

Knowledge Creation and Business Process Re-Engineering Outcomes of Financial Services: Moderating Effect of Knowledge Sharing

Gideon Nkurunziza ¹ , Joseph Mpeera Ntayi ², Ahmed Walugembe ³ ,

Vincent Obedgiu ^{4 *}

^{1,2,3,4} Makerere University Business School, Kampala, Uganda

* Corresponding author: vobedgiu@gmail.com

Article History

Received 2023-07-13

Revised 2023-10-28

Accepted 2023-11-02

Published 2023-11-17

Keywords

Knowledge Creation

Business Process Re-engineering

Knowledge Sharing

Financial Services

Abstract

Purpose - The researcher investigates the extent to which knowledge sharing moderates the relationship between knowledge creation and business process re-engineering (BPR) outcomes of financial services offered by financial institutions in Uganda.

Design/Methodology - The study adopted cross-sectional survey design to collect data at one point in time using self-administered questionnaire to examine the relationship between knowledge creation and business processes. The study at first used statistical package for social scientists to establish clusters among the surveyed financial services and later a model was derived using R programming software to test for knowledge creation and business process re-engineering performance outcomes.

Findings - The study found a significant conditional effect of knowledge sharing on knowledge creation and business process re-engineering outcomes. Implying that investment in knowledge sharing creates awareness about the financial services outcomes of financial institutions using business process re-engineering to provide financial services.

Originality - This study contributes to business process re-engineering literature by advancing the idea that BPR is an important economic resource that enhanced through instituting knowledge creation and sharing practices in a complex environment. Ideally, creating and sharing knowledge is one of the drivers of customer value, efficiency, and effectiveness of financial services in financial institutions.

Practical Implications - Managers of financial institutions need to pay keen interest in managing business processes using relevant knowledge and transforming in new products, new processes, and new markets to boost business process re-engineering outcomes by building a strong knowledge creation system through training and development programs for senior managers.

Copyright © 2023 The Author(s)



Introduction

The ability of a corporate organization to remain viable in the face of escalating local and international competition depends on the adoption of innovative strategies. According to Jayatilake, Withanaarachchi, and Peter (2016), the world is headed toward the fourth industrial revolution, which would merge cyber-physical systems, the internet of things, and the idea of smart factories. Consequently, in order for companies and organizations across all industries to remain competitive, they must alter the way that they operate. Further to the above, for businesses, organizations, and manufacturing industries to continue operating in the face of quick changes in an unstable environment, it is necessary to review current organizational structures, procedures, and responsibilities and redesign new ones. Business process re-engineering (BPR) is frequently used as a suggested technique to increase the organization's success. Business process re-engineering has historically been used to drive operational performance metrics and the competitiveness of the financial sector in developing world (Al-Omran, AlZayer, & Arnout, 2019; Nzewi, Chiekezie, & Ogbeta, 2015).

The concept of business process re-engineering has become inevitable in the financial sector. However, despite the popularity of the concept in the financial sector, there is a drift of attention to how human, technological, and organizational factors have been used to describe the success of BPR, as well as the difficulties BPR practitioners might face in the operationalization of the concept in the financial sector (Fetais, Abdella, Al-Khalifa, & Hamouda, 2022a). Further, the move from the information age to the knowledge age in this era of local and global competition and digital advancement has attracted the attention of scholars, policymakers, and managers to improve business process re-engineering outcomes. The concept of business process re-engineering is rooted in the work of Hammer and Champy (1993), who described business process re-engineering as "the fundamental rethinking and radical redesign of core business processes to achieve dramatic improvements in quality, cost, and cycle time." Additionally, Al-Mashari, Irani, and Zairi (2001) assert that business process re-engineering outcomes are inherently subjective because of the variance in goals and targets set in different organizations.

There is a general belief among scholars, policymakers, and management that business process management is the way to go to address inconsistencies in service delivery other than business process outsourcing, which has been widely used in Sub-Saharan Africa. The attention of global and local policy perspectives has focused on the institutionalization of knowledge creation processes in terms of creation, sharing, or dissemination, and transformation of knowledge to drive business process re-engineering performance without examining the key knowledge creation practices that drive business process re-engineering outcomes of financial services in a developing world context (Fetais, Abdella, Al-Khalifa, & Hamouda, 2022b; Mlay, Zlotnikova, & Watundu, 2013; Nkurunziza, Munene, Ntayi, & Kaberuka, 2019; Nkurunziza, Ntayi, Munene, & Kaberuka, 2018). With reference to the banking sector in the developing world, financial institutions report higher levels of service inefficiencies, which in some situations result in business failure attributed to the inability to achieve the desired business process re-engineering outcomes. Apparently, in a survey conducted by Al-Omran et al. (2019); Mlay et al. (2013) indicated that over 70% and 68% of financial institutions fail to yield significant results, which is still attributed to the ineffectiveness of the business process re-engineering outcomes.

There has been evidence of failures in business process re-engineering outcomes in Uganda. The Lakuma, Sunday, Sserunjogi, Kahunde, and Munyambonera (2020); Gogo (2019); and Vally and Spreen (2012) indicated that seven commercial banks, including Teefe Bank, Crane Bank, Greenland Bank, International Credit Bank, Cooperative Bank, Global Trust Bank, and African Renaissance Bank, were closed as a result of failure to meet the business process re-engineering outcomes related to quality of service and cost management, among other factors. This has indeed attracted the attention of policymakers, practitioners, and researchers from diverse contexts to explain the current phenomenon. In an ideal world, business process re-engineering would be one of the cornerstones of success for financial organizations from both a local and global standpoint, according to

a report by the Organization for Economic Cooperation and Development (Brancaccio, De Cristofaro..., 2020). Actually, business process re-engineering results in financial services have received less attention than anticipated, even with this guaranteed value. Indeed, Kamukama, Tumwine, Opiso, and Korutaro Nkundabanyanga (2014), Fetais et al. (2022a), and Nkurunziza et al. (2018) reveal that in most developing countries, there exists catastrophic evidence of re-engineering performance issues in terms of ineffective service delivery that requires scholarly attention.

Empirically, previous literature from the perspective of both local and global contexts paid more attention to the business process re-engineering principles (Davenport & Short, 1990; Hammer, 1990). Subsequently, the focus has widely addressed the questions of what business process re-engineering means and why business process re-engineering is necessary, impact of business process re-engineering on organizational performance, and assessing the enabling information technology's role in business process re-engineering implementation, to mention but a few (Bako & Banmeke, 2019; Davenport & Short, 1990; Hammer, 1990; Mlay et al., 2013; Nkurunziza et al., 2019; Nkurunziza et al., 2018). Accordingly, Li and Nazif (2022) used the views of academics and practitioners to guide the future scholars on the existing knowledge gap based on conceptual mapping of business process re-engineering. Firstly, one of the central concerns pointed out was the need to bridge the gap between business process re-engineering theory and evidence-based practice, which the study seeks to address. Secondly, scholars have widely explored knowledge creation, management commitment, artificial intelligence, information technology, leadership, people management, change readiness, centralization, and formalization as the antecedents of business process re-engineering (Fetais et al., 2022a; Hashem, 2020; Nkurunziza et al., 2019), yet the moderating role of knowledge sharing as an intangible asset that drives the link between knowledge creation and business process re-engineering outcomes is largely ignored. This is quite surprising in the current digital era where there is a paradigm shift from information era to knowledge age. As such, this paper empirically demonstrates the link between knowledge creation and business process re-engineering outcomes using the lens of complexity science theory and methodologies.

Literature Review

This section covers theoretical and empirical reviews related on knowledge creation and business process re-engineering. The central research question is to determine the moderating role of knowledge sharing in the relationship between knowledge creation and business process re-engineering outcomes. Generally, there is scant literature that has looked at the role of knowledge creation and business process re-engineering outcomes in a developing world context using an objective reality perspective. Most of the business process re-engineering studies in the developed world context have concentrated on practitioner-based research studies, precisely using case study methodologies. This limits the generalization and applicability of the study findings to guide managers, researchers, and policymakers operating in the current developing economies with their diversity of contexts. While business process re-engineering outcomes occur at the intersection and redesign of core business processes such as operational, support, and management processes, the potential role of knowledge creation remains blurred. In this regard, financial services attempt to radically change business processes to achieve a competitive advantage within the financial markets, with less emphasis on knowledge creation (Kimotho & Muturi, 2019; Zhu, Zhao, & Bush, 2020). This study contributes to the existing literature by studying business process re-engineering outcomes from an objective reality perspective. The study adopted complexity theory to premise business process re-engineering outcomes in financial institutions in less developed countries like Uganda.

According to Goldstein (2013); Goldstein, Hazy, and Silberstang (2010), complexity theory provides a theoretical explanation of business process re-engineering outcomes through processes where new knowledge is created, shared, and stored. The theory argues that as institutions interact, they gain new knowledge that results in the emergence of a new order of processes while meeting customer demands. The new patterns and

processes are capable of forming knowledge transformations, storage, sharing, and absorptive practices. Indeed, complexity theory draws attention to the science of the emergence of new patterns and emergence behavior (Goldstein, 1999; Millán, Torres, & Marro, 2019). The theory explains how organizations interact, co-evolve, innovate, and coexist to create new knowledge in business processes. The theory advances the view that acquiring and using appropriate knowledge systems and adapting to new organizational systems within a given market can improve business processes (Goldstein et al., 2010).

Scheer (2012) introduced BPR to the American private sector for the first time. Hammer created BPR as a technique for achieving significant organizational changes with the goal of successfully altering company procedures for increased productivity in the American private sector. Beginning in the 1990s, BPR began to contradict or reflect the idea of total quality management (TQM), a related Japanese approach. Hammer and Champy (1993) claim that the BPR approach completely transforms a company's operations for greater overall performance in terms of costs, service quality, efficiency, and speed. Therefore, in a rapidly evolving global economy characterized by fierce rivalry and accelerating technical innovation, adjustments to boost corporate productivity are required. The management's agenda is desirable in order to get the best results, hence best result can only be achieved through BPR. As a result, business process reengineering (BPR) is a widely accepted notion that has been around for more than 20 years as a tool for change in the corporate sector. A large improvement in output, cycle time, and quality can be attained with BPR, a process that entails radically revamping important business procedures. In order to help organizations apply the 4ir principles, BPR is suggested (Jayatilake et al., 2016). The rate of economic and technological advancement, as well as the procedure for making modifications in organizations, have all grown more varied and difficult as a result of the market's unpredictability.

The study contributes to existing literature by examining the moderating effect of knowledge sharing on the relationship between knowledge creation and business process re-engineering outcomes of financial services in financial institutions in Uganda. Numerous studies have been conducted on the study of business process management; however, less emphasis has been put on the business process re-engineering outcomes of financial institutions, yet they are re-inventing a number of business processes such as online account opening processes, mobile banking processes, and agent banking processes, among others, so as to meet the dynamic needs of clients. Financial institutions are also driving incremental and radical changes to gain a competitive advantage (Bank, 2010, 2011; Maharmah & Al Jbour, 2023). Ideally, this is the essence of business process re-engineering initiatives in driving sustainable operational and financial performance metrics. It is a trendy development paradigm, through which financial institutions exist to make sustainable process innovations while appreciating significant business process re-engineering outcomes. This is perhaps why, globally, business process re-engineering has become a prerequisite for financial institutions with a focus on sustainable process-based innovative developments. It is no wonder that business process re-engineering is becoming the cornerstone of the World Business Council for Sustainable Development (WBCSD) (Wilkinson & Mangalagiu, 2012).

According to Sharma and Kansal (2014) knowledge creation and sharing was operationalized in in the field of academia. The reviews show that the extent of business process reengineering is sufficiently understood. The relationship between knowledge production and the results of business process re-engineering is one viewpoint on the subject (Fan, Rajib, & Alam, 2012). Furthermore, it is frequently recommended as best practice for businesses to provide knowledge to their representatives and employees (Bhasin & Dhami, 2018). Though Wickens and Kötter (1995) argues that he synthesized information and knowledge gained from observations of more than 100 companies into a set of eight steps to facilitate organizational transformation. The central argument is that knowledge creation practices contribute to organizational performance through business process re-engineering. However, this gap has drawn the attention of some academics. Thus, it's critical to comprehend how knowledge creation components influence re-engineering outcomes in developing nations'

financial services. The primary method by which team members make use of their collective knowledge resources is knowledge creation (Cao, Ali, Pitafi, Khan, & Waqas, 2021).

Knowledge sharing practices are a central process through which team members collectively utilize their available knowledge resources (Cao et al., 2021). Organizations need to facilitate communications and knowledge sharing to manage resistance to change and culture. Knowledge sharing reduces adverse selection by improving financial institutions' knowledge of credit applicants and allowing them to exchange knowledge about their knowledge sharing reduces adverse selection by improving financial institutions' knowledge of credit applicants and allowing them to exchange knowledge about their clients' credit worthiness (Pagano & Jappelli, 1993; Powell & Snellman, 2004). More so, Xin (2009) revealed that knowledge sharing plays a pivotal role in business process re-engineering activities. The importance of linking knowledge creation to business goals, targets, and objectives is addressed by the concept of business process re-engineering. Organizations tend to rethink the conditions and ways of managing knowledge processes to effectively respond to dynamic and competitive pressures. This implies that there is a need to find ways of coordinating and managing new knowledge and business process implementation in dynamic situations (Mollaei & Mirkhalili, 2014). Subsequently, knowledge sharing is associated with improved availability and a lower cost of credit, particularly in transition countries with very weak legal environments, which enhances credit availability. So, knowledge sharing allows for cost reductions, reduces waste, ensures quality (Fawcett & Birou, 1992), flexibility, and improved responsiveness (Mendonça Tachizawa & Giménez Thomsen, 2007). While the impact of knowledge sharing on credit process access is limited, it is particularly valuable to guide financial services in evaluating credit applicants who would be otherwise costly to screen due to poor accounting knowledge or small loan volumes (Bebbington, 2006).

Methodology

The study was guided by research methodology, methods, and analysis approaches. The study adopted a cross-sectional survey design to collect data at one point in time using a self-administered questionnaire due to cost effectiveness. The study used a quantitative approach to objectively understand the relationship between knowledge creation and business processes. The data were analyzed in two stages. Firstly, the data were interrogated using a statistical package for social scientists to establish clusters among the surveyed financial services that were homogeneous. Secondly, to derive a tested model relating to knowledge creation and business process re-engineering performance outcomes using the LME4 package for R programming software.

The study targeted 157 financial institutions operating in Uganda (Irau, 2015; Uganda, 2011; Villasenor, West, & Lewis, 2015). The focus was on re-engineering the business processes of financial services offered by the financial institutions in Uganda, irrespective of their status, i.e., whether regulated or unregulated. An approximate sample size of 113 financial institutions was derived following Yamane (1973) approach of determining the sample size with a 5% level of precision and a 95% level of confidence using statistical power analysis (Cohen, 1988). The method yields a fairly representative sample size (Burrell & Morgan, 1979). Sampling design and procedures were done at two levels: the unit of inquiry at respondent levels and the unit of analysis at financial institution levels. Transcribed sampling was used where heterogeneous financial services were divided into different homogeneous strata of insurance firms, commercial banks, micro-deposit institutions, and credit institutions.

A random sample of financial services was drawn from each homogeneous group of financial services. However, it is noted that financial services were constantly re-engineering business processes differently and at different levels in Uganda. Based on the known financial services that had re-engineered their business processes, this warranted the need to use the snowball sampling technique to select the financial services that practiced business process re-engineering as a way of validating the selected unit of analysis. This technique was

possible because evidence existed for a few particular re-engineered financial services that ensured the use of a chain of referral based on the desired characteristics of financial services. The selection of senior managers that formed the unit of inquiry was based on the purposive sampling technique. Two senior managers were selected as respondents (these were either an operations manager, finance manager, relationship manager, general manager, or IT manager) because of their fundamental technical expertise and experience in the application of business process re-engineering approaches and knowledge creation. To address variations in unit of analysis responses, a minimum of 2 respondents (1 senior manager and 1 operations manager) were considered for analysis. The decision to accept a statistical minimum before data aggregation is supported by Field (2006). Data was screened and aggregated to the unit of analysis before further statistical analyses were carried out. We further elaborate on the measurement and operationalization of study variables in the next section.

Measurement and Model specification

Study variables were operationalized and measured based on guidance from previous studies. Business process re-engineering involves financial re-engineering solutions, redesigning work flow and information processes, eliminating bureaucratic structures, managing queues, and ensuring operational effectiveness and efficiency in financial services. Business process re-engineering outcomes are dimensionally measured in terms of cost reduction, time reduction, output quality, and quality of work life (Cempel & Tabaszewski, 2010; Hassan, 2003; Modarres; Nkurunziza et al., 2018; Pruijt, 1998). On the other hand, knowledge creation and sharing is operationalized as an activity that transfers or disseminates knowledge from individuals, groups, and organizations to others (Islam, Low, & Hasan, 2011; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). According to Ryu, Ho, and Han (2003), knowledge creation and sharing are components of knowledge creation and this is a kind of delivery behavior through which people in the organization acquire and share knowledge from others to adapt to environmental dynamic forces (Kearns & Lederer, 2003, 2004; Tsai, Lai, Hwang, Lin, & Weng, 2004).

We used a traditional generalized linear mixed model (GLMM) with fixed and random effects and random effects (Bolker, 2015) to predict business process re-engineering outcomes based on the data from the surveyed financial services (Stijnen, Hamza, & Özdemir, 2010). The surveyed financial services were predicted using the generalized linear mixed model equation in the form $y_{ij} = \alpha + \epsilon_{\alpha} + \beta_1 x_i + \epsilon_i$ such that: $\epsilon_i \sim \text{Normal}(0, \sigma_i)$ and $\epsilon_{\alpha} \sim \text{Normal}(0, \sigma_{\alpha})$. Where we define ϵ_{α} as the error term for the individual observations and ϵ_i as the error term for the intercept. In this study, α and β_1 are fixed effects, while ϵ_{α} and ϵ_i are random effects. y_{ij} represents the business process re-engineering outcomes, x_i represents knowledge creation. We further let y_{ij} denote the j th measurement available for the i th cluster, $i = 1, \dots, m$, $j = 1, \dots, n_i$, where clusters can represent the sample of financial services. Further, let y_i denote the corresponding vector of all measurements for cluster i . Given the methodology, methods and analysis tools, the generated results are interpreted and discussed in the subsequent sections.

Results

In this study, we used two-step cluster analysis, which has relative advantages over other cluster analysis techniques. It allows assessment of the relative contribution of each variable to cluster formation based on predictor performance (SPSS, 2004). A two-step cluster analysis was performed using Statistical Package for Social Scientists version 23. Cluster analysis refers to a family of statistical techniques that can be used to group individual cases based on their similarities. The main purpose of using Cluster Analysis (CA) was to classify the data into groups (clusters) with similar characteristics, attempting to maximize the similarity between in-cluster elements and the dissimilarity between inter-cluster elements (Fraley & Raftery, 1998). A two-step cluster analysis procedure was also preferred because the optimal number of clusters was unknown and because two-

step procedures do not require a priori specification. The cluster analysis was performed using the procedure recommended by Norusis (2010).

Before the analyses were conducted, all variable items were standardized by z-score. The first step in two-step cluster analysis is initially grouping entities in a sequential fashion based on distance criterion to reduce the size of the data matrix. The distance measure used to group cases was log-likelihood, which is recommended when variables are not considered completely independent from one another. We further used R programming software to capture the responses of business process re-engineering outcomes as per the study purpose. Restricted maximum likelihood estimates of the parameters in linear mixed-effects models were determined using the lmer function in the lme4 package for R software. Both fixed and random effects were tested. The appropriate criterion was optimized, using one of the constrained optimization functions in R to provide the parameter estimates. The changes in the phenomenon were measured only once for each individual financial institution.

Accordingly, data were analysed at two stage levels. Firstly, data were interrogated using a statistical package for social scientists to establish clusters among the surveyed financial services that were homogeneous. Conclusively, we established the significance differences of business process re-engineering outcomes among financial services and determined the predictor importance of knowledge creation dimensions and business process re-engineering outcomes. Secondly, to derive a predictive model of business process re-engineering performance outcomes using the LME4 package for R programming software. We thus examined the role of knowledge creation on business process re-engineering outcomes in financial services using empirical evidence from Uganda.

Descriptive results

This section focuses on both descriptive statistics of demographic profiles of individual and institutional respondents. As such, the unit of analysis was a re-engineered financial service while the unit of inquiry was an individual (senior managers) and each category has the descriptive statistics of demographic profiles as elaborated in this section. The sample characteristics of individual are analysed using frequencies; the results reveal that most of the respondents were master's degree graduates as indicated by 99 (63.9%) and least were professional PhD holders with 15 (9.6%). The results further indicate that most of them had re-engineering experience of 6-10 years as indicated by 66 while those that operated over 25 years had less re-engineering experience with only 7 respondents (42.6%). Majority of the respondents were senior Information Technology managers as indicated by 44 (28.4%) followed by operations managers of 38 respondents (24.5%). This means that the respondents were having adequate qualifications that enabled them to freely fill the questionnaire with vast experiences and competencies in the field of study.

In this study, we explored the characteristics of re-engineered financial services. The results were obtained after aggregating the data to the unit of analysis. The number of employees per departmental unit of the 75 re-engineered financial services were ranging from 16 to 20 as indicated by 19.9%. The results imply that most department units in financial services are dominated by 16 to 20 employees. The re-engineering experience of the 75 financial services surveyed was at most 5 years (44.5%), followed by a period of 16–25 years (23.2%). The 75 respondents' financial services are distributed by the re-engineered business processes. The results indicate that most institutions re-engineered the work flow support processes (39.1%), followed by network processes (23.2%), and then core processes (17.2%). The least re-engineered processes include management processes (10.6%) and logistical processes (7.3%). However, 2.6% of the 75 financial services re-engineered all the above business processes.

We further addressed the key research questions that guided this study. First, we checked whether there were significant differences in business process re-engineering outcomes among financial services. We investigated

the significance of differences in business process re-engineering outcomes among financial services based on the confounding variables at the unit of analysis level, such as the nature of financial services, re-engineering experience, and category of re-engineered processes.

Analysis of variance

Firstly, the analysis of variance was used to test for the presence of significant differences among the sample characteristics of the surveyed financial services. There were no significant differences between the nature of financial services ($p > 0.05$), re-engineered business processes ($p < 0.05$) indicating that there is a significant difference in the business processes, duration of financial services ($p > 0.05$) and number of employees ($p > 0.05$), which suggested that all differential characteristics of the unit of analysis did not matter except for the business processes that were re-engineered. It was revealed that financial services re-engineered three categories of business processes that include; operational processes, support processes and management processes that yield value to the surveyed financial services.

Secondly, we established the predictive importance of knowledge creation and business process re-engineering outcomes. We used two-stage level analysis to determine the relative contribution of indicator variables and segment the cases of knowledge creation (in terms of the way knowledge is created and shared) and business process re-engineering outcome indicators as guided by the second objective. The model fit was fairly good across all fields. F-test statistics were used to investigate the importance of each indicator as a predictor of variable indicators being placed in a cluster and the mean values of each indicator to summarize similarities and dissimilarities between clusters within each field.

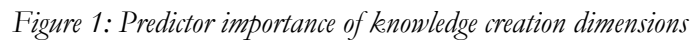
Table 1: Analysis of variance results

Sample characteristics		Sum of Squares	Df	Mean Square	F	Sig.
Category of re-engineered processes	Between Groups	86.55	70	1.24	13.19	.01
	Within Groups	.38	4	.09		
	Total	86.92	74			
Re-engineering experience	Between Groups	100.88	70	1.44	4.61	.07
	Within Groups	1.25	4	.31		
	Total	102.13	74			
Number of employees	Between Groups	133.28	70	1.90	1.02	.58
	Within Groups	7.50	4	1.88		
	Total	140.78	74			

Predictor importance of knowledge creation dimensions

The importance of each indicator as a predictor of the cluster was investigated so as to determine which indicator distinguished the cluster. Based on the F-test statistic, scores range between 0 and 1; the closer to 1, the less likely the variation for a variable between clusters is due to chance and more likely due to some underlying difference (High, 2012). The indicators of knowledge creation shown in figure 1(a) showed good cluster quality close to 1 and predictor importance > 0.4 . The results of knowledge creation indicator variables reveal less variation in the clusters as shown by the predictor importance continuum. The study results showed that the indicator variables showed high homogeneity of knowledge creation. Knowledge data bases are saved on electronic files, knowledge sharing focuses on process performance outcomes, and electronic data interchange systems are used to acquire and share knowledge. It was revealed that knowledge creation showed high variation in clusters.

Predictor Importance



Finally, we examined whether the configurations of knowledge creation dimensions provide a superior explanation of the business process re-engineering outcomes in financial services. The next stage was to derive a predictive model of business process re-engineering outcomes using knowledge creation. The results are presented in table 2. We proceeded to derive a generalized model of business process re-engineering outcomes. The restricted maximum likelihood estimates of the parameters in linear mixed-effects models, as shown in table 2. From the hypothesized generalized linear mixed model equation in the form $y_{ij} = \alpha + \epsilon_{\alpha} + \beta_1 x_i + \epsilon_i$ such that: $\epsilon_i \sim \text{Normal}(0, \sigma_i)$ and $\epsilon_{\alpha} \sim \text{Normal}(0, \sigma_{\alpha})$. Where we define ϵ_{α} as the error term for the individual observations and ϵ_i as the error term for the intercept. In this study, α and β_1 are fixed effects while ϵ_{α} and ϵ_i are

random effects. y_{ij} represents the business process re-engineering outcomes, x_i represents knowledge creation dimensions.

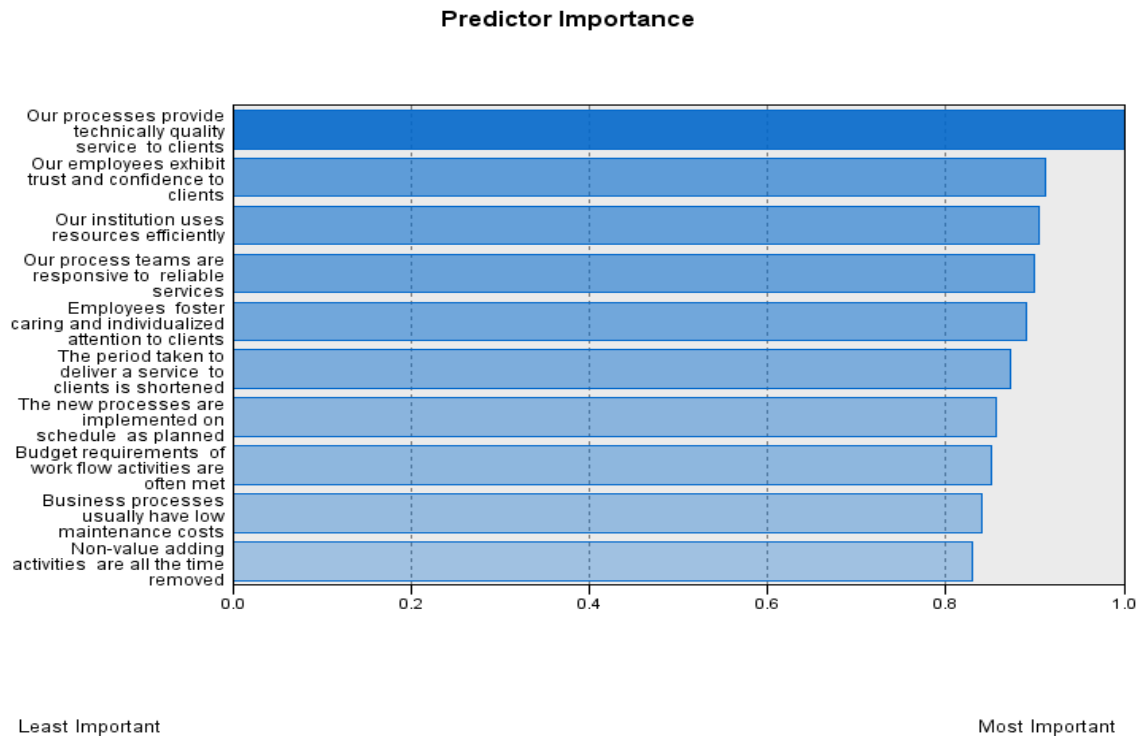


Figure 2: Predictor importance of business process re-engineering outcomes

Moderating effect of knowledge sharing on the relationship between knowledge creation and business process re-engineering outcomes

Statistical Package for Social Scientists Process Macro version 3.2 applying the 5,000 bootstrap sampling with 95% confidence intervals (Hayes, 2013a) was used to test for moderating effect of knowledge sharing on the relationship between knowledge creation and business process re-engineering outcomes as per Table 2.

Table 2: The effect of knowledge sharing on the relationship between knowledge creation and business process re-engineering outcomes

R	R-sq	MSE	F	df1	df2	p
.6810	.4637	.2783	13.8367	3.0000	48.0000	.0000
Variable	Coeff	SE	t	P	LLCI	ULCI
constant	.0198	.0793	.2494	.8041	-.1397	.1793
K creation (X)	.6383	.1350	4.7283	.0000	.3669	.9098
Ksharing (W)	.0290	.1246	.2327	.8170	-.2216	.2796
Int_1	-.1480	.0391	-3.7810	.0004	-.2267	-.0693

Moderation testing was carried out based on Hayes (2013b) with particular focus of Knowledge sharing specified as a moderator (W) causally interacting with Knowledge creation (X) and the criterion variable as Business process re-engineering outcomes (Y). The study tested for the direct effect of Knowledge creation and knowledge sharing on Business process re-engineering outcomes. The result revealed that there was a significant effect of Knowledge creation on Business process re-engineering outcomes ($\beta = .6383$, $p < .001$).

The result further indicated that there was insignificant direct effect of Knowledge sharing on Business process re-engineering outcomes ($\beta = .0290$, $p > .001$). The study proceeded to ascertain the moderating effect of Knowledge sharing on the relationship between Knowledge creation and Business process re-engineering outcomes. The result indicated that there was a significant conditional effect of Knowledge sharing on Knowledge creation and Business process re-engineering outcomes ($\beta = -.1480$, $SE = .0391$, $t = -3.7810$, $p < .001$, $CI = -.2267, -.0693$) as per Table 3.

Table 3: Direct and Moderation Effects

Variables	β	SE	T	p-v	LLCI	ULCI
Lower Ks (-1.000)	.7863	.1554	5.0593	.0000	.4738	1.0988
Modest Ks (0.000)	.6383	.1350	4.7283	.0000	.3669	.9098
High Ks(1.000)	.4903	.1239	3.9564	.0003	.2411	.7395
ΔR^2 (X*W)			.1597	($p = .0004$)		
F			14.2963**			

The conditional effect of Knowledge sharing on Knowledge creation and Business process re-engineering outcomes was further explained by the mode of interactions that occurred between the Knowledge creation and Business process re-engineering outcomes at three levels of Knowledge sharing. The conditional effect was significant at three levels with varying degree of strengths. For example, Knowledge sharing had a stronger moderating effect at lower mean level ($\beta = .4903$, $SE = .1239$, $t = 3.9564$, $p < .001$, $CI = .2411, .7395$), modest mean level ($\beta = .6383$, $SE = .1350$, $t = 4.7283$, $p < .001$, $CI = .3669, .9098$) and high mean level ($\beta = .7863$, $SE = .1554$, $t = 5.0593$, $p < .001$, $CI = .4738, 1.0988$). The model explains 15.97% variance in Business process re-engineering outcomes ($\beta = -.105$, $p \leq .001$, $\Delta R^2 = .1597$, $F = 14.2963$, $p \leq .001$) as shown in Table 5.

Knowledge sharing moderates the relationship between knowledge creation and business process re-engineering outcomes, indicating that low knowledge creation correlates with low business process re-engineering outcomes and vice versa. Therefore, when knowledge sharing is high and knowledge creation is low, business process re-engineering produces high-level results. The figure indicates that by offsetting low levels of knowledge creation, knowledge sharing enhances the results of business process re-engineering.

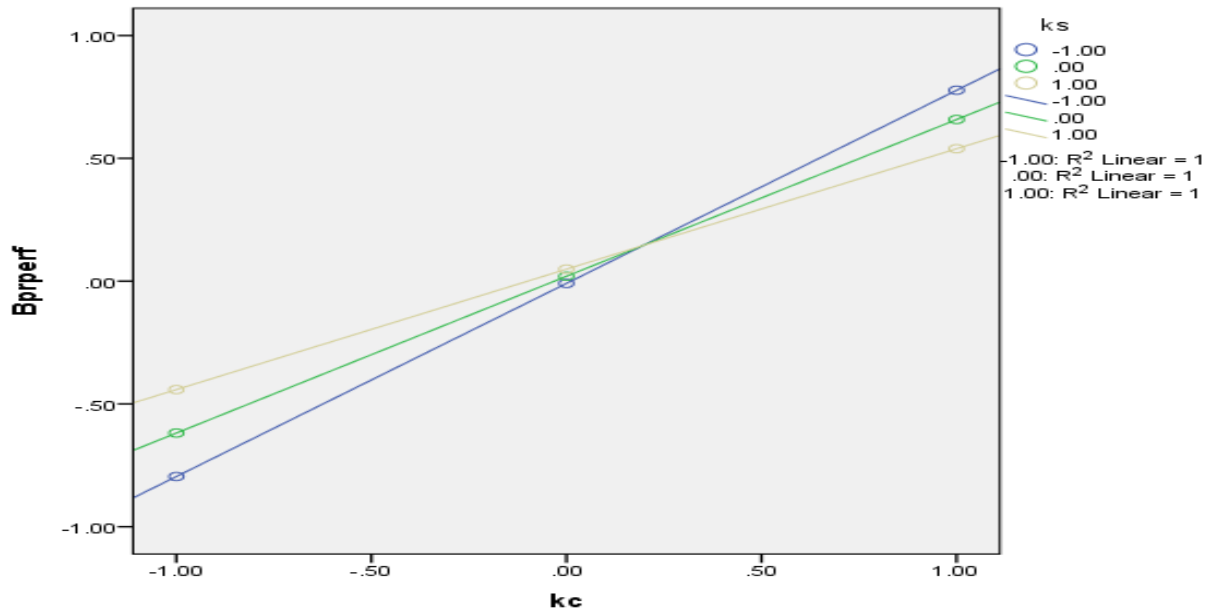


Figure 3: Medigraph showing the moderating effect of knowledge sharing on the relationship between knowledge creation and business process re-engineering outcomes

Business process re-engineering results do, however, increase in tandem with knowledge creation, albeit at a high rate and with little knowledge sharing. This finding shows that the presence of knowledge sharing improves the performance of business process engineering.

Discussion

The moderating role of knowledge sharing on the association between knowledge generation and business process reengineering outcomes is covered in this section. Acquiring actionable information that is pertinent, satisfies quality standards, and helps in meeting customer demands is a key component of knowledge creation practices. Financial services generate new knowledge through their mutual interactions in order to meet both internal and external demands. In order to provide immediate customer updates, the newly acquired knowledge by banks, insurance companies, and financial services institutions was moved from various functional departments to central information processing units. It was then stored in both physical and electronic files for future reference. Many financial processes in pertinent departmental units, including finance, marketing, operations, risk, and human resources, are improved by the developed knowledge practice. More so in the context of financial services, senior managers and heads of units organize conferences, on-the-job training, workshops, refresher courses, seminars, and field trips to train staff to identify process inefficiencies and generate valuable information and resources. Financial services further create new knowledge through socialization by creating collaborations and networks with both public and private organizations to identify new market opportunities and share with different customers about their products and services offered.

We also advocate for knowledge sharing practices that include the dissemination of pertinent and useful information to establish efficient and successful financial operations. In order to share pertinent information about available products, such as interest rates and foreign exchange rates, financial services have implemented web-based access, bar code systems for service access, electronic data interchange systems for information sharing, and social media via the internet. Circulars and calendars are other tools used by financial services for internal and external communication. They get together to discuss how various functional departments' business operations are performing in order to better serve their clients. Financial knowledge about new

products like bank assurance and payment cards is shared by a number of financial services, including commercial banks.

The managers of the respective departments are able to make quick decisions for instance, compliance department checks whether the bank is doing the right in line of consumer protection, cash limits and whether audits are going on well; audit department check whether the branch and bank departments are meeting the guidelines and set standards as per their work; human resources uses the information shared to carry out the right internal staff adjustments; risk department uses the shared information to determine the value of premium, manage risks of the financial services through mitigation, analysis, avoidance and transfer of risks; loans departments use the shared information of the interest charge and loan defaulters of the bank; business and development uses the shared information to develop new electronic channels to facilitate the banking processes of the financial services and customer servicing. It is clear that the new knowledge is shared among the case managers and across functional teams to identify business process inefficiencies such as identifying the critical problems such as delays in banking halls, increasing costs of credit in financial banks, claims and verification processing time in insurance firms, detrimental quality of services, delays in cycle processing time, customer complaints. As such, financial services often seek to apply the relevant knowledge for quality change decisions outcomes in terms of reduced operational costs, minimal processing time and quality claim and verification processes.

Melo, Netto, Ferreira Filho, and Fernandes (2010) state that the results offer empirical support for knowledge creation practices in producing complex, inventive, and efficient network processes, workflow support processes, management processes, and core processes. According to Hussein (2016); Keshtmand, Nowroozian, and Hatami (2016), knowledge is a vital intangible resource that can be produced through socialization, externalization, combination, and internalization of actionable knowledge. Knowledge is also what drives both gradual and drastic changes as well as institutional competitiveness. Financial services consistently capitalize on knowledge sharing to increase the efficiency of business processes (Melo et al., 2010; Valdez-Juárez, García-Pérez de Lema, & Maldonado-Guzmán, 2016). In terms of knowledge sharing practices, the findings also support the claims made by earlier researchers (Mafabi, Munene, & Ntayi, 2012; Valdez-Juárez et al., 2016) that process innovations perform better in organizations when they are responsive to the sharing of pertinent knowledge through the creation of collaborative structures and networks. We also stress that knowledge, experience, and expertise must be formalized, dispersed, shared, and applied to improve process efficiency in order to turn knowledge into a valuable institutional asset (Galandere-Zile, 2009). Therefore, in the following section, we derive the following final lessons.

Conclusion

The research concludes by arguing that creating a knowledge-sharing environment is crucial to building financial services that are able to systematically learn from mistakes and inefficiencies, create process value chains, continuously make reflections, foster competitive advantage, and build on their success. The knowledge sharing environment builds a conduit through which financial services create new ideas share them among the departments of banking services, insurance, and banking as financial services, and with external stakeholders such as the media, governments, academia, public and private entities, and regulators. In such a knowledge environment, managers work together using the redesigned systems and processes to efficiently reach a shared goal. The sharing of knowledge in such an environment enables the management of complex structures; managers are able to learn and understand how best to deliver services to clients, guide people on how to communicate, and team up as communities of practice to solve business process-based problems as a team. The operating environment facilitates knowledge sharing through physical and virtual meetings. Socio-technological environment through collaborative knowledge building and creating communities of participation that will acquire and transfer knowledge to the right users. It also involves a decision environment where

knowledge and opinions are shared for dynamic decisions made by the players in the financial sector and regulatory authorities. Communication environments ensure information flow and exchange with immediate feedback.

Financial institutions that create knowledge sharing environments are able to facilitate business process re-engineering practices, cognitive processes to innovate existing processes, knowledge creation technological systems, collaborative knowledge building teams, and decision making. The knowledge sharing environment's outcomes are manifested in predictive learning, effective communication, the attainment of goals, and quality innovative decisions. Accordingly, instituting a knowledge sharing environment is a critical factor that is attained when financial services interact to share actionable information, resources, create new knowledge that is shared internally and externally to enhance business process efficiency. Besides, the implications of the study are discussed in the next section.

Implications

Theoretical implications

The results of the study improve complexity theory's application. Using sampled cases from the financial services studied, complexity theory was applied in this study to justify the need to identify the complexity of business processes. In order to generate new knowledge and adaptive behaviors, the idea promotes the coexistence and interactions of institutions. The two emerging components of knowledge production—knowledge creation and sharing—that result in productive and successful operations processes are highlighted in this study, which strengthens complexity theory. This study focuses on the results of business process re-engineering using complexity theory, as opposed to other research that examined the subject using linear work flow approaches (Habib & Shah, 2013; Mahmoudi & Mollaei, 2014; Tikkanen & Pölönen, 1996).

Methodological implications

The study advances methodology by objectively elucidating the function of knowledge management in propelling business process re-engineering outcomes through the use of a quantitative approach. Two-step clustering and extended linear modeling techniques were used to analyze the collected data. The structural realities of the results of business process re-engineering are captured by this methodological technique. The investigation looked at connection number two between business process re-engineering results and knowledge management.

Policy implications

The study makes the case that in order to promote business process effectiveness and efficiency in the financial services industry, attention is given to the development of awareness and a platform for institutionalizing leadership and knowledge creation systems in a complex adaptive structure. In order to improve the results of business process re-engineering, governments of developing nations and regulated financial services should also offer comprehensive trainings and capacity building to financial services in knowledge production. To raise awareness, policymakers ought to plan conferences, workshops, field excursions, and meetings with emphasis is on learning practical information, imparting financial information regularly to the users of financial services.

Additionally, the study advances business process re-engineering techniques. Managers of financial services in Uganda should take a particular interest in managing business processes successfully and efficiently by applying pertinent knowledge they have gained and repurposing it to create new products, new procedures, and new markets in order to maximize the benefits of business process re-engineering. Financial services managers ought to take an active role in creating a robust system of knowledge generation that will enable the implementation of senior manager training and development initiatives. In order to provide value for customers and increase the effectiveness and efficiency of business processes, knowledge is a crucial intangible asset that must be

effectively acquired, processed, and shared. This understanding is necessary for researchers, managers, and policymakers.

Funding: This research received no external funding.

Acknowledgments: The authors would like to express their gratitude to the financial institutions that made data for the study available, as well as to the research assistants who helped collect data from financial institutions offering financial services in Uganda.

Conflicts of Interest: The authors declare no conflict of interest.

Data Availability Statement: The data that support the findings of this study are available on request from the corresponding author on vobedgiu@gmail.com.

References

- Al-Omran, K., AlZayer, J., & Arnout, M. (2019). Causes of Business Process Reengineering Failure in the Kingdom of Bahrain and Saudi Arabia. *International Journal of Engineering and Management Research*, 9(6).
- Al-Mashari, M., Irani, Z., & Zairi, M. (2001). Business process reengineering: a survey of international experience. *Business process management journal*, 7(5), 437-455.
- Bako, Y., & Banmeke, M. (2019). The impact of business process re-engineering on organizational performance (A study of commercial banks and micro-finance banks in Ilaro). *Journal of Management and Technology [JORMATECH]*, 5(1), 1-14.
- Bank, W. (2010). *The world bank annual report 2010*: The World Bank.
- Bank, W. (2011). *The world bank annual report 2011*: The World Bank.
- Bebbington, A. (2006). *The search for empowerment: Social capital as idea and practice at the World Bank*: Kumarian Press.
- Bhasin, S., & Dhami, S. (2018). Business Process Reengineering–The Role of Human Resource Function: A Comprehensive Review of Literature. *International Journal of Business Management & Research*, 8(2), 1-17.
- Bolker, B. M. (2015). Linear and generalized linear mixed models. *Ecological statistics: contemporary theory and application*, 309-333.
- Burrell, G., & Morgan, G. (1979). Assumptions about the nature of social science. *Sociological paradigms and organisational analysis*, 248(1), 1-9.
- Cao, X., Ali, A., Pitaifi, A. H., Khan, A. N., & Waqas, M. (2021). A socio-technical system approach to knowledge creation and team performance: evidence from China. *Information Technology & People*, 34(7), 1976-1996.
- Cempel, C., & Tabaszewski, M. (2010). Optimization of dimensionality of symptom space in machine condition monitoring. *Mechanical Systems and Signal Processing*, 24(4), 1129-1137.
- Cohen, J. (1988). Set correlation and contingency tables. *Applied psychological measurement*, 12(4), 425-434.
- Davenport, T. H., & Short, J. E. (1990). The new industrial engineering: information technology and business process redesign.
- Fan, L., Rajib, M. S. U., & Alam, M. S. (2012). Business process re-engineering in the SMEs: critical success factors perspective of an emerging economy. *International Journal of Contemporary Business Studies*, 3(6), 6-18.
- Fawcett, S. E., & Birou, L. M. (1992). Exploring the logistics interface between global and JIT sourcing. *International Journal of Physical Distribution & Logistics Management*, 22(1), 3-14.
- Fetais, A., Abdella, G. M., Al-Khalifa, K. N., & Hamouda, A. M. (2022a). Business Process Re-Engineering: A Literature Review-Based Analysis of Implementation Measures. *Information*, 13(4), 185.

- Fetais, A., Abdella, G. M., Al-Khalifa, K. N., & Hamouda, A. M. (2022b). Modeling the relationship between business process reengineering and organizational culture. *Applied System Innovation*, 5(4), 66.
- Field, A. P. (2006). The behavioral inhibition system and the verbal information pathway to children's fears. *Journal of abnormal psychology*, 115(4), 742.
- Fraley, C., & Raftery, A. E. (1998). How many clusters? Which clustering method? Answers via model-based cluster analysis. *The computer journal*, 41(8), 578-588.
- Galandere-Zile, I. (2009). The effective management approach: integration of business, quality management and knowledge management processes. *Computer Science (1407-7493)*, 38.
- Gogo, P. (2019). *The Effect Of Financial Deepening On Economic Growth In The East Africa Community Bloc*. UoN,
- Goldstein, J. (1999). Emergence as a construct: History and issues. *Emergence*, 1(1), 49-72.
- Goldstein, J. (2013). Complexity and philosophy: Re-imagining emergence: Part 1. *Emergence: Complexity and Organization*, 15(2), 78.
- Goldstein, J., Hazy, J. K., & Silberstang, J. (2010). A complexity science model of social innovation in social enterprise. *Journal of social entrepreneurship*, 1(1), 101-125.
- Habib, M. N., & Shah, A. (2013). *Business process reengineering: Literature review of approaches and applications*. Paper presented at the Proceedings of 3rd Asia-Pacific Business Research Conference.
- Hammer, M. (1990). Reengineering work: Don't automate, obliterate. *Harvard business review*, 68(4), 104-112.
- Hammer, M., & Champy, J. (1993). Business process reengineering. *London: Nicholas Brealey*, 444(10), 730-755.
- Hashem, G. (2020). Organizational enablers of business process reengineering implementation: An empirical study on the service sector. *International journal of productivity and performance management*, 69(2), 321-343.
- Hassan, M. M. (2003). Reengineering the process in the design of object-orientation using concepts of industrial engineering. *International journal of computer applications in technology*, 16(4), 167-180.
- Hayes, A. F. (2013a). Introduction to mediation, moderation, and conditional process analysis: Methodology in the Social Sciences. *Kindle Edition*, 193.
- Hayes, A. F. (2013b). Model templates for PROCESS for SPSS and SAS. In.
- High, R. (2012). The era of cognitive systems: An inside look at IBM Watson and how it works. *IBM Corporation, Redbooks*, 1, 16.
- Hussein, A. K. (2016). Applications of nanotechnology to improve the performance of solar collectors—Recent advances and overview. *Renewable and Sustainable Energy Reviews*, 62, 767-792.
- Irau, T. (2015). Demand for Money in Papua New Guinea. *Bank of Papua New Guinea Working Paper Series*, 1, 5-17.
- Islam, Z. M., Low, K., & Hasan, I. (2011). Knowledge management practices and organizational effectiveness: Empirical evidence from banks of an underdeveloped country. *Global Education Journal*, 2011(3), 1-28.
- Jayatilake, H., Withanaarachchi, A., & Peter, S. (2016). Possibility of applying Industry 4.0 as a business process re-engineering tool: Case study from an apparel production plant.
- Kamukama, N., Tumwine, S., Opiso, J., & Korutaro Nkundabanyanga, S. (2014). Business process management and service delivery; a case of Uganda's public entities. *World Journal of Entrepreneurship, Management and Sustainable Development*, 10(4), 285-299.
- Kearns, G. S., & Lederer, A. L. (2003). A resource-based view of strategic IT alignment: how knowledge sharing creates competitive advantage. *Decision sciences*, 34(1), 1-29.
- Kearns, G. S., & Lederer, A. L. (2004). The impact of industry contextual factors on IT focus and the use of IT for competitive advantage. *Information & Management*, 41(7), 899-919.
- Keshtmand, Z., Nowrozian, M., & Hatami, K. (2016). The Effect Of Technology And Administrative Automation On Employees' Work Life Quality (Case Study: Department Of Youth And Sports Of Kermanshah Province).
- Kimotho, M., & Muturi, W. (2019). Effect of Innovations on Financial Performance of Microfinance Institutions in Kenya. *International Journal of Social Sciences and Information Technology*, 5(3), 1-14.

- Lakuma, P. C., Sunday, N., Sserunjogi, B., Kahunde, R., & Munyambonera, E. F. (2020). How has the COVID-19 pandemic impacted Ugandan businesses? Results from a business climate survey.
- Li, N., & Nazif, H. (2022). Systematic literature review on business process re-engineering approaches in logistics. *Kybernetes*, 51(10), 3009-3024.
- Mafabi, S., Munene, J., & Ntayi, J. (2012). Knowledge management and organisational resilience: Organisational innovation as a mediator in Uganda parastatals. *Journal of Strategy and Management*, 5(1), 57-80.
- Maharmah, M. H., & Al Jbour, F. K. (2023). The Impact of Applying Re-Engineering Application Process on Critical Performance Criteria in Jordanian Islamic Banks. *International Journal of Professional Business Review: Int. J. Prof. Bus. Rev.*, 8(6), 40.
- Mahmoudi, M. M., & Mollaei, E. (2014). The effect of business process re-engineering factors on organizational agility using path analysis: Case study of ports & maritime organization in Iran. *Asian Economic and Financial Review*, 4(12), 1849.
- Melo, A. C. S., Netto, M. A. C., Ferreira Filho, V. J. M., & Fernandes, E. (2010). Knowledge management for improving business processes: an analysis of the transport management process for indivisible exceptional cargo. *Pesquisa Operacional*, 30, 305-330.
- Mendonça Tachizawa, E., & Giménez Thomsen, C. (2007). Drivers and sources of supply flexibility: an exploratory study. *International Journal of Operations & Production Management*, 27(10), 1115-1136.
- Millán, A. P., Torres, J. J., & Marro, J. (2019). How memory conforms to brain development. *Frontiers in Computational Neuroscience*, 22.
- Mlay, S. V., Zlotnikova, I., & Watundu, S. (2013). A quantitative analysis of business process reengineering and organizational resistance: the case of Uganda. *The African Journal of Information Systems*, 5(1), 1.
- Modarres, M. Enhancing strategic values of business modeling and simulation technologies in process reengineering: Exploring an integrated enterprise knowledge base approach.
- Mollaei, M., & Mirkhalili, S. M. (2014). Execution analysis in Iran law. *Advances in Environmental Biology*, 658-662.
- Nkurunziza, G., Munene, J., Ntayi, J., & Kaberuka, W. (2019). Business process reengineering in developing economies: Lessons from microfinance institutions (MFIs) in Uganda. *Innovation & Management Review*, 16(2), 118-142.
- Nkurunziza, G., Ntayi, J. M., Munene, J. C., & Kaberuka, W. (2018). "Knowledge management, adaptability and business process reengineering performance in microfinance institutions.
- Norusis, M. J. (2010). *PASW statistics 18 guide to data analysis*: Prentice Hall Press.
- Nzewi, H., Chiekezie, O., & Ogbeta, M. (2015). Talent management and employee performance in selected commercial banks in Asaba, Delta State, Nigeria. *European journal of business and social sciences*, 4(09).
- Pagano, M., & Jappelli, T. (1993). Information sharing in credit markets. *The Journal of Finance*, 48(5), 1693-1718.
- Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of applied psychology*, 88(5), 879.
- Powell, W. W., & Snellman, K. (2004). The knowledge economy. *Annu. Rev. Sociol.*, 30, 199-220.
- Pruijt, H. (1998). Multiple personalities: the case of business process reengineering. *Journal of Organizational Change Management*, 11(3), 260-268.
- Ryu, S., Ho, S. H., & Han, I. (2003). Knowledge sharing behavior of physicians in hospitals. *Expert Systems with applications*, 25(1), 113-122.
- Scheer, A.-W. (2012). *Business process engineering: reference models for industrial enterprises*: Springer Science & Business Media.
- Sharma, A., & Kansal, A. (2014). Technological innovations in banking sector: impact, behaviour and services. *International journal of information & computation technology*, 4(9), 885-890.

- Stijnen, T., Hamza, T. H., & Özdemir, P. (2010). Random effects meta-analysis of event outcome in the framework of the generalized linear mixed model with applications in sparse data. *Statistics in medicine*, 29(29), 3046-3067.
- Tikkanen, H., & Pölönen, P. (1996). Business process re-engineering projects in Finland: An evaluation of change management in 21 large Finnish organizations. *Business process re-engineering & management journal*, 2(3), 10-25.
- Tsai, K.-C., Lai, J.-W., Hwang, Y.-C., Lin, S.-L., & Weng, C.-H. (2004). *Research and application of double-core buckling restrained braces in Taiwan*. Paper presented at the Proceeding of the 13th World Conference on Earthquake Engineering, Paper.
- Uganda, B. O. (2011). Financial stability report.
- Valdez-Juárez, L. E., García-Pérez de Lema, D., & Maldonado-Guzmán, G. (2016). Management of knowledge, innovation and performance in SMEs. *Interdisciplinary Journal of Information, Knowledge, and Management*, 11(4), 141-176.
- Vally, S., & Spreen, C. A. (2012). Human rights in the World Bank 2020 education strategy. In *The World Bank and Education* (pp. 173-187): Brill.
- Villasenor, J., West, D., & Lewis, R. (2015). *The 2015 Brookings financial and digital inclusion project report: Measuring progress on financial access and usage*: Brookings Institution Press.
- Wickens, J., & Kötter, R. (1995). Cellular models of reinforcement.
- Wilkinson, A., & Mangalagiu, D. (2012). Learning with futures to realise progress towards sustainability: The WBCSD Vision 2050 Initiative. *Futures*, 44(4), 372-384.
- Xin, C. (2009). *Approaching to application of business process re-engineering and information strategy and technology*. Paper presented at the 2009 IITA International Conference on Control, Automation and Systems Engineering (case 2009).
- Yamane, T. (1973). Research Methodology/Sample Size. *Florida: University of Florida*.
- Zhu, Z., Zhao, J., & Bush, A. A. (2020). The effects of e-business processes in supply chain operations: Process component and value creation mechanisms. *International Journal of Information Management*, 50, 273-285.