitable environment for women to work and a friendly working from home policy. The G02 team is confident the market is transitioning and feel government support has worked in their favour – however do believe that not enough women apply for roles when advertised.

21 Natasha Beschorner, Siou Chew Kuek, Junko Narimatsu, The World Bank Group, 2015
22 Natasha Beschorner, Siou Chew Kuek, Junko Narimatsu, The World Bank Group, 2015
23 ibid

ACTON

ACTON Fiji Limited is a 100% employee owned Fijian Company, operated and led by Managing Director Shobha Reddy. Their aim is to be a Microsoft shop, rationalising upfront costs to the market with subscription / cloud based technologies. The team has been in business for two years and now employs 21 people, outsourcing to Indonesia and Singapore, complemented by an increasing domestic portfolio. ACTON has four women working in technical roles including software development, function advisory, NAV advisory and technology support. ACTION have an active internship programme and involve themselves closely with the USP careers fair and target the best graduates for the year. They note graduates do not have the work ready skills and their internship programme seeks to train coders with modern languages needed in the outsourcing industry. While they believe that their positive and supportive work environment encourages female applications, their core incentive for staff is equity, which is used to create permanency and loyalty.

Software Factory

Software Factory is a boutique software development house for enterprise wide application systems. They have 18 years experience in Fiji specialise in superannuation and financial platforms and own a range of products. They employ six people in Suva, two in PNG, and have recently opened an office in Sydney with four personnel. Software Factory are known as a technology pioneer in the Pacific, however remain lean and rarely hire. Their goal is to expand regionally and not focus on Fiji and have strong working from

home policies. Their staff are loyal and rarely move on, and are seen as a model to exemplify across Fiji. Software Factory have a fun office and a positive work environment. They employ some women but the numbers or ratio is unclear.

Other major employers and emerging players

While not interviewed as part of this analysis, we learned that Digicel, Vodafone and BSP Bank remain major recruiters of ICT graduates and professionals. Non-transitional industries are also increasingly bringing ICT to the forefront of their businesses. One female ICT specialist we interviewed worked for a tourism operator in digital marketing and web development, and multilaterals such as SPC have teams of developers, technology analysts and designers to assist with their digital transformation agenda (we interviewed two women from SPC). E-commerce platforms are growing in the Pacific, recognised as one of the best ways for businesses access international markets while supporting local ICT services. As part of the DFAT / UN funded Seedstars event (2019) which supports technology start-ups, a majority of the "pitches" were from women, and all the e-commerce platforms were managed by women.

Broadly speaking there were not a wide range of software development firms beyond those mentioned in this report. We also noted a lack of digital design expertise, with only Greenhouse Studios providing website development and strong desktop publishing skills. Dedicated software design, user experience and interface skills and companies were not noticed in our research.

The Greenhouse Studio

The Greenhouse Studio is a female led, creative design house that specialises in branding, corporate events, print, digital and integrated communication experiences. The team focuses on servicing the international development sector and take a modern approach to design and user experience. They are doing an increasing amount of website development services. The team has a strong gender balance and are led by a progressive ICT leader who is heavily involved in the Graduate Women of Fiji and their more recent work with NanoGirl Lab's STEM camps. The Greenhouse team have strong aspirations about creating a space for startups and digital nomads, which is a large gap in the market.

During this interview is was noted that a recent STEM camp had 200 applications and only 30 places, demonstrating strong demand for this type of activity. The camp targeting girls from squatter settlements and was run by NanoGirl Labs.

Pacific Islands Chapter of the Internet Society (PICISOC)

Another notable organisation that does not fit into the above categories but is worth mentioning is PICISOC which, among other things, raises awareness on the intersection between gender and technology.

PICISOC is a chapter that represents the interests of internet users in the Pacific region. It focuses on local issues and developments and seeks to provide impartial advice to governments and the public on internet-related matters. PICISOC has been at the forefront of a number of important initiatives in the Pacific region. As well as gender and technology, it raises awareness in a number of areas including geographic information systems (GIS), remote sensing (RS), cybersecurity, people with disabilities and the importance of access for all, internet governance, and free and open software.

Creating a positive space for women to work in tech

The ICT interviewees did appear to be making positive steps to support women in the workplace. There appeared to be strong working from home policies, support for flexible work and access to child care arrangements (both formal and informal). There are maternity leave provisions and most ICT workplaces were designed in a manner to attract and retain staff and promote a positive cultural environment. We know from our survey that women highly value working from home, and all workplaces supported this option.

The Fijian Government has also taken some major steps forward to mitigate cyber bullying and harassment online, including the harassment of women. There is a newly appointed Cyber Safety Commissioner that we interviewed as part of this analysis. The team is developing a strategy to limit harassment and educate young Fijians experimenting with new technologies. We would hope these efforts are translated to the workplace over time and that the strategy takes clear steps to minimise cyber harm to women in the workplace.

Accessing Talent

All interviewees noted that accessing talent was a major barrier to growth and that there were a limited number of female applicants. Our survey also noted that women saw less opportunity than men. Many employers have existing relationships with USP and FNU to cherry pick the best performing students. Almost all interviewees mentioned that there is a significant skill gap entering the workforce, and that the pathway into employment was not always clear. This is a detriment to women who might be more risk averse in their career choices due to social and cultural norms.

A consistent view is that many of the evolving sets digital skills are not coming through to the workplace, and there are very few professional user experience designers in the region.

Our assessment is that there are opportunities to improve the strategic dialogue between the private and tertiary sector to better inform the range of skills required in a rapidly growing sector - and within that dialogue - discuss how to improve the employment pathways for female graduates. This would also be aligned to Fiji new National Employment Policy (2018).

SUMMARY

Fiji is going through significant economic and social change. The ICT sector represents an incredible opportunity for small island states to prosper, and the Fijian labour market must be able to respond to the likely increase in demand for skills. As women are a significantly under-represented demographic in the ICT sector, it makes sense from both a social and economic perspective to invest heavily in women's participation.

Technology jobs across sectors is a good area to focus because of nascent opportunities and potential for future growth. By addressing cultural barriers and fixing the leaky pipeline and from education to careers and beyond, we believe women can be supported in making inroads into digital jobs.

As much as practical, we recommend organisations take an approach which supports all parts of the digital value chain. However, our research has found that support of the education sector - both teachers, government and students - would offer the highest development return on investment. Initiatives must be in line with Fiji Government priorities, while at the same time providing the greatest chance for women to excel in an ICT career should they so chose.