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Evolution of Generative Artificial Intelligence: A Review of the Developed and Developing

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Abstract

The evolution of technology and computational processing power has given rise to powerful and digital intelligent tools such as Generative AI (GenAI), a subset of AI, and has become popular among people due to evident advantages. This article offers a review of GenAI, including its evolution, applications, and concerns related to its use. While the developed countries delved deeper into GenAI, there is a significant disparity in its uptake and use in the Pacific Island Countries (PICs). For this research validated online survey was disseminated to gauge the use of GenAI in the South Pacific. The results showed that 76% of the people surveyed know about GenAI tools, and the most common ones used in the South Pacific are ChatGPT, Quill Bot, and Grammarly Go, followed by Google Bard. Moreover, the participants stated several perceived benefits of using GenAI and visioned the incorporation of GenAI tools by organisations in the South Pacific. However, the analysis also shows that the participants need an awareness on the integrity and ethics of using GenAI tools, therefore, relevant stakeholders must include the advocacy of ethically use of GenAI tools and development of appropriate policies for the use of GenAI tools in the South Pacific.

Keywords: Artificial intelligence; Generative AI; Pacific Island countries.

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1. Introduction

The evolution of intelligent and innovative Information and Communication Technology (ICT) tools and technologies has transformed various sectors, driving innovation and improving service delivery in unimaginable ways.[1] Artificial intelligence (AI) has significantly contributed to the progressive development of various sectors, such as education, health, commerce, telecommunications, and weather forecasting. The AI has been known to support effective decision-making in organisations and improve operational efficiency based on data insights or data outputs generated through rule-based or expert systems.[2,3] Rule-based or expert systems, or traditional AI, perform tasks based on predefined rules and patterns. Recently, new AI models, such as generative artificial intelligence models or tools, have been designed that work on data-driven learning and probabilistic modeling to generate new content such as text, images, or audio, make decisions, or solve problems.[4] The Gen AI tools such as ChatGPT, DALL-E 2, Google Gemini and Copilot are extensively used by industries and individuals. The global deployment rate of AI is 35%, while the AI exploration rate is 42%.[5] The use of AI tools has crossed 250 million in 2023 and is expected to cross 700 million users by the end of 2030.[6] Industries use Gen AI tools for varied reasons and applications: for example, business (improving their services through AI automation), healthcare (smart health), education (personalized learning), and sustainability (smart environment). While the world is adapting and adopting AI and GenAI tools and technologies, the people of the South Pacific are also embracing GenAI tools and technologies to survive and thrive in the digital society.

This research study presents an overview of the evolution of GenAI tools and technologies and reflects on their growing adoption and application in the South Pacific. Adopting AI technology in the South Pacific differs from industry to industry. For example, telecommunication, airlines, meteorology and education have gradually but decisively started to integrate Gen AI while the other sectors are at the stage of developing policies and standard operating

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procedures for its implementation. To the author's knowledge, this is the first study that presents baseline information on using GenAI in the South Pacific. Stakeholders can leverage the information provided to gain insights into the status of GenAI adoption and usage in the South Pacific compared to global trends. Additionally, they can prioritize policy development and implementation, considering emerging ethical, privacy and cybersecurity considerations that may stem from the increasing utilization of GenAI in the South Pacific.

2. Literature review

Intelligent digital technologies such as the Internet of Things (IOT), cloud computing, robots, ubiquitous devices and AI have fundamentally transformed numerous sectors by automating processes, improving decision-making, and creating new opportunities for innovation. The evolution of the AI began in 1956; researchers and experts have defined the AI as the branch of computer science that deals with the simulation of intelligent behavior in computers and their capacity to mimic and improve human behavior.[7] Moreover, Cardillo states that the AI is a technology that enables machines to imitate various complex human skills,[5] whileLiu defines it as a study of "how to express knowledge and how to acquire knowledge and use knowledge" using complex technological models.[8] Frank also stated that the AI is a branch of computer science that aims to create intelligent machines capable of performing tasks that typically require human intelligence, such as learning, problem-solving, and decision-making.[9]

Researchers and experts have stated that the AI significantly improves the reliability of human thinking and understanding of the essence of intelligence and the development of new intelligent systems capable of replicating or surpassing human cognitive abilities.[10] AI is classified into the following categories: traditional artificial intelligence (TAI) and generative artificial intelligence (GenAI). The TAI is described as a system that retrieves information from a particular dataset and is designed to focus on a single job at a time using heuristic algorithms; these kinds of systems only carry out the designated duties.[10] Thus, researchers state that the TAI excels at language translation, image recognition, and recommendation systems.[9,10] Traditional AI has achieved significant advancements in language translation by using machine learning models, such as neural networks and related models, such as convolutional neural networks (CNNs) which have revolutionized image recognition by automatically learning to detect features such as edges, textures, and shapes from raw pixel data.[11-13] However, TAI models are unsuitable for large datasets and cannot generate new and complex content, which became a requirement as new technology evolved.[14] Therefore, researchers and experts, especially from the gaming industry, worked on complex and large algorithms and models to mark the beginning of GenAI tools and technologies.[11]

GenAI is an AI system that can generate new content, such as text, images, or audio, based on given inputs or prompts.[11] The GenAI expanded and gained popularity recently due to its complex language models and ability to facilitate natural language conversations, answer queries, and assist with various activities.[11] Some popular applications of GenAI are ChatGPT, Gemini, Scribe, Alphacode, GitHub Copilot, Dall-E2, Claude, and Duet AI. [9]

Significant benefits of the GenAI can be captured as:

i. Translation and productivity: Text-based natural language processing (NLP) algorithms significantly improve textual communication and translation for example, Google Translate applies NLP algorithms for immediate translations in over 100 languages.[14] It is constantly improving its accuracy through machine learning, making it an effective tool for communication.

ii. Democratize organization data: Organizations of various sizes aim to democratize their data by scanning extensive databases for large language model (LLM) models, allowing internal people to gain value.[14] For example, websites such as that of Zendesk and the University of the South Pacific (USP) use LLMs to automate customer support interactions by assessing client inquiries and responding appropriately. This enables customer service staff to manage a higher volume of requests more efficiently.

iii. Easy to generate Structured Query Language (SQL)queries: A text-based model can help generate SQL queries, benefiting analysts who lack SQL writing skills (Meli *et al*., 2024). Moreover, GenAI applications make data browsing and query creation easier for non-technical users like business analysts.[15]

iv. Chatbot for dialog and prompt engineering: The chatbot is an application designed to pretend human conversation based on text or voice. Advanced chatbots, which are developed using Natural Processing Language (NPL) and Machine Learning (ML), can handle a wide range of tasks, such as managing customer service queries. Therefore, these chatbots are classified as event-based and prompt service and communication providers among suppliers and stakeholders.[14] For example, Klynveld Peat Marwick Goerdeler (KPMG), a global audit, tax, and advisory services firm, utilizes International Business Machines (IBM) Watson Assistant for internal training and support.[14] The chatbot guides employees through onboarding processes and compliance training and answers HR-related queries. It enhances the efficiency of employee training programs by providing instant access to relevant information.

However, usage of the GenAI has significant challenges as well, and these can be captured as:[16,17]

i. AI-generated academic writing answers are unique and relevant but lack human viewpoints and improper connections, highlighting the need for human input in these tasks. Human input or knowledge is required to cross-check whether the information is actually present. Moreover, the information the AI tool provides can be inaccurate.

ii. Ethical and societal implications are a challenge as there is potential for misuse, misinformation, and manipulation of the information provided by GenAI tools. The user must know how to use the information provided ethically.

iii. Quality and diversity of generated output- some GenAI models may produce outputs lacking realism and exhibit artifacts or diversity, leading to repetitive or uninteresting results. Some models may also have training instability.

iv. Interpretability and explainability- understanding how GenAI models generate output remains a challenge, particularly for complex deep-learning architectures. Improving the interpretability and explainability of GenAI systems is crucial for building trust and understanding their behavior in real-world applications.

Table 1 highlights the variation between Traditional AI and Generative AI. The variations between TAI and GenAI are presented in the following dimensions: focus, rules, data dependency, learning capability, adaptability, application

Table 1: Difference between TAI and GenAI.

Characteristics	Traditional AI	Generative AI
Focus	• Analysing data and performing specific tasks. • Designed with a specific set of tasks in mind, limiting their scope of potential applications.	• Generating new content like text, images, music, *etc*. • Taking large quantities of existing data, analyzing it, and producing new content based on those findings.
Rules	Works based on preprogrammed algorithms and rules.	It is adaptable and versatile and uses data and prompts to create new content instead of simply analyzing existing data.
Data Dependency	Requires structured data and explicit knowledge.	Works with large amounts of unstructured data, such as text, images, and videos.
Learning Capability	Limited and dependent on data sets.	Data-driven learning and probabilistic modeling.
Adaptability	Limited as it requires manual updates to its rules to handle new scenarios.	It can adapt to changing data and environments without manual rules.
Application Areas	Expert systems, game-playing, and simple automation.	Natural language processing, image recognition, recommendation systems, and autonomous systems.
Techniques and Models Used	Deterministic models, expert systems, and logical reasoning frameworks. These include decision trees, rule-based systems, and other structured models that follow explicit programming to deliver results.	Leverages ML algorithms and neural networks, such as Generative Adversarial Networks (GANs) and Variational Autoencoders (VAEs), to understand, learn, and create.
Limitations	• Adapting to dynamic and evolving environments might not be the right fit. • Issues with large data sets. • Rules are specific, so they are less versatile.	• Requires substantial data and computing resources for training and inference. • Data transparency and accountability issues. • Ethical concerns include the generation of deepfake content and potential misuse.
Examples	- Siri (Apple): Voice-activated assistant that performs tasks based on user commands. Apple Siri Official Page - Cortana (Microsoft): Virtual assistant that helps with tasks and information retrieval. Microsoft Cortana Official Page - Alexa (Amazon): Voice-controlled assistant for smart home management and information retrieval. Amazon Alexa Official Page	- GPT-4 (OpenAI): Generates human-like text based on input prompts. GPT-4 Announcement - DALL-E (OpenAI): Creates images from textual descriptions. DALL-E 2 Announcement - MidJourney (MidJourney, Inc.): Generates unique and artistic images from text descriptions. MidJourney Official Website
Foundation Models used to incorporate innovation into current models	• Model-centric AI • Data-centric AI • Explainable AI (XAI) • Responsible AI	• Google AI's PaLM • Meta AI's LaMDA • OpenAI's GPT-3 • DeepMind's Gopher • Microsoft Research's Megatron-Turing NLG

areas, techniques and models use, limitations, examples and foundation models used to incorporate innovation into current models.[18,19]

2.1 Applications

Different sectors have adopted the AI-enabled approaches to enhance operations and service delivery. Given below are ways in which different sectors have embraced the GenAI applications to reshape traditional practices:

Health sector - AI has evolved from its traditional use for classification and prediction ability to provide alerts and reminders for clinical decompensation to the use of new GenAI models for differential diagnosis.[19] Moreover, the GenAI has also been used in expert domains such as cancer detection, cancer diagnosis, cardiopulmonary resuscitation, and neurological clinical decisions, with studies showing that the GenAI has the potential to produce better and error-free results compared to humans.[19] Moreover, the intelligent assistants such as healthcare chatbot can be used by medical professionals to help patients get assistance faster, assist patients and individuals with their frequent questions, appointment booking, reminders and other queries.[16]

Service sector — For this research study, banking, retail, manufacturing and marketing companies are taken as the service provider organisations. The service sector has harnessed the power of the AI to enhance its service capabilities, solving problems and challenges for retail, banking, manufacturing and marketing companies. These capabilities were further improved when the new GenAI models were introduced, giving the commerce sector a competitive advantage in enhancing its operational strategies. With the GenAI, the commercial industry was able to provide its customers with better experiences through data-driven retail interactions, guided discovery applications that assisted customers with product selection, and Advanced Customer Relationship Management (ACRM) and marketing systems leverage AI to learn and understand consumers' behaviors and preferences. Moreover, the GenAI is used to automate tasks, enhance collaboration, improve engagement, perform real-time language localization, ensure quality checks, and perform product ideation.[20]

Telecommunications—Traditional AI was used to improve efficiency, reliability, and user experience in the telecommunication sector by performing tasks such as load balancing, mobility optimization, resource allocation, network optimization, and anomaly detection.[21] The GenAI is now used to improve reasoning tasks in telecommunications.[22] Moreover, the telecommunication industry seeks to use GenAI to empower wireless devices to deliver collective intelligence - conventional communication networks, forming a multi-agent GenAI wireless network.[21] This multi-agent GenAI network will improve general telecom tasks and enable networks to adapt, change, and evolve with the variations of experiences in the network and the surrounding environment.[22] It will also offer offline operation and reduce reliance on cloud services.

Climate resilience – AI has the potential to enhance climate resilience through transformative climate solutions. Using machine learning combined with AI can improve environmental sustainability and further achieve sustainable development goals. The AI has also been used to combat environmental challenges and promote Green AI.[23] More examples of using AI for sustainability include developing self-driving cars, monitoring the operating conditions of expensive equipment, recommending suitable products at the right time and location, and facilitating human communication and interaction via machine translation tools.

Education - AI tools and technologies have also been leveraged to enhance educational capabilities, making teaching and learning more meaningful and effective. The AI tools and technologies have assisted in educational reforms such as the digitalization of academic resources, gamified learning, personal learning environments, and the development of reactive and adaptive learning styles for students and intelligent tutoring systems.[24-26] Educators can use multiple AI tools to develop learning material for students, considering the legal and ethical issues related to the content. Other uses of in education include providing information about the institute/programs/courses, academic and learning analytics, and automatic repackaging of courses.[27]

The adoption of AI to enhance the services is much faster by the service sector such as banking, retail, manufacturing, travel and banking industries as per several reports and information available on the website followed by Education and then Health sector.[28,29] Increased efficiency, automation, reshaping service delivery were the driving forces that urged the incorporation and integration of the AI tools. However, the cross-sector barriers to the adoption of AI are cost of AI implementation, risk management, customer expectation, regulation and compliance, data complexity and data privacy issues, and the lack of tools and experts.[5,30] While, there are several studies explaining the adoption of AI by different sectors, its by the educator sector is in its primeval stage. To better understand the growing adoption of AI, the next section of the study will delve into recent use of AI in the education sector.

2.2 Use of AI in education

Advances in technology, particularly AI, have greatly influenced the field of education.[31] Some examples of AI-enhanced technologies for education include AI-powered learning assistants to improve student learning, intelligent tutoring systems, chatbots, learning assistants for people with disabilities, gamification technologies, and virtual reality systems to design a more creative learning environment allowing students to interact with virtual objects, simulations, and environments.[32,33] Some examples are AI tutors and Learning Management System (LMS) supported with chatbots can adapt to the different learning style of the students and create a more tailored and customised learning, Grammarly,

Duolingo, Carnegie learning, Kahoot, Edmodo, zSpace, and Google Assistant, to name a few.[33]

Prior studies have shown that integrating the AI tools and technologies in higher education can have significant benefits, such as improving student learning outcomes, personalizing instruction, and enhancing administrative tasks.[34,35] The authors also discuss how AI technology can improve learning processes and innovative educational approaches, such as blended learning environments. Through the AI-powered algorithms, educational platforms can adapt to each student's needs, learning pace, and preferences, fostering a tailored approach to education.[36] For example, LMS can be enhanced through chatbots, early warning systems, and intelligent tutors.[37] The AI systems with natural language processing capabilities can analyze and understand human language, enabling automated essay grading, generating personalized feedback, and supporting language learning activities. For example, NLP models integrated into LMS can enhance learning environment by promoting peer-to-peer discussions, making suggestions proposing edits, and guide students by providing real-time feedback.[33]

Moreover, AI-powered recommender systems can suggest relevant educational resources, such as books, articles, or online courses, based on a student's interests, previous choices, and learning goals. For example, educators can perform data analytics, generate detailed reports, and further work on creating a recommender for students to improve their performance. Systems like early warning systems can be created.[38] These data can then be further used to perform data analytics on large sets of educational data, such as student performance, to identify patterns, trends, and areas for improvement.

Globally, institutions are using GenAI models to enhance the teaching and learning processes.[38] The GenAI applications can provide real-time feedback, simulate classroom scenarios, generate personalized content for individual students and support the development of learners' digital literacy skills, hence making these applications a learning buddy.[39] These GenAI tools and technologies can be advantageous for facilitators as well; it can assist in course preparation, creating summaries of documents and lecturers, creating mind maps, creating assessments and relevant rubrics, orchestrating classes, and receiving real-time feedback on the teaching methodologies.[30] For example, in South Korea, there has been a growing interest in using generative AI models to develop virtual tutors that can provide personalized instruction to students based on their individual learning needs.[32] These virtual tutors use GenAI to create customized learning materials and adapt their teaching methods according to the student's progress and preferences. Santa is a multi-platform AI tutoring service with more than a million users in South Korea that helps students prepare for standardized tests like the Test of English for International Communication (TOEIC). This application generates personalized study plans, adapts to student performance, and provides real-time feedback to enhance learning efficiency.[40,41] China uses a similar application, Squirrel AI, which uses adaptive learning technologies to provide personalized education to K-12 students. The platform employs generative AI to analyze student performance and customize learning plans to address individual strengths and weaknesses.[41,42]

In the United States, GenAI is employed in educational chatbots to provide personalized support and guidance to students. These chatbots can answer questions, provide resources, and engage in interactive conversations tailored to each student's individual needs.[38] Moreover, the GenAI models promote creativity and critical thinking skills among students.[30] For instance, in Japan, a language learning platform called ChatGPT uses generative AI to simulate conversations with native speakers. This allows language learners to practice speaking and listening skills realistically and interactively.[39] Some examples of GenAI tools used are Copilot, ChatGPT, AI Summarizer, and Claude.[43]

Many challenges appear while implementing GenAI tools and technologies into teaching and learning practices. These challenges are divided into two categories- primary and secondary challenges. The primary challenges are as follows.

Ethical considerations: GenAI raises ethical challenges like misinformation and deepfakes, bias and discrimination, copyright and intellectual property concerns, and privacy and data security. Since GenAI models use deep learning neural networks and other machine learning algorithms, the content generated can be impacted; thus, critical concern needs to be placed by educators while they are creating content and by learners when they are using content for their assessments and learning.[38,39]

Privacy: Personal data privacy is a concern as experts can use personal data to improve GenAI models. The use of the GenAI poses a risk of oversharing personal data by both educators and learners, such as medical information, travel information, employment information, and purchasing intentions. As such, GenAI tools can capture these data and further improve their performance.[42]

Data security: Some GenAI applications may sidestep security control and amplify data breaches/leaks, allowing unauthorized access to sensitive data for educational institutes. To mitigate this risk, education providers must implement stringent security measures to protect themselves from GenAI security attacks from malicious personnel. Controlling access, enforcing proper data hygiene, validating data and monitoring adversarial activities, and implementing data risk for AI implementation and execution are some mitigating measures organizations must take in the GenAI era.[44]

Training and professional development: Integrating GenAI tools in the learning environment requires appropriate training for the individuals who will customize and implement these GenAI tools for learning, individuals who will use these tools to facilitate learning, and individuals who will use the GenAI tools for learning. Institutes must have a well-designed plan to navigate the implementation and use of GenAI learning tools,

and training and professional development is essential.[38] There is a risk of producing outdated replies due to stale content, and as a result, the content quality is affected. Trained individuals are needed to monitor content quality and implement appropriate data curation strategies.[44]

Moreover, the secondary challenges of implementing the GenAI tools and technologies are:

i. Lack of clear guidelines and framework since the concept of implementing and integrating GenAI into learning is new, many educational institutes lack framework, policies, and standard operating procedures to guide the integration of GenAI tools and technologies.[45]

ii. Educational shift issues- integrating GenAI into education may raise issues within the educational institute's norms, as the availability of resources, infrastructure and cost requirements need a thorough evaluation.[42]

iii. Facilitator digital fluency – the teachers will require digital fluency to use and integrate GenAI tools for learning. If the teachers do not have appropriate skills or training provided, their workload may also be affected.[31] An initial survey on the digital competencies of educators and learners must be evaluated, and appropriate interventions for improving user capabilities must be enforced to ensure equitable access and use of GenAI tools for learning.[27]

iv. Equity and accessibility: Implementing GenAI educational tools must ensure equal access and opportunities for all students, regardless of socioeconomic background or learning abilities

v. Sustainability and maintenance- due to the evolving nature of technology, education institutes will need to provide ongoing support to maintain technological resources.[23]

Despite the existing concerns about using GenAI tools for learning, educational institutes are exploring integrating of GenAI tools to enhance pedagogical potential.[33] Researchers, and academics strongly believe that although there is a risk that GenAI tools will widen educational disparities, incorporating GenAI tools with proper policies and implementation strategies will transform teaching and learning practices.[45-47] As such, professionals must develop and implement intelligent solutions while integrating the GenAI ecosystem for education.

The revolution of the GenAI is driven by the number of individuals using it across the globe for various reasons, such as entertainment, health care, daily interactions, and education. According to a report by Deloitte Access Economics and Deloitte AI, as of 2023, developing economies such as the Asia-Pacific region have adopted GenAI much faster than other developed nations.[46] Students from India, followed by Southeast Asia, Australia, and Japan, are embracing GenAI better than the rest of the World. However, digital infrastructure, digital fluency, data fluency security, and ethics remain challenging when implementing and using GenAi tools and technologies. The next section of this study will look into the evolution and adoption of GenAI in the South Pacific.

2.3 AI in the South Pacific

The South Pacific countries are located in the geographic region of the Pacific Ocean. They comprise 15 countries, with Australia and New Zealand as neighboring countries. Over the last decade, the South Pacific has significantly improved its information, communication, and technology (ICT) infrastructure, broadband development, connectivity, and usage.[47] To meet the SDGs and support inclusion, the South Pacific countries have adopted and adapted ICT and have integrated ICT-driven services and ICT-mediated applications such as e-governance, e-education, e-health, e-commerce, and e-agriculture to reshape and digitize the South Pacific community.[48] Although the uptake of ICT tools and technologies is not the same for all the South Pacific countries, the proliferation of ICT and advanced ICT tools and technologies, such as AI technology, cloud computing, and IoT, is evolving and expanding.[49] Moreover, since the release of ChatGPT, the use of GenAI tools in the South Pacific has been exponentially increasing. However, there is no documentation or evidence of which GenAI tools are popular amongst the South Pacific populace or what they are used for; as shown in Fig. 1, the authors of this research study present the evolution of the AI and its usage in the South Pacific. Some applications and initiatives of TAI and GenAI tools in the South Pacific are as follows.

Fig. 1: AI-based initiatives in Fiji and Samoa.

Predicting disasters—South Pacific countries are vulnerable to disasters, and organizations such as the World Bank are working on using AI to predict disasters in the South Pacific under the Unmanned Aerial Vehicle (UAV) resilience project. The partners of the UAV project are the Pacific Community (SPC), the National Emergency Management Office Tonga, and the Ministries of Land, Surveying, Natural Resources and Environment (Tonga); the Civil Aviation Authority of Fiji and Tonga which is supported by the European Union.[50]

In 2023, Fiji released its first customer service chatbot, Avaia.[51] Local businesses can use the chatbot to support customers, elevate their online presence, and recolonize the e-commerce sector. Moreover, Vodafone Fiji and the Fiji Development Bank were next to implement chatbots for their customers.[52] Fiji Airways has also invested in new AI-powered State-of-the-art technology to enhance Operational efficiency. This AI-powered system is an innovative computer vision event detection technology that uses specialized tools that allow airlines and ground handlers to monitor, manage, and optimize their turnaround operations efficiently.[53]

The EON reality released Samoa's first Spatial AI Center in 2024 to reshape the educational and professional development landscape for Samoan students and workforce.[54] This project uses virtual reality (VR) and augmented reality (AR) to create dynamic learning environments for about 10,000 tailored courses for the Samoan populace. The iLab-Fiji is a research-based AI solution and IT consulting service. It has developed AI-based tools such as a Land Registration and Insurance Fraud detection tool that is powered by AI.[55]

The tertiary institutions in Fiji, such as the University of the South Pacific, Fiji National University and the University of Fiji are developing GenAI policies so that the staff and students abide by academic integrity while using these tools.[56] While universities are leaning on readily available GenAI tools to revolutionize teaching and learning in higher education, academics are using a proactive approach to understand the dynamics of using these tools to protect academic integrity. The universities are actively creating awareness about using GenAI tools and academic integrity policies.[57]

Furthermore, the relevant stakeholders in the South Pacific are focusing on improving ICT infrastructure, creating awareness of ethical concerns related to the use of TAI and GenaI tools and technologies, providing training on skills acquired for using the available applications, tackling vulnerabilities and cybersecurity challenges, and researching on the use of GenAI applications in the South Pacific. This research study presents a brief application of GenAI in the South Pacific.

3. Experimental section

3.1 Methodology

This study uses an exploratory research design to highlight the evolution of GenAI in the South Pacific. Since this study is the first to highlight the evolution and use of AI in the South Pacific, the discussion in literature on the use of GenAI in the South Pacific is limited. Furthermore, a validated survey was used to capture the current knowledge of GenAI in the South Pacific. An online questionnaire was disseminated through emails and social media platforms. The questionnaire was developed using prior studies.[58,59] A pilot test was performed with a sample of 20 participants. The validity test results retrieved a Cronbach alpha value of 0.91, and since the participants did not face any difficulty in answering the questions, the questionnaire was deemed valid and reliable. The validated questionnaire was then disseminated widely in the South Pacific. The ethics approval was taken from the University research committee and the approval number is FNU-HREC-24-19. The survey was disseminated online and participation consent was taken online. They proceeded with the survey if they agreed to participate.

3.2 Research objectives

1. To carry out a comprehensive discussion on the evolution of generative AI through a narrative literature review.
2. To evaluate the applications and use of generative AI in the South Pacific.

4. Results and discussion

The validated questionnaire developed for this study was piloted through emails and social media platforms to individuals in the South Pacific. Since participation was voluntary, the research team did not receive the expected number of responses. As of 31st July 2024, 190 participants attempted the survey which was active for three months. Fig. 2 shows the demographics of the participants. Most of the participants were from the Fiji Islands. A total of 65.4% of the participants were employed in different sectors in the South Pacific- education, tourism, banking, health, and entertainment while the rest were unemployed.

Of the 190 participants, approximately 77.4% knew what generative AI is. Some standard GenAI tools used in the South Pacific are ChatGPT, Google Bard, Quill Bot, Grammarly Go, DALL-E, Co-pilot, Bing Chat, and Sustain AI. Most of the surveyed participants use ChatGPT – 58.9%, followed by Quill Bot – 31.5%, Grammarly GO – 25.7%, Google Bard – 17.3%, Bing Chat – 13.2%, Co-Pilot – 7.8%, DALL-E – 4.2% and Sustain AI – 3.6%. The participants use GenAI tools for research, work purposes, assignments, proofreading and editing, communication, generating art and visuals, and writing descriptions.

The participants observed that GenAI makes work more accessible, provides multiple solutions, provides accurate guidance, provides the needed information and instant feedback, and is cost-effective. Fig. 3 presents the responses from the participants; approximately 65% of the participants indicated that GenAI tools are helpful for their work/studies, make research more accessible, enable them to complete their work, and increase productivity. On the contrary, there can be

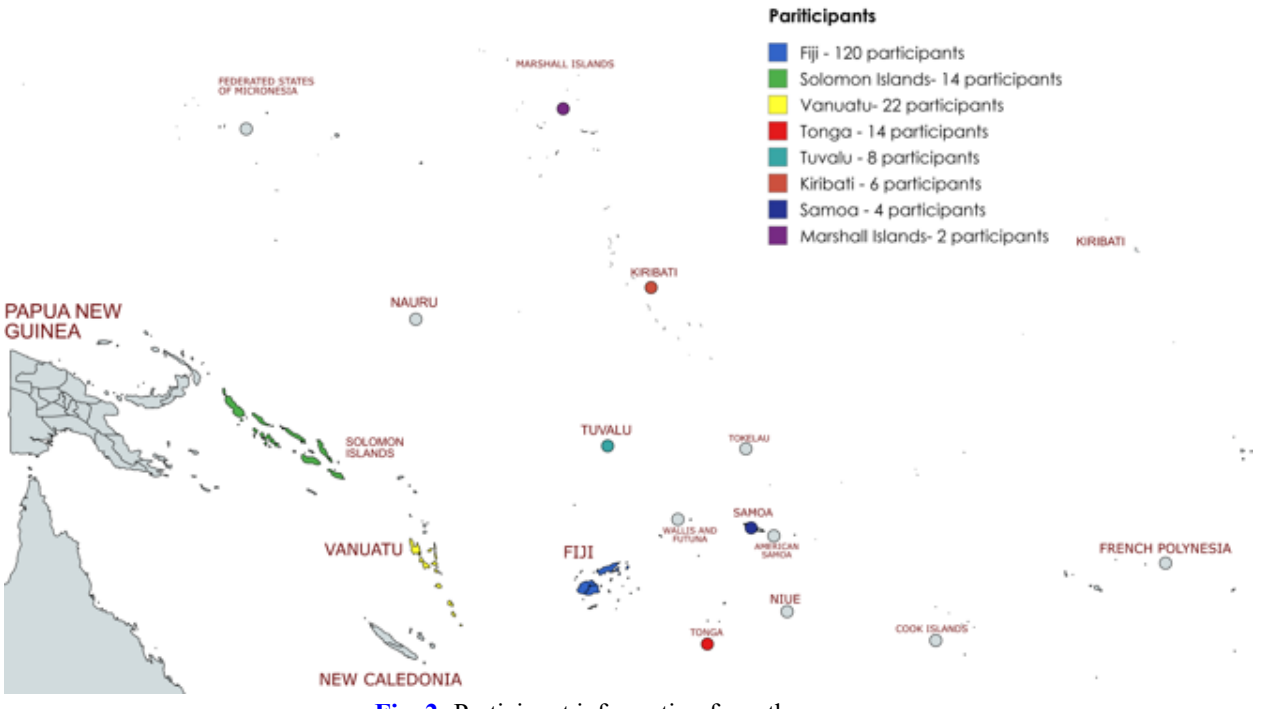

Fig. 2: Participant information from the survey.

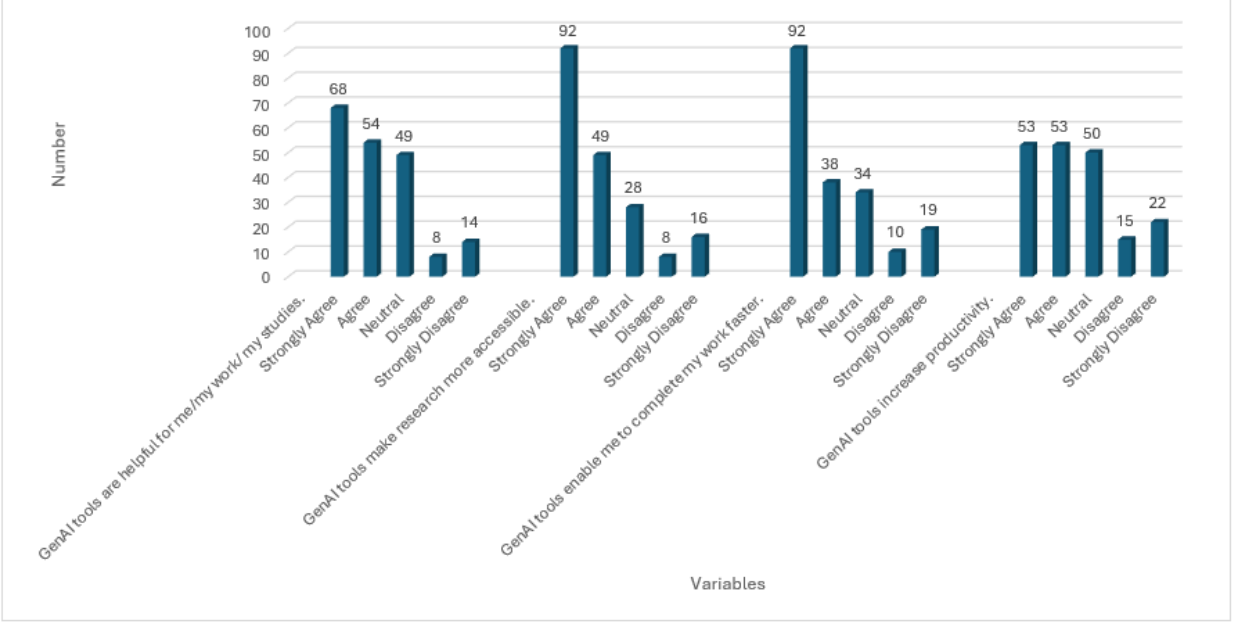

Fig. 3: Benefits of using GenAI tools.

academic integrity and ethical issues; misinformation can be disseminated, and data security issues and digital fluency are required. Approximately 65% of the participants were aware that applications such as MS Office Suite, Zoom, and social media apps have AI plug-ins, and they were using these to assist them with the relevant tasks. Moreover, the authors of this research study tested the accuracy of the AI plug-in in Zoom. The Zoom AI Companion was enabled for one of the meetings, and at the end of the meeting, the meeting summary was sent to the participants' email. It was noticed that only 60% of the information in the summary by Zoom AI Companion was accurate

Table 2 displays the participants' ability to use the different types of GenAI. The responses indicate that most individuals who participated in the survey in the South Pacific know how to use various kinds of GenAI tools, approximately 70% while the rest of the participants indicated that they lack skills in using the tools. Moreover, approximately 70% of the participants agreed they would continue using the GenAI tools due to its apparent benefits. The participants recommended that organisations develop and implement AI policies to guide users appropriately when using GenAI tools. This initial survey showed that the use of GenAI tools in the South Pacific aligns with the global trend. Moreover, organisations in the

Table 2: Participants' responses to their ability to use GenAI tools.

Variable	Number	Variable	Number
Learning how to use GenAI tools is easy for me.		I have the necessary tools to enable me to use GenAI tools.	
Strongly Agree	61	Strongly Agree	46
Agree	46	Agree	34
Neutral	51	Neutral	56
Disagree	16	Disagree	28
Strongly Disagree	19	Strongly Disagree	29
I know how to interact with the GenAI tools.		I know how to use GenAI tools.	
Strongly Agree	66	Strongly Agree	47
Agree	38	Agree	46
Neutral	50	Neutral	56
Disagree	21	Disagree	25
Strongly Disagree	18	Strongly Disagree	19
I find it easy to use the GenAI tools.		Help or guides are available for me when using GenAI tools.	
Strongly Agree	73	Strongly Agree	39
Agree	43	Agree	39
Neutral	47	Neutral	57
Disagree	13	Disagree	30
Strongly Disagree	17	Strongly Disagree	28

South Pacific are integrating GenAI. However, the strategies used in implementing the GenAI tools, current GenAI tools used, and related policies in place have yet to be explored.

5. Conclusion

This research study presented an overview of the global evolution of GenAI. An in-depth analysis of prior studies on GenAI was conducted to show its evolution and the innovation of GenAI tools and technologies. Furthermore, the study includes an overview of the recent trends in GenAI within the South Pacific. A case study approach was used to gather data on the different types of GenAI tools and technologies in the South Pacific.

The findings of this study revealed that although GenAI has been widely adopted worldwide for its apparent benefits, such as the potential to innovate and improve efficiencies across different sectors, its implementation poses several challenges. Experts highlighted the most crucial challenges: data privacy and security, infrastructural investment, sustainability, digital fluency, ethics and integrity, and lack of guidance. Prior studies have highlighted that the global adoption rate of GenAI is increasing, prompting stakeholders to swiftly develop policies, frameworks, and standard operating procedures to oversee a legitimate implementation and usage of GenAI tools.

The adoption rate of GenAI in the South Pacific showed a similar trend to that of the rest of the world. Although, in its early stages, the survey results showed that people in the South Pacific are becoming aware of and using GenAI applications, such as ChatGPT, Quill Bot, Grammarly Go, and Google Gemini. The participants highlighted that GenAI tools make their work easier, increase accuracy, provide instant feedback, and are cost-effective. However, challenges like digital competencies exist, and people in the South Pacific will continue to explore the potential of GenAI tools in the future. The participants emphasized that concerns regarding the ethical use of GenAI tools need to be addressed by implementing appropriate policies that should be made accessible to the public. Further recommendations from the research team are: (1) developing a suitable framework at the national level on the ethical use of GenAI tools and technologies. Different organizations can adopt this framework and customize it as needed, (2) develop short courses (OERs and MOOCs) for experts and academics so that they can be trained and the proper use of GenAI tools and technologies can be advocated to the relevant groups in the South Pacific, and (3) stakeholders and professionals to create awareness of GenAI hygiene to mitigate risks and promote the best practices by individuals and organisations in the South Pacific. As such, creating a safer and more ethical environment that utilizes and maximizes the potential of GenAI in the South Pacific.

Conflict of Interest
There is no conflict of interest.

Supporting Information
Not applicable.

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