Chargeback as an ICT Cost Reduction Strategy

G K Ajufo*[1]

[1]Directorate of Research and Graduate Studies, University of Zambia, Lusaka, Zambia

Email: gkajufo@gmail.com[1]

Abstract. A leading financial institution in Nigeria, hereinafter referred to as "the Bank", has deployed Information and Communications Technology (ICT) systems to drive the Bank's strategy and operations with significant success, albeit with massive investments. However, despite the benefits derived, there have been concerns, especially with the dwindling revenues of the Bank, that the ever-increasing cost of ICT could become unsustainable. These concerns have led the Bank's management to request the ICT Department to find ways of reducing costs. This study investigated the adoption of ICT chargeback to reduce ICT costs in the Bank without impacting ICT service quality. The study adopted the Technology-Organization-Environment framework and utilized variables identified by prior researchers on ICT chargeback. Data was gathered from the Bank's staff using online surveys. The findings from the analysis of data provided sufficient evidence to support the assertion that ICT chargeback adoption would lead to ICT cost reduction in the Bank, consistent with the results of previous studies. The study also indicated that chargeback adoption would facilitate decision-making and more responsible usage of ICT infrastructure in the Bank. However, the study also found some negative consequences which would result from its adoption. For instance, the study showed that ICT Chargeback would discourage innovation due to cost consciousness and foster an unhealthy relationship between ICT and the business. In conclusion, the study recommended the adoption of ICT chargeback with the caveat that the negative consequences identified should be minimized to ensure that they do not vitiate the gains from the adoption.

Keywords: ICT Chargeback; Technology-Organization-Environment; ICT Costs; Cost Reduction; Cost-effectiveness and efficiency; Perception

1. Introduction

Information and Communication Technology (ICT) has long been recognized as a veritable tool for business operations and survival and to drive organizational strategies to gain a competitive advantage in the global environment [1-3], with technologies such as cloud computing, mobile digital platforms, social networking, online collaboration and virtual meetings, analytics, and artificial intelligence being at the forefront. This trend has resulted in massive ICT investments in software, hardware, and communications [4- 6]. According to Forrester, this trend is expected to continue with global investments in ICT in areas such as software, generative AI, and green and digital innovation projected to reach $4.7 trillion in 2024, a 5.3% increase from the 2023 expenditure [7].

In the Banking sector, these investments have significantly improved service efficiency, worker performance, and profitability and have also facilitated increased returns on equity for deposit money banks (DMBs), leading to increased profitability, efficiency, and competitiveness [8].

However, despite the many benefits of ICT, the burgeoning expenditure partly due to the increased cost of remediating cybersecurity breaches required to keep these ICT installations operational has continued to be a major concern to organizational management and users globally. While several factors have been adduced for these breaches, according to the Ponemon Institute, the foremost organization dedicated to research on privacy, data protection, and policy on information security, remediating breaches arising from human factors alone could require substantial annual costs of between $4.1 and $6.6 million [9]. The management of the Bank has also raised this concern in light of the fluctuating earnings accruable from crude oil sales, especially during uncertain times, as was experienced during the coronavirus disease of 2019 (COVID-19) pandemic.

Organizations have employed different ICT cost reduction techniques, and the success levels of these techniques have varied depending on how each organization's ICT costs and internal ICT organization are structured to deliver service [10][3]. Similarly, Cheng et al. [3] argue that ICT chargeback only promotes strategic alignment and performance in organizations with business-competent chief information officers (CIOs) instead of IT-competent business executives. In a leading financial institution in Nigeria, hereinafter referred to as the "Bank", ICT cost reduction has been achieved mainly through the renegotiation of license costs, insourcing certain ICT activities such as application development, hardware maintenance, cybersecurity monitoring and remediation, server infrastructure virtualization, software rationalization, modernization of the Bank's obsolete ICT infrastructure and applications, and migrating to less expensive software options. Although the Bank's management acknowledged that implementing these initiatives brought significant improvements in the overall operational efficiency of the Bank, questions were raised as to whether the gains attained justified the considerable cost of yearly licenses and support fees, which are majorly denominated in foreign currencies. Also, the need to transform the Bank into a digital organization and improve cybersecurity protection has necessitated additional ICT expenditure without a significant increase in the Bank's revenue. Furthermore, while the adopted techniques were discussed within the ICT department, recommended to the Bank's management, and approval obtained, no formal research was carried out to ascertain if other effective methods could be applied in the Bank. This study attempts to fill that void by investigating the suitability of chargeback as an ICT reduction strategy without impacting the quality of ICT service. This study is critical because although several studies have been conducted globally on chargeback as an ICT cost reduction strategy, a significant number of the key studies are over ten years old. Also, no such research has been carried out in the Bank, which plays a critical role in the Nigerian economy and requires cost-effective and efficient ICT operations to ensure the overall health of the Nigerian State.

2. ICT Cost Reduction – An Overview

According to Jafari [10], organizations have adopted several cost-cutting strategies and techniques, generally classified into three categories. The first category includes those that allow users to determine ICT costs based on their demand. This includes ICT chargeback, which facilitates the disclosure of ICT costs to users [11][10], enabling them to set their priorities and choose which services should be provided based on the investments they are willing to make and has become one of the growing practices in management accounting [12]. The second category includes approaches that facilitate the reduction of resource expenditure related to labor and ICT infrastructure, as well as platform and application costs [10]. They usually account for the most significant costs related to information systems deployment, including bring your own device (BYOD) and cloud computing. The third and last category covers strategies that enable the renovation of operating practices. These strategies and techniques facilitate the simplification of complex ICT operating models, formalization, and improvement of business practices and processes to reduce costs and improve business operations' effectiveness and efficiency [10].

2.1. ICT Chargeback Concept

Chargeback in ICT refers to the allocation of costs to business units within an organization for ICT services delivered by the in-house ICT function to control and manage ICT expenditures [13, 3, 14]. This contrasts with the practice where all the costs for providing ICT infrastructure and services are domiciled in one central department (usually ICT), which pays for such expenditure from their budget [3]. Edberg and Kuechler [13] identify two forms. The first is the soft money method, which determines the ICT cost for each cost center for informational purposes only. The second is the hard money approach, which extends the first approach by transferring the computed costs for services enjoyed to each cost center.

Cheng et al. [3] provide four main drivers that influence the adoption of implementing chargeback. The first driver identified is the need to provide information that enables organizations to decide whether to charge business units for the cost of ICT services delivered or to warehouse such costs in a single business unit such as ICT. The second objective is to enable the determination of the individual business unit cost component of the total ICT expenditure to facilitate the allocation of such costs to each business unit if desired. The third is the need to manage the ever-increasing costs of providing ICT services efficiently, while the fourth and last driver is the requirement to promote responsible and efficient usage of ICT services in the organization.

Different approaches have been adopted to implement ICT chargeback. Table 1 presents the strategies identified by Killian [14].

Table 1. ICT Chargeback Implementation Approaches (Adopted from *[14]*)

Method	Description
Service Based Pricing (SBP)	Charges are per specific measured unit of service.
Negotiated Flat Rate (NFR)	Charges are based on a negotiated and often projected usage of service.
Tiered Flat Rate (TFR)	Charges are based on providing access to a service, whether the service is being used or not (fliers or brand pricing).
Measured Resource Usage (MRU)	Charges are based on measured usage of specific ICT resources (e.g., KW consumed, network bandwidth consumed, and storage consumed).
Direct Cost (DC)	Charges are based on dedicated ownership of the resource (e.g., time and material-based costing).
Low-level Allocation (LLA)	Charges are based on more straightforward user metrics (e.g., user and server counts).
High-Level Allocation (HLA)	Charges are based on user size (e.g., number of employees and amount of revenue).

2.2. ICT Chargeback Benefits and Drawbacks

Numerous organizations have embraced the practice of ICT chargeback as a crucial strategy to hold end users accountable for the increasing ICT expenditure, although despite widespread adoption, this practice continues to spark significant controversy [15]. This may not be unrelated to the difficulty in determining what portion of the total cost is allocated to different user groups in areas such as computing power or network infrastructure usage and maintenance, where cost allocation may be problematic [13]. The difficulty in determining allocation costs arises from the fact that if a user group chooses to cut costs by reducing their use of computer infrastructure, the overall expenses are unlikely to decrease as the infrastructure still needs to be maintained and remain operational, which can increase costs for other users who continue to rely on the same ICT services.

According to Drury [15], the chargeback reveals the actual cost of ICT services to users, allowing them to manage their usage, enhance overall decision-making, and foster a more cost-effective and equitable use of ICT resources. However, even if costs are distributed fairly, ICT Chargeback may not lead to cost reduction unless users perceive value and connect quality of service to the costs allocated [16]. Additionally, Gartner [17] argues that ICT Chargeback is essential for organizations to effectively manage demand for ICT resources by directly linking costs to demand and ensuring a balance between value and costs. Furthermore, Gartner [17] reports that many organizations have reported that chargeback significantly enhances users' understanding of ICT costs and promotes responsible usage of ICT resources, leading to cost reductions of between 5% and 10%.

Despite the benefits highlighted, Edberg and Kuechler [13] argue that chargebacks may discourage the development of innovative ICT solutions through experimentation if it is not clear from the beginning that the solution will be cost-effective. Also, Gartner [18] argues that ICT chargeback adoption may promote user engagement of less expensive external ICT service providers whose solutions may not meet their requirements. Chargeback may also lead to an antagonistic and unhealthy relationship between ICT and the business, especially when business units do not perceive the charges as fair or cannot control the allocated charges [13][18]. Additionally, ICT chargeback may require much effort to implement, while its adoption may lead to additional costs [13].

2.3. Factors that facilitate the adoption of ICT Chargeback

Multiple factors have been advanced as influencing factors for the adoption of ICT Chargeback in organizations. These are accuracy, cost of costing, transparency and understandability, controllability, fairness, and accountability. Other factors identified are measurability, predictability, comparability, and top management support.

Accuracy is defined as the degree to which the amount charged for an ICT service precisely reflects the actual cost of that service [15][19][20]. Chargeback models that demonstrate high accuracy can help reduce costs effectively [15][20], encourage stakeholder adoption, as users are less motivated to pursue change due to inaccuracies [15], and also promote the acceptability and effectiveness of ICT chargeback [20]. However, while this factor positively influences chargeback adoption, increased accuracy requires more effort, potentially leading to higher overall costs. Cost of Costing is the cost required to implement ICT chargeback, which influences its effectiveness [20]. However, if the cost of this model exceeds the savings, the chargeback model would lead to an overall cost increase. Therefore, the cost of implementing the chargeback model should be weighed against the potential savings to ensure that the benefits gained exceed the costs involved.

Transparency refers to the extent to which customers know how allocated charges are derived, while understandability refers to whether customers understand the relationship between charges and services enjoyed. The two factors are closely related; without understandability, there cannot be transparency, leading to low customer buy-in due to resentment. [20][15]. Baars et al. [20] define controllability as the extent to which consumers influence their ICT costs and posits that chargeback implementations that allow customers to control their consumption patterns tend to have high customer buy-in and acceptance, whereas those that do not often lead to customer antipathy. While this may be true, high controllability may prompt organizations to choose cheaper solutions that might not fulfill user requirements while attempting to cut costs.

Fairness is a crucial factor in determining the success of chargeback systems. A chargeback system is considered fair when it is both reasonable and equitable [19]. Additionally, customers may perceive unfairness when they lack the freedom to purchase services from external suppliers and believe that the costs charged are higher than market prices. However, achieving fairness can be challenging when it is difficult to determine the exact consumption of users. Accountability, which affects the acceptability of

ICT chargeback, refers to the extent to which customers can validate the correctness of their bill for services received. According to Baars, et al. [20], low accountability in ICT services can lead to disputes. However, since many users at the Bank are not proficient in ICT service delivery, they may find it challenging to verify the accuracy of their bills. This difficulty can contribute to lower accountability.

Measurability affects the accuracy, effectiveness, and acceptability of ICT Chargeback and refers to how easy it is to determine the units of each ICT service consumed and the ability to apportion the consumed units to each user [20]. For example, if the cost of an ICT service is based on the number of successful transactions processed, it should be possible to accurately track the number of transactions made by each customer during a billing period. This high measurability minimizes the need for special equipment to determine the units consumed, ultimately reducing overall costs.

Predictability indicates how well future bills can be predicted [20]. Implementing ICT chargeback with low predictability, especially when this results in higher initial customer estimates, can negatively affect budget performance, causing resentment and low acceptability of the chargeback implementation [20]. Comparability refers to how the internal ICT service charges measure up against the prices of external service providers for similar services [20]. When chargebacks have high comparability, it often results in lower prices from suppliers, as users can easily compare prices and request fair pricing. Top management support is essential for providing the necessary resources to achieve organizational goals [21]. Such support also facilitates the adoption and implementation of changes required for the success of ICT Chargeback by fostering a positive environment [22][23].

3. Theoretical Background

The Technology-Organization-Environment (TOE) framework is an organizational-level methodology for technological innovation that outlines how three contexts (technological, organizational, and environment) of an organization impact the adoption and utilization of technological innovations [24]. The technological context refers to how the technologies within the organization and those available externally influence decisions regarding innovation adoption. According to the TOE framework, technological innovations can lead to incremental changes by adding features or improvements to existing products or services, synthetic changes by employing existing ideas or technologies to create significantly new products or services, and discontinuous or radical changes by producing entirely new products and services. The organizational context refers to the structures and processes that may facilitate or hinder the adoption and use of technological innovations. Some of these structures are formalized and designed to enhance worker skills, streamline supervision, and standardize processes, procedures, and work outputs. Others are informal and reflect some informal organizational cultures and roles that support achieving the same organizational goals expected from the formal structures and processes. The TOE environment refers to the organization's external context, encompassing market factors and the regulatory and competitive landscape. It also includes the competitive nature of the organization's industry, the availability of relevant technology support infrastructure, and the structure of customer-supplier relationships within the organization's industry. The TOE framework has been employed in numerous studies to identify the factors influencing technology adoption and use [25- 27].

4. Research Model and Hypotheses

The research model (Figure 1) adopted in this study is based on the TOE framework, with the environment and organization contexts having the factors, comparability, and top management support, respectively. In contrast, the technology context has nine factors: accuracy, cost-effectiveness and efficiency, cost of costing, transparency and understandability, controllability, fairness, accountability, measurability, and predictability. These factors are derived from ICT chargeback implementation's facilitators, advantages, and drawbacks outlined in sections 2.2 and 2.3.

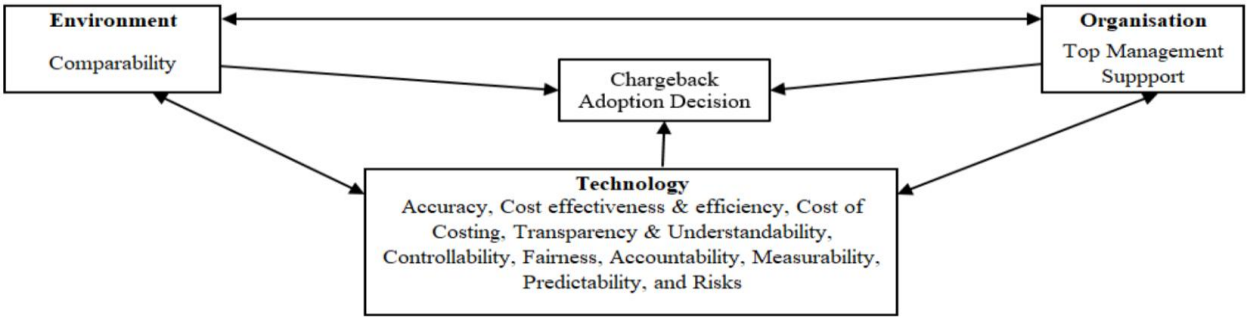

Figure 1. Chargeback Research Model.

Based on the research model, the following hypotheses are proposed:

H1a: Chargeback will promote cost-effectiveness and efficiency, leading to cost reduction.
H1b: Chargeback will improve decision-making.
H2a: Chargeback will enable users to know how charges are derived.
H2b: Difficulties will be experienced in determining and apportioning ICT service units.
H3a: Chargeback will facilitate more responsible usage of ICT.
H3b: Chargeback will enable users to influence their ICT costs.
H4a: Chargeback will discourage Innovation
H4b: Chargeback will foster an unhealthy relationship between ICT and the business.
H4c: Chargeback will force users to engage less expensive external ICT services that may not meet requirements.
H5: Chargeback will promote accountability.
H6: Chargeback will promote the understandability of ICT costs.
H7: Chargeback will promote fair cost distribution.
H8: Chargeback charges will be accurate.
H9: Chargeback will facilitate the prediction of future bills for each service.
H10: Top management supports cost-effectiveness and efficiency strategies.
H11: Chargeback will enable comparability of prices.
H12a: Chargeback will require a lot of effort to achieve.
H12b: Chargeback will require high implementation costs.

5. Research Method

A web questionnaire survey method was adopted in line with other studies on technology adoption and use [28-31]. Two questionnaires were administered via online surveys to obtain staff perceptions of the expected benefits and drawbacks of ICT chargeback implementation in the Bank. The first questionnaire featured general questions targeted at the Bank's approximately nine thousand staff to ensure the maximum number of responses was collected. However, the second questionnaire contained only questions relating to ICT Chargeback risks, which was targeted only at the Bank's approximately three hundred ICT departmental staff, as the questions in the questionnaire pertained to issues that only the ICT technical staff of the Bank could answer. The general questionnaire yielded 353 responses, while the ICT questionnaire yielded 65 responses. All questions listed in Table 4 were based on the advantages, disadvantages, and factors impacting the implementation of ICT chargeback, which were synthesized from the review of the work of previous researchers presented in Section 2. All measurements were based on a five-point Likert scale [32-34], and all questions were mandatory to ensure that there were no incomplete responses.

Data analysis was conducted in two stages with the aid of the Jamovi software. The first stage adopted the weighted average mean of the responses to the questions as the cut-off value for determining the staff's perceptions of the research variables. The weighted mean was calculated assuming equal importance of all variables. The second stage applied the Wilcoxon Signed-Rank Test to analyze the research model and test the hypotheses [35] after confirming the validity and reliability of the data collected.

6. Results

One way to determine any study's quality is by ensuring its measurements' reliability and validity [36, 37]. This study guaranteed reliability by ensuring internal consistency using Cronbach's alpha [38, 39]. Validity was confirmed through content validity [40] by asking colleagues with the requisite expertise to review the questionnaire for readability, completeness, and clarity before it was administered. Accordingly, to ensure the acceptance of the test results, the reliability of the data was confirmed before the commencement of analysis. Table 2. presents the reliability scores for the two data sets, which were deemed acceptable as they are higher than the minimum of 0.70 used by most researchers [36, 41].

Table 2. Reliability Scores for the Two Data Sets

Data Set	Cronbach's Alpha
General Data	0.884
ICT Staff Data	0.740

Table 3 shows the demographic profile for the data, while Tables 4 and 5 present the descriptive statistics for all items in the General and ICT questionnaires, respectively.

Table 3. Demographic profile

Demographics	Respondents	
	General Data	ICT Data
Age Bracket (Years)		
18 – 24	5 (1%)	2 (3%)
25 – 34	120 (34%)	17 (26%)
35 – 44	141 (40%)	28 (43%)
45 – 54	67 (19%)	16 (25%)
55 – 60	20 (6%)	2 (3%)
Gender		
Male	268 (76%)	52 (80%)
Female	85 (24%)	13 (20%)
Bias in Tech		
Bias – No	247 (70%)	23 (35%)
Bias – Yes	106 (30%)	42 (65%)

Notes: N for General Data = 353; N for ICT Data = 65

Table 4. Descriptive Statistics for the General Data

Context	Item	SD (%)	D (%)	Un (%)	A (%)	SA(%)	Mean	σ	Perception

Context	Item	SD (%)	D (%)	Un (%)	A (%)	SA(%)	Mean	σ	Perception
Technology (Cost-effectiveness and efficiency)	2. Promote cost-effectiveness and efficiency due to user ability to obtain ICT costs for SBUs.	5 (1.4)	10 (2.8)	76 (21.5)	165 (46.7)	97 (27.5)	3.96	0.855	High
Technology (Cost-effectiveness and efficiency)	3. Improve Decision Making due to the availability of cost data for each SBU.	4 (1.1)	11 (3.1)	63 (17.8)	164 (46.5)	111 (31.4)	4.04	0.849	High
Technology (Measurability)	9. Enable users to know how charges are derived for different ICT Services rendered by the ICT Department.	19 (5.4)	21 (5.9)	97 (27.5)	130 (36.8)	86 (24.4)	3.69	1.070	High
Technology (Controllability)	4. Facilitate more responsible usage of ICT due to user ability to control SBU ICT Costs.	2 (0.6)	10 (2.8)	53 (15.0)	171 (48.4)	117 (33.1)	4.11	0.798	High
Technology (Controllability)	11. Enable users to influence their ICT costs by deciding which services to consume and how much of each service they should consume.	19 (5.4)	25 (7.1)	94 (26.6)	120 (34.0)	95 (26.9)	3.70	1.100	High
Technology	5. Discourage	47	78	98	82	48	3.02	1.240	Low

Context	Item	SD (%)	D (%)	Un (%)	A (%)	SA(%)	Mean	σ	Perception
(Risks)	Innovation due to cost consciousness and continuous efforts to reduce ICT Service costs (Reversed).	(13.3)	(22.1)	(27.8)	(23.2)	(13.6)			
Technology (Risks)	6. Foster an unhealthy relationship between ICT and the business because of disagreements between ICT and users over the cost assigned to SBU (Reversed).	44 (12.5)	87 (24.6)	104 (29.5)	73 (20.7)	45 (12. 7)	2.97	1.210	Low
Technology (Risks)	7. Force users to engage less expensive external ICT services that may not meet requirements in a bid to save costs (Reversed).	59 (16.7)	108 (30.6)	108 (30.6)	43 (12.2)	35 (9.9)	2.68	1.180	Low
Technology (Accountability)	8. Give users confidence that the amount charged for an ICT service mirrors the actual cost expended to deliver the service.	12 (3.4)	28 (7.9)	114 (32.3)	145 (41.1)	54 (15.3)	3.57	0.957	Low

Context	Item	SD (%)	D (%)	Un (%)	A (%)	SA(%)	Mean	σ	Perception
Technology (Transparency & Understandability)	10. Enable users to understand what services they are being charged for.	14 (4.0)	21 (5.9)	71 (20.1)	143 (40.5)	104 (29.5)	3.86	1.040	High
Technology (Fairness)	12. Enable users to confirm that charges are reasonable and equitable.	17 (4.8)	17 (4.8)	101 (28.6)	131 (37.1)	87 (24.6)	3.72	1.040	High
Technology (Accuracy)	13. Enable users to validate the correctness of the bills received for each service.	18 (5.1)	13 (3.7)	98 (27.8)	145 (41.1)	79 (22.4)	3.72	1.020	High
Technology (Predictability)	14. Allow users to predict future bills for each service.	19 (5.4)	34 (9.6)	88 (24.9)	127 (36.0)	85 (24.1)	3.64	1.110	High
Organization (Top Management Support)	1. Cost-effectiveness and efficiency are important to the Bank's management.	2 (0.6)	17 (4.8)	59 (16.7)	130 (36.8)	145 (41.1)	4.13	0.898	High
Environment (Comparability)	15. Allow users to compare prices of internal ICT services with charges obtainable for corresponding or similar services provided by external service	23 (6.5)	22 (6.2)	73 (20.7)	151 (42.8)	84 (23.8)	3.71	1.100	High

Context	Item	SD (%)	D (%)	Un (%)	A (%)	SA(%)	Mean	σ	Perception
	providers.								

Notes: N = 353; Weighted Mean = 3.63; SD = Strongly Disagree; D = Disagree, Un = Undecided; A = Agree; SA = Strongly Agree

Table 5. Descriptive Statistics for the ICT Data

Context	Item	SD (%)	D (%)	Un (%)	A (%)	SA(5)	Mean	σ	Perception
Technology (Cost of Costing)	1. Requires a lot of effort to achieve.	0 (0)	5 (7.7)	11 (16. 9)	23 (35. 4)	26 (40.0)	4.08	0.941	High
Technology (Cost of Costing)	2. Requires a high cost to implement.	5 (7.7)	14 (21.5)	25 (38.5)	15 (23.1)	6 (9.2)	3.05	1.07	Low
Technology (Measurability)	3. Experience difficulties determining the units consumed for each ICT service and apportioning them to SBUs.	1 (1.5)	9 (13.8)	16 (24.6)	30 (46.2)	9 (13.8)	3.57	0.951	High

Notes: N = 65; Weighted Mean = 3.57; SD = Strongly Disagree; D = Disagree, Un = Undecided; A = Agree; SA = Strongly Agree

Analysis of the general data indicated that "1. Cost-effectiveness and efficiency are important to the Bank's management", "2. Promote Cost-effectiveness and efficiency due to user ability to obtain ICT costs for SBUs", "3. Improve Decision-making due to the availability of cost data for each SBU", "4. Facilitate more responsible usage of ICT due to user ability to control SBU ICT Costs", and "9. Enable users to know how charges are derived for different ICT Services rendered by the ICT Department" were perceived as high. Other variables with high staff perceptions were "10. Enable users to understand what services they are being charged for", "11. Enable users to influence their ICT costs by deciding which services to consume and how much of each service they should consume", "12. Enable users to confirm that charges are reasonable and equitable", "13. Enable users to validate the correctness of the bills received for each service", "14. Allow users to predict future bills for each service" and "15. Allow users to compare prices of internal ICT services with charges obtainable for corresponding or similar services provided by external service providers". However, four variables in the general data were perceived as low. These were "5. Discourage Innovation due to cost consciousness and continuous efforts to reduce ICT Service costs", "6. Foster an unhealthy relationship between ICT and the business because of disagreements between ICT and users over cost assigned to SBU", "7. Force users to engage less expensive external ICT services that may not meet requirements in a bid to save costs", and "8. Give confidence to users that the amount charged for an ICT service mirrors the actual cost expended to deliver the service".

Analysis of the ICT data indicated that "1. Requires a lot of effort to achieve" and "3. Experience difficulties determining the units consumed for each ICT service and apportioning them to SBUs" were perceived as high, while "2. Requires a high cost to implement" had a low perception amongst staff. To

examine the proposed hypotheses, the Wilcoxon Signed-Rank Test was conducted using the corresponding weighted average as the hypothesized test value. The hypotheses testing indicated the hypotheses H1a, H1b, H2b, H3a, H4a, H4b, H4c, H6, H10, and H12a were supported, while H2a, H3b, H5, H7, H8, H9, H11, and H12b were not supported. Although the p values for H8 and H12b were < 0.05, the hypotheses were not supported since the perceptions were low, and therefore, the significant values supported the alternate hypotheses. Tables 6 and 7 show the test statistics for the two data sets.

Table 6. Test Statistics for the General Data

Context & Hypothesis	Item	W	p-value
Technology (Cost-effectiveness and efficiency) – H1a	2. Promote cost-effectiveness and efficiency due to user ability to obtain ICT costs for SBUs.	41825	< .001
Technology (Cost-effectiveness and efficiency) – H1b	3. Improve Decision Making due to the availability of cost data for each SBU.	44943	< .001
Technology (Measurability) – H2a	9. Enable users to know how charges are derived for different ICT Services rendered by the ICT Department.	31778	0.777
Technology (Controllability) – H3a	4. Facilitate more responsible usage of ICT due to user ability to control SBU ICT Costs.	47817	< .001
Technology (Controllability) – H3b	11. Enable users to influence their ICT costs by deciding which services to consume and how much of each service they should consume.	32150	0.632
Technology (Risks) – H4a	5. Discourage Innovation due to cost consciousness and continuous efforts to reduce ICT Service costs (Reversed).	13219	< .001
Technology (Risks) – H4b	6. Foster an unhealthy relationship between ICT and the business because of disagreements between ICT and users over the cost assigned to SBU (Reversed).	11701	< .001
Technology (Risks) – H4c	7. Force users to engage less expensive external ICT services that may not meet requirements in a bid to save costs (Reversed).	6861	< .001
Technology (Accountability) – H5	8. Give users confidence that the amount charged for an ICT service mirrors the actual cost expended to deliver the service.	26056	0.006
Technology (Transparency & Understandability) – H6	10. Enable users to understand what services they are being charged for.	38012	< .001
Technology (Fairness) – H7	12. Enable users to confirm that charges are reasonable and equitable.	32658	0.455

Context & Hypothesis	Item	W	p-value
Technology (Accuracy) – H8	13. Enable users to validate the correctness of the bills received for each service.	32942	0.369
Technology (Predictability) – H9	14. Allow users to predict future bills for each service.	30058	0.534
Organization (Top Management Support) – H10	1. Cost-effectiveness and efficiency are important to the Bank's management.	46505	< .001
Environment (Comparability) – H11	15. Allow users to compare prices of internal ICT services with charges obtainable for corresponding or similar services provided by external service providers.	33862	0.166

Notes: N = 353; alpha = 0.05

Table 7. Test Statistics for the ICT Data

Context	Item	W	p-value
Technology (Cost of Costing) – H12a	1. Requires a lot of effort to achieve.	1511	0.004
Technology (Cost of Costing) – H12b	2. Requires a high cost to implement.	381	< .001
Technology (Measurability) – H2b	3. Experience difficulties determining the units consumed for each ICT service and apportioning them to SBUs.	924	0.326

Notes: N = 65; alpha = 0.05

7. Discussion

Mixed results were obtained for the factors of the technology context. Overall, the findings indicate that chargeback implementation promotes cost-effectiveness and efficiency (H1a) and improves decision-making (H1b), thus collaborating the work of researchers such as Drury [15], Gartner [18] and Baars et al. [20], who posited that ICT Chargeback enables users to control their ICT usage, improve overall decision-making, and engender a more cost-effective use of ICT resources. Regarding the technology context cost of costing factor, H12a, which posits that much effort would be required for implementation, is supported, while H12b (Requiring high implementation cost) is not supported. This finding is somewhat surprising as extra efforts may lead to additional costs. Accordingly, this finding should be interpreted as ICT chargeback would not require significant extra direct costs but may result in additional expenditure due to the extra work required. H6, which represents the technology factor of transparency and understandability, is supported. Thus, chargeback implementation will enable users to understand what services they are being charged for. Concerning the controllability technology factor, the hypotheses testing supported H3a, while there was no support for H3b. Hence, ICT implementation would facilitate more responsible usage of ICT [18, 20, 15] but would not enable users to influence their ICT costs by deciding which services to consume and how much of each service they should consume.

The misalignment in the findings for H3a and H3b may suggest management's overbearing influence on ICT purchases and consumption decisions, with users having minimal influence on the services they consume. The hypotheses testing for the technology factor of measurability resulted in mixed results with H2a, which posited that chargeback would enable users to know how charges are derived being

supported, and H2b (Difficulties will be experienced in determining and apportioning ICT service units) having no support. Thus, although respondents highly perceived that difficulties would be experienced in determining and apportioning the units consumed for each ICT service, which aligns with the findings of Andriotti et al. [11], the analysis indicates that it would not be a significant issue. Although the study found that chargeback facilitates cost-effectiveness and efficiency, leading to cost reduction, the study results for the risks technology factor indicate that it would also discourage innovation due to cost consciousness and continuous effort to reduce ICT Service costs (H4a), foster an unhealthy relationship between ICT and the business because of disagreements between ICT and users over cost assigned to SBU (H4b) and force users to engage less expensive external ICT service providers that may not meet requirements in a bid to save costs (H4c). These findings are serious impediments to implementing ICT chargeback and are consistent with the studies of Edberg and Kuechler [13] and Gartner [18]. Lastly, the hypotheses testing finds no support for the remaining technology factors of accountability (H5), fairness (H7), accuracy (H8), and predictability (H9). Accordingly, chargeback implementation would not enable consumers to confidently say that the amount charged for ICT services mirrors the actual cost of delivering the service, nor would chargeback empower users to confirm that charges are reasonable and equitable. Also, chargeback implementation would not enable users to validate the correctness of the bills received for each service, nor would it allow users to predict future bills for each service. The high perception of the item represented by H2b may explain the lack of support for these technology factors. Alternatively, the lack of support for H5, H7, H8, and H9 may suggest a lack of transparency in the current costing of ICT services in the Bank or may be due to the misalignment in the findings for H3a and H3b.

Concerning the organization context, the study findings support H10, positing that top management supports cost-effectiveness and efficiency strategies, thus indicating the importance placed on cost-effectiveness and efficiency by the Bank's management. Finally, the study findings did not support hypothesis H11, which postulated that chargeback would enable comparability of prices. Thus, chargeback will not facilitate the comparison of prices of internal ICT services with charges obtainable for corresponding or similar services provided by external service providers. The lack of support for H11 is unexpected and may be similarly explained by the clarifications for the lack of support for H3b.

8. Conclusion

Based on the strong evidence from the data analysis, we conclude that implementing ICT chargeback will assist in reducing costs in the Bank in addition to other benefits such as improved decision-making and facilitating more responsible usage of ICT infrastructure. This conclusion is consistent with the findings of Gartner [18] and Baars et al. [20]. However, the analysis also indicated that significant efforts would be required to implement ICT Chargeback in the Bank. Therefore, care must be exercised during implementation to ensure that the effort required does not lead to significant costs that vitiate the gains from its implementation. The study also found significant evidence that ICT chargeback implementation would discourage innovation due to cost consciousness and continuous efforts to reduce ICT Service costs. Additionally, the study found that ICT chargeback would foster an unhealthy relationship between the ICT department and the business because of disagreements between the technology department and users over the cost assigned to business units, which could force users to engage less expensive external ICT services that may not meet their requirements. Because of these negative consequences that may result from implementing ICT chargeback, extra care should be taken during implementation to minimize these effects through improved communication with the business. Furthermore, it is recommended that the adoption should commence with the soft money approach and simpler and more straightforward chargeback methods such as Low-Level Allocation (LLA), High-Level Allocation (HLA), Negotiated Flat Rate (NFR), and Tiered Flat Rate (TFR). As the ICT chargeback implementation matures, the hard

money approach and more advanced methods, such as Service Based Pricing (SBP), Measured Resource Usage (MRU), and Direct Cost (DC), can be considered.

9. References

[1] M. Yunis, A. Tarhini and A. Kassar, "The role of ICT and innovation in enhancing organizational performance: The catalysing effect of corporate entrepreneurship," *Journal of Business Research,* vol. 88, no. 1, pp. 344-356, 2018.

[2] V. Kumar, P. Verma, A. Mitta, J. A. T. Panduro, S. Singh, M. Paliwal and N. K. Sharma, "Adoption of ICTs as an emergent business strategy during and following COVID-19 crisis: evidence from Indian MSMEs," *Benchmarking: An International Journal,* vol. 30, no. 6, pp. 1850-1883, 2023.

[3] R. C.-N. Cheng, X. Men, P.-A. J. J. Hsieh, Z. J. Cheng, X. Cui, T. Wang and S.-H. Hsu, "The effects of IT chargeback on strategic alignment and performance: the contingent roles of business executives' IT competence and CIOs' business competence," *Internet Research,* vol. 33, no. 1, pp. 57-83, 2023.

[4] L. Kappelman, R. Torres, E. R. McLean, C. Maurer, V. L. Johnson, M. Snyder and K. Guerra, "The 2021 SIM IT Issues and Trends Study," *MIS Quarterly Executive,* vol. 20, no. 1, pp. 75-114, 2021.

[5] Gartner, "Gartner," 17 October 2018. [Online]. Available: https://www.gartner.com/en/newsroom/press-releases/2018-10-17-gartner-says-global-it-spending-to-grow-3-2-percent-in-2019.

[6] Gartner, "IT key metrics data 2021: industry measures-Executive summary," 2020.

[7] Forrester, "Global Tech Market Forecast, 2023 To 2027," Forrester Research, Inc., 2024.

[8] N. P. Nwakoby, C. P. Sidi and O. S. Abomeh, "Impact of Information and Communication Technology on the Performance of Deposit Money Banks," *International Journal of Management and Sustainability,* vol. 7, no. 4, pp. 225-239, 2018.

[9] Ponemon, "2022 Cost of Insider Threats Global Report," 2022.

[10] S. M. Jafari, "Strategic Cost-Cutting in Information Technology: toward a Framework for Enhancing the Business Value of IT," *Iranian Journal of Management Studies (IJMS),* pp. 21-39, January 2014.

[11] R. F. Andriotti, T. P. Filomena, F. J. K. Neto and R. R. Campagnolo, "A Cost management system for information technology," *Base Revista de Administração e Contabilidade da UNISINOS,* vol. 15, no. 4, pp. 264-274, 2018.

[12] B. Odonkor, S. Kaggwa, P. U. Uwaoma, A. O. Hassan and O. A. Farayola, "A Review of U.S. Management Accounting Evolution: Investigating Shifts in Tools And Methodologies in Light Of National Business Dynamics," *International Journal of Applied Research in Social Sciences,* vol. 6, no. 1, p. 51 72, 2024.

[13] D. Edberg and W. L. Kuechler, "A case study of IT chargeback in a government agency," *Journal of Cases on Information Technology,* vol. 6, pp. 522-539, 1 January 2004.

[14] S. Killian, "IT Chargeback Drives Efficiency," 2015. [Online]. Available: https://journal.uptimeinstitute.com/it-chargeback-drives-efficiency/.

[15] D. H. Drury, "Assessment of Chargeback Systems in IT Management," *INFOR: Information Systems and Operational Research,* vol. 38, no. 3, pp. 293-313, 1 August 2000.

[16] M. H. Olson and B. Ives, "Chargeback Systems and User Involvement in Information Systems - An Empirical Investigation," *MIS Quarterly,* vol. 6, no. 2, pp. 47-60, June 1982.

[17] Gartner, "Why, what and how organizations charge back IT cost," 2021.

[18] Gartner, "Spend Less, Get More:25 IT Containment Techniques," *Gartner Inc.*, October 2006.

[19] E. M. Hufnagel, J. G. Birnberg and J. M. Katz, "Perceived Chargeback System Fairness in Decentralized Organizations: An Examination of the Issues," *MIS Quarterly,* pp. 415-430, December 1989.

[20] T. Baars, R. Khadka, H. Stefanov, S. Jansen, R. Batenburg and E. Van Heusden, "Chargeback for cloud services," *Future Generation Computer Systems,* vol. 41, pp. 91-103, 2014.

[21] A. Khayer, S. M. Talukder, B. Yukun and M. N. Hossain, "Cloud computing adoption and its impact of SMEs performance for cloud supported operations: A dual-stage analytical approach," *Technology in Society,* vol. 60, p. 101225, 2020.

[22] J. Zhen, Z. Xie and K. Dong, " Impact of IT governance mechanisms on organizational agility and the role of top management support and IT ambidexterity," *International Journal of Accounting Information Systems,* vol. 40, p. 100501, 2021.

[23] A. D. Diamantidis and P. Chatzoglou, "Factors affecting employee performance: an empirical approach," *International Journal of Productivity and Performance Management,* vol. 68, no. 1, pp. 171-193, 2019.

[24] L. G. Tornatzky and M. Fleischer, The processes of Technological Innovation, Lexington Books, 1990.

[25] S. Hasan, M. Ali, S. Kurnia and R. Thurasamy, "Evaluating the cyber security readiness of organizations and its influence on performance," *Journal of Information Security and Applications,* vol. 58, p. 102726, 2021.

[26] I. Ahmed, "Technology organization environment framework in cloud computing," *TELKOMNIKA Telecommunication, Computing, Electronics and Control,* vol. 18, no. 2, pp. 716-725, 2020.

[27] A. A. Hadwera, M. Tavana, D. Gillis and D. Rezania, "A Systematic Review of Organizational Factors Impacting Cloud-based Technology Adoption Using Technology-Organization-Environment Framework," *Internet of Things,* vol. 15, p. 100407, 2021.

[28] L. Li, W. He, I. Ash, M. Anwar and X. Yuan, "Investigating the impact of cybersecurity policy awareness on employees' cybersecurity behavior," *International Journal of Information Management,* vol. 45, pp. 13-24, 2019.

[29] K. C. Ng, X. Zhang, J. Y. L. Thong and K. Y. Tam, "Protecting Against Threats to Information Security: An Attitudinal Ambivalence Perspective," *Journal of Management Information Systems,* vol. 38, no. 3, pp. 732-764, 2021.

[30] M. S. A. Alqahtani and E. Erfani, "Exploring the relationship between technology adoption and cyber security compliance: A quantitative study of UTAUT2 model," *International Journal of Electronic Government Research (IJEGR),* vol. 17, no. 4, pp. 40-62, 2021.

[31] I. Junglas, L. Goel, B. Ives and J. Harris, "Innovation at work: The relative advantage of using consumer IT in the workplace," *Information Systems Journal,* vol. 29, no. 2, pp. 317-339, 2019.

[32] L. A. Clark and D. Watson, "Constructing Validity: New Developments in Creating Objective Measuring," *Psychological assessment,* vol. 31, no. 12, p. 1412, 2019.

[33] A. T. Jebb, V. Ng and L. Tay, "A Review of Key Likert Scale Development Advances: 1995–2019," *Frontiers in Psychology,* vol. 12, p. 637547, 2021.

[34] L. J. Simms, K. Zelazny, T. F. Williams and L. Bernstein, "Does the number of response options matter? Psychometric perspectives using personality questionnaire data.," *Psychological assessment,* vol. 31, no. 4, p. 557, 2019.

[35] F. S. Nahm, "Nonparametric statistical tests for the continuous data: the basic concept and the practical use," *Korean journal of anesthesiology,* vol. 69, no. 1, pp. 8-14, 2016.

[36] R. Heale and A. Twycross, "Validity and reliability in quantitative studies," *Evid Based Nurs,* vol. 18, no. 3, pp. 66-67, July 2015.

[37] C. Quintão, P. Andrade and F. Almeida, "How to Improve the Validity and Reliability of a Case Study Approach," *Journal of Interdisciplinary Studies in Education,* vol. 9, no. 2, pp. 264-275, 2020.

[38] K. S. Taber, "The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education," *Research in science education,* vol. 48, pp. 1273-1296, 2018.

[39] J. J. Vaske, J. Beaman and C. C. Sponarski, "Rethinking Internal Consistency in Cronbach's Alpha," *Leisure Sciences,* vol. 39, no. 2, pp. 163-173, 2017.

[40] I. Ahmed and S. Ishtiaq, "Reliability and validity: Importance in Medical Research," *Methods,* vol. 12, no. 1, pp. 2401-2406, 2021.

[41] L. Sürücü and A. Maslakçi, "Validity and Reliability in Quantitative Research," *Business & Management Studies: An International Journal,* vol. 8, no. 3, pp. 2694-2726, 2020.