



Digital literacy: a review in the South Pacific

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Abstract

In this era of exponential prominence and adoption of technology, one needs to have the ability to find, evaluate, utilize, share and create ideas, responsibly and ethically, using Information Communication Technology (ICT) tools and technologies combined with the Internet. This emerging human attribute is known as digital literacy. Today, digital literacy is an essential component of everyone's personal and professional lives to survive and thrive in the digital world. The notion of advocating digital literacy around the world is leveraged on the shoulders of higher education institutes. The institutes are playing a pivotal role in mentoring the younger generation to be digitally literate so that they can contribute effectively towards an individual, societal and national development and progression. This same now applies to the South Pacific region as well, with its recent progressive growth of ICT and the dynamic use of digital technology. It can also be added that digital literacy and, by extension, digital fluency is more needed in developing countries, including the South Pacific region, as these countries rely heavily on ICTs for their economic survival, competition and progression. However, there is a dearth of baseline research on digital literacy in the South Pacific since the concept is still new and an emerging one in the region. A few works have been done on the components of digital literacy highlighted in this integrative literature review paper. The anecdotal research will elaborate on the concept of digital literacy, discuss its importance and impacts with major emphasis on the South Pacific, and provide a comprehensive review of digital literacy, its importance and its impact on higher education in the South Pacific.

Keywords Digital literacy · South Pacific · ICT · Digital technology · Higher education

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Introduction

The advancements in technology have created smart tools and multifunctional devices that have changed societies in the Information Age. These innovations have brought both positive and negative impacts for the people and society. On one hand, the use of technologies and the Internet has put information on human fingertips, communication has improved, applications and research are increasing, and better and more inclusive services are offered to the people (Chaudhary et al., 2017; Hongthong & Temdee, 2018; Kumar et al., 2019; Reddy et al., 2020b; Sharma et al., 2019b; Stricevic, 2018; Reddy et al., 2017; Sharma & Reddy, 2015). On the other hand, the authors Lynch (2017) and Erstad (2016) state that due to the differences in ability and digital competencies of individuals in a society, how the innovations are used is a concern. For example, according to Cunningham (2019), an individual coming from an industrialised nation that has a higher per capita level will be better positioned to make good use of these innovations when compared to those coming from developing countries that are less industrialised with lower per capita levels. The developing countries lack technical and structural skills to fully utilise Information Communication Technology (ICT) innovations for the many benefits associated with them (Delponte et al., 2015).

To overcome the problems associated with the digital environments, one needs to acquire a range of skills such as technical, cognitive and sociological skills. According to Eshet (2002), digital literacy is associated with a special set of skills of retrieving data and evaluating it, utilizing and communicating by deciphering. Digital literacy has brought new horizons and has restructured the definition of literacy. A digitally literate person now perceives literacy as an innovative approach to understand and manage the information around him (Lynch, 2017). Researchers have defined digital literacy in many ways, and this is further elaborated upon in the next section.

The concept of digital literacy has been implemented in the developed countries and continues to get a firm hold of the education sector with time; however, with the growing use of ICT technologies in many facets of human endeavours, including new pedagogical developments in education, the South Pacific countries also stand to be impacted. Table 1 shows the percentage of the Internet and social media users in the South Pacific. It can be assumed from the statistics given in Table 1 that the revolution of the Internet, the use of digital technologies has amplified in the past decade. The growing use of the Internet and mobile devices, coupled with the proper induction of digital literacy in the South Pacific region, can provide remarkable benefits. The need for individuals in the South Pacific to be digital literate is critical since there has been an accelerated growth in the use of digital technology and digital platforms in the South Pacific (Reddy et al., 2016, 2020d; Nand & Sharma, 2019; Sharma et al., 2019a). The notion of digital fluency amongst the South Pacific populace will enable them to use the new digital technologies more responsibly. As South Pacific individuals become digitally literate, they will contribute effectively towards their nation's development and progress (Reddy et al., 2020c; Kuzminska et al., 2018; Martin & Grudziek et al., 2015; Zhang & Zhu, 2016).

Table 1 Percentage of the internet and social media users per country (Miniwatts Marketing Group, 2018)

Country	Internet users (% population)	Social media (% population)
Fiji	54.9	51.5
Samoa	50.6	47.5
Tonga	53.0	49.5
Vanuatu	29.3	22.3
Tuvalu	46.2	15.2
Solomon Island	12.1	10.9
Nauru	53.4	29.9
Marshall Island	39.5	37.6
Kiribati	27.8	25.3

The awareness and mentoring of digital literacy require much work in the South Pacific region, keeping in mind the existence of challenges, some of which may be unique to the region. These challenges include the very common amongst all countries; motivating the individuals to upskill their digital skills due to the different ages, background, existing ICT knowledge, objectives and culture (Hongthong & Temdee, 2018; Lynch, 2017; Reddy et al., 2017; Sharma et al., 2019b; Zhang & Zhu, 2016). Also, challenges faced by developing countries such as poor infrastructure, lack of financial support from stakeholders, digital divide and lack of trainers widely exist (Heick, 2019; Kumar et al., 2019; Kuzminska et al., 2018; Martin et al., 2015; Reddy et al., 2020; 2020b; 2020c; 2020d; Sharma & Reddy, 2015); Zhang & Zhu, 2016. To add on, the challenges faced in the South Pacific region include the underlying issues such as the need for proper ICT infrastructure, penetration of the Internet and availability of resources that affects an individual's adaptability to the digital society (Reddy et al., 2020b; Sharma et al., 2019a, 2019b). This paper reflects on the following:

1. The definition and components of digital literacy by different researchers under the heading
What is digital literacy?
2. Active components of digital literacy in the Pacific under the heading Active Components of Digital Literacy—South Pacific Context.
3. Importance of digital literacy and its impacts on higher education in the South Pacific under the heading Importance and Impacts of digital literacy at higher education in the South Pacific
4. Future directions of digital literacy in the South Pacific under the heading Conclusion and Future Directions.

Research questions

This research paper intends to study the emerging concept of digital literacy, its impact on higher education and its active components in the South Pacific. Thus, this study examined the following research questions:

1. How have different researchers defined digital literacy?
2. How have the components of digital literacy evolved?
3. What is the role of digital literacy in higher education, particularly in the South Pacific?
4. Which components of digital literacy are active in the South Pacific?
5. What is the impact and importance of digital literacy at higher education in the South Pacific?

Methodology

The methodology used for this study is an integrative literature review. According to Snyder (2019), this literature review style intends to study an emerging concept with the overview of previous knowledge or studies being conducted, conceptualizes and expands on a specific topic's theoretical foundation. Since there have been no studies conducted in the South Pacific on digital literacy, this study takes an approach to first review prior research done worldwide on this subject and its impacts on higher education. After which, the study relates the impacts of digital literacy in higher education in the South Pacific and the active components of digital literacy in the South Pacific context. This study reflects on the role and impact of digital literacy at higher education in the South Pacific and how the higher education institutes are addressing the issue for the populace. The paper concludes with recommendations on how the South Pacific people can become digitally literate with an emphasis on higher education.

Background

What is digital literacy?

In this Information era, every citizen needs to be literate. Traditionally, researchers have defined literacy as the ability to read and write. The concept of literacy has evolved with the advent of technology; in other words, new technologies and the Internet have changed the form of literacy (Heick, 2019). The new digital platforms have transformed literacy into digital literacy. Today, with the digital revolution in place, the concept of digital literacy has not only become popular but highly researched and included in education through new pedagogies, policies, and curriculum (Reddy et al., 2020c; Ata & Tilirim, 2019; Kumar et al., 2019; Nand & Sharma, 2019; Brofman & Pelegrin, 2018; Sharma & Lauano, 2018; Sharma & Nand, 2018; Perdana et al., 2016).

This section of the paper will reflect on how different researchers have defined digital literacy. According to Hargittai (2005), more information is now available to users online due to technological developments. However, that does not guarantee that people will be able to navigate efficiently through billions of pages on the Internet, as they require special skills to deal with the queries and knowledge about the search engines to find information. This limits people to maximize the information

available on the web. Therefore, Hargittai (2005) states that digital literacy provides a visible solution to this problem. The author defines digital literacy as people's web-use skills, that is, a user's ability to locate content on the web effectively and efficiently.

On the contrary, Jones and Flannigan (2008), in their article "Connecting the Digital Dots: Literacy of the 21st Century" state that the current generation of teenagers—sometimes referred to as E-Generation, already possess the digital competencies that are needed to navigate through the multidimensional digital environment. The senior population and late adopters have to adapt to the new digital skills that are foreign to them. According to the authors, the literacies associated with digital literacy continue to be identified with an emphasis on ethics, responsibility and security attributes of digital literacy, which have emerged to be very important in recent years. However, the common findings have weaved the following literacies to digital literacy; visual literacy, media literacy, information literacy, lateral literacy and reproductive literacy.

According to GoodFellow (2011), digital literacy is the awareness, attitude and ability of individuals to use digital tools for communication, expression and social action in specific life situations. He has conflated several literacies to digital literacy, such as ICT literacy, technology literacy, information literacy, media literacy, visual literacy and communications literacy. He also stated that the literacies combined could lead to the continuous development of critical pedagogy and social practices.

Park (2011) defines the notion of digital literacy as one's knowledge regarding computer-related functions combined with the user's knowledge about Internet privacy. He stated that if a person is digitally literate, he or she must be aware or possess knowledge on privacy and online privacy-related behaviours in this Internet era. There must be a critical understanding of data flow and its implicit rules for users to be able to act, and hence digital literacy may serve as a principle to support, encourage, and empower users to undertake informed control of their digital identities.

Dutta and Mathur (2014) define digital literacy as the ability to effectively navigate, evaluate and create information using a variety of digital technologies. The authors state that if a person is digitally literate, he or she can operate and transform digital media, distribute it widely and easily adapt to new forms of media. One of the challenges faced in advocating digital literacy in developing countries like India is a lack of resources such as funding and trained instructors for supporting the education infrastructure. The authors believe that if the countries work on developing literacy programs for their citizens, each individual that becomes digital literate will contribute to the national economic development.

According to Martin and Grudziecki (2015), the evolution of literacies begun in the late 1960s, this was termed as ICT literacy. The authors defined ICT literacy as a three-phase development, which was from skills through usage to reflection. The concept of three-phase development literacy and the incoming of new digital tools and technologies led to the evolution of other new literacies, which formed the subordinate layers of the more complex and multilayered literacy concepts. The new literacies that evolved are technology literacy, information literacy, media literacy, visual literacy and communication literacy. The authors also state that literacies could overlap. However, the literacies can be defined based on the context they are used.

While researchers have given different definitions of digital literacy or associated a different set of literacies to be a part of digital literacy, Erstad (2016) has a different point of view. According to him, digital literacy is not about IT literacy, ICT literacy or computer literacy. It is about how one can relate to different forms of media while using and incorporating technological changes. The author's idea of literacy is about how meaning can be derived from resources in the environment, and how it can be communicated by using different means, not only understood as 'reading' and 'writing' written text or bounded by certain technologies. The author categorises all these activities under media literacy. Therefore, in his research, he focused on the uptake and use of digital technologies on the different aspects and categories of media literacy, such as basic skills, downloading, searching, navigating, classifying, and integrating, evaluating, communicating and creating.

Buckingham (2016) emphasises that digital literacy is much more than just learning how to use the computer, keyboard and Internet and how to look for information online. Although it begins with the attributes mentioned above, digital literacy skills are not confined to that. The author also states that together with the basics, one needs to know how to evaluate information, understand how to produce information and the ways it represents information in the world. In his paper, he also mentions that a digitally literate person in this era needs to know about media literacy since the use of media such as books, magazines, newspapers, television and social networking sites permeating the digital society today. In addition to this, gaming literacy is as important because, in the coming years, gaming literacy will address the challenges the other associated literacies will bring.

Stricevic (2018) states that the changes in the environment and how information is disseminated result from new developments in the digital world. For the people to be active participants of this new environment, a new set of skills and abilities is required to utilize these new digital formats and tools. These new sets of skills and abilities are termed digital literacy. According to Stricevic (2018), the essential components of digital literacy are access and information acquisition, interaction with this information, communication and dissemination.

According to Hongthong and Temdee (2018), digital literacy is more than just having the ability to use software and electronic devices. It involves assimilation and accommodation of the learning process; it involves different literacies (visual literacy, information literacy, reproduction literacy) and has elements (culture, construction, communication, confidence, creativity and critical thinking). The authors also state that although there are challenges present to upgrade ones' digital skills, people have to enhance their digital literacy to obtain benefits from the digital society.

Table 2 shows how different authors have perceived digital literacy. The table summarises how the definition of digital literacy has changed over 8 years and what new literacies have been developed and included as part of digital literacy. According to the literature, the associated literacies vary due to the nature of the research and environmental settings. Also, (Meyers et al., 2013) stated that due to the availability of new and emerging ICT and digital tools, the definition of digital literacy ranges and varies as per different researchers. The authors of this study conclude that for an educational setting, the most appropriate literacies would be technology, media, communication, information, visual and computer literacy.

The definition of digital literacy ranges from the simple use of technology to read and write or present views to the ability to apply information literacy skills in the digital environment. It is not only the responsibility of individuals in the formal environment such as schools to prepare an individual to be digitally literate but now the updating and understanding of one's digital literacy skills begin from the informal environment such as homes, that is, from toddlers to seniors (Meyers et al., 2013). Today, digital literacy is not strictly about competence in school-based research tasks, but it is about effectively participating in our new digital world. This learning strategy is the beginning of life-wide and lifelong learning.

Digital literacy and higher education

The emergence of digital technology has fostered a plethora of change in not only the industries and societies but also the way teaching and learning are taking place. The higher education institutes (HEIs) have added responsibilities in the way they deliver formal education and prepare their graduates for the existing and future job markets because these job markets are becoming increasingly competitive (Nawaz & Kundi, 2010) and technology-driven (Sharma & Reddy, 2015; Reddy et al., 2016). However, higher education is still debating on making education based on intellect or for the dynamic job market (Reddy, Chaudhary, et al., 2020; Ata & Yildirim, 2019; Kim & Choi, 2018; Bronfman & Pelegrin, 2018). The employers value candidates' university qualification as they see them as a reliable indicator of the candidate's competencies, therefore, the HEIs must prepare their students for the job market (Premuzic & Frankiewicz, 2019; Harvey, 2000). To add on, Harvey (2000) states that learning at higher education must change with the changing environment and developments so that individuals develop appropriate skills for the job market. Since many technological innovations are taking place, organisations and businesses are adopting them to make their systems and processes more efficient and productive. Hence, the workforce now requires relevant skills to perform tasks and achieve goals set by the organisations. To meet these new and growing demands of the job market, many HEIs around the globe are now aiming to develop new yet dynamic programmes, which will widen their learner's 21st-century skills (Tanaka, 2012; Ken, 2018; Raturi, 2018). The authors (Kalolo, 2019; Premuzic & Frankiewicz, 2019; Erstad, 2016) state that 21st-century skills include collaboration, communication, digital literacy, citizenship, problem-solving, critical thinking, creativity and productivity. The aforementioned authors also indicate that 21st-century skills are more related to the skills required by individuals living in this digital era. Therefore, the HEIs play a pivotal role in mentoring 21st-century skills to the future generation.

The education sector has the most potential to incorporate technology than any other sector in the world (Aristizabal et al., 2019; Voogt et al., 2013). The use of mobile devices such as laptops, notebooks, tablets and smartphones in pedagogical practices has become a norm at higher education today, which has transformed the higher education pedagogical practices. The integration of technology with higher education practices has created virtual learning environments, developed new delivery modes, developed interactive education applications and

Table 2 Summary and definition of digital literacy perceived by different authors over 9 years

Year	Author (s)/title	Literacies associated with digital literacy
2018	Hongthong and Temdee "Personalized Mobile Learning for Digital Literacy Enhancement of Thai Youth"	Visual, Information Reproduction
2018	Stricevic "Literacies in the Digital Age- New Teaching Paradigms and Solutions for Academic Libraries."	ICT
2017	Dutta "Evolution of Digital Literacy project in rural India."	Media
2016	Buckingham "Defining Digital Literacy: What do young people need to know about digital media?"	Media Gaming
2016	Erstad "Educating the Digital Generation: Exploring Media Literacy for the 21st Century"	Media
2015	Martin and Grudziecki "DigEulit: Concepts and Tools for Digital Literacy Development."	Technology Information literacy, Media literacy, Visual literacy Communication literacy
2011	Park "Digital Literacy and Privacy Behavior Online."	Internet Privacy
2011	GoodFellow "Literacy, literacies and the digital in higher education."	ICT Technology Media Visual Communication

online diagnostics and initiated collaborative and personalized learning, and differentiated instructions to name a few (Aristizabel et al., 2019; Nand & Sharma, 2019; Reddy et al., 2016; Flewitt et al., 2015, Sharma et al., 2015). According to Bekker et al. (2015), the new digital technologies have introduced new digital tools for higher education teaching and learning purposes. For example, 3D printers, digital toolkits, Short Message Service (SMS) and app-based notifications, mobile apps, mobile learning and tablet learning, communication and collaboration software such as Edmodo, Zoom and Big Blue Button, the use of SMARTboards and SMARTdesks, Intelligent Tutoring Systems, the use of gamification (Newman, 2017; Reddy et al., 2016, 2017; Sharma et al., 2015).

Flewitt (2015) also mentioned that digital technology had facilitated design-based learning in the Netherlands, whereby interactive products with societal relevance are used towards the development of digital literacy skills of the students. The use of digital technology has also benefitted the students who fall under inclusive education. The use of digital tools has made the curriculum more accessible to these students and enabled the facilitators to develop resources and relevant activities, which assisted them in developing the students learning capabilities at HEIs (Alsalem, 2016; Dennis et al., 2015).

The researchers Kalolo (2019), Dneprovskaya et al. (2018), Ken (2018, Nawaz and Kundi (2010), state that in the higher education sector, digital technology is used in the following manner:

1. Digital technology as a device is delivered and get access to course resources
2. Digital technology as an adaptive technology can be used for teaching and learning
3. Digital technology as a possibility-opener- can open up new opportunities for pedagogical practices.

However, research has also shown that together with resolving the challenges faced like lack of time and guidance and training, a new set of skills and competencies are required to use these new digital technologies for purpose and maximum benefit. These necessary skills are now coined as digital literacy skills, which are needed for the productive and responsible use of the existing and future technologies (Voogt et al., 2013). The researchers of digital literacy in the literature indicated a gap between the education system and the digital tools used for pedagogical practices. Digital literacy and, subsequently, digital fluency can ease this gap (Reddy et al., 2020c; Flewett et al., 2015; Bekker et al., 2015; Voogt et al., 2013).

Literacy practices and education need to begin from home from an early age since the use of digital technology over the past decade has exponentially risen because it is readily available and affordable. According to Lankshear and Knobel (2015), this form of digital literacy can be categorised as personal digital literacies that are knowing how to use the computers, the use of the web, the use of online videos and blogs, and using the Internet to search for information. The author (Pangrazio, 2016) states that individuals must have the skills to use digital

tools so that they are not behind in various aspects of their lives. With the incorporation of digital tools in educational practices from early childhood education to higher education, the learners must know how to use these tools and for that, they need to keep developing their digital literacy skills. Pangrazio (2016) associates digital literacy with socio-cultural practices meaning individuals need to have some digital literacy before they receive more education on the subject in schools, colleges and universities. An individual's personal experience with the use of digital tools and digital platforms enable them to explore deeper ideologies when they use digital tools and digital platforms at the educational level (Frank, 2017). Also, (Burnett, 2009) adds that if students are aware of the use of digital tools and platforms, it becomes easier for the teachers to incorporate new teaching methodologies and techniques in the classroom. Therefore, the authors (Burnett, 2009; Frank, 2017) strongly emphasise that personal digital literacies complement digital literacies in education and enables students to efficiently understand, explore and be responsible for the digital practices in the education landscape.

Active components of digital literacy

The notion of being a digital literate has already begun in developed countries; however, the divide in the developing countries still exists. A developed country is more industrialised and has a higher per capita level for example Australia, United States, Spain, Korea whereas a developing country is less industrialised with lower per capita levels, for example, China, Fiji, India, Argentina etc. (Cunningham, 2019). Closing the gap of digital literacy has become crucial, and this is achievable if a country's populace is provided with access to the Internet and ICT resources and trained how to use these resources responsibly, ethically and safely. For the developing countries, HEIs are now working towards closing this gap by mentoring the students on relevant digital skills (Goodfellow, 2011; Chan et al., 2017). Since the HEIs in the developing countries are leveraging their educational delivery on technology, each student enrolled needs to be digitally literate so that they can be successful, complete their higher education learning journey and contribute effectively towards the national building (Bronfman & Pelegrin, 2018). Also, the government and relevant stakeholders are supporting the HEIs of the developing countries to improve infrastructure, provide adequate access to the Internet and implement relevant policies related to the use and implementation of digital technology into the teaching and learning practices (Reddy et al., 2020; 2020b; 2020c; 2020d; Sharma et al., 2019a, 2019b; Bronfman & Pelegrin, 2018; Techataweewan & Prasertin, 2017).

A nation's government will play an important role in this as it will be developing and implementing policies associated with digital access and digital education. With proper policies in place and initiatives like Wireless Fidelity (Wi-Fi) access, free and low-cost devices for students, low cost of ICT devices and services, the government can assist its nation to bridge the digital divide and enhance digital literacy amongst its people (UNESCO, 2018; Unicef, 2017). Many digital literacy initiatives such as including digital literacy education in

the education sector, digital training programs for disadvantaged backgrounds, upskilling digital literacy skills for adults are in place so that everyone has the opportunity to participate in the digital world by using the various digital tools available contribute effectively to a vibrant, informed and civic community (ITU, 2020). Table 2 shows the literacies associated with digital literacy by researchers in literature. Globally, the active components of digital literacy are information literacy or ICT literacy, computer literacy, media literacy and visual literacy (Reddy et al., 2020c; Hongthong & Temdee, 2018; Strivevic, 2018). However, the most common literacies studied and associated with digital literacy and information or ICT literacy, Internet literacy and media literacy. Researchers claim that digital literacy involves the technical skills, evaluation of information for biasness and trustworthiness with more emphasis placed on media representations (Nikou & Aavakare, 2021; Zoubi, 2021; Madge & Ronu, 2020; Kusumashtuti & Nuryani, 2020; Polizzi, 2020). Therefore, it is evident that information or ICT literacy and media literacy are most commonly associated with digital literacy and researched upon.

The quest for digital literacy is the same in the South Pacific region, where the governments with non-profit organisations are collaborating to implement the notion of digital literacy or at least some components of digital literacy. In addition to this, organisations such as the Commonwealth of Learning (COL), the Pacific Region Infrastructure Facility (PRIF), United Nations Educational, Scientific and Cultural Organization (UNESCO), the Technical Centre for Agricultural and Rural Cooperation (CTA), European Union (EU), are implementing initiatives for the South Pacific countries to improve their status of digitalisation. The initiatives by the organisations mentioned above are:

1. Infrastructure development, improved connectivity and bandwidth for the HEIs in the South Pacific to support distance and flexible learning courses (UNESCO, 2018; Commonwealth of Learning, 2012)
2. Development and implementing policies relating to the use of digital technology (CTA, 2019; UNESCO, 2018)
3. Training of trainers who can educate the South Pacific populace about digital literacy and providing platforms to integrate digital technology such as the integration of technology in agriculture (CTA, 2019; UNESCO, 2018; Commonwealth of Learning, 2012).

According to Asian Development Bank (2018), the governments of the South Pacific countries are now working towards Information Communication Technology for Education (ICT4E) intervention to provide better education to their students—much of the focus is on the higher education sector. The ICT4E aims to align policies to meet the rapid growth and usage of technology at the HEIs in the South Pacific region. Also, good Enterprise Resource Planning software to support student administration, human resources and financial functions are being implemented (Asian Development Bank, 2018). All the initiatives mentioned above have been developed and implemented to provide better learning

opportunities for students. Advocating digital literacy to the students at HEI means educating the future workforce of the South Pacific, which will eventually contribute to the economic and infrastructure development of these regional countries, enhance the quality of health and education services, and social and political progress (Nand & Sharma, 2019; Sharma et al., 2019a, 2019b; Raturi, 2018; Reddy et al., 2017).

Active components of digital literacy: South Pacific context

The South Pacific Island consists of 22 countries which are located in the Pacific Ocean. Figure 1 shows the dispersion of the South Pacific countries, covering about 551 452 km² of land area and a populace of about 11 930 769 (Pacific Community, 2018a, 2018b). The population of the 22 countries in the South Pacific is summarised in Table 3.

The South Pacific region comprises of developing countries, which share a dependence on imports and exports for economic development. Agricultural-based products, including forestry and fisheries products, are the next important trade patterns, while the leading exports and producers are sugar from Fiji, palm oil from the Solomon Islands and Papua New Guinea, and processed fish from American Samoa, Solomon Islands and Fiji (Fairbairn, 2020; Reddy et al., 2017).

The study of literacy in the South Pacific began in the latter half of the twenty-first century, and as it was explored and researched, the notion and definition of literacy kept changing (Mangubhai, 1987). The innovation of technologies and new digital tools enforced literacy to be part of people's daily lives, which was then used to acquire new knowledge, disseminate information and support daily activities (Whelan, 2008; Cave, 2012; Reddy et al., 2020d).

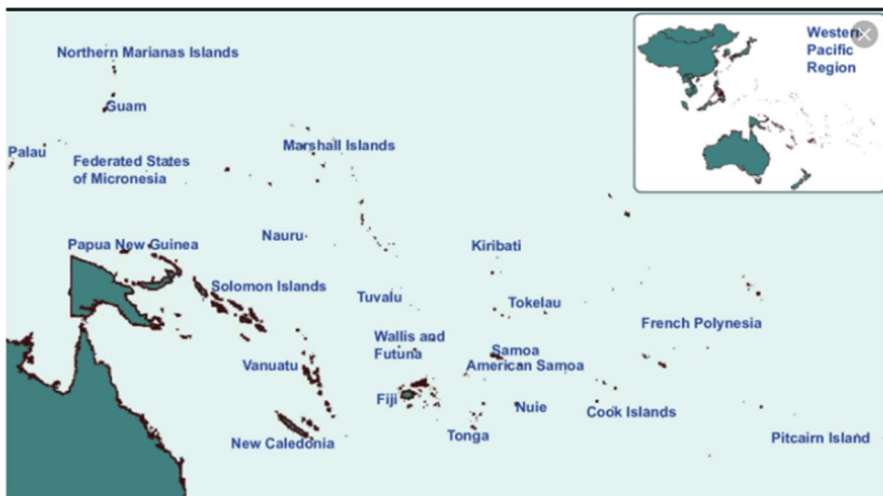


Fig. 1 South Pacific countries (Adopted from Craig et al., 2016)

Table 3 South Pacific countries with their corresponding population size

	South Pacific Country	Current Population
1	 Papua New Guinea	8558800
2	 Fiji	888400
3	 Solomon Islands	682500
4	 Vanuatu	304500
5	 New Caledonia	285500
6	 French Polynesia	277100
7	 Samoa	196700
8	 Guam	172400
9	 Kiribati	120100
10	 Federated States of Micronesia	105300
11	 Tonga	100300
12	 American Samoa	56700
13	 Northern Mariana Islands	56200
14	 Marshall Islands	55500
15	 Palau	17900
16	 Cook Islands	15200
17	 Wallis and Futuna	11700
18	 Tuvalu	10200
19	 Nauru	11000
20	 Niue	1520
21	 Tokelau	1400
22	 Pitcairn Islands	50

Over the years, the South Pacific region has witnessed enormous growth in the utilisation of the digital technology especially the Internet in various fields (Reddy et al., 2020b; Nand & Sharma, 2019; Sharma et al., 2019a, 2019b; Raturi, 2018; Reddy et al., 2017; Sharma & Reddy, 2015). According to Vula (2019) as of 2019, the Pacific Islands stands on the cusp of a digital revolution. Table 1 summarises the statistics of Internet penetration in the South Pacific. By 2023 the penetration of Internet users will double the figure obtained at the end of 2018 as there will be sufficient infrastructure to support the digital switchover process in the region (GSMA, 2019).

The use of digital technology especially the Internet has penetrated every aspect of a South Pacific Islander's life, be it health or agriculture, governance or transport, electricity or water supply, finance or education (Reddy et al., 2020b; Raturi, 2018; UNESCO, 2018; Chaudhary et al., 2017; Sharma et al., 2019a, 2019b; Reddy et al., 2017, Reddy et al., 2016; Ravindra et al., 2015; Sharma et al., 2015; Commonwealth of Learning, 2012; Tanaka, 2012). According to Cave (2012), the Pacific's digital revolution has been sustained and accelerated by the youths or 'digital generation' of the Pacific. Therefore, the Pacific

countries have undertaken major reforms in their telecommunication sectors to meet their populace's demands. The education sector was one of the most recent, yet major adopters of digital technology (Reddy et al., 2016, 2020d; Sharma et al., 2019a, 2019b; Reddy, Chaudhary, et al., 2020) due to the realization that this would make the learning processes more effective and demands from the students are met. According to the researchers conducting studies in the South Pacific region, the issue of lack of digital literacy persists due to poor ICT infrastructure, lack of equipment and networking materials. Also, there is a lack of technical support, maintenance and electricity supply, lack of ICT policies and support from the stakeholders. Moreover, the issue of the digital divide and lack of trained people who can mentor the South Pacific populace on digital literacy persists (Kala, 2013; Sharma & Reddy, 2015; Reddy et al., 2016, 2020d). The studies conducted revealed that although the education sector, particularly higher education, was progressing well with the adoption, adaptation and design of digital tools and digital platforms for learning, digital literacy is still an issue as there is a lack of knowledge, skills and competencies amongst the users. Also, most administrators, management and decision and policymakers are not fully aware of the impact and importance of digital literacy. Hence, the investments into digital literacy have been sub-standard and the establishment of essential components of digital literacy still in its infancy. Notwithstanding the ignorance, there are pockets of definitive work in the area of digital literacy. Since not much research has been done on digital literacy, this paper discusses the components of digital literacy known to the South Pacific people.

Looking at the literacies that have been summarised in Table 2, in the South Pacific, the most common and active ones have been *Information Literacy (IT literacy)*, *Information Communication Technology Literacy (ICT literacy)*. We highlight a few examples of the active components of digital literacy in the Pacific studied by researchers. According to Davis et al. (2002) IT literacy has become of utmost importance for people to be successful as the working industry has become Information Technology (IT)-enabled. In the South Pacific, Fiji is ranked the most favourable in terms of literacy; therefore, the country needs to focus more on IT literacy so that its populace can be ready for the IT-enabled working environment. A report by (Ministry of Economy, 2017) stated that the IT literacy of Fiji's populace was not sufficient for Fiji's IT-enabled work sector. Therefore, the government plans to work closely with industry, tertiary education institutions and development partners to prepare a workforce of highly skilled Fijians in line with future industry demand, in particular for the new growth sectors. The development mentioned above is in line with the plan to adopt new technologies that will support transportation, renewable energy, manufacturing, agriculture, ICT, education and other service-related sectors. ICT literacy is another component of digital literacy, which has been a major focus in the South Pacific. The University of the South Pacific (USP) has been playing a proactive role in improving student's ICT literacy to create the ICT culture in the South Pacific with the inclusion of technology into its teaching and learning process (Park, 2018; Raturi, 2018; Reddy et al., 2016; Reddy, Chaudhary, et al., 2020; Sharma et al., 2015, 2019a, 2019b). It was in the 1950s that ICT came to the Pacific, and the South Pacific Community (SPC) was its mandated custodian. By 1970, SPC

formed the Council of Regional Organisations in the Pacific (CROP) agencies which consisted of the University of the South Pacific (USP), Forum Fisheries Agency (FFA), Pacific Islands Development Programme (PIDAP), Pacific Islands Forum Secretariat (PIFs), Secretariat of the Pacific Regional Environment Programme (SPREP), South Pacific Tourism Organisation (SPTO), Pacific Power Association (PPA) and Pacific Aviation Safety Office (PASO) who worked on the South Pacific's ICT plans (Thompson, 2016). It was later in 2012 when the responsibility of ICT moved from SPC to USP. The USP from then till now is the major driver of ICT in the South Pacific (Reddy et al., 2017, 2020; 2020b; 2020c; 2020d; Sharma et al., 2019a, 2019b; Sharma & Reddy, 2015).

The USP was the early users and adopters of ICT in the South Pacific region and this usage gradually penetrated to all its 12 member countries across the region (Sharma et al., 2015, 2019a, 2019b). By 2005, the Pacific leaders adopted the Regional Digital Strategy as the penetration of the Internet, ICT tools and new digital technologies were becoming popular amongst the students (PRIF, 2015). Recently, with the improved IT infrastructure, high use of the Internet and the incoming of new digital tools, other higher education institutes; secondary and primary schools in the Pacific have also introduced the use of digital tools for learning (Reddy et al., 2016, 2020d; Park, 2018; Raturi, 2018). The authors also stated that the South Pacific region is now at a focus since UNESCO is putting an effort to improve the education that is sustainable development goal number 4 (SDG4) by the year 2030 by improving the digital skills of the youths and the adults. On the other hand, while educational institutes are welcoming the idea of using ICT tools for education, there are various concerns regarding the ICT literacy skills of the South Pacific populace to achieve a life-long and life-wide learning experience. The researchers in the South Pacific have included IT literacy skills as part of ICT literacy; therefore, advocating for ICT literacy means the inclusion of IT literacy skills. Through the review of most of the work categorised as ICT, some of the major initiatives for the South Pacific region in recent times to improve ICT literacy skills are:

1. The USP also provides free use of open-source software (FOSS) to enrolled students from the South Pacific region (Yusuf, 2009).
2. Workshop for the Australian Council on Open, Distance and eLearning (ACODE) to harness the tremendous prowess of Information Communication Technology hosted by USP (USP, 2013).
3. National Framework of Digital Literacy in Fiji, which includes programmes for students from Year 1 to 12 (Vakasukaawaqa, 2015).
4. SchoolNet Project in Samoa to incorporate learning and increasing the use of computers at secondary and primary schools (PRIF, 2015).
5. One Laptop per Child (OLPC) initiative in Fiji, Samoa, Solomon Island, Tonga and Vanuatu. However, after the pilot, this project was not scaled up (PRIF, 2015).
6. Digital Finance Service workshop for the South Pacific hosted in the Solomon Islands by PFIP (PFIP, 2016).
7. The initiatives from PVCs (Peace Corps/Tonga Volunteers) to use technology to improve the literacy of Tongan teachers (Jurmo, 2017).

8. The USP provided ICT training to about 860 primary school students and 680 parents in the Western division of Fiji (Yusuf, 2009). Such training programs are common in recent times, and several organizations and government ministries, in collaboration with overseas donors, facilitated these (USP, 2018; Ministry of Economy, 2017).
9. Developing a framework for Pacific Regional Framework 2018–2030 Moving towards Education 2030 (Pacific Island Forum Secretariat, 2018).
10. The introduction of the Pacific Islands Literacy and Numeracy Assessment (PILNA) by the South Pacific Community (SPC) to improve literacy amongst the South Pacific (Pacific Community, 2018a, 2018b).
11. The Science Teachers Accelerated Programme (STAP) for the teachers in Tonga, Samoa and Kiribati enabled the teachers to learn to use new digital tools for their learning process (Sharma et al., 2018; Sharma & Nand, 2018).
12. The development of the USP Pacific TAFE App, SKILL ME UP, will keep the Pacific TAFE students informed about the latest use and upskill their literacy and numeracy skills (USP, 2019a, 2019b).
13. In Fiji, the initiative of digital Fiji, which is a Fiji Government digital transformation, is now making several government applications online such as applying for and printing birth certificates, company and business name registration (Ministry of Health, 2019)
14. ICT initiatives by The Technical Centre for Agricultural and Rural Cooperation ACP-EU (CTA) to improve development in the Pacific, such as TraSeable Farms which uses blockchain technology to solve the challenges faced in fisheries and agriculture. The group train and educate their customers about their products. The MyKana app, which is a product of the USP and the National Food and Nutrition Centre that helps the people in Fiji to keep track of their calorie intake (CTA, 2019).
15. The integrating of financial education (FinEd) within the Fijian national school curriculum by the Pacific Financial Inclusion Programme (PFIP) (PFIP, 2019). This has also been implemented for online learning to educate Pacific Islanders who are part of the seasonal workers' schemes in Australia and New Zealand.

The USP, a major higher education provider in the South Pacific, has shown a keen interest in incorporating ICT literacy education into its curriculum and learning and support practices with the adoption of new digital tools and technologies. The university has many ICT related tools and technology for educational purposes, such as (Raturi, 2018; Sharma & Lauano 2018; Sharma & Nand, 2018; Nand & Sharma, 2019; Sharma et al., 2019a, 2019b; USP, 2019a, 2019b; Reddy et al., 2020b):

1. mLearning—whereby mobile apps have been developed to assist the students, for example, a Course Finder app, USP/Course news, Instant Notification, Events, Course Timetable, Exam Timetable, Frequently Asked Questions and First-Year Tools

2. Tablet learning—whereby the first-year students and students in cohort-based programmes are distributed with tablets which consist of course resources for elective courses
3. Development of sign language tools through the use of ICT
4. Eye cane and braille eye slate— which aids in mobility for blind and visually impaired individuals
5. Creating an electronic portfolio (e-Portfolio) to assess students' competencies for the industry
6. Other ICT related initiatives and innovations such as Online Mathematics Diagnostic Tool (OMDT), Faculty Online Orientation Tool (FOOT) and eMentoring
7. Workshops on developing equitable access to quality resources and information literacy by Pacific Islands Forum Secretariat (PIFS), Pacific Regional Initiatives for the Delivery of Basic Education (PRIDE), Secretariat for the Pacific Community (SPC), United Nations Children's Fund (UNICEF), United Nations Educational, Scientific and Cultural Organisation (UNESCO) and the Pacific Resources for Education and Learning (PREL).

Since the uptake of digital technology is high amongst the youths of the South Pacific region and incorporating these new digital tools into the teaching and learning process at USP was a success, the university introduced a generic mandatory course on Communication and Information Literacy for all the undergraduate students. The introduction of this course was needed as the youths only knew how to use the digital devices and did not have the relevant skills that were needed for the technology-driven learning at the HEIs. This course is for upskilling the ICT skills of the students enrolled at the university (Chief et al., 2014). In addition to this, the USP library provides and conducts training on digital literacy for its students (Chief et al., 2014).

Together with supporting ICT literacy for the South Pacific students, the USP also has programs for *media literacy* as well. Once again, USP is playing a dominant role in this by introducing undergraduate programs for media literacy under the journalism program (Papoutsaki & Sharp, 2005). However, media literacy in the South Pacific has not been promoted well, and this creates a knowledge divide between students, as only those who take these programs know about media literacy, and the others have no knowledge about it. However, USP continues to integrate digital literacy components in its higher education programmes, systems, and processes. Also, the other higher education institutes in the South Pacific region are promoting ICT literacy in the following ways:

1. In Samoa, all pre-service education students undertake a compulsory literacy course in ICTs (Tanaka, 2012).
2. In Vanuatu, the Vanuatu Literacy Education Programme (VANLEP) aims to upskill important literacy skills of teachers so that they can improve their teaching and delivery for students in higher education (Lumelume, 2016).
3. In the Solomon Islands, a project named ICT for Better Education aims to use ICT to improve education delivery. The project is divided into the following cat-

- egories to improve ICT and Information Literacy in the Solomon Islands; Teaching and learning, Development for Teachers, Management and Administration, Distance Flexible Learning, Workshops for the use of ICT (Ministry of Education & Human Resources Development, 2016).
4. In Fiji—the Fiji National University has introduced information literacy as a mandatory course to all students of the university (Jayasundara, 2014).

The next section considers the importance and impact of digital literacy in higher education in the South Pacific.

Importance and impact of digital literacy at higher education in the pacific

Looking at the underlying research that has been conducted on the components of digital literacy, it can be stated that the major focus in the South Pacific has been the IT and ICT literacies, which have been integrated into the concept of digital literacy today (Cave, 2012; Buckingham, 2016; Ata & Yildirim, 2019). The HEI in the South Pacific consisting of the USP, Fiji National University (FNU), University of Fiji, National University of Samoa, Solomon Island National University (SINU), College of Education Institute for Teacher Education in American Samoa, Vanuatu Agriculture College, Vanuatu Institute of Teacher Education, Vanuatu Institute of Technology and Vanuatu Maritime College is focusing on promoting digital literacy with the growing usage and importance of new digital technologies in the South Pacific (CTA, 2019; PFIP, 2019; USP, 2019a, 2019b; Jurmo, 2017). Another reason for integrating digital literacy in the HEI in the Pacific is to work towards achieving the Sustainable Development Goals (SDGs) (Atikson, 2017; United Nations, 2018).

The authors (Reddy et al., 2020b; Sharma et al., 2019a, 2019b; Sharma & Lauano, 2018; Sharma & Nand, 2018) state that the expedition of facilitating higher education programmes in the South Pacific using digital platforms have become a norm. The students of HEI are now required to have digital literacy skills to be successful in their higher education journey so that when they graduate, they can secure good employment and perform their jobs effectively in technology-oriented workplaces (Bronfman & Pelegrin, 2018; Techataweewan & Prasertin, 2017; Dennis et al., 2015). Although higher education in the South Pacific is now operating using digital platforms, the students lack the relevant skills that they need to perform the tasks assigned to them successfully. Additionally, if the new generation, which will be the future of the South Pacific is digitally literate, the problem of the digital divide, which is a common problem in the region, can be eradicated. Being digital means one is aware of digital technology, and different users use digital platforms, hence filling the gap of the digital divide (Perdana et al., 2016; Kim & Choi, 2018; Ata & Yildirim, 2019), internally within each country as well as externally in the region. Digital fluency in the South Pacific can bring the region to an equal footing with the developed countries and invariably help the region in workforce mobility, improved bilateral arrangements, economic development and successful trades, including a wide spectrum of digital trades. The authors (Anzak & Sultana, 2020) state that digital literacy allows pursuing social empowerment (overcoming

traditional barriers of mobility, managing social ties, multi-tasking through digital devices and access to eServices) and economic empowerment (entrepreneurship from digital platforms, presentation of creativity from home using digital platforms, getting access to training and delivering mentoring) which eventually contributes to the economic development of a country. This is in line with the work done on economic empowerment in the South Pacific region (Pacific Community, 2017) where the government of the South Pacific countries and the Council of Regional Organisations in the Pacific (CROP) agencies in the South Pacific work towards the development and promotion of economic empowerment through implementing policies and digital financial services. To curb the digital divide issue, the South Pacific countries, are dependent on the HEI to integrate technology to improve access to education and learning experiences of the students in the South Pacific (Wardhani & Saad, 2018). Moreover, while mentoring digital literacy skills, the universities in the South Pacific contribute towards enhancing the regional identity amongst its graduates who will be the future workforce and leaders.

The HEIs in the South Pacific have integrated many digital tools for learning such as learning management systems, mobile apps, online orientations, diagnostic tools, virtual classrooms, eLearning, mobile learning, early warning system, tablet learning and lecture capture systems (Nand et al., 2019; Sharma et al., 2019a, 2019b; Ministry of Education & Human Resources Development, 2016; Vaa, 2015, Jayasundara, 2014). Since the mentoring of digital literacy is explicitly on the shoulders of HEIs in the South Pacific, newer programmes, courses and modules have been introduced where digital tools are used to facilitate these courses such as cohort-based learning (Institute for Teacher Education (ITE), 2018; NauruNews, 2018; Sharma & Lauano 2018; Sharma, Nand, 2018; USP, 2017).

The students of the South Pacific region are using different digital platforms, and as a result, they are exposed to explicit content, misinformation and misuse of digital technologies (Techataweewan & Prasertin, 2017; Ata & Yildirim, 2019; Reddy et al., 2020d). To use digital technologies for the learning process and stay away from the negative impact of engaging in the use of digital technologies and platforms, students at HEIs need to have the necessary digital literacy skills. Moreover, cybercrime is an imminent threat to the South Pacific region and cases such as cyber deception at Reserve Bank of Fiji, email phishing, website defacement at the Royal Fiji Military Force, ATM/Credit card scam at ANZ Fiji, cyberbullying, Facebook defamation in PNG, and others that have not been published are present (Nisha & Farik, 2016; RNZ, 2019). Therefore, digital literacy plays an important role in controlling and minimising the existing cybercrimes in the South Pacific region.

In addition to the HEIs addressing and promoting digital literacy in the South Pacific, the Council of Regional Organisations in the Pacific (CROP), the Forum Secretariat, South Pacific Community, Pacific Islands ICT Council under the act of Pacific Regional Digital Strategy are placing initiatives under the Pacific Plan to improve digital literacy for the Pacific Islanders (Network Strategies, 2010). These organisations are working towards developing and improving ICT infrastructure and revisiting the ICT policies and legislation so that a strategic direction is set towards digital developments. The regional governments' relevant ministries are actively collaborating with non-profit organizations, the HEIs and the Ministry of Education

to implement strategies and digital literacy programs. There are also multi-government based projects in the region facilitated by HEI in collaboration with other education bodies and organizations to operationalize training workshops and programs addressing digital literacy. For example, the Pacific Regional Education Framework (PacREF) program, which is initiated by the Forum Secretariat and the USP aims to curve the Pacific's education up, improve the literacy and numeracy skills and improve the quality of education delivered to students (Council of Regional Organisations in the Pacific, 2018).

In the South Pacific, if the full form of digital literacy is rightfully prioritised, supported, advocated by all stakeholders, and implemented successfully in higher education, the individuals, societies and region will reap apparent benefits in the future. Digital literacy has the potential to improve the economic and personal wellbeing of the people in the South Pacific as today the use of digital platforms in the health, government, banking, education and employment sector is at its peak (Sharma & Reddy, 2015; Reddy et al., 2016, 2020c; Raturi, 2018). Being digitally literate will enable the South Pacific region to overcome many obstacles highlighted above and drive to create a digital culture in the South Pacific.

Conclusion and future directions

In this information era, digital tools have evolved rapidly, and individuals and communities have adopted these electronic means of fulfilling their daily needs and wants. According to the researchers, there is a direct link between education, literacy skills, and a country's economic growth. If the people of a country are educated and have good literacy skills, they will contribute more towards their country's economic growth. Therefore, in this information era, the education sector plays a vital role in enhancing people's ICT/digital skills, especially the students who are in every nation's future. Since digital literacy is a life-long process, many countries around the globe have developed frameworks for digital literacy, have initiatives and programs to improve the digital skills of their people so that the benefits of having a digitally literate society can be harnessed.

In the South Pacific, similar initiatives have been introduced, and education institutes have begun to incorporate digital tools for teaching and learning purposes. However, the concept of digital literacy is still in its early stages in the South Pacific when compared to the rest of the world. The youths of the region are increasing in numbers. This means that the numbers at HEIs in the South Pacific region are increasing. Since these youths are the majority of those who use and explore the new digital technologies, they will be bringing this knowledge to classrooms; hence, there needs to be a focus on using the new digital tools for educational purposes.

The South Pacific stakeholders should put policies in place and develop relevant frameworks, which can help turn the South Pacific society eventually into a "digitally literate South Pacific society". Since there is almost no research done on the digital literacy of the South Pacific people, researchers should now focus on ways in which digital literacy of the people could be evaluated, ways in which digital

literacy could be improved and how the people are adapting to the existing use of digital technology in the region.

As far as the HEIs in the South Pacific are concerned, they have done much work on the development of various aspects and components of digital literacy in the South Pacific; however, they should now focus on all the components of digital literacy. Since this paper lays a foundation on all the relevant components of digital literacy, it can be used by the HEIs to re-align their contributions to digital literacy. The HEIs are the drivers of digital literacy and most of their workforce are researchers. Therefore, major contributions can come from HEIs if they encourage and support their workforce to research on digital literacy so that findings can be used to improve the work done on digital literacy. The government and the donor agencies of the South Pacific countries can support this research by providing research funds and sponsoring projects in digital literacy. Finally, the HEIs can act as a custodian of digital literacy, and in doing so, design more programs and tools for different aspects of the education sector and work to improve the digital literacy of the new generations. Also, community-based workshops and programs can be initiated by the HEIs so that the people who are not part of the education sector can also be mentored on digital literacy.

Following recommendations are suggested to improve the digital literacy initiatives in the South Pacific:

1. Make improvements in ICT infrastructure
2. Promote more involvement in the use of digital tools for learning and teaching in education institutes
3. Provide training of the trainers and academics
4. Create more awareness about the digital infused society
5. Develop a digital literacy scale to measure digital literacy and devise appropriate interventions to improve digital literacy

By carrying this out, probably more understanding of the lifelong benefits of being digitally literate can be understood by the South Pacific populace.

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