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Abstract

Government institutions pay particular attention to project performance using advanced technologies. Cloud-based virtual technologies play vital roles in project environments with numerous scholars examining the imperatives of project performance. However, a particular focus on information technology experts' consensus on the potential of cloud-based virtual technologies to enhance project management in government agencies is still lacking. This study explored the consensus of information technology experts on the potential of cloud-based technologies to enhance project management in West Coast governments. The study adopted a Delphi method design, which involved collecting and analyzing data from a panel of information technology experts on the West Coast holding managerial positions. Twenty experts were sourced from the LinkedIn platform and an informed consent form was sent to them to sign electronically and return to the researcher via the provided email address. The phone numbers sent together with the consent form were used to schedule the virtual interviews. The interviews were conducted in three cycles/rounds and the findings were analyzed using the thematic analysis technique and Kendall coefficient of concordant. The findings established a consensus of information technology experts on the potential of cloud-based virtual technologies to enhance project management in West Coast governments. Based on the study findings, it was recommended that the West Coast government agencies adopt cloud-based virtual technologies to enhance project management because it helps to minimize costs and increase adaptable scalability.

Keywords: *Project Management, Information Technology, Cloud-Based Virtual Technologies, West Coast, Government Agencies.*

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1.1 Introduction

Cloud-based virtual technologies are rapidly becoming imperatives in several spectrums of business operations (Mabry et al., 2020; Liang et al., 2021). The instrumental role of cloud technologies in enabling teams and individuals to execute critical activities has made them significant considerations in project management (Ahmad & Waheed, 2015; Abd et al., 2019). Despite the undeniable role of cloud-based computing technologies in enhancing project management processes, the consensus of technology experts on this phenomenon is widely lacking, especially in the West Coast governments. Inefficiencies that characterize the United States government agencies have been traced to the continued reliance on outdated technologies (U.S. Government Accountability Office, 2023; Schank, 2021). The continued use of outdated technologies exposes government operations to significant security risks, particularly cyber-attacks or data loss (Dada, 2018; Correia et al., 2023). The increased concerns emphasize the need to establish the potential of cloud and virtual technologies in government agencies' project management to enable governments to appreciate their use in project implementation.

Despite the increased desire for governments to adopt cloud-based virtual technologies in their project management processes, the lack of consensus among information technology experts on the potential role of the cloud infrastructure limits the knowledge available to persuade project managers to apply it (Evans & Farrell, 2021; Holzmann et al., 2022). Evans and Farrell (2021) further expressed that gaps in leadership's understanding of how to use cloud-based virtual technologies to improve project management and the overall technological understanding may cause sluggishness in adopting advanced cloud-based virtual technologies. Araral (2020) tested a managerial contingency by studying why the United States increased the adoption of smart city technologies using a sample of 329 cities; the results revealed that the willingness to adopt smart city technologies is contingent upon context, managerial incentives, and constraints.

Cloud-based virtual technologies have exhibited unquestionable potential to prevent service interruption elsewhere. For example, governments relied on cloud-based virtual technologies to maintain the connection between instructors and students during the COVID-19 pandemic (Mahaye, 2020). Utami et al. (2022) hailed cloud-based computing technologies for supporting efficient learning during the pandemic. Moreover, Alashhab et al. (2021) recognized the cloud-based computing environment as an unsung hero in the COVID-19 pandemic crisis because of its fast-paced service delivery practices that allow instant deployment of applications for maintaining data. Virtual technologies, such as Blackboard®, Google Classroom®, CenturyTech®, and ClassDojo® widely benefited the interaction between academic institutions, government agencies, and students during the global pandemic crisis. The pandemic acted as a wake-up call for organizations to appreciate the centrality of cloud-based computing services for continuity of service delivery (Shafiq & Shakor, 2021; Wang et al., 2021). The capability of virtual and cloud technologies to provide resources for managing the learning process implies that county governments can also benefit from the technologies to manage government projects. Despite cloud-based infrastructure having attained scholarly coverage, it is necessary to understand how cloud-based technologies facilitate the industry's competitive edge from the expert perspective (Yathiraju, 2022).

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1.2 Problem statement

The state of technological advancements across the globe is providing an impetus for investments in advanced technologies. Scholarly recommendations have persistently insisted on adopting advanced technologies, including cloud-based virtual technologies, to enhance government operations (Priyadarshinee et al., 2018). However, research shows that several government agencies are still lagging, evidenced by the continued use of obsolete technological systems (Bur, 2018; Schank, 2021), which may threaten the safety and security of sensitive information. Project management is a complex undertaking that requires real-time collaboration among project teams using cloud infrastructure. However, limited knowledge of the potential of cloud-based technologies to enhance the outcomes of project management seems to minimize the speed of transition from traditional approaches to managing projects to cloud-based activity management practices (Alsaffar et al., 2016; Khan et al., 2021). The resulting slow response to the changing technologies and installation of upgrades by county governments has created a situation where the public faces challenges in engaging with the devices correctly when accessing county government services as per the demand (Samuel et al., 2020). Establishing a consensus of information technology experts could provide a basis for encouraging government agencies to adopt cloud-based virtual technologies. However, the lack of information technology experts' consensus limits the empirical knowledge available to elicit transformative interest among government agencies. This study sought to address this gap by obtaining a consensus from a panel of IT experts on the West Coast on the potential of cloud-based computing technologies to enhance project management in governments.

1.3 Research Question

What is the consensus of information technology experts on the potential of cloud-based virtual technologies to improve project management in West Coast governments?

2.1 Literature review

Governments plan projects with specific timelines within which they should be completed. Pursuing tools, techniques, and methods to complete tasks in the public sector is a priority (Nanos et al., 2019). Based on a study by Bello et al. (2021), cloud-based computing environments enable coordination and timely feedback that facilitate cost-minimization during project implementation. The effective monitoring of project processes that characterize cloud-based computing environments allows timely detection and identification of variation, ensuring corrective actions are executed instantly to ensure project continuity (Abanda et al., 2019). The motivation to improve the timely completion of projects led Li et al. (2018) to develop a cloud-enabled platform that could provide decision support tools based on cloud and virtual technologies suitable for collaborative decision processes and task supervision. Tang et al. (2019) expressed an unending concern with the untimely and irregular site inspection, which motivated them to develop a Personalized Safety Instruction Method (PSIM) system using the software as a service (SaaS) cloud with Global Positioning System (GPS). The PSIM would lead to accelerated project management due to real-time inspections and achieve timeliness in project completion.

Increased access to technology devices has accelerated the diffusion of technology in service environments. Kraemer and King (2006) argued that American society had witnessed a pervasive diffusion of computer technology, as evidenced by computers and the Internet extending to most households in America. Homes, governments, and businesses have created a more subtle information technology environment through the rapid connection of internet-based e-government and e-business. A study by Dean (2002) confirmed that 67% of adults using the Internet had visited a government website (federal, state, or local) by 2002. Fountain (2001) noted that almost all federal agencies and state governments actively enable citizens to access information or services on the web. Based on the observation by Norris (2006), about 95% of the city and county governments were operating websites by 2004. Most government units offered non-financial services, although 10% had already started enabling citizens to access financial services, including tax payments, licenses/permits, parking tickets, and utility bills (Norris & Moon, 2005).

Government operations require vast amounts of information from various sectors of the economy, and the data provides insights regarding areas governments should channel resources to in community development endeavors. Artem et al. (2018) evaluated the role of virtual communities on the cloud services platform in providing information support for scientific researchers. The study results confirmed the instrumentality of cloud-based information systems for improving the effectiveness of scientific communication when using an electronic science platform to conduct research. Consistent with the assertion by Meng and Zhang (2022) and Al-Malah et al. (2021), it was evident from the study by Artem et al. (2018) that apparent that complex systems of informational and technological support for conducting scientific research enhance communication effectiveness among the virtual scientific research teams participating in interdisciplinary research.

Alassafi et al. (2016) recommended promoting the effective adoption of cloud computing by paying attention to the potential of adopting the technologies. However, Joshi et al. (2017) argued that most countries still struggle to benefit from using cloud-based e-government technologies to deliver services. Although some of the analyzed studies were based on developing countries' contexts dissimilar to the United States, the studies confirmed certain prohibitive elements that impede the effective implementation and management of cloud and virtual technologies to deliver government services.

The vast literature on cloud and virtual technologies mainly concentrates on details regarding the benefits of cloud computing in government institutions. Studies such as Smitha et al. (2012) and Hashemi et al. (2013) have applauded cloud and virtual technologies for enhanced data scaling, providing for analysis of vast volumes of data through auditing and logging, reporting intelligence, and performance and scalability. Cloud computing provides a platform for addressing the weaknesses of e-governance, thus enhancing government service delivery. Hashemi et al. (2013) noted that the benefits of implementing cloud and virtual technologies lie in their features, including ubiquitous network access, resource pooling not restricted to location, elasticity, and measurable service processes. The service process is easy to monitor, control, and report. Given the notable benefits of cloud-based computing, scholarly interest in improving cloud-based government services has been unending despite the scarcity of literature. West (2010b) provided comprehensive policy guidance to enhance public cloud computing. The policy is founded on addressing security, ensuring users have the skills and passion to use the technology correctly, and effectively leading change.

Delays tend to occur in cloud computing environments, especially when cloud-based systems fail to handle several tasks and commands presented simultaneously. The consequence of delays is that they interfere with information flow and service breakdowns. Sekaran et al. (2019) identified that the heavy traffic requests from several cloud users' terminals cause heavy traffic/unbalanced loads. The heavy traffic causes cloud data centers and associated servers to cease transmitting information effectively. Cloud computing environments experiencing delays fail to achieve the timeliness dimension of service quality (Abd et al., 2019). Information technology experts have made an effort to solve the load imbalance issues. Cloud load balancers such as the dominant fiery algorithm and Cloud-Structured Language (SQL) effectively balance tasks in academic environments (Sekaran et al., 2019). However, it is not yet clear if the meta-heuristic algorithm can improve the response efficiency of cloud government cloud servers.

The purpose of the current study was to establish the consensus of the information technology on the West about the potential of cloud-based virtual technologies to enhance project management in West Coast governments. The expert opinion revealed how using the cloud and virtual technologies in West Coast governments can improve project management processes through accelerated project completion and cost minimization to realize efficiency and effectiveness.

2.2 Theory

The Unified Theory of Acceptance and Use of Technology (UTAUT) provides a set of factors influencing user behavior towards a technology through behavioral intention. Venkatesh et al. (2003) conducted further analyzes of TAM and TAM2, leading to several conclusions that saw the development of UTAUT. In UTAUT, the behavioral intention results from three predictors: performance expectancy, effort expectancy, and social influence. Facilitating conditions, albeit insignificant in voluntary contexts, influence user behavior. Venkatesh et al. (2003) found that gender and age affect only performance expectancy, effort expectancy, and social influence, but age also affects facilitating conditions. While scholars such as Li (2020) and van Raaji and Schepers (2008) have criticized UTAUT for being less parsimonious because of moderating key relationships to achieve an artificially high coefficient of determination (R^2), Bagozzi (2007) believed that UTAUT is a thoughtful presentation that brings together several variables that influence technology user behavior.

Recent research has shown that all the factors in the UTAUT have significant and positive correlations for Generation Z's user behavior toward mobile technology, with facilitating conditions having the strongest positive correlation (Persada et al., 2019). Moreover, Chopdar et al. (2018) conducted a cross-country analysis of the utilization of UTAUT to analyze the adoption of and perceived risks of UTAUT. The results supported the UTAUT variables in influencing user behavior towards mobile apps but indicated that cultural influences affect consumers'' perceived risk toward m-shopping apps. Evaluating the UTAUT in the context of West Coast governments is crucial to determine its impact on implementing and managing cloud and virtual technologies to execute projects.

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3.1 Research Methodology

Method and Design

The study used a qualitative research method collecting and analyzing non-numeric data that increases the information technology experts' consensus on the potential of cloud-based virtual technologies to enhance project management in West Coast governments (Creswell, 2013). The research design for the current study was the Delphi technique. Flostrand et al. (2021) defined the Delphi technique as a research design used to forecast a future state within the technology industry using a panel of subject-matter experts. Studies adopting the Delphi technique use a panel of subject matter experts when examining consensus on topics such as the future of a phenomenon or topic being studied or the best practices that define an operation in a given industry (Ćwiklicki & Pilch, 2021).

Population and Sampling

The study's target population included executive information technology experts working on the West Coast. The executives were chosen because they have an in-depth understanding of information technology operations and project management; hence, they could provide crucial information about using cloud-based virtual technologies to manage government projects on the West Coast. The sample for the current study included 20 information technology experts working for various organizations on the West Coast in managerial positions. The sampling technique for the study was purposive sampling. Etikan et al. (2016) defined purposive sampling as the non-probability sampling technique in which sample selection is based on the researcher's judgment of the participants' knowledge and experience. The sampling technique was appropriate for the study because it enabled the selection of a sample that could provide credible information to answer the research questions.

Research Instruments

The study adopted interview guides as the data collection instruments. The weakness of structured interviews is that they limit how much a participant can describe a phenomenon being investigated to generate in-depth data (Wolff & Burrows, 2021). However, structured interviews are mostly adopted to enable researchers to minimize time wastage and ensure the collection of data pertinent to the study phenomenon. A list of semi-structured interview questions guided the study's data collection process for round 1. During round 2, the interview questions were adjusted to emphasize the unclear responses to the questions during round 1 interview sessions and establish a consensus from the information technology experts. Similarly, the researcher modified the questions to seek further clarification and confirmation for the data the participants provided during rounds 1 and 2 of the interview sessions. The interview questions for round 3 were structured so that the researcher read the statements to the participants from which they selected options based on a 7-point Likert scale. The Likert scale that Habibi (2014) proposed for qualitative studies comprised seven options, including extremely disagree (1), mostly disagree (2), somewhat disagree (3), neither agree nor disagree (4), somewhat agree (5), mostly agree (6), and extremely agree (7). The responses were used to determine the consensus of the IT experts on each thematic aspect that emerged from the study.

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Participant Recruitment

The participants were recruited through a LinkedIn search, which enabled the researcher to filter and list 20 information technology experts on the West Coast who held managerial positions. The listed participants were directly messaged with the informed consent and asked to sign electronically before emailing it back to the researcher via the address provided. The participants provided phone numbers to enable contacting them when returning the informed consent form.

Data Collection and Analysis

The study involved conducting the interviews in three rounds. The media of participant engagement were video and phone calls. The choice was contingent upon each participant's preference. In each round of interviewing, the researcher initiated a call, confirmed that the informed consent was signed, and requested the participant to permit recording interview responses using an audio-recorder device fitted with voice distorter. After each cycle/round of data collection, the researcher transcribed the data verbatim and sent back the transcripts to the participants for confirmation. No major discrepancies were recorded, permitting the researcher to progress instantly to data analysis using the six-step thematic analysis process.

4.1 Findings

Demographics and Response Rate

The study achieved a 100% response rate in cycle 1. In cycle2, the response rate dropped to 85% and 75% in cycle 3. The study engaged more males in cycle 1 (55%) but more females in cycle 2 (53%) and cycle 3 (53%). However, the difference between the number of males and females stood at two in cycle 1, one in cycle 2, and one in cycle 3. Despite the differences, the study engaged both males and females in the data collection exercise.

Cycle 1

Two themes emerged in cycle 1. The first theme was using cloud infrastructure to control costs and the second was increasing adaptive scalability to project management dynamics.

Theme 1: Using Cloud Infrastructure to Control Costs

The theme 'using the cloud infrastructure to control project costs' underscores regulating project performance elements of finances and time by ensuring that projects meet requirements within budget and schedule using cloud-based virtual technologies. The participants' responses depicted that West Coast government organizations can control the costs of projects using cloud-based virtual technologies. Based on the study findings, cloud-based virtual technologies have project management tools that offer cost-tracking features, hence allowing teams to monitor project expenses in real time.

> Cloud-based virtual technologies would enhance West Coast government agencies' project management with respect to its completion time and associated costs. Project completion time and costs can be minimized if agencies fully adopt cloud-based virtual technologies ($P1C_1$).

One of the core virtual technology tools that became evident during the study is cloud-based virtual accounting software. The study findings singled out cloud-based virtual accounting as a new technology that can enable government agencies to manage financial data, provide unparalleled convenience, increase accessibility, and improve cost-effectiveness.

> Yea […] yea, there are many tools, especially cloud-based accounting software. What it does is that it hosts, you know, accounting information on remote cloud server. Approved project personnel can access and analyze what is there, and …and they can manage costs and processes from any device connected to the internet ($P16C_1$).

Using cloud-based accounting software requires organizations to automate project information related to accounting so that the personnel responsible for managing projects can view it and use the information to make decisions. Most decisions they make relate to saving the expenses of implementing projects. Similar to $P16C_1$, $P4C_1$ agreed that sustaining cloud-based virtual technologies over time will enable the government to save costs when it comes to purchasing new hardware and additional storage and making expensive installations and configurations. The participant further said that the time-tracking capability of cloud-based virtual will simplify the planning and implementation of project management methodologies.

> This feature will help in evaluating and visualizing the overall project completion timeline an aspect that will guarantee the sustenance of this tool at the West Coast government ($P4C_1$).

The participants amplified the necessity of cost control concerns over people thinking that governments do not need to regulate project costs, assuming that governments have money flowing all the time. According to $P20C_1$, governments all over the world have limited budgets that they must spend on projects. The participant insisted that the governments on the West Coast cannot deny the need to identify, evaluate, and utilize technologies that they believe can help minimize the costs of projects. The study confirmed that cloud-based computing helps to reduce costs and simplify deployments because only the used resources are paid for when the project is run and accomplished.

> Cloud-based virtual technologies will improve project management by enabling cost savings. This is possible because of the pay-as-you-go system which will enable agencies pay for the exact service and space that is needed with no charges for what is not needed. Hence, combining these cloud technology aspects would result in lower costs and attainable outcomes ($P8C_1$).

The study further showed that cost savings can be achieved through resource optimization, as teams can allocate resources more efficiently ($P3C_1$; $P7C_1$). Models such as pay-as-you-go are anchored on cloud services, and they help minimize upfront infrastructure costs (P17C1). Moreover, the study confirmed the essential role of cloud-based computing technologies to help project implementers in setting and controlling budgets.

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> I have previously used cloud technologies to help teams set and control budgets more effectively with cloud-based financial tools, I think cloud is useful here ($P19C_1$).

Effective cost control requires organizations to conduct cost forecasting correctly. The study revealed that predictive analytics can help in forecasting project costs accurately. Based on the response by $P10C_1$, forecasting is effortless in cloud environments because the project implementors fill the figure and generate tables and figures that predict the possible changes in the project costs in the future. Accurate predictions can enable West Coast government agencies to control the costs of managing projects.

Theme 2: Increasing Adaptive Scalability in Project Management Dynamics

The theme 'increasing adaptive scalability to project management dynamics' emerged from the participants' responses concerning the capability of cloud-based virtual technologies to allow for easy expansion or upgrading of project specifications on demand and in response to changes in environmental conditions. The participants agreed that cloud-based virtual technologies enable an automatic adjustment to the available resources to meet changing demands and needs. Most importantly, the analyzed responses show that cloud-based computing technologies allow project personnel to adjust project specifications when the need arises without compromising the quality of the output.

> I believe cloud services could enable project managers in governments to adjust to changes in resource need without impacting the overall performance of a project or reliability of the results ($P11C_1$).

The study findings revealed that scaling of resources is an undeniable occurrence in government project management due to sudden changes that tend to affect the work processes. The participants ($P4C_1$; $P9C_1$) noted that the changes cannot be avoided due to the nature of the service required. It was evident from the study that project resources such as time and finances may not remain constant, given the dynamics that characterize the project environment ($P2C_1$; $P9C_1$). The participants' responses reflected the need to use scalable resources effectively (P11C1; P14C1; P17C1).

> Government priorities tend to change from time to time. A war or a disease such as Coronavirus may hit a country, and a government's response is to divert resources, especially if the emergency was not planned for in advance ($P14C_1$).

When sudden events happen, a project or few projects can be required to reduce the number of resources but still be expected to deliver a high-quality outcome. Virtualized systems and experienced users can click on a few buttons to see exactly where to adjust and the potential effect of such adjustments on the overall project performance. The completion is made possible because cloud-based project management allows teams to scale resources up or down as needed, optimizing project efficiency.

Scalability is founded on the principle of flexibility, which the study showed provides the freedom to plan and readjust project strategies as the project continues without compromising performance. The flexibility of operations emerged strongly from the study findings. The cloud enables remote work capabilities by giving team members the flexibility to work from anywhere.

> Primarily, it is the remote access as well as flexible and scalable infrastructures that make the cloud-based virtual technologies more outstanding ($P3C_1$).

As per the study findings, the role of flexibility is to enable project teams to react to barriers and ultimately achieve the targets consistently. The participants recognized the role of flexibility in allowing the West Coast government agencies to adjust project specifications when needed and still complete the project. $P8C_1$ said that flexibility in project execution helps in adjusting project plans and budgets according to changing requirements. However, flexibility requires advanced technologies to be actualized. Based on the study findings, cloud-based virtual technologies provide a pathway toward

> Implementing cloud-based virtual technologies would revolutionize project management on the West Coast by enabling flexibility. By saying flexibility, I mean having an increased ability to fulfil project objectives quickly ($P8C_1$).

The participant further said that given that the current e-government solutions demand excessive commitment and attention to files and storage issues, the West Coast governments could not fully concentrate on achieving project goals. Therefore, adopting cloud-based virtual technologies would offer project managers more flexibility where a cloud-based service can provide that instantly in case of any demands.

The study recognized the central role of cloud-based virtual technologies in enabling adaptive project management. Cloud technologies facilitate adaptive project management by enhancing the capability of project stakeholders to respond to dynamic project environments.

> The project management environment is not a statistical one, you know. Whether you are an IT expert for private or government, you must understand how to respond to changes in the environment in which the project is being implemented. Effectively set up cloud services provide such solutions to project personnel ($P16C_1$).

In cloud environments, it is easy to execute agile integration**.** The cloud tools seamlessly integrate with agile methodologies and provide unprecedented support for iterative and incremental project development. $P1C_1$ said that minimized project completion time and costs are linked to cloud-based virtual technologies' distributed collaboration, which is enhanced by agility, scalability, and modifiability.

The study confirmed that government agencies using cloud-based virtual technologies make informed decisions and maintain project schedules.

> Therefore, government agencies will have the ability to track project timelines, task completions and also identify project roadblocks earlier therefore making informed decisions and maintaining project schedules in an adaptive way ($P3C_1$).

The participants noted that technology will continue to advance, and if the government accepts to adopt technologies, it will be possible to maintain the agility and flexibility necessary for experiencing efficient and seamless performance in operations associated with project management ($P4C_1$). Thus, the study findings applauded the crucial role that cloud-based virtual technologies play in improving flexibility due to their adaptive scalability feature.

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Cycle 2

Cycle 2 of the Delphi study commenced one week after the participants confirmed data from cycle 1. The results from cycle one were used to develop the interview questions for cycle 2. The twenty participants who participated in round 1 received an invitation letter through email to participate in cycle two interviews. Of the initial 20 participants, only 17 participants were available to participate in cycle 2 data collection. The interview questions sought data that could clarify the cycle one finding. Fundamentally, the participants were asked to confirm if they agreed with the findings from cycle 1.

Theme 2: Using Cloud Infrastructure to Control Costs

Fourteen out of seventeen participants (82.4%) of the participants agreed that cloud-based virtual technologies could facilitate West Coast government agencies' efforts to control project costs. However, 17.6% of the participants were not sure whether cloud infrastructure could enable governments to control project costs. Despite the responses, all the participants (100%) agreed that controlling project costs can help improve project management in West Coast government agencies.

Theme 3: Increasing Adaptive Scalability in Project Management Dynamics

All seventeen participants (100%) agreed that using cloud-based virtual technologies provides opportunities for increasing adaptive scalability to project management dynamics in West Coast government agencies. The participants mentioned flexibility, ease of response to changes, proactivity, and adjustment, meaning that they view cloud infrastructure as an adaptable tool for project management. When asked about the role of increased adaptive scalability in improving project management performance, 16 out of 17 participants (94.1%) agreed that adaptive capability can greatly improve project management in West Coast government agencies.

Cycle 3

Cycle 3 data collection occurred one week after the participants transcribed and approved the cycle two results. The core focus of cycle 3 was to use a rating scale to determine the level of consensus for each key result from cycle 2. All the seventeen participants who responded to cycle 2 received an invitation to participate in cycle 3. However, only 15 participants were willing to participate. The participants were asked to rate each statement based on a seven-point Likert scale (Key: 1-Extremely disagree, 2-Mostly disagree, 3-Somewhat disagree, 4-Neither agree nor disagree, 5-somewhat agree, 6-mostly agree, 7-Extremely agree). The study results were presented using the Table 1.

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Table 1: Consensus on Cloud-based Virtual Technology Influence

	Mean	Standard deviation	Kendall's *W*
1. Do you agree that cloud-based virtual technologies help to control project costs in West Coast government agencies?	6.7333	.45774	0.719
2. Do you agree that cloud-based virtual technologies help to increase adaptive scalability to project management dynamics in West Coast government agencies?	5.4000	.50709	
Aggregates	6.07	0.4824	

The aggregate mean of 6.07 indicates that the participants 'mostly agreed' with the Likert scale statements. The mean standard deviation is 0.4824; the value depicts a low variability in the participants' options between 1 and 7, indicating a consensus among the information technology experts who participated in the study. Kendall's *W* is 0.719. The concordance coefficient is greater than 0.7, which indicates a strong consensus among the information technology experts that cloud-based virtual technologies result in the six thematic aspects presented in the study. The mean for statement 1 is closer to 7, indicating that the participants mostly agreed with it while statement 2 depicts somewhat agree (5).

The study also investigated the participants' consensus regarding the role of each cloud-based virtual technology feature on project improvement. The seven-point Likert scale was used to collect data, and the results were presented using Table 2.

Table 2: Consensus on Cloud-based Virtual Technology in Enhancing Project Management in West Coast Governments

	Mean	Standard deviation	Kendall's *W*
Using the cloud infrastructure to control project costs	6.7333	0.45774	0.701
Increasing adaptive scalability to project management dynamics	5.4000	0.50709	
Aggregates	6.07	0.4824	

Table 2 shows the responses to cycle 3 interview question 2. Based on the results, the aggregate mean value is 6.077 (~6). The results indicate that the majority of the participants mostly agreed that each element of cloud-based virtual technologies emerged from the study as they can help the West Coast government agencies enhance project performance. The standard deviation of 0.4824 indicates that there was a low variation in the responses the participants selected from the 7-point Likert scale. Kendall's *W* of 0.701 indicates a strong consensus among the participants that cloud-based virtual technologies can enhance project management in West Coast governments.

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5.1 Discussion

The study revealed that there is a consensus among the information technology experts on cloud-based virtual technologies provide a basis for project cost control. Table 4 shows that the majority of the participants' responses regarding the cloud-based virtual technologies enabling the West Coast governments to control project costs were around 6 (mean=6.733, SD=0. 45774). The values indicate the majority of the participants mostly agreed with the statement, and the responses did not vary. Thus, the study revealed that cloud-based virtual technologies play a key role in improving project costs. Kendall's *W* (*W*=0.719) in Table confirms that the participants held a consensus about the instrumentality of controlling projects in improving project management on the West Coast. The participants had a consensus that the cloud tools enable project implementors to control costs effectively. The core aim of project management is to minimize costs without compromising quality. Alashhab et al. (2021) stated that the capabilities of cloud-based computing technologies play a key role in enabling project implementors to minimize project costs. Past studies such as Alzakholi et al. (2020) and Caprolu et al. (2019) agree with the study findings that cloud-based virtual technologies improve project management processes by minimizing project costs.

The cost-tracking features of cloud-based virtual technologies enable project management teams to monitor and regulate project expenses in real time. Advanced cloud technologies do not require project teams to move physically and, hence, do not incur transportation costs (Agrawal, 2021). However, it is critical to use the correct cloud to optimize cost control (Abd et al., 2019). The study findings revealed that cloud-based virtual technologies such as cloud-based virtual accounting software facilitate the automation of project information and allow for quick view to enable project teams to make effective decisions on costs. The West Coast government agencies need to exhibit proactivity in need to identifying, evaluating, and utilizing technologies that they believe can help minimize the costs of projects. The agencies can achieve remarkable success in cost minimization by adopting effective cloud-based virtual technologies.

A limited understanding of utility procurement and the cost of cloud infrastructures where governments can still be operating outdated IT solutions due to public sector budgeting and strict investment norms may influence the use of cloud infrastructure in West Coast's government agencies. Adopting cloud-based computing technologies enables organizations to control the costs of managing projects (Schank, 2021). Studies showing that cloud-based virtual technologies play a critical role in project cost reduction emphasize the need to adopt the technologies (Mousa, 2020; Martens, 2023). Thus, using cloud-based virtual technologies enables government agencies to monitor and regulate the costs of project management in real-time.

Controlling costs effectively ensures that projects deliver results within budget and schedule, thus achieving performance expectations (Holzmann et al., 2022). Thus, effective cost forecasting can enable West Coast government agencies to control project management costs effectively. Based on Table 5 results, the mean is 6.7333 (~6) with a Kendall's *W* of 0.701 (W>0.7), further indicating that the participants agreed (had a consensus) that controlling projects is key in project management. Cost control allows project teams to minimize project management expenses, thereby enabling project completion within budget.

Based on Table 1 and Table 2, the study confirmed that there is a consensus among information technology experts that cloud-based virtual technologies enable organizations' abilities to adjust

their capacity and resources in response to changing demands and requirements. Table 4 shows that the mean is 5.4 (~5), indicating somewhat agreement among most participants but Kendall's *W* indicates that there was an agreement among the participants that cloud-based virtual technologies are a source of adaptive scalability in project management. Similarly, Table 5 results show that W=0.701 (w>0.7); hence, most participants agreed that increasing adaptive scalability to project management enhances project management in West Coast government agencies. Past studies that focused on the adaptive scalability phenomenon argued that the activities should provide for dynamic and intelligent allocation of resources to meet current needs while being prepared to accommodate increased or decreased workloads without significant disruptions or inefficiencies (Peng et al., 2020; Zamboni et al., 2019). Although the term 'adaptive scalability' is mostly used to describe the process of system development, it is a relevant theme in the current study because it depicts the ability of a project to respond to changing needs yet achieve the predetermined goals without compromising quality. Exhibiting adaptability implies that government agencies on the West Coast can adjust the project management processes by factoring in the changes that occur in the micro and macro environment to prevent stagnation.

6.1 Conclusions

The study obtained a consensus of the technology experts on the potential of cloud-based virtual technologies to enhance project management in West Coast governments. The study findings revealed that cloud-based virtual technologies have the potential to enhance project management performance because it can reduce costs of projects and enable adaptive scalability. Minimizing project costs is necessary for project management because it improves project performance by enabling the achievement of project outcomes within the budget (Alashhab et al., 2021; Abd et al., 2019). The participants agreed that the cloud infrastructure is associated with adaptive scalability, which makes it flexible and responsive to changing circumstances (Zamboni et al., 2019). The two features associated with project management increase the potential of cloud-based virtual technologies to enhance project management in West Coast governments.

7.1 Recommendations

Government agencies pay attention to cost minimization during project management. The consensus among the information technology experts participating in the study was that West Coast government agencies can use cloud-based virtual technologies to control project costs. Thus, the West Coast government agencies should assess different types of cloud infrastructure and select the most suitable cloud tools to minimize costs.

It was evident from the study that cloud-based virtual technologies are associated with high performance, scalability, ubiquity, and flexibility. Government agencies should consider using high-performance cloud-based virtual technologies to execute and process project data at high speeds. Cloud-based virtual technologies should be flexible and scalable to allow decreasing or increasing information technology resources based on changing demands.

8.1 Areas for further research

Future researchers should consider conducting studies that compare the consensus among information technology experts on using cloud-based virtual technologies to manage projects in

public and private organizations. The current study focused on public organizations (government agencies). Researchers may adopt qualitative research method and the Delphi research design to explore the consensus among information technology but compare the findings between private and public sector organizations. Consistently with the assertion by Goodrick (2020), comparative studies will show differences and similarities in consensus between the public and private organizations, given that the organizations may exhibit dissimilar contextual realities. The target population for comparative studies may include information technology experts from both private and public sector organizations.

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