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QUEUING SYSTEM AND PERFORMANCE OF GUARANTY TRUST BANK NIGERIA PLC, EKPOMA, EDO STATE

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ABSTRACT: *The broad objective of this paper is to determine the effect of queuing system analysis on performance of Guaranty Trust Bank Nigeria Plc, Ekpoma, Edo state. Specifically, this paper seeks to examine the effect of system (facility) utilization rate on competitive advantage of the focused institution. The study was anchored on resource base theory propounded by Robert Grant (1996). Survey design was used, a population of 1,129 which emanated from the service rate of a five- day study was used for the study, the data was analyzed using tables, bar charts and tora soft- ware version 1.00. Findings revealed that facility (system) utilization impacts the competitive position of Guaranty Trust Bank Nigeria Plc. Ekpoma since (Rho/c) value = 0.435, (Mu) value = 15.05 and (Ws) value = 0.07. The study concludes that an analysis of the queuing system of the institution from time to time could aid its performance level. Sequel to the conclusion, the researcher recommended an increase in the number of servers used by the financial institution in focus because of the number of local governments (Esan West, Esan Central, Igueben and Uhunwonde) it serves.*

KEYWORDS: Queuing system, system (facility) utilization, performance, competitive advantage.

INTRODUCTION

A lot of business organizations makes use of queues in an attempt to rendering certain services to their customers. These organizations include banks, hospitals, situation offices, schools, super markets and any other place where customers queue to be served. Queuing theory started with a study carried out by Agner Krarup Erlang when he created models to describe the Copenhagen telecommunication industry (Sundarapandian, 2009). Outside the telecommunication industry, queuing theory is now being applied in different areas like factories, financial institutions, offices and hospitals (Mayhew & Smith 2006, Tijms, 2003). This gives credence to the determination of the effect of queuing system on the performance of Guaranty Trust Bank, Ekpoma, Edo State.

The different foundations that make use of queues vary in area and sophistication but they all consist of a series of activities and protocol that require queuing, in which a client must undergo

in order to receive the needed services. The facilities (servers) in these systems, (queuing system) are the trained individuals and specialized equipment that these activities and procedures require (Olaniyi, 2004). Often, customers get to these servers to receive the needed services only to find that they are not been attended to as soon as they get there due to one reason or the other. This causes the buyer to wait for the services for usually an unknown period of time. Olaniyi (2004) warned that the danger of keeping buyers or customers in a queue is that their waiting time could become a cost to them because the time wasted on the queue would have been judiciously utilized elsewhere. Talia (2007) contends that the study of queues deals with quantifying the phenomenon of waiting in lines using representative indicators of performance, such as average queue length, average waiting time in queue, average facility (system) utilization, cost of given level of capacity, probability that an in-coming patient would have to wait.

The variable that was used for this study is facility (system) utilization. It was used because it shows the traffic intensity values in the organization of study. The system utilization rate in one way or the other impacts the performance level of an organization. Richard, (2009) suggests that organizational performance encompasses some specific domain of business outcomes: (a) financial performance (profits, return on assets, return on investment, etc.); (b) Product (service) market performance (sales, market share, firm innovation, competitive advantage etc.); and (c) shareholder return (total shareholder return, economic value added, etc.). A non-financial attainment (Competitive advantage) was used for the study.

Marek, Robert, Marcia, Blake and Ahahinu (2009) assert that the number of service channels employed could affect customers' waiting time in a system. According to Singh (2006), if an institution decides to increase the level of service provided, cost of providing service would increase, if it decides to limit the same, costs associated with waiting for service would increase. So management has to balance the two costs and make a decision that ensures the provision of optimum level of service. Hence it is one of the tasks of queuing theory to try to see how these costs can be reduced by adaptation to the mechanics of the design in other to affect the performance level of an organization (Asmussen & Boxma, 2009).

Some organizations operate with multiple parallel queues each owning a server while a few others have a single pooled queue with many servers. Multiple queues and multiple server queuing situations are frequently encountered in the telecommunications sector, customer service environment and hospitals. The single queue where customers arrive at the service station in a single file could ensure better performance in certain conditions and the multiple queue could be better in other situations. In other words, both the multiple and single queues could be used depending on the circumstance. For many systems owning multiple queues, it is possible to reduce the tally of queues (pooling them into a single queue) in other to achieve better efficiency. A single queue with many servers could be more efficient compared to parallel queues with the same number of servers. Pooling of several queues seems to be beneficial in the sense that if these multiple queues are pooled together, none of the servers would likely be idle waiting for customers

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to arrive at their queue when customers to be served are still waiting on other queues, hence facilities are less likely to be wasted. It also eliminates the annoying habit of jockeying from one line to another in a bid to get a faster queue (Singh, 2006).

The long queues found in the various financial institutions in Nigeria prompted the researcher to delve into this study. Specifically, the long queues found in Guaranty Trust Bank Nigeria Plc. Ekpoma spurred the researcher to ascertain the traffic intensity values and its effect on the competitive positions of the bank in focus.

The broad objective of this study is to analyze the effect of queuing system has on the performance of Guaranty Trust Bank Nigeria Plc. Ekpoma. Specifically, this study seeks to analyze the effect of system (facility) utilization on the competitive advantage of Guaranty Trust Bank Nigeria Plc. Ekpoma.

REVIEW OF RELATED LITERATURE/THEORETICAL UNDERPINING

Queuing System

In the early l905, A.K. Erlang, a Danish telephone engineer, began a study on the congestion and waiting times occurring in the completion of telephonic calls. Since then, queuing theory has grown far more sophisticated and has been applied to a wide variety of institutions (Bode, 200l). The result of queuing analysis can be used in the context of a cost optimization model, where we seek the minimization of the amounts of two costs: the cost of offering the service and the cost of waiting. The main blockade in supplying cost pattern is the difficulty of acquiring reliable estimates of the cost of waiting, particularly when human behaviour is an integral aspect of the operation.

According to Okeke (I996), queue is defined as a collection of objects awaiting service. When we talk of queues, the human endeavour comes to mind. In studying queuing systems, some things that comes to mind are cars awaiting service or queuing in a fuel station, machines awaiting repairs and so on. Whether the actual line is observed or not, queues evolve because it not easy for supply to be equal to demand at every point in time. In their opinion, Dannenbring and Stair (2000) contend that a queuing system essentially consists of the following four components; a. power source or calling population that generates customer. b. A service schemes that consists of one of more service facilities. c. A line that indicates the number of buyers waiting for service. When the customers arrive at the service facilities, they examine the queue conditions and then decide whether or not to join the queue. Some customers are discouraged by the length of the queue and therefore do not join the queue while some customers after waiting in the queue for a while become impatient and drop out of the queue. d. A queue discipline or service discipline according to which the customers are selected for service. The queue discipline indicates the decision rate for service. For example, in the campus refectories, students are usually served on a "first-come, first-served"

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basis. However, in a hospital emergency room, the service may be rendered on the basis of some medical priority.

Talia (2007) contends that the study of queues deals with quantifying the phenomenon of waiting in lines using measures of performance, such as average queue length, average waiting time in queue, average facility (system) utilization, cost of given level of capacity, probability that an arriving patient would have to wait. The focus of this study is facility (system) utilization.

Service Facility (System)

According to Lipsky (1992), the service system is characterized by the configuration (structure) of the service facilities and the service distribution. Depending upon the nature of the service process, service facilities can be classified in terms of their configuration of channels (single or multiple) and phase (single or multiple). The term channel refers to the number of points of entry to the service system (Lipsky, 1992). A single channel means that there is only one point of entry. Multiple channels refer to the parallel arrangement of service facilities i.e two or more points of entry exist so that two or more service stations can simultaneously begin the service process. The term phase refers to the number of service stations through which the customer must pass before the service is considered complete. A single phase implies that there exists only one service station. Multiple phase refers to the service management of service facilities that is, client must go through two or more service stations in sequence before the service is considered complete (lipsky, 1992).

Traffic Intensity

Traffic intensity could be viewed as a measure of the average occupancy of a service facility at a given time, usually a busy hour, measured in traffic units. It can also be seen as the ratio of the time or period during which a service facility is occupied by people to the time the facility is available for occupancy by individuals (Talia, 2007). It also refers to the ratio between the average number of customers in service or been served and the number of servers (Lipsky, 1992).

Organizational Performance

Organizational performance is a socially constructed phenomenon that is subjective, complex, and particularly hard to measure in most organizations (Au 1996; Anspach 1991). According to Wikipedia, (2008) organizational performance comprises the actual performance of an entity as measured against its intended outputs (or goals and objectives). According to Richard, (2009) organizational performance encompasses some specific field of business outcomes: (a) financial performance (profits, return on assets, return on investment, etc.); (b) product (service) market performance (sales, market share, firm innovation, competitive advantage etc.); and (c) shareholder return (total shareholder return, economic value added, etc.). According to Upadhaya, Munir and Blount (2014) an organization is regarded as effective when it has a high performance level. This study is centered on a non-financial performance indicator. The foregoing shows that organizational performance shows how well an organization is functioning.

Competitive Advantage

Firms that earn persistently higher levels of profit than competitors have a competitive advantage (Grant, 2008). A lot of theories within the strategic management domain addresses competitive advantage as a way of explaining how an organization can attain superior economic performance. According to Rayport and Jaworski (2004), to have a competitive advantage a business must create superior value for buyers by offering lower prices for services or products than competitors or by providing unique services that a client is willing to pay for at a given price. Using this definition, a given enterprise must devise a competitive strategy that is able to establish a profitable and sustainable policy compared to competitors. Grant (2008) asserts that building unique and valued know-how and capabilities that rivals cannot easily imitate entails owning a competitive advantage. Rayport and Jaworski (2004) assert that an organization's interface with its customer is its sole plan of gaining competitive advantage over its competitors. Walsh, Enz, and Canina (2008) assert that when an enterprise has a competitive advantage over its competitors, it could positively affect the profitability of the organization. A review of the definition of the concept by various scholars shows that an enterprise could have a competitive advantage when it has the ability to satisfy customers better than others.

THEORETICAL FRAMEWORK

This study is anchored on Resource Based Theory propounded by Robert Grant in (1996). The resource-based theory comprises a growing and dominant area of the strategic management literature which addresses the question of an organization's disposition and it is principally concerned with the source, kind and utilization of strategic capabilities. The basis of the resource-based theory is that successful corporations will find their future competitiveness on the development and utilization of distinctive and unique capabilities (Teeche, Pinsno & Shuen, 1991). This theory is relevant to this study because an effective utilization of the facilities and resources of the establishment in focus could impact its competitive advantage.

Empirical Review

Ogunsakin and Bola (2013) did a comparative breakdown of service delivery by ATM in two banks in Lagos State with the application of queuing theory. From the empirical analysis, the study found that the average arrival rate, average service rate, average time spent in the queue for Access bank as 2.01, 1.65, 0.5 respectively and UBA as 3.28, 1.75, 1.67minutes, respectively. The study concluded that the average amount of idle time obtained for the two banks were 3minutes and 7minutes respectively. The study therefore recommended an improvement in the service facilities of these organizations.

In offering the queuing model as a technique of queue solution in Nigerian banking industry, Anichebe (2013) found that, using a three-server system was better than a 2-server or 4-server systems in terms of the performance level of the studied institution. The study recommended that

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the studied organization should adopt at least a three-server model to reduce total expected costs and increase customer satisfaction.

Odunukwe (2013) examined the application of queuing theory to customers' management in the banking industry using United Bank for Africa, Okpara Avenue Branch Enugu, as a case study. The results obtained from the study showed that the arrival pattern or trend follows a poisson distribution and that the service pattern follows an exponential distribution. The study recommended that management of the financial institution should increase the number of servers so as to help reduce the time customers spend on queue and also reduce cost incurred from waiting. In examining the queuing system and its application to customer service delivery in Fidelity bank Plc, Maiduguri by Bakari and Baba (2014), the study obtained the value of the traffic intensity, otherwise known as the utilization factor to be less than one (i.e. $p<1$). The study concluded that the system operates under steady-state condition. Thus, the value of the traffic intensity, which is the probability that the system is busy, implies that 95% of the time period considered during data collection reveals that the system was busy as against 4% idle time. This indicates high utilization of the system which is essential for the survival of any financial institution. None of the empirically reviewed examined queuing system analysis as it relates to the performance of Guaranty Trust Bank (GTB) Nigeria Plc. Ekpoma, Edo State. This is the lacuna in knowledge that this study intends to fill.

METHODOLOGY

The research design adopted for this study was the survey research design. It was used because of the nature of the study. Survey research design enables the researcher to observe what happens to the sample subjects without manipulating them. The population of study comprise the service rate recorded for the five (5) days of the study from the three (3) servers used by the bank of study. The total population is 1,129.Complete enumeration sampling was used for this study. It was chosen because of the nature of the study.

Observation method was used to collect data. The data recorded from what was observed by the researcher and two research assistants was used for the study.Quantitative research approach was used for the study. This was ensured by the application of queuing theory model. This was aided by tables, bar-charts and Tora soft-ware version 1.00.

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DATA PRESENTATION AND INTERPRETATION

Data Presentation and Analysis

Queuing System Analysis for Guarantee Trust Bank Nigeria Plc. Ekpoma.

Table 1: Day (One) 1 Queuing Analysis of the Servers.

Monday						
	Server 1		Server 2		Server 3	
Time	Arrival Rate	Service Rate	Arrival Rate	Service Rate	Arrival Rate	Service Rate
10 – 11am	27	18	19	15	23	`21
11 – 12pm	24	09	22	14	29	16
12 – 1pm	21	07	20	18	22	18
1 - 2pm	19	10	25	20	17	12
2 – 3pm	16	16	13	10	15	11

Source: Field Survey, May 2019.

Table 2: Day (Two) 2 Queuing Analysis of the Servers.

Tuesday						
	Server 1		Server 2		Server 3	
Time	Arrival Rate	Service Rate	Arrival Rate	Service Rate	Arrival Rate	Service Rate
10 – 11am	21	19	20	17	29	20
11 – 12pm	31	22	18	22	17	12
12 – 1pm	34	21	22	16	32	19
1 - 2pm	25	18	17	13	18	11
2 – 3pm	17	14	14	14	15	09

Source: Field Survey, May 2019.

Table 3: Day (Three) 3 Queuing Analysis of the Servers.

Wednesday						
	Server 1		Server 2		Server 3	
	Arrival Rate	Service Rate	Arrival Rate	Service Rate	Arrival Rate	Service Rate
10 – 11am	14	11	16	12	22	13
11 – 12pm	25	20	19	17	18	14
12 – 1pm	12	08	15	12	13	10
1 - 2pm	23	19	22	16	24	21
2 – 3pm	13	10	14	11	16	20

Source: Field Survey, May 2019.

Table 4: Day (Four) 4 Queuing Analysis of the Servers.

Source: Field Survey, May 2019.

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Thursday						
	Server 1		Server 2		Server 3	
	Arrival Rate	Service Rate	Arrival Rate	Service Rate	Arrival Rate	Service Rate
10 – 11am	11	08	14	13	17	11
11 – 12pm	23	16	22	19	23	14
12 – 1pm	18	14	16	12	15	12
1 - 2pm	25	19	23	18	24	21
2 – 3pm	15	10	16	14	17	20

Table 5: Day (Five) 5 Queuing Analysis of the Servers.

Friday						
	Server 1		Server 2		Server 3	
Time	Arrival Rate	Service Rate	Arrival Rate	Service Rate	Arrival Rate	Service Rate
10 – 11am	28	22	19	14	17	12
11 – 12pm	15	12	18	16	27	21
12 – 1pm	17	13	15	11	19	23
1 - 2pm	18	14	23	17	12	10
2 – 3pm	21	20	24	19	13	08

Source: Field Survey, May 2019.

Table 6: Daily Queuing Analysis of the Servers.

		Server 1		Server 2		Server 3	
		Arrival rate	Service rate	Arrival rate	Service rate	Arrival rate	Service rate
Day 1 (Monday)	Total arrival or service rate	107	60	99	77	106	78
	Average arrival or service rate	21.4	12.0	19.8	15.4	21.2	15.6
Day 2 (Tuesday)	Total arrival or service rate	12.8	94	91	82	111	71
	Average arrival or service rate	25.6	18.8	18.2	16.4	22.2	14.2
Day 3 (Wednesday)	Total arrival or service rate	87	68	86	68	93	78
	Average arrival or service rate	17.4	13.6	17.2	13.6	18.6	15.6
Day 4 (Thursday)	Total arrival or service rate	92	67	91	76	96	78
	Average arrival or service rate	18.4	13.4	18.2	15.2	19.2	15.6
Day 5 (Friday)	Total arrival or service rate	99	81	99	77	88	74
	Average arrival or service rate	19.8	16.2	19.8	15.4	17.6	14.8
Total	Total Average or service rate	513	370	466	380	494	379
	Average system utilization (Traffic Intensity)	1.386		1.226		1.303	

Source: Field Survey, May 2019

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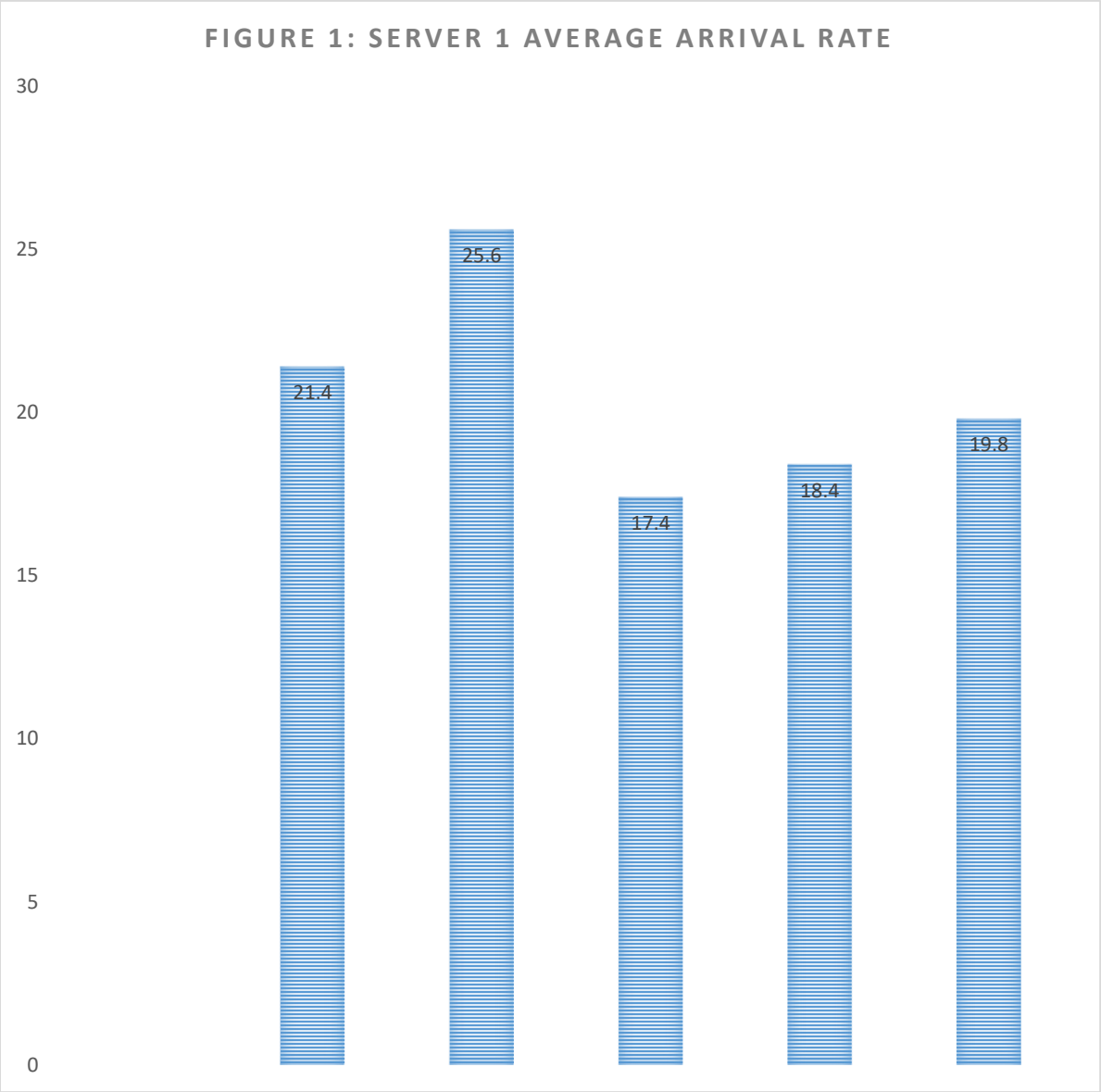

Source: Field Survey, May 2019.

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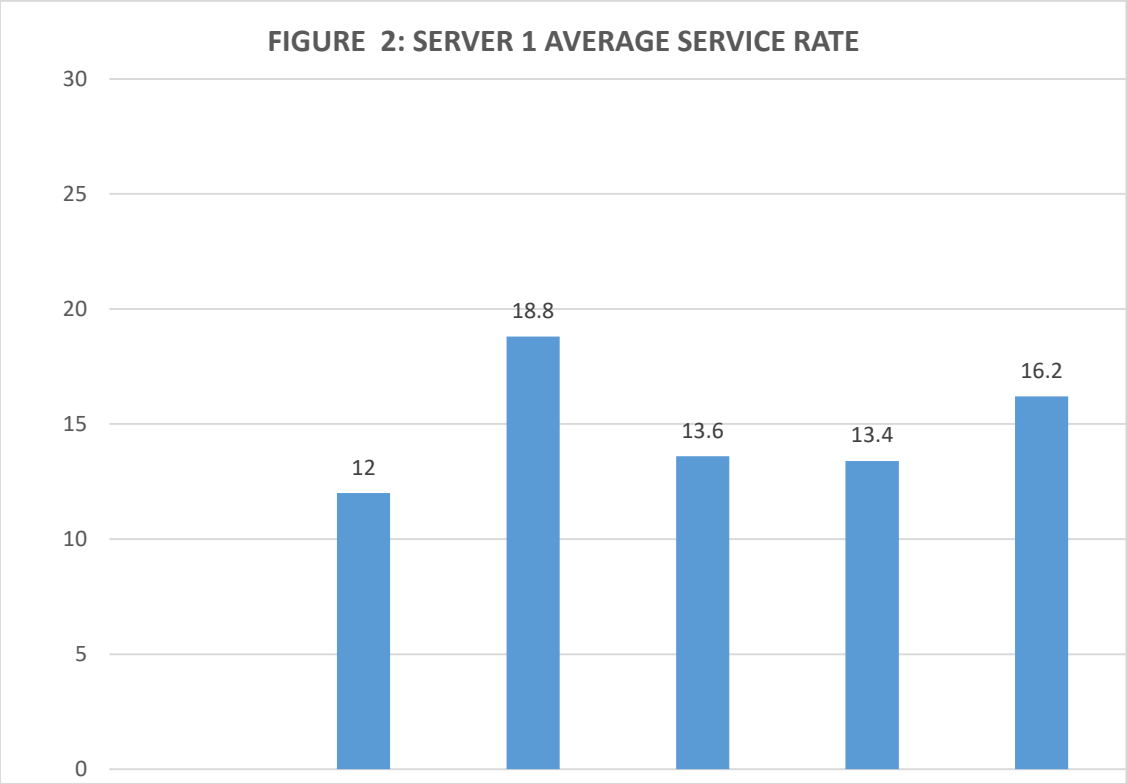

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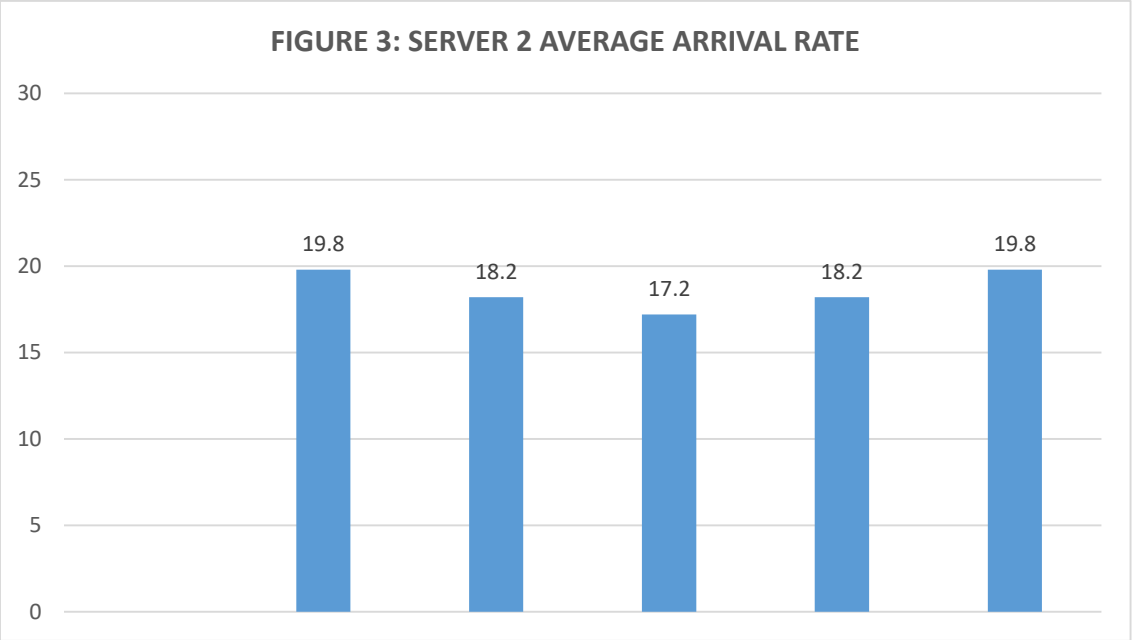

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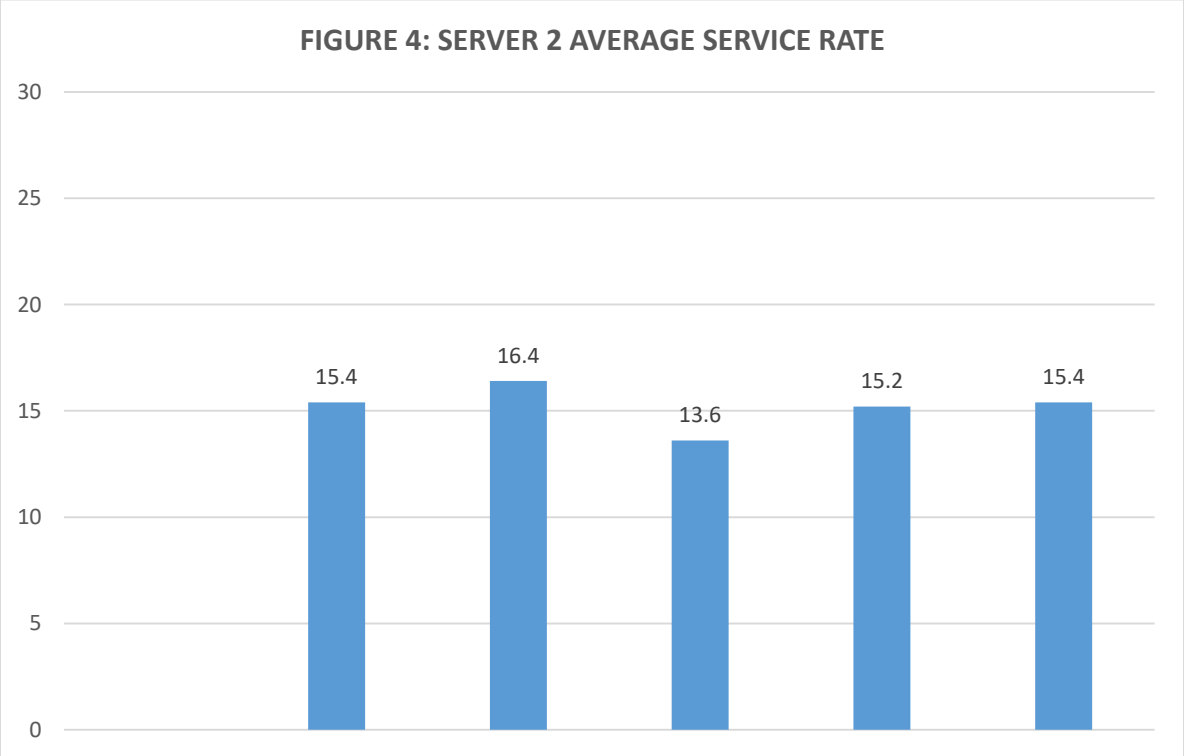

Source: Field Survey, May 2019.

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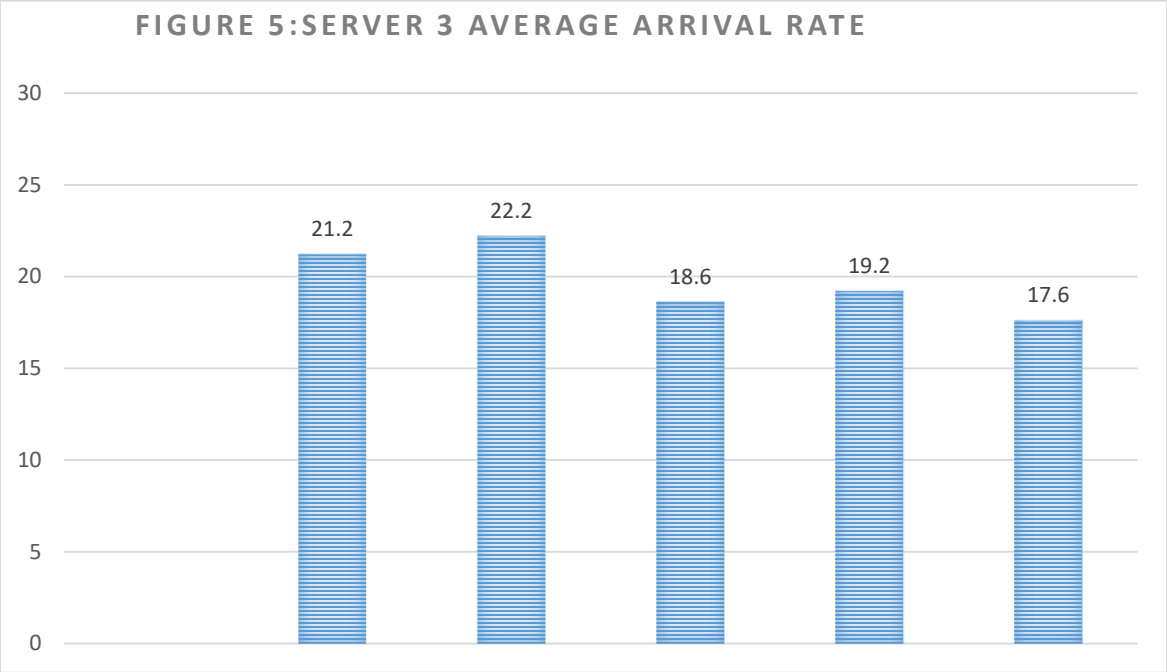

Source: Field Survey, May 2019.

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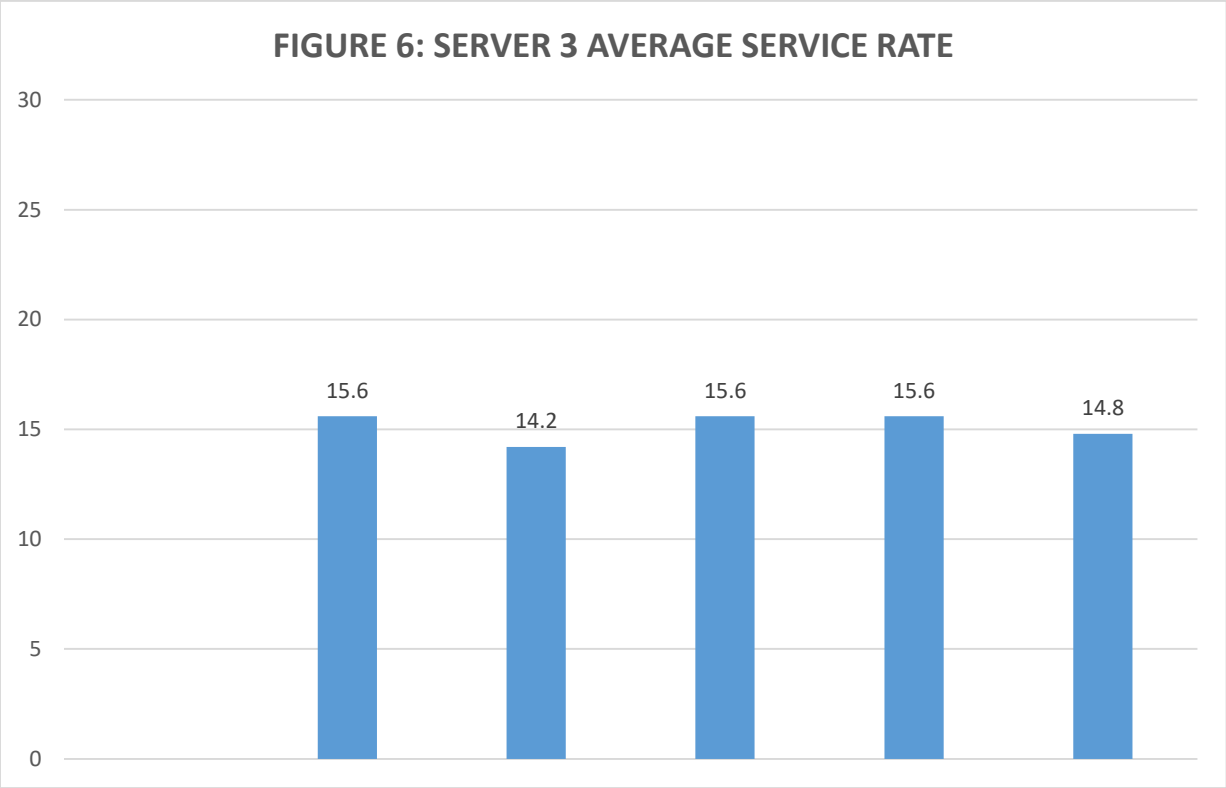

Source: Field Survey, May 2019.

Table 7: Daily System Utilization for Each Server

Daily Record	Server 1	Server 2	Server 3
Day 1	1.783	1.286	1.359
Day 2	1.362	1.110	1.563
Day 3	1.274	1.265	1.192
Day 4	1.373	1.197	1.231
Day 5	1.222	1.286	1.189

Source: Field Survey, May 2019.
Formula: Total Arrival/n
Customer arrival rate for server 1 (λ_1) = 20.52
Customer arrival rate for server 2 (λ_2) = 18.64
Customer arrival rate for server 3 (λ_3) = 19.76
Average Customer arrival rate for server (λ) = $\frac{513 + 466 + 494}{75} = 19.64$
Formula: Total Service Rate/n
Service rate for server 1 (μ_1) = 14.8
Service rate for server 2 (μ_2) = 15.2

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Service rate for server 3 (μ_3) = 15.16

Average serve rate for the server (μ) = $\frac{370+380+379}{75} = 15.05$

The average number of customers being served (r)

Formula: $R = \frac{\lambda}{\mu}$

$$R_1 = \frac{\lambda_1}{\mu_1} = \frac{20.52}{14.8} = 1.386$$

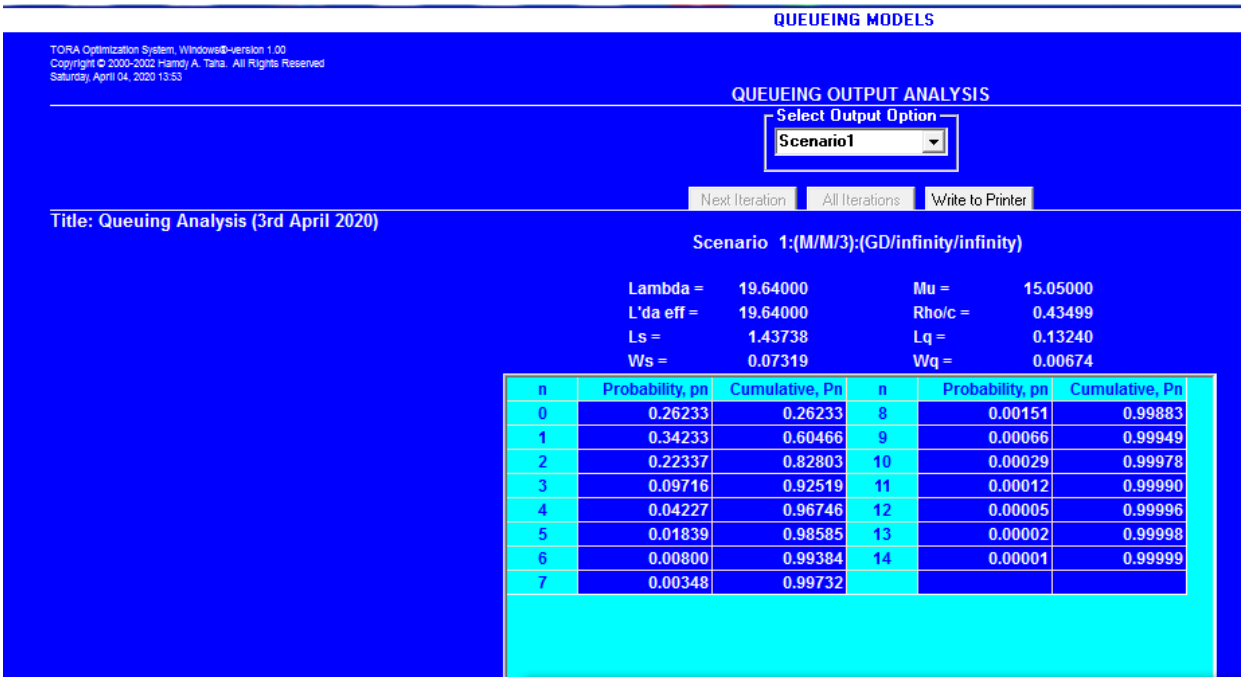
$$R_2 = \frac{\lambda_2}{\mu_2} = \frac{18.64}{15.2} = 1.226$$

$$R_3 = \frac{\lambda_3}{\mu_3} = \frac{19.76}{15.16} = 1.303$$

$$R = \frac{\lambda}{\mu} = \frac{19.64}{15.05} = 1.305$$

Test of Hypothesis

Ho: Facility (system) utilization does not impact the competitive position of Guaranty Trust Bank Nigeria Plc. Ekpoma.



n	Probability, pn	Cumulative, Pn	n	Probability, pn	Cumulative, Pn
0	0.26233	0.26233	8	0.00151	0.99883
1	0.34233	0.60466	9	0.00066	0.99949
2	0.22337	0.82803	10	0.00029	0.99978
3	0.09716	0.92519	11	0.00012	0.99990
4	0.04227	0.96746	12	0.00005	0.99996
5	0.01839	0.98585	13	0.00002	0.99998
6	0.00800	0.99384	14	0.00001	0.99999
7	0.00348	0.99732			

Source: Tora-software version 1.00.

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Results obtained from an analysis of the results generated from the field survey revealed a system utilization (Rho/c) value of 0.435, a system capacity (Mu) value of 15.05 indicating that there was unnecessary pressure on the existing system, waiting time for service (Ws) value of 0.07 indicating that customers were spending too much time on the queue. The foregoing reveals that the non-configuration of the present structure to accommodate more servers could impact the competitive position of the studied firm.

DISCUSSION

Findings revealed that facility (system) utilization impacts the competitive advantage of Guaranty Trust Bank Nigeria Plc. Ekpoma. This corroborates the study of Ogunsakin and Bola (2013) who did a comparative analysis of service delivery by the ATM's of two banks in in Lagos State with the application of queuing theory. The study suggested an enhancement in the service facilities of these organizations. In suggesting the queuing analysis as a method of queuing decision in Nigeria banking industry, Anichebe (2013) recommended that the management of Nigerian financial institutions should adopt at least a three-server model to reduce total expected costs and increase customer satisfaction. The work of Odunukwe (2013) who examined the application of queuing models to customers' management in the banking industry using United Bank for Africa, Okpara Avenue Branch Enugu, as a case study also aligns with findings of the study. The study recommended that the bank management should increase the number of servers so as to help reduce the time customers spend on queue and also reduce cost incurred from waiting.

SUMMARY CONCLUSION AND RECOMMENDATIONS

Summary

Facility (system) utilization impacts the competitive position of Guaranty Trust Bank Nigeria Plc. Ekpoma since (Rho/c) value = 0.435, (Mu) value = 15.05 and (Ws) value = 0.07.

Conclusion

The study concludes that an analysis of the queuing system of the institution from time to time could aid its performance level. The findings revealed that the servers in the focused financial institution is inadequate. In other words, the servers are not enough for the day to day transaction of the institution.

Recommendations

The following recommendations were made:

1. An increase in the number of servers used by the financial institution in focus because of the number of local governments (Esan West, Esan Central, Igueben and Uhunwonde) it serves.

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https://doi.org/10.37745/ijbmr.2013

References

Anichebe, A. (2013). Queuing Model as a Technique of Queue Solution in Nigeria Banking Industry. *Developing Country Studies*, 3(8), 34-42.

Anspach, R.R. (1991). "Everyday Methods for Assessing Organizational Effectiveness." *Addressing Social Problems,* 38:1-19.

Asmussen, S.R. & Boxma, O.J. (2009). Editorial Introduction: *Queuing Systems*. 63 (1), 18-25.

Au, C. (1996). "Rethinking Organizational Effectiveness: Theoretical and Methodological Issuesin the Study of Organizational Effectiveness for Social Welfare Organizations." *Administration in Social Work,*20:1-21.

Bakari, C. & Baba, A. (2014). Queuing Process and its Application to Customer Service Delivery: A Case study of Fidelity Bank Plc, Maiduguri. *International Journal of Mathematics and Statistics Invention*, 2(1), 14-21.

Bode, O.C. (2001). *Operations Research*. Ikeja: Segun Press.Dannenbring, D. G. & Staar, M.K.(2000). *Management Science*: An Introduction, New York, Mc Graw-Hill Book Company.

Egbo, V. O. (2001). *Quantitative Techniques*: A Business Decision Approach. Enugu: Sphash Media Organization.

Grant, R. M. (1996). Toward a Knowledge-based Theory of the Firm. *Strategic ManagementJournal*, 17, 109−122.

Grant, R. (2008). *Contemporary Strategy Analysis* (6th ed.). Maiden, MA: Blackwell Publishing.

Lipky L. (1992). *Queuing Theory*: A Linear Algebraic Approach. New York: Macmillan.Marek, L., Robert, D., Marcia F., Blake, W. P. & Ahahinu, S., A. (2009). Models of Emergency Department for Reducing Customers Waiting Times. *Plos One*, 1 (7), 36-43.

Mayhew, L. & Smith, D. (2006). Using Queuing Theory to Analyse Completion Times in Accident and Emergency Departments in the Light of the Government 4-hour Target. Cass Business School. ISBN 978-1-905752-06-5. Retrieved on the 19th of June 2019.

Odunukwe, A. (2013). Application of Queuing Models to Customers' Management in the Banking System (A Case Study of United Bank for Africa, Okpara Avenue Branch Enugu): An Unpublished Undergraduate Project, Caritas University, Enugu State, Nigeria.

Ogunsakin, D. & Bola, F. (2013). Application of Queuing Theory in Nigerian Banking Sector: A Case of Selected Banks in Lagos State, Nigeria. *Manufacturing & Service Operations Management Research*,10 (3),41-51.

Okeke, M. C. (1996). *Quantitative Techniques*. Onitsha: Onwubiko Printing and pack Ind Nig. Ltd.

Olaniyi, P. (2004). Waiting for Orthopaedic Surgery: Factors Associated with Waiting Time and Customers Opinion. *International Journal for Quality in Healthcare*. 17: 133-140.

Rayport, J. E, & Jaworski, B. J. (2004). Best Face Forward. *Harvard Business Review,* 52(12), 47-54.

Richard, P.A. (2009): Measuring Organizational Performance: Towards Methodological BestPractice. *Journal of Management*.13:65-72.

Singh, V., (2006). Use of Queuing Models in Health Care. Department of Health Policy and Management, University of Arkansas for Medical Sciences.

Sundarapandian, V. (2009). "*Queuing Theory*". Probability, Statistics and Queuing Theory.London: PHI Learning.

Talia H. A. (2007) *Operations Research*: Introduction. New York: Wiley Press.

Teece D.J, Pisano G. & Shuen A. (1991). Dynamic Capabilities and Strategic Management. *Strategic Management Journal*, 18(7): 509-533.

Tijms, H.C. (2003). *Algorithmic Analysis of Queues*: A First Course in Stochastic Models. Chichester: Wiley.

Upadhaya, B., Munir, R., & Blount, Y. (2014). Association between Performance MeasurementSystems and Organisational Effectiveness. *International Journal of Operations & Production Management*, 34(7), 2-22.

Walsh, K., Enz, C. A., & Canina, L. (2008). The Impact of Strategic Orientation on Intellectual Capital Investments in Customer Service Firms. *Journal of Service Research, 10*, 300-317.