OPERATIONAL RISKS AND ORGANIZATIONAL PERFORMANCE OF SUGAR MANUFACTURING COMPANIES; A CASE OF SOUTH NYANZA SUGAR COMPANY

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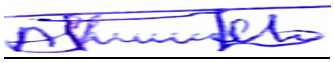
DECLARATION

This research project is my original work and it has not been submitted for the award of a degree in any other university.

Signature  Date: May 28, 2022

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This project has been submitted for examination with my approval as the university supervisor.

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ABBREVIATIONS AND ACRONYMS

CIMA	Chartered Institute of Management Accountants
CSF	Chemelil Sugar Factory
GPD	Generalized Pareto Distribution
KACC	Kenya Anti-Corruption Commission
KEBS	Kenya Bureau of Standards
KNA	Kenya National Assembly
KSB	Kenya Sugar Board
KShREF	Kenya Sugar Research Foundation
KSSCT	Kenya Society of Sugarcane Technologists
MSC	Mumias Sugar Company
MSF	Muhoroni Sugar Factory
NSC	Nzoia Sugar Company
ORM	Operational risk management
ORMMM	Operational Risk Management Maturity Model
QMP	Quality Management Plan
ROA	Return on Assets
ROE	Return on Equity
ROI	Return on Investment
SAR	Sugar Annual Report
SAT	Sugar Arbitration Tribunal
SONY	South Nyanza Sugar Company
SOP	Standard Operation Procedure

ABSTRACT

While taking deliberate and informed risks is a significant component of a strategy of any company, amplified operational risks has led to extremely high-risk exposures to business firms. Insomuch as risk management is thought to be an important control and tool of management, there is limited data from the previous empirical research that link operational risks to the poor performance of sugar production companies in Kenya. The general rational of the research was to find out the effects of operational risks on financial performance of sugar production companies, a case of South Nyanza Sugar Company (SONY). The specific objectives of the research were to ascertain the operational risks faced by SONY sugar firm, determine connection between operational risks and organization performance of SONY and determine the mitigation measures for the operational risks in SONY. The theoretical models that guided the study include the Extreme Value Theory (EVT), and top-down versus bottom-up models. This study used descriptive case-study design and the study population was the entire SONY employees. The target population of the study, therefore, consists of 33 employees in risk management department, who were all involved in the study through judgmental sampling technique. The study used both primary and secondary data sources, where primary data was gathered by administration of questionnaires. Descriptive statistics (mean, frequencies, standard deviation and percentages) as well as Pearson correlation test were used to analyse quantitative data. From the results, rendement (yield) as an operational performance had a moderate positive relationship with financial performance (profitability) of SONY sugar firm. The study also found that operational risks had a moderate but negative relationship with financial performance (profitability) of SONY sugar firm and also had moderate but negative relationship with rendement rate of the firm (yield or efficiency). Operational risk mitigation measures were also found to be strongly and positively correlated with the profitability of the firm, as well as with rendement. However, it had moderate but negative relationship with the operational risks. According to the findings of the study, sugar processing companies are exposed to a variety of operational risks. Therefore, they should develop practical risk management programmes that can be implemented to reduce the level of risks in sugar cane processing into sugar. Sugar mills will be revitalized by performing repairs and replacements of equipment whose performance has declined, and by supervising the implementation of Standard Operation Procedures (SOPs) at the mills in order to reduce the level of sugar loss during processing. The entire sugar mill management team must be committed to improving the performance of the sugar mills. In addition, an overall mill audit, beginning with the steam generating station all through to the grinding station and processing station, is required in order to identify the sources of sugar loss and sugar mill inefficiency and to make recommendations for improvement.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Many business entities are currently worried about four main portfolio risks of a company. Notably, these risks are liquidity risk, market risk, operational risk and credit risk (Jarrow, 2006). Market risks are described as risks that are incurred as a result of loss from unexpected price variations in monetary securities and asset values. This entails of price variants as a result of either equities, interest rates, commodities, or international currencies. On the other hand, credit risks are financial threats of diminution that comes as a result of defaults, while liquidity risk are risks that are experienced as a result of diminution which is a consequent of organization's inability to liquidate its assets at a sensible price within a realistic period of time.

In reference to the Basel Committee of banking supervision (2006), Pakhchanyan (2016), defines risk of operations as risks which are incurred due to loss from inadequate or clumsy people, internal practices, and systems or from peripheral events. From this account, risk of operations involves legal risks, but never inclusive of reputational and strategic risks. Other risks categories contain security, privacy protection, fraud, or environmental associated risks. Operational risk damages are unanticipated, high profile, and headline-grabbing. Notwithstanding the best easing approaches by business societies, 'operational risk' losses keep on (Canadian Institute of Actuaries, 2014). According to Zainuddin, Setyawati, & Wibowo, (2017) operational risks go up due to human and internal system error. Poorly trained employees and broken processes can lead to more minimal errors that amass high descending pressure on profit level of the organization. The risk experienced by any organization varies from each other contingent on the operation undertaken by the business establishments.

One of the most vital agro-industries in the biosphere is sugar industry. As asserted by Mandegari, Dogbe, and Gorgens (2017), sugar beet as well as sugarcane "major raw materials" for sugar are grown in more than 130 nations. Sugarcane therefore, is the world's leading cash-crop and is principally grown for sugar manufacture in more than 90 countries, and represents almost 80 percent of universal sugar manufacture. A large workforce can be absorbed by sugar industry right from on to off-farms. It also has forward and backward bonds thus improving the welfare of the entire community (Zainuddin, et al., 2017).

Agriculture in Kenya was acknowledged as one main economic sector envisioned to fuel growth of an economy to about 10 percent of Gross Domestic Product (GDP) annually from the year 2008 to 2030. In Kenya, over 250 million US dollars is saved from Sugar industry annually in foreign exchange thus the ability to be globally competitive and prosperous with high quality of living standards for its citizens by 2030. Presently, sugarcane is predominantly grown in Western Kenya within Migori, Nyando, Mumias, Muhoroni, Busia, Nandi and some parts of Coastal. Around 250,000 small-scale farmers in Kenya are supplying cane to milling companies. An average of six million livings in Kenya is supported either directly or indirectly, contributing to rural household economies by the sugar industry (Mati & Thomas, 2019). Sugar forms part of the main Kenya commercial crops together with vegetables, coffee, tea, flowers as well as maize. In Kenya, the area under which sugar-cane is grown is about 202,000 hectares with 5.262 million tonnes production averagely supplied to factories yearly. Sadly, there is constant sugarcane diminishing averagely at 66 tonnes from every hectare in 2015 to 55 tonnes per hectare as at 2018 (Ministry of Agriculture, 2019).

This likens unfavourably with the worldwide mean of 63 tonnes from every hectare (Kenya National Assembly 2015).

Sugar manufacturing companies in Kenya have over the years registered dismal performance financially with enormous debts in spite of their overall growth prospective. It is dreaded that in case the contemporary tendency continues, the vision 2030 growth forecast in Kenya may not be realized. Consequently, this may mean that anticipated yearly growth of 10 percent in GDP may not be achieved (Waswa, Mukras, and Oima, 2018). It is crystal clear that sugar industry in Kenya has not done well commercially according to the government expectations on objectives of self-revenue sustainability. This decline in productivity and dismal financial performance can be attributed to risks in the production process (operational risks).

Sugar Campaign for Change (SUCAM) (2020) report indicates that the sugar industry in Kenya is constrained by operational challenges which include but are not limited to stumpy production volumes, huge debts, high operating costs, and supervisory inadequacy. Several analytical researches carried out in the sugar industry paints a portrait of a department that has always been in crisis for years and without change, and has failed to advance despite several exertions to reinvigorate it. Utmost reports attribute let-downs to basic glitches stemming from involvement of government in administration of this sub-section of agriculture. More research needs to be done in order to comprehend the various operational risks affecting the sugar industry. The present study was guided by two operational risk theories and models, which are Extreme Value Theory (EVT) and top-down vs bottom-up models.

1.1.1 Operational Risks

One time classified as the risk with far more devastating effects after market and credit risk, operational risk from its definition was generally known to be immeasurable. Basel Committee of banking supervision (2006) that established a governing background for operational risk in universal banking gave out an accepted general definition of operational risk as the risk of loss occasioned by poor or ineffective internal systems, processes, external events and or people (Coleman, 2018). Broken down into its components, this definition means that first, there has to be a risk of forfeiture. Thus, existing operational risk is associated with loss anticipated. The foregoing description further gives four causes in number that might be central to operational risk losses. These include: botched or scant procedures, systems, persons, or exterior events.

Simply put, the procedure that ropes the activity is faulty, system that enables the activity is wrecked, person doing the activity makes an error, or even peripheral event transpires which dislocates business activity. Conferring to Jarrow (2006), there are two types of operational risks and include risk of a loss owing to operating system of the firm: failed internal transactions and processes, or risk of a loss as a result of cost of agency; mismanagement and fraud. Chalupka and Teply (2008) point out that business organizations have confronted over 100 operational loss events since the late 1980s exceeding $ 100 million. However, Rogner (2012) observes that operational risks are generally less an issue for utilities with a sufficiently large portfolio of production capacities.

Three significant contributors to operational risks as suggested by Bai and Jin (2016) are; human operated equipment to produce products and equipment maintenance activities for production. Thus, losses in production (turnaround and scheduled maintenance) as well as sub-standard quality of product are operational risks. This implies that production loss may happen because of failure of equipment, shortage in packaging, lack of raw material supplies, or freight and storage; and people are the major providers to working risks as persons frequently cause system let-down and make up costs due to failure, production decreases, insufficient labour costs.

Chartered Institute of Management Accountants (2008) explains existence of great diversity of precise operational risks, which are less visible often time compared to other risks, and are generally tough to reduce accurately. Risk of operational nature may span from a tiny risk like risk of loss as a result of negligible human errors, to a huge one like risk of insolvency because of a severe fraud occurring at any level of business organization.

The CIMA (2008) further explains that the category of risk linked with business as well as operations relate to business disruption, errors of omission or commission by personnel, health and safety, product failure, information technology systems failure, deception, litigation, loss of suppliers and loss of key people. Jongh et al., (2013) echoes this view by asserting that operational risk occurrence stem from wide-ranging causes such as transaction and execution faults, inappropriate business practices, fraud, system/technology failures, product flaws, natural disasters, employment prejudice and terrorism. Indeed, Hemrit and Arab (2012) notes that the central source of operational risk lies in cognizant or with unconscious procedures. Girling (2013) warns that unlike

credit and market risk, operational risk is generally not unswervingly taken in an expected reward return. On the contrary, risk of operational nature occurs in the normal course of activity of the business and in general, the risk is within organizational control through risk valuation and management practices of risk, in conjunction with internal control as well as insurance.

1.1.2 Financial Performance

Performance of finance implies assessment of the results and achievements of organization's strategies, plans and procedures in fiscal terms. In most cases, the outcomes are shown by institution’s profitability, investments return, return on assets and value addition. According to Turyahebya (2013) financial performance is the potential of organization to operate proficiently and generate profits, which in so doing, makes the organization to stay afloat, grow and respond to the prospects and economic hurdles.

Many financial organizations tend to evaluate their financial strength and performance through profit ratios of the organizations. These profitability ratios are major indicators of meaningful credit evaluation and analysis in majority of business organizations such as sugar firms, given that they are associated with the outcome that are attributable to the management performance of the organization (Gibson, 2012).

In assessing the profitability of an organization, most sugar firms use financial ratios to capture the level of return on equity and that on assets (Aduda, & Kalunda, 2012). The dominance level of return on equity should be at a reduced minimum of between 15 percent and 30 percent, while for return on assets ought to be slightly above 1 percent. The Return on Equity (ROE) is vital financial indicator in determining profitability and

financial performance. Further, ROE estimates the proficiency of sugar firms elucidating level at which sugar firms invest their incomes to get their revenues. As explained by Öttker-Robe and Podpiera (2010), ROE is measured by in-between a company's net twelve-monthly income after tax by stockholder equity.

The ROE increase might indicate that establishment's revenue is on the rise without unavoidably accumulating supplementary capital. Therefore, increase on equity return and return on assets designates that institution is fiscally stable. A larger return on equity or return on assets shows increased proceeds for a sugar company and its ability to extend and be flexible to shocks, thus indications to good response to risks (Öttker-Robe & Podpiera, 2010). As demonstrated by the Kenya Monetary Report 2019 the Kenyan monetary sector has advanced extensively in terms of the general GDP highlighting the stability of the sector (Central Bank of Kenya (CBK), 2020).

The industry's assets increased to 89.52 percent of GDP in December 2019 as compared to the previous year 85.9 percent. Further, the Market Capitalization for all equities trading at the Nairobi Securities Conversation accounted for 42.93 percent of GDP as December 2019 weighed against 40.60 percent the preceding year. Consequently, it can be decided that the financial stability as well as sugar companies' performance affects the overall stability of the Kenya's financial sector. The present study will measure financial performance of sugar firms through profitability, return on equity and return on assets.

1.1.3 Sugar Manufacturing Companies in Kenya

According to Sugar Campaign for Change (SUCAM) (2020), sugarcane was initially introduced in Kenya in 1902, with an establishment of Miwani factory in 1902 close to

Kisumu. In 1927, another factory was later established in Coast province - Ramisi. The Government of Kenya after independence decided to expand sugar industries by investing in sugarcane growing schemes hence setting up more sugarcane crushing factories. These factories included 1966 - Muhoroni Sugar Factory (MSF), 1968 - Chemelil Sugar Factory (CSF), Mumias Sugar Company (MSC) in 1973, Nzoia Sugar Company (NSC) in 1978, and South Nyanza Sugar-Company (SONY) - Awendo in 1979.

According to (Ojera, Bulitia, and Ogutu, 2017) the dominant sugar manufacturing companies in Kenya are MSC, CSF, Miwani, MSF, NSC, SONY, Kibos, West Kenya and Soin. Others include Transmara, Butali, Kwale, Tana and Sukari Industries. The farmers' out grower farms include CSF, Kibos, Butali, Busia, Nandi Escarpment, Miwani, MSC, West Kenya, MSF, SONY, NSC and Soin. The Government of Kenya has a considerable shareholding in six of the companies, which are MSC, CSF, SONY, NSC, MSF and Miwani.

Most of these local companies produce white-sugar for both local and overseas consumption. The companies develop and manage their own sugar-cane estates, but they also have quite a good number of contracted farmers to provide cane for milling. Apart from the government, other stakeholders in the sugar industry include farmers, private investors, employees, millers, and tax payers. Oversight in sugar manufacturing is kept fit by KSB (Kenya Sugar Board), KESREF (Kenya Sugar Research Foundation), and SAT (Sugar Arbitration Tribunal), KEBS (Kenya Bureau of Standards), Foremost Forum for Research Dissemination (FFRD), and Kenya Society of Sugarcane Technologists (KSSCT) are other influential players (Ojera et al., 2017).

The joint installed contemporary crushing capacity is about 0.3 million tons of cane in a day for the mill's operation. This existing capacity is adequate to yield almost a million tons of sugar annually. Unfortunately, it is not adequate to meet national consumption volume of sugar and therefore, target to scale up daily capacity to about 0.5 million tons per day in order to produce 0.4 million tons to make Kenya a sugar surplus producer (SUCAM, 2020).

Owiye et al. (2016) raises a point of concern as to why sugar firms in Kenya are getting it enormously hard to compete within the fluctuating business environment of Kenya. A number of operational difficulties seem to be dogging native sugar companies. These glitches are believed to emanate from poor management of the company, frosty relationship between contracted sugarcane growers and management of companies as well as government interference in companies' management among others. Another problem thought to be affecting indigenous sugar firms is the unregulated importation of sugar from highly subsidized economies such as Brazil, India, Mexico China, South Africa and Pakistan.

Sugar Annual Report (SAR, 2020) forecasts a drop in sugar production in the year 2020/2021 due to the disruption of labour and input supply for critical activities such as planting and harvesting, brought about by measures to contain COVID-19. The COVID-19 is likely to have a negative impact on a production system that is already reeling from both technical and governance challenges bordering on poor agronomy, poor access to inputs, delayed cane harvesting as well as delayed payment to farmers. At the processing level, state owned sugar mills still dominate the landscape after the

stalled privatization programme. It is important to point out that the mills run on obsolete technology and have accumulated huge debts to farmers.

1.1.4 South Nyanza Sugar Company

SONY-sugar governed by government corporations act positions out as the most important industrial venture by Kenyan Government in South Nyanza. Situated in Migori County, South Western Kenya and was set in 1976 under Companies Act Cap 486 of Kenyan Laws and then commissioned in 1979. The company properties and sugar-cane nucleus estate sit on an area jacketing 2,492 hectares, with-out-grower cane area of 15,500 hectares. SONY sugar factory caters for over 25,000 sugarcane farmers spread out within cane-growing regions of, Homabay, Migori Narok, Nyamira and Kisii counties. The corporation donates meaningfully to realization of vision 2030 of Kenya through sugar manufacture, whose present volume stands at 2,500 tons per day. The company plans to strategically increase its optimization of the existing capacity to 3,000 tons crushed per day by safeguarding cane availability and stream, and also by strengthening the plant to operate optimally.

The Government of Kenya has the lion shareholding in the company at 98.8 percent and other shareholders include Centum Investment Company at 0.71 percent, Industrial Development Bank (IDB) at 0.28 percent, and Mehta Group at 0.21 percent. The corporation is registered as a state business in Kenya, and is, therefore, inclined to align its plans and operations to state plans, dogmas, and rules at all times.

1.2 Problem Statement

While taking deliberate and informed risks is a significant component of any company strategy, amplified operational risks has led to extremely high-risk exposures to

business firms. Insomuch as risk management is thought to be an important control and tool of management, there is tiny or no data from the previous empirical research that links operational risks to the poor performance of sugar production companies in Kenya.

Internationally, several studies have been conducted on operational risks management and organizational performance. For instance, Zainuddin, Magfiroh, Setyawati and Rahman (2020) conducted a study on operational risk analyses and management approaches adopted by sugarcane producing companies in Kediri, East Java, and found that risks grouped as high category of risks were caused by selecting certain sugarcane variants, and these risks were sugar price risks, production risks and quality risks.

Similarly, Zainuddin, Setyawati, & Wibowo (2017) carried out a study to examine operational risks management that was practiced in sugar production firms in Indonesia and found that losses incurred by sugar firms were high at 3 percent. This magnitude of losses indicated that sugar firm performance was dismal and the mills were also inefficient. Islam, Tedford and Haemmerle (2008) also carried out an analysis of operational risks practiced in Small Medium manufacturing firms in New Zealand. The study found that absenteeism, unforeseen faulty products, machine breakdown, auxiliary equipment fault, and material scarcity were found to be the major internal disturbances among manufacturing SMEs in New Zealand.

Locally, a number of studies have also been conducted on operational risk management and performance of sugar firms. For instance, Ambetsa et al., (2020) conducted a study on Technical Determinants and its Efficiency in Sugarcane Manufacturing Among Small-scale Sugarcane Farmers in the Sub-County of Malava, Kenya; Ojera et al.,

(2017) on " Interactive Control Systems and Strategic Orientation on Competitive Position of Sugar Firms in Western Kenya"; Owiye et al., (2016) on "Effect of Trade Liberalization on Performance of Sugar Firms in Kenya: The Case of Government-Owned Firms"; Mugenda et al., (2012) on "Implications of Risk Management Practices on Financial Performance of Sugar Manufacturing Firms in Kenya"; Waswa et al. (2018) entitled "Effect of Effectiveness on Financial Performance of Sugar Industry in Kenya; and Gongera et al. (2013) entitled "Effects of Financial Risks on Profitability of Sugar Firms in Kenya" focus outside the contemporary problem of research, but offer some hints on the dismal performance of sugar sub-sector.

In all these studies both local and international, the scholars unequivocally stipulate that companies in the sugar industry continue to register nominal development partly due to unethical management decisions made under indeterminate investment environment. Other studies carried out in the area of operational risks majorly dwelt in the financial institutions, and other manufacturing companies other than sugar in an entirely different setting. These studies, therefore, bring a gap in knowledge which the researcher wishes to fill.

Several reports indicate that sugar industry has mainly grown under environment that is protected with the aim of making it reliant and strong. But this sustained protection has seemingly hindered technological up-gradation, integration and export orientation with other parts of the world, as demonstrated from the low production levels and meagre exports. The SAR (2020) discloses that the sugar companies are heavily indebted to farmers and other creditors. According to SUCAM sugar report (2020), the sugar department is inhibited by low manufacturing capacities, huge debts, high

operating costs, and inefficiency of management. This portrays an image of a department that has stayed in crisis for years and has botched to advance despite many efforts applied to re-energize it. The sugar industry faces imminent collapse if these problems are not adequately addressed. It is against the backdrop of the aforementioned that this study seeks to answer the question; what are the operational risks hindering the organizational performance of sugar manufacturing companies?

1.3 Objective of the Study

The general rational of the research was to find out the effects of operational risks on organizational performance of sugar manufacturing companies, a case of SONY sugar. The specific objectives of the research were to:

(i) Evaluate the operational risks faced by SONY sugar.

(ii) Determine connection between operational risks and organizational performance of SONY sugar.

(iii) Determine the mitigation measures for the operational risks in SONY sugar.

1.4 Value of the Study

The research outcomes will be useful to various parties including policy makers as well as regulators, sugar manufacturing companies, academicians and researchers. To policy makers, the study findings will be of great value to other regulators such as KSB and government in respect to formulation of policies, guidelines and offering advisory that will help in creating ethical conduct in the sugar sub-sector as well as enhance growth and expansion in the sub-sector.

The discoveries of this research will also be of significance to the sugar manufacturing corporations that may be able to understand operational risks they face in their operations and hence come up with mitigation measures that can minimize the impacts of these risks. To other academicians and researchers, the research will enhance the existing works on the operational risks in the sugar manufacturing companies as well as add value to the current theory by either challenging or supporting it through study results. This research will also form a foundation for forthcoming studies on operational risks in the sugar manufacturing companies.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This part looks into literature that formed the foundation of the research and has four sections, which are the theoretical perspectives of the study, the empirical review, summary of empirical review, and the conceptual framework. The theoretical perspectives present a framework of the theoretical foundation upon which the subject thought of this study is based while the empirical review was analysed based on the past studies related to the subject matter to provide new knowledge on the topic.

2.2 Theoretical Perspectives

The theoretical evaluation of the research was grounded on two operational risk theories and models. The theoretical models that guided the study include the Extreme Value Theory (EVT), and top-down versus bottom-up models.

2.2.1 Extreme Value Theory

The EVT gained dominance in 1920s with hydrology related problems and led to the first essential theorem of Fisher-Tippett (1928), then Gnedenko (1948). Another frame of reference emerged in 70s with second essential theorem of EVT when Balkema-de Haan (1974) and Pickands (1975) characterized the asymptotic tail distribution as a Generalized Pareto Distribution (GPD) family (Magnou, 2017). The major attraction of EVT is that it focuses on the analysis of the tail area of the distribution, laying out appropriate methods for modelling excess losses and their impact in quantitative risk management. The EVT gives a correct model for exceedances over a high verge by means of GPD. In regard with the theorem of classical circulations, distribution of excess losses over a certain threshold congregates in the direction of a GPD when the

brink goes towards right endpoint of loss distribution under the assumption (Gourier et al., 2009). This means that spreading of excess losses over a high threshold can be estimated by a GPD.

Given that some of the operational risks are rare but have major consequences on the operations of the organization, EVT model fits in the present study. These are referred to as low frequency- high severity risks. These risks therefore have heavily tailed distributions and owing to its simple fitting procedure, the lognormal distribution is the most preferred method for modelling severity distribution. Nevertheless, due to precise modelling of exceedingly high losses (the tail of the severity distribution) is critical high quantile level prerequisite for operational risk capital charge hence, it is always helpful to explore other heavy tailed distributions for tail of severity distribution, and this is where EVT comes into play. The tail of severity distribution is demonstrated by making use of a GPD with the tail limited from below by a process known as GPD-threshold. This displays a body of severity distribution limited from above by same threshold (Dahlberg, 2015).

2.2.2 Top-Down Versus Bottom-Up Models

According to Kessler (2007), there exist two complete categories of operational risk models: top-down and bottom-up models. The top-down model seeks to assign business unit level risk down to the industries, where earnings or loss volatility statistics are consolidated self-reliantly of actual workflow. One notable example is the Capital Asset Pricing Model (CAPM) approach which is frequently utilised as point of reference for institutions that are similar. Movements in CAPM inputs like equity prices, debt leverage and betas are brought about by large operational failures. The main advantage

of this model is that it is easy to implement, but it only suply an overview of an organization-wide operational risk capital. Consequently, this model does not fit well for capital allocation to business processes.

The other way of categorizing operational risk is via bottom-up replicas. In these models, similarity for operational risk, market risk and credit risk are cojoined with the principles for business line mapping. Furthermore, risk is evaluated through definite causal associations between failures and given losses. This makes the bottom-up models suitable for business process enhancement but very hard to implement (Kessler, 2007). Additionally, to find a risk profile of an enterprise, it is imperative to investigate loss events in individual business lines, and as well try to recognize and enumerate each category of risk at the level given. The controls and frequencies of loss events are evaluated anywhere they may have occurred. Subsequently, impacts of potential losses are valued, but after considering cover and any risk transfers associated.

This theoretical model informs the present study in that by implementing a bottom-up or top- down model there is computation of Operational Risk Capital Requirement (ORCR) over chosen horizon or a year, then total up resulting operational Value at Risk (VaR), also referred to as Conditional Value at Risk (CVaR), for different forms of loss event. Using arithmetic methods in this perspective, an extra sophisticated application might be achieved that can model both event regularity and strictness as probability distributions.

2.3 Empirical Review

Zainuddin, et al. (2020) conducted a study on operational risk analyses and management approaches adopted by sugarcane producing companies in Kediri, East Java. The purpose of the study was to conduct an analysis of production risks and the methodologies used by the companies to counter these risks as a result of selecting various kinds of sugarcane for production. The study utilised a sample size of 30 respondents from different departments and ranks. Quantitative data was analysed through Failure Mode and Effect Analysis (FMEA) approach. The study found that risks grouped as high category of risks were caused by selecting certain sugarcane variants, and these risks were sugar price risks, production risks and quality risks. The study further found that risk management approaches had the potential of lessening risks as a result of using superior variety when conducting sugarcane variant selection. It was also found that new sugarcane variant that yields high production capacity increases cultivation technology and innovation among the farmers.

Similarly, Wibowo, Setyawati and Zainuddin (2017) carried out a study to examine operational risks management that was practiced in sugar production firms in Indonesia. The researcher decided to analyse the magnitude of loss index and its effects on sugar mill efficiency, and to examine the risks as a result of losses. The study used both secondary and primary data. Secondary data provided yearly performance data of sugar firms. The performance pointers were general recovery, quantity of bagasse and cake filters, Boiling House Recovery (BHR) and mill extraction data for 2011 to 2015. Using the FMEA methodology of analysis, the study used index computation, risks assessment and evaluative descriptive analyses. The study found that losses incurred by sugar firms were high at 3 percent. This magnitude of losses indicated that sugar

firm performance was dismal and the mills were also inefficient. The production risks evaluation as a result of losses similarly showed a high magnitude of risks. The study findings further showed that Indonesian sugar mills lacked programmes and strategies for decreasing the level of losses to less than 2 percent which is the recommended level. The sugar mills similarly did not have good structures and plans that turn losses to value added products.

Islam, Tedford and Haemmerle (2008) carried out an analysis of operational risks practiced in Small Medium manufacturing firms in New Zealand. The study came up with a theoretical model that relate with risk management suitable for the Small and Mediam Enterprises (SMEs). The study concentrated on establishing the distinctive disturbances experienced by SMEs through empirical exploration applying a mailed survey technique. The study therefore carried out a mailed survey to 212 wide range of manufacturing SMEs.

To gather disturbance data from various areas of concerns, two different questionnaires were utilised. One questionnaire was made for top calibre management, while the other was made for middle calibre management of every business organization. From the analysis, the study found that absenteeism, unforeseen faulty products, machine breakdown, auxiliary equipment fault, and material scarcity were found to be the major internal disturbances among manufacturing SMEs in New Zealand. On the other hand, unanticipated severe hazards, unforeseen accidents or injuries, glitch and scarcity in measuring equipment were found to be not significant among these firms. As for the external disturbances, it was established that delays in supply by the suppliers, market competition, demand variation, skilled labour scarcity and government policies and

regulations were the main significant, as the financial limitations were the least significant based on their barriers to business performance.

Reim, Parida and Sjodin (2016) also carried out an investigation on risks management mechanisms in Product Service Systems (PSS) operations among the manufacturing firms in Sweden. The aim of the research was to come up with a PSS risk management framework, which can make worldwide manufacturing firms to give PSS effectively. Therefore, the study objective was to take part in mainly in coming up with the PSS literature by incorporating understandings from various literatures on risks management. The study particularly sought to identify and understand PSS operational risks, inclusive of both behavioural and technical risks and also risks related to providers of competences. The study was guided by exploratory case study design that revolved around a multinational manufacturing firm in Sweden that aggressively offers PSS. The study carried out 25 interviews with various respondents from various unit of analyses. The study categorised risks into three classes which were behavioural risk, technical risk and delivery competence risk.

Similarly, (Cipriano, Zulkeflee, Amran, & Shahudin, 2018) examined operational risks and its predictors among the five manufacturing companies in Germany. The research sought to examine how external and internal dynamics in manufacturing industry influence operational risks. The study utilised time series approaches in analyses of manufacturing firms in Germany that has been in operational from 2012 to 2016. The analyses found that firm particular factors such as mean current ratio and mean collection period and macro-economic elements such as the firm's beta affected the operational risks of the firms. Further, it was found that manufacturing firms need to

control their mean collection period through efficient management of account receivables. This can be done through establishing efficient clear credit structures and integrate a number of corporate governance factors like accountability, independence and fairness.

Mulu (2013) assessed the predictors of operational risks in manufacturing organization in Kenya. The study involved 30 manufacturing companies that has been in operation since 2012 to 2016. The purpose of the study was to analyse macro and micro-economic factors that influence losses and operational risks in manufacturing firms. The study employed a descriptive design to determine factors linked with particular occurrences, results, circumstance or nature of behaviours. Self-administered questionnaires collected the primary quantitative data. The study found that available strategies, company policies, governance determined or predicted operational risks and losses of the firms. It was also found that for every unit rise in governance, there would be a proportional decline in operational risks and losses.

Muriithi and Waweru (2017) also assessed how operational risks and bank size influence performance of registered commercial financial firms in Kenya. The study aimed at assessing how operational risks effect the financial performance of the financial institutions. The study was also anchored on descriptive design, where the ordered logistic framework was applied to describe a condition or situation. Data was gathered through expert opinion questionnaires that were administered to top management staff members of the 43 registered banks. The study found an inverse correlation between operational risks and performance. However, the bank size moderately influenced the financial performance. The size of the bank was also found

to be moderately influencing execution, service delivery and management progress on financial performance by augmenting it. Further, it was found that four constituents of operational risks which were failed internal procedures, fraud, people and systems had significant but negative influence on the firms' profitability.

Onsongo, Muathe and Mwangi (2019) carried out a study on organization size and operational risks and how these two variables influence fiscal performance of the banks in Nairobi Securities Exchange. The study aimed at examining the influence of operational risks on the financial performance of commercial banks and determining the moderating influence of organization size on the correlation between operational risks and banks' performance at Nairobi Securities Exchange (NSE). The explanatory design guided the research and 14 banks were sampled out. Secondary data on yearly financial statement from 2013 to 2017 were solicited. The researcher used panel regression framework to assess how operational risks influence performance of commercial firms that have been in operation between 2013 to 2017. The study found that operational risk positively and significantly affected bank performance as measured through Return on Assets (ROA). It was further revealed that organization or firm sizes moderated the influence on the correlation between risks and performance. It was therefore concluded that size of the firm had a significant role on organization risk management.

Nyaga (2017) also evaluated management quality of commercial financial institutions in Kenya. The chief reason of the research was to assess the nature of correlation that exist between Management Principles and operation risks management in Kenyan commercial financial firms. The study sampled out 41 commercial banks from the 43

registered banks in Kenya. The study gathered primary data through administration of questionnaires and carried out both linear regression methodology and descriptive statistics. The study found that banks had not employed Quality Management Plan (QMP) in totality, although, implementation of leadership commitment philosophies was evidenced in most of the banks, but QMP implementation of employee involvement and customer focus was largely weak in all banks. It was further found that commercial banks experienced a number of operational risk management (ORM) limitations, which ranges from absence of employee motivation to operational failures. In-depth evaluation of operational failures, learning, distribution lessons and looking for input from employees on ways of making continuous progresses involving senior management and leadership commitment to management quality were seen as the best practices in ORM. There was also a significant correlation that existed between QMP and ORM.

Ndaiga (2016) studied the efficiency of ORM approaches used by Co-operative Bank of Kenya. The aim of the study was to assess how management practices of internal risks was effective in determining external ORM approaches and come out with measures that would be used to alleviate challenges of implementation of ORM. A descriptive research approach was used and 36 middle level staffs from bank branches in Nairobi was used as target and sample size population. The study used both quantitative and qualitative methodologies of data analyses and presented the results in frequencies and percentages. On the other hand, correlation analysis technique was applied to assess the association trends between the variables. The study established that majority of the employees possessed the skills that enabled them carry out their work efficiently and also, meaningful security strategies and appropriate practices were

in place. The findings further revealed that bank customers adhered to contractual provisions, and that staff-members maintained confidentiality of information belonging to their clients. Lastly, most of the respondents confirmed that the financial firms should have strong digitalised solutions, apply well outlined guidelines and policies, and implement effective and robust internal control processes. The study further recommended that it is necessary to effectively monitor processes and maintain high ethical standards for proper corporate governance.

2.4 Summary of Empirical Review

Based on the literature reviewed, the current business firms are experiencing frequent operational risks which considerably enhance complications when it comes to management of these firms and hurting their financial performance as well. Therefore, many of the reviewed studies have established that the management of many business firms have found it difficult to properly plan, coordinate and control functions of the companies. Regardless of the nature and risks sources, operational risks in any manufacturing firm are best handled when the management of the business firms designed appropriate operational risks management methodologies and processes for the company.

In line with the reviewed empirical studies, operational risks identification, analysis and management are mostly used in the financial firms, especially in the local banking industry. However, non-financial firms such as sugar companies also need to apply ORM approaches if they are to function efficiently. Although many of the reviewed studies have stressed on the need to have a well-structured operational risks management methodologies for good financial performance, there is inadequate

information on how such measures influence the financial performance of the sugar manufacturing firms given that the reviewed studies have used different methodologies and contexts. The methodology variants and contextual gaps limits the generalisation of the findings of the reviewed studies to the present study. The present study seeks to fill these gaps by examining operational risks in the sugar manufacturing companies in Kenya. Table 2.1 below shows the summary of empirical review.

Table 2.1 Summary of Empirical Review

Author(s)	Study Topic	Objectives	Methodology	Findings	Knowledge gaps	How Gaps are Addressed
Zainuddin et al. (2020)	Operational risks analysis and management methodologies of sugarcane producing firms	Analyse the production risk and the approaches to neutralise the risks as a result of selecting sugarcane variants.	FMEA	Risks were experienced as a result of selection of particular sugarcane variant were production risks, quality risks and price output risk	Did not measure the financial performance with respect to the operational risks	Assess operational risks in SONY sugar firm and also assess how these risks relate to financial performance of the sugar firm as measured through profitability, ROA and ROE
Wibowo et al. (2017)	Operational risk management in sugar processing as a consequent of quantity of losses in PT Perkebunan Nusantara X	Analyse extent of losses and its effects on sugar mills efficiencies, and assess the risks as a result of losses.	Secondary and primary data analysed by evaluative descriptive analysis	Losses resulting from sugar mills were quite high at around 2.60 to 2.88 percent, and there was high level of production risk.	Did not assess how Operational risk management of sugar production due to the magnitude of losses affected financial performance of the sugar company	Assess operational risks in SONY sugar firm and also assess the influence of operational risks on financial performance of the sugar firm
Islam et al. (2008)	Managing operational risks in SMEs engaged in manufacturing- an integrated approach	Find out typical disturbances encountered by SMEs	Empirical investigation using a mailed survey questionnaire	There were internal and external disturbances such as equipment failure and skilled labour shortage	• Focused on only SMEs and not sugar Companies hence contextual gap • Failed to link operational risks in SMEs with financial performance of SMEs	Focuses on SONY sugar company and will assess the influence of operational risks on financial performance of the sugar firm

Reim, et al., (2016)	Risk management for PSS operations	Identify and understand PSS operational risks	Exploratory single case study conducted using semi-structured interviews	There were technical, behavioural and delivery competence risks.	• Only relied on qualitative data • Used exploratory design and not descriptive design • Failed to link the risks with financial performance	Uses quantitative data from questionnaires, uses descriptive case study design and will assess the influence of these risks on financial performance of the sugar firm
Cipriano et al. (2018)	Operational risks and its predictors in five firms in manufacturing sector in Germany	Determine Germany manufacturing companies' operational risk	Time series regression analysis	Firm distinctive factors and macro-economic predictors affected operational risks of a company.	Only used inferential statistics Did not assess the link between operational risk and financial performance Study was based on German and not Kenya hence contextual gap	Looks at operational risk in SONY sugar company and asses the influence of these risks on financial performance of the sugar firm by using both descriptive and inferential statistics
Mulu (2013)	Predictors of operational risk in manufacturing companies in Kenya	Give analyses of both micro and macro-economic predictors of operational risk and losses	Primary data collected using questionnaires	Governance, strategies, policies, periodic assessment and firm structure are the determinants of operational risks and losses.	Only studied predictors of operational risks and losses but failed to associate how these risks influence financial performance. Focused on manufacturing firms and not on sugar firms hence contextual gap	Looks at operational risk in SONY sugar firm and asses how these risks affect financial performance

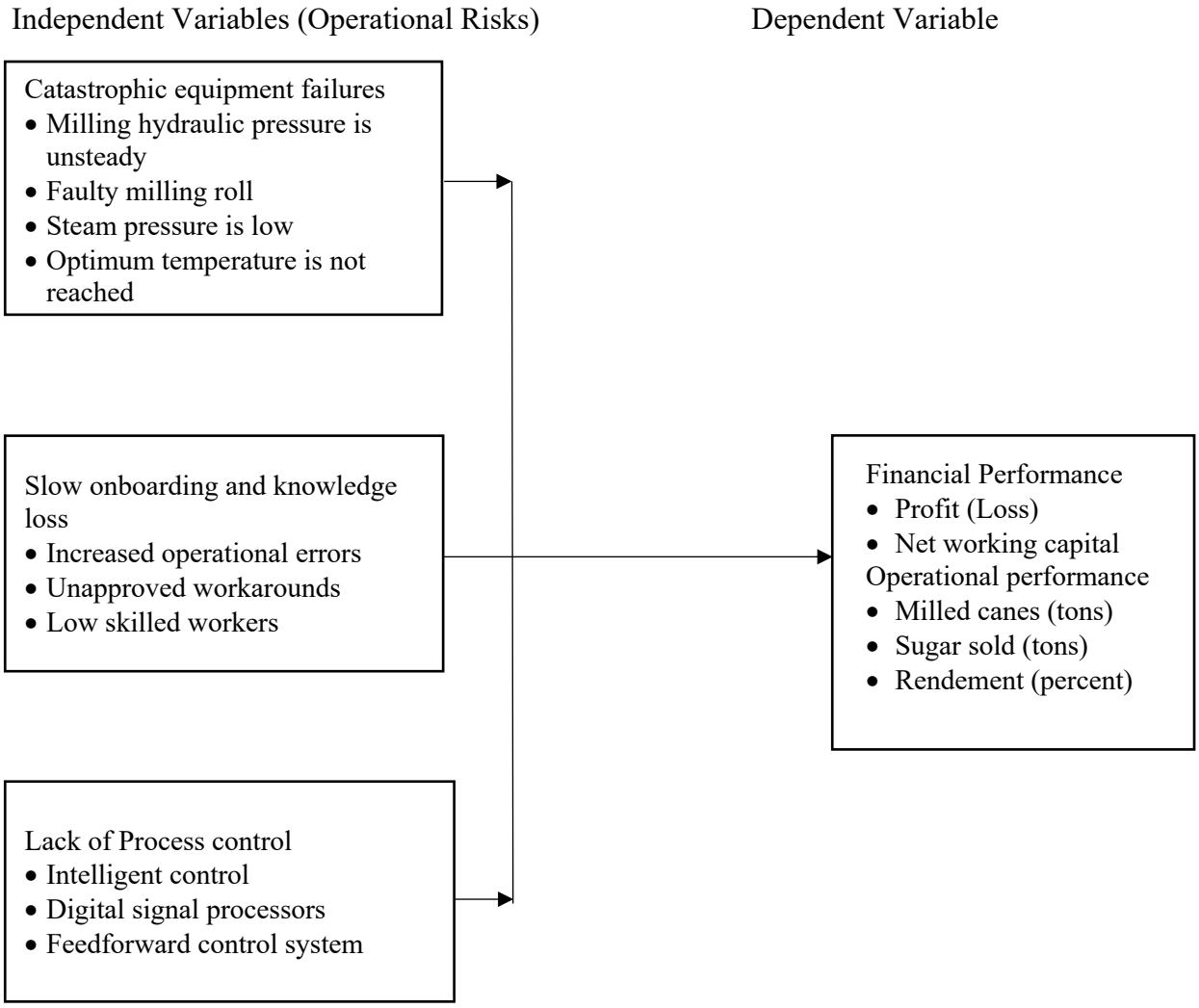
Muriithi and Waweru (2017)	Operational risks, size of the bank and the financial performance of Kenyan commercial financial institutions	Assess how operational risks influence financial performance of the banks.	Primary data collected using expert opinion survey questionnaires	There existed an inverse association between operational risks and performance.	Focused on commercial banks and not on sugar firms hence contextual gap	Looks at operational risk in SONY sugar company and asses the influence of these risks on financial performance
Onsongo et al. (2019)	Size of the firm, operational risks and performance of commercial companies in NSE	Examine the effect of operational risk on the fiscal performance of commercial companies in NSE	Panel data regression analysis model	Operational risks influenced positively but insignificantly on the performance.	Focused on the commercial and service firms and not on sugar firms. Only used inferential statistics for the analysis	Looks at operational risk in SONY sugar and asses the influence of these risks on financial performance by using both descriptive and inferential statistics to fill the gap
Nyaga (2017)	Quality management and ORM in commercial banks in Kenya	Assess the correlation between QMP and ORM in commercial financial firms in Kenya.	Primary data gathered through questionnaire, analysed using linear regression approach and descriptive statistics	QMP and ORM had a significant and direct relationship	Studied commercial banks and not sugar firms Looked at only the quality management aspects and not operational risks	Looks at operational risk in SONY sugar and asses the influence of these risks on financial performance
Ndaiga (2016)	Effectiveness of ORM strategies: A case of Co-Operative Bank	Establish the effectiveness of internal and external operational risk management practices.	Primary data collected and analysed.	ORM practices employed by the bank were ineffective.	Studied commercial banks and not sugar firms Studied ORM practices and not operational risks	Looks at operational risk in SONY sugar and asses the influence of these risks on financial performance

Source: The Researcher (2022)

2.5 Conceptual Framework

The study adopted the conceptual model illustrated in Figure 2.1 below. The independent predictors were operational risks, which include catastrophic equipment breakdown, slow on boarding and knowledge loss, and lack of process control. The dependent variable was organisational performance in terms of finance and operations among the sugar manufacturing firms, with a case study of SONY sugar.

Figure 2.1 Conceptual Model



Source: The Researcher (2022)

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

In this chapter, methodologies and designs that were used for conducting the research are outlined. These include the design, study or target population, sample size and techniques, data collection approaches and data analysis methods.

3.2 Research Design

This study used descriptive case-study design. The advantage of this design is that it is appropriate for describing and measuring phenomena at a given point in time, giving little room for data manipulation. The design is also useful in providing answers to questions of what, who, how, where and when (Birgen & Bogonko, 2018). This allowed the study to give in-depth insights on the research findings. In addition to these, the design also allows for generalization of research findings for the entire population. Primary data was collected by administering questionnaires to respondents.

3.3 Population and Sample Size Determination

The study population was the entire SONY sugar employees. The target population of the study, therefore, consisted of 33 employees in risk management department. Using judgmental sampling, the study involved and concentrated on all the 33 employees in risk management department of SONY sugar, because they had the relevant information needed in the study.

3.4 Operationalization of Variables

Operational risks were the independent variables and these include catastrophic equipment failures, slow on boarding and knowledge loss, and lack of process control. The indicators of catastrophic equipment failures are unstable milling hydraulic pressure and low steam pressure, both of which use ratio scale of measurement, damage on milling roll which utilizes nominal scale of measurement, and unreached optimum

temperature which uses the interval scale of measurement. Indicators for slow on boarding and knowledge loss include increased operational errors by new employees, unapproved workarounds, and low skilled workers all of which utilizes nominal scale of measurement. Process control indicators were determined by the presence or absence of intelligent control, digital signal processors and feed forward control system, all of which uses nominal scale of measurement. Organizational performance (dependent variable) was measured in terms of both financial performance and operational performance. The indicators of financial performance were profit ratios (ROE and ROA) and networking capital, whereas the operational performance was measured in terms of Milled canes (tons), Sugar sold (tons) and Rendement (percent). Table 3.1 on the next page shows the operationalization of the study variables.

3.6 Data Collection Methods

The study used both primary and secondary data sources, where primary data was gathered by administration of questionnaires. The questionnaire was semi-structured type, having three parts, based on the study objectives. Section A captured the characteristics of the respondents, which entails seeking information on the respondent's department, gender, age, education and position held. Section B addressed the first objective of the study, which is identifying the operational risks faced by SONY sugar. The section collected information on operational risks by seeking information on operational risk elements such as unstable milling hydraulic pressure, damage on milling roll, increased operational errors, intelligent control and the rest. Section C was in line with the third objective, which is to determine the mitigation measures for the operational risks in SONY sugar.

The questionnaires were given out to the respondents through drop and pick technique. In order to be granted permission to collect data from SONY sugar, the researcher was required to present a request letter, a research authorization from the National Commission for Science, Technology and Innovation (NACOSTI), and approval from the University of Nairobi (UoN) to proceed with the project. These documentations were sought before proceeding for data collection. Secondary data were sourced to provide the financial performance of SONY sugar for the last five years. The study collected information on profit/loss, ROE and ROA.

Table 3.1 Operationalization of Variables

Variables	Operational Definition	Type of Scale
Catastrophic equipment failures	Delayed or complete shutdown of operations due to equipment failure	Nominal
	Unstable milling hydraulic pressure	Ratio
	Damage on milling roll	Nominal
	Low steam pressure	Ratio
	Unreached optimum temperature	Interval
Slow on boarding and knowledge loss	Occurs when new employees are hired, resulting into steep learning curve which require many hours of coaching and training	Nominal
	Increased operational errors	Nominal
	Low skilled workers	Nominal
Lack of Process control	Lacking correct process in place to analyse and create models which guide operators on performance, quality and uptime optimization	Nominal
	Intelligent control	Nominal
	Digital signal processors	Nominal
	Feed forward control system	Nominal
Organizational performance of sugar firms	Financial performance	
	Profit (loss)	Ratio
	Net working capital	Ratio
	Operational performance	
	Milled canes (tons)	Ratio
	Sugar sold (tons)	Ratio
	Rendement (percent)	Ratio

Source: The Researcher (2022)

3.7 Reliability and Validity Tests

In order to achieve content validity, the researcher ensured that the research measurement instruments cover all aspects of the research objectives being measured. The researcher ascertained this by inviting an expert in risk management to assess the research instruments. According to Kuria (2016), validity checks out whether research tools measure the intended objectives and the extent of reliability and truthfulness of the research findings. The researcher also pre-tested the questionnaires to determine homogeneity in answers by the respondents, thus ensuring reliability during data collection.

3.8 Data Analysis

The study adopted qualitative techniques of data analysis, where data were coded based on various study variables to ease data entry and explanation. Every study objective was analysed using descriptive statistics (mean, frequencies, standard deviation and percentages). Descriptive statistics were appropriate since it assist in describing variables in form of measures of central tendency, give results needed to accomplish the study objectives. The data was presented in tables. The study also used Pearson correlation analysis to establish the relationship between operational risks and organizational performance of SONY sugar. Table 3.2 next page shows the summary of objectives, type of data gathered, questionnaire items and the analyses that were done.

3.9 Ethical Considerations

To ensure confidentiality, the researcher sought a letter of introduction from UoN as proof of identity. Further, SONY sugar being a parastatal, the researcher sought

research authorization from NACOSTI. These documents were accompanied by a letter of request from the researcher to the company management for permission to collect data. The researcher ensured and assured respondents of confidentiality of the information provided. The researcher also ensured that the respondents are comfortable with data collection timing.

Table 3.1 Objectives, Data Collected, Questionnaire Items and Analyses

Objectives	Data Collected	Questionnaire Items	Analyses
Identify operational risks faced by SONY sugar	Quantitative data	• Unstable milling hydraulic pressure • Low steam pressure • Unreached optimum temperature • Increased operational errors • Unapproved workarounds • Failure to monitor process parameters • Low skilled personnel • Unhealthy machines • Damage on milling roll	Descriptive analysis
Determine connection between operational risks and financial performance of SONY sugar	Quantitative data	Secondary data sought on: • Profit (Loss) • Turnover • ROE • ROA	Correlation analysis
Determine possible mitigation measures for operational risks in SONY sugar	Quantitative data	• Controlled planning on milling process • Machine renovation schedule • Substitution of mill roll with appropriate standard quality and regular improvement • Improved management planning • Enhanced communication structure between production unit and hauling unit • Quality control of bagasse through milling control • Installing impurities prevention system into the process	Descriptive analysis

Source: The Researcher (2022)

CHAPTER FOUR: FINDINGS AND DISCUSSION

4.1 Introduction

In this section, the study presents the findings from the analysis as well as discussions based on the research questions. It also highlights background information of the respondents which are analyzed and presented in tables. The study used descriptive and inferential statistics and all the results were presented in form of tables.

4.2 Response Rate

The study targeted 33 respondents who were from risk management department of SONY sugar firm in western Kenya. The findings in Table 4.1 below reveals that 31 respondents dully filled the questionnaires to completion and returned them for analysis, signifying 94 percent response return rate. Mugenda and Mugenda (1999) supports that a return rate of above 50 percent is a sufficient representative for meaningful investigation and discussions hence the return rate for the present study was considered excellent and sufficient.

Table 4.1 Response Rate

Respondents	Frequency	Percent
Filled	31	94
Unreturned/unfilled	2	6
Total administered	33	100

Source: The Researcher (2022)

4.3 Reliability Analysis

The study used Cronbach's Alpha reliability test to assess the reliability of the data collection tools. To assess whether items also measure similar construct the study also tested for internal consistency through Cronbach's Alpha assessment. This measure tested the method of quantifiable items and its association. For every variable expressing the specific objective, Cronbach's Alpha test was computed and the result indicate that considering the 12 items of operational risks and 10 items of operational

risk mitigation measures, the output for Cronbach's Alpha was 0.841. This points that the variables were dependable given that their reliability value exceeded the threshold of 0.7 (Field, 2009). The mean index was found to be 0.841 which was above 0.7. This result provided the researcher with an assurance that the data collection instrument (questionnaire) applied was reliable and gave out consistent results.

4.4 Socio-Demographics of the Respondents

Respondents were asked to indicate their socio-demographic characteristics of which they were probed on their gender, age, work service in terms of years and academic qualification. Table 4.2 below shows the response.

Table 4.1 Socio-Demographics of the Respondents

Variable	Socio-Demographic	Frequency	Percent
Gender	Male	22	71.0
	Female	9	29.0
	Total	31	100
Age (years)	Below 30	4	12.9
	30 to 50	26	83.9
	Above 50	1	3.2
	Total	31	100
Work service (years)	Below 2	3	9.7
	2 to 4	22	71.0
	Above 4	6	19.4
	Total	31	100
Academic qualifications	Certificate	1	3.2
	Diploma	9	29.0
	Bachelor's degree	17	54.9
	Master's degree	4	12.9
	Total	31	100

Source: The Researcher (2022)

The study found that of the 31 respondents that took part in the study, majority were males at 71 percent while their female counterparts were 29 percent. This clearly shows that there was gender bias in the sugar processing firm. In addition, the study depicted that most of the respondents that took part in the study at (83.9 percent) were between 30 to 50 years of age, 12.9 percent were below 30 years while a paltry 3.2 percent were

50 years and above. This clearly shows that data collected were from the ideal age bracket given that below the age of 30 years had just been employed and therefore may not have more information on organizational operations whereas those with over 50 years were almost leaving the employment hence may not be interested in giving the information.

The study revealed that out of the 31 respondents, majority at 71.0 percent had worked in the sugar firm in the operations risk department for a period of 2-4 years, 19.4 percent indicated more than 4 years, while only 9.7 percent had less than 2 years of experience. This points that most of the members in the operations risk department of SONY sugar had offered their services for the company for a period long enough to know the firm's operations. Further, the study depicted that most of the participants 54.9 percent had attained bachelor's degree, 29.0 percent had diploma qualification, and 12.9 percent had master's degree while only 3.2 percent had just a certificate. This indicates that most of the respondents had good and relevant academic qualifications for their roles in operation risk department hence increasing the credibility and reliability of the data collected.

4.5 Operational Risks in the Organization

Respondents were asked to indicate the extent to which the following operational risks were witnessed in their organization, using a 5point Likert scale where: 1 = no extent; 2 = little extent; 3 = moderate extent; 4 = great extent; 5 = very great extent. The results are shown in Table 4.3 below.

Table 4.1 Operational Risks in the Organization (Percent)

Operational Risks	1	2	3	4	5	Mean
Unhealthy machines	0.0	0.0	19.4	38.7	41.9	4.2
Lack of feed forward control system	0.0	0.0	12.9	51.6	35.5	4.2
Increased operational errors	0.0	3.2	19.4	48.4	29.0	4.0
Damage on milling rolls	0.0	3.2	22.6	45.2	29.0	4.0
Optimum temperature is not reached	6.5	6.5	16.1	32.3	38.7	3.9
Lack of digital signal processors	0.0	3.2	25.8	51.6	19.4	3.9
Milling hydraulic pressure is unstable	0.0	6.5	25.8	45.2	22.6	3.8
Steam pressure is low	3.2	9.7	22.6	35.5	29.0	3.8
Lack of intelligent control	3.2	3.2	35.5	25.8	32.3	3.8
Failure in monitoring of process parameters	3.2	3.2	25.8	48.4	19.4	3.8
Unapproved workarounds	3.2	3.2	38.7	32.3	22.6	3.7
Low skilled personnel	6.5	6.5	61.3	19.4	6.5	3.1

Source: The Researcher (2022)

As Table 4.3 above shows, on status of the machines, 41.9 percent of the respondents indicated that SONY sugar firm had unhealthy machines to a very great extent, 38.7 percent indicated to great extent, while 19.4 percent indicated to moderate extent. None of the respondents indicated little or no extent. A weighted mean of 4.2 shows that the sugar firm had obsolete machines that were unhealthy for its operations, which would then consequently influence its productivity and financial performance. The study also found that to a great extent, there was lack of feed forward control system as indicated by majority of the respondents at 51.6 percent, 35.5 percent indicated to a very great extent, while 12.9 percent indicated to a moderate extent. None of the respondents indicated little or no extent at all. Overall, a weighted mean of 4.2 shows that SONY sugar firm had insufficient feed forward control and monitoring system to wide extent, and this could compromise quality production and general financial performance of the firm.

On the extent at which there was increased operational errors, majority of the respondents at 48.4 percent confirmed that this occurred to a great extent, 29.0 percent indicated to a very great extent, while 19.4 percent indicated that increased operational

errors occurred in the plant to a moderate extent. Only 3.2 percent) indicated to a little extent. Overall (mean = 4.0) implies that SONY sugar firm witnessed operational errors to a large extent which influenced quality production and financial performance.

In addition, the study established that to a great extent, SONY sugar firm experienced damages on milling rolls as indicated by majority of the respondents at 45.2 percent, 29.0 percent indicated to a very great extent, while 22.6 percent indicated to a moderate extent. Only 3.2 percent indicated a little extent. This shows that the sugar firm experienced a rampant milling roll damage (mean 4.0) and this could lead to interruption of production, poor productivity, and hence low financial performance.

The study also sought to establish the extent at which optimum temperature was not reached. On this, majority of the respondents at 38.7 percent indicated that optimum temperature in SONY sugar processing plant was not reached to a very great extent, 32.3 percent) indicated to a great extent, while 16.1 percent indicated moderate extent. Only 6.5 percent indicated a little extent while another 6.5 percent indicated no extent at all. This shows that optimum temperature for good production quality of sugar that would also enhance financial performance of the sugar firm was mostly not reached (mean = 3.9).

On digital signal processors, the study established that most of the respondents at 51.6 percent confirmed that SONY sugar lacked digital signal processors to a great extent, 25.8 percent indicated to a moderate extent, while 19.4 percent indicated to a very great extent. Only 3.2 percent indicated to a little extent. This therefore shows that the sugar processing firms did not adequately incorporate Information and Communication Technology (ICT) in its operation (mean = 3.9) and this could as well slow down its operations and negatively affect its financial performance.

Majority of the respondents at 45.2 percent confirmed that milling hydraulic pressure of SONY sugar plant was unstable to a great extent; 25.8 percent indicated to a moderate extent; 22.6 percent indicated to a very great extent; while only 6.5 percent indicated to a little extent. With a weighted mean response of 3.8, it shows that generally, SONY sugar milling hydraulic pressure was always unstable.

On the extent at which the steam pressure was low, the study found that majority of the respondents at 35.5 percent indicated that steam pressure was low to a great extent and 29 percent indicated that this was the case to a very great extent. However, 22.6 percent indicated that steam pressure was low in SONY sugar to moderate extent; while only 9.7 percent indicated to a little extent as 3.2 percent indicated no extent at all. A weighted mean of 3.77 shows that low stream pressure was prominent in the sugar processing plant which would also compromise the quality of sugar and hence financial performance.

On lack of intelligent control, the study found that majority of the respondents at 32.3 percent indicated that SONY sugar plant had insufficient intelligent control in its process to a very great extent, 25.8 percent indicated to a great extent, while 35.5 percent indicated moderate extent. Only 3.2 percent indicated a little extent while another 3.2 percent indicated no extent at all. Generally, (mean = 3.8) shows there was lack of intelligent control system in the plant for good production quality of sugar that would also enhance financial performance.

The study also established that there were cases of failure in monitoring of process parameters to a great extent as indicated by 48.4 percent, 25.8 percent indicated a moderate extent, while 19.4 percent indicated to a very great extent. Only 3.2 percent indicated a little extent while another 3.2 percent indicated no extent at all. A weighted

mean response of 3.8 shows that generally, there was common failure in monitoring and evaluating process parameters in SONY sugar firm.

The study also found that majority of the respondents at 38.7 percent confirmed that there were cases of unapproved workarounds in SONY sugar processing plant to a moderate extent, 32.3 percent indicated to a great extent, while 22.6 percent indicated to a very great extent. Only 3.2 percent indicated to a least extent while another 3.2 percent showed that there was no extent at all. With the weighted mean response of 3.7, it shows that generally, there were rampant cases of unapproved workarounds.

On skilled personnel, majority of the respondents at 61.3 percent indicated that SONY sugar firm had low skilled personnel to a moderate extent, 19.4 percent indicated great extent, while 6.5 percent indicated to a very great extent. Only 6.5 percent indicated little extent as another 6.5 percent indicated no extent at all. With a weighted mean of 3.1, it shows that SONY sugar firm had low skilled personnel to a reasonable extent.

4.6 Operational Risks Mitigation Measures in the Organization

Respondents were asked to indicate the extent to which the following mitigation measures for operational risks were applied in their organization, using a 5-point Likert scale where 1 = no extent; 2 = little extent; 3 = moderate extent; 4 = great extent; 5 = very great extent. The operational risks mitigation measures in the organization results are shown in Table 4.4 below.

Operational Risks Mitigation Measures	1	2	3	4	5	Mean
Hauling, SOP implementation, reward and punishment	9.7	6.5	38.7	22.6	22.6	3.2
Improved communication between production and hauling	6.5	22.6	29.0	25.8	16.1	3.1
Replacement of mill rolls with appropriate standard quality	9.7	32.3	32.3	12.9	12.9	2.7
Quality control of bagasse through milling control	16.1	29.0	38.7	6.5	9.7	2.6
Improved management planning	16.1	35.5	32.3	9.7	6.5	2.5
Installation of intelligent control	29.0	25.8	9.7	16.1	19.4	2.5
Controlled planning on milling process	16.1	51.6	6.5	22.6	3.2	2.4
Installation of impurities prevention system into the process	22.6	32.3	25.8	12.9	6.5	2.4
Installation of digital signal processors	29.0	35.5	16.1	9.7	9.7	2.4
Machine repair schedule	25.8	32.3	29.0	12.9	0.0	2.3

Table 4.1 Operational Risks Mitigation Measures in the Organization

Source: The Researcher (2022)

The study found that majority of the respondents at 38.7 percent revealed that hauling, SOP implementation, reward and punishment was practiced in the sugar firm to a moderate extent, 22.6 percent indicated a great extent while another 22.6 percent indicated to a very great extent. Only 9.7 percent indicated that hauling, SOP implementation, reward and punishment was not practiced at all, while 6.5 percent indicated a little extent. This shows that hauling, SOP implementation, reward and punishment was practiced in SONY sugar processing firm to a considerable extent (mean = 3.2). The study also found that there was improved communication between production and hauling in SONY sugar firm to a moderate extent as shown by majority

of the respondents at 29.0 percent, 25.8 percent indicated a great extent, while 22.6 percent indicated little extent. Only 16.1 percent indicated that improved communication between production and hauling in SONY sugar firm was to a very great extent, while 6.5 percent indicated no extent at all. Overall, improved communication between production and hauling in SONY sugar firm was to moderate extent (mean = 3.1).

On replacement of mill rolls with appropriate standard quality, 32.3 percent of the respondents revealed that this was conducted to a moderate extent, while another 32.3 percent indicated this happens to a little extent. Only 12.9 percent indicated that replacement was done to a great extent and another 12.9 percent indicated to a very great extent. However, 9.7 percent indicated that replacement of mill rolls with appropriate standard quality was not done at all. This shows that replacement of mill rolls with appropriate standard quality was practiced in SONY sugar processing firm to a considerable or less extent (mean = 2.7). In addition, the study found that quality control of bagasse through milling control in SONY sugar firm was carried out to a moderate extent as shown by majority of the respondents at 38.7 percent, 29.0 percent indicated to a little extent, while 16.1 percent indicated no extent at all. Only 9.7 percent and 6.5 percent indicated a very great and a great extent respectively. Averagely, quality control of bagasse through milling control in SONY sugar firm was done to moderate or less extent (mean=2.6). Quality control of bagasse through milling control if not optimally done would compromise productivity and ultimately financial performance of the firm.

When probed on improved management planning, majority of the respondents at 35.5 percent revealed that improved management planning in the firm took place to a little extent, 32.3 percent indicated to a moderate extent, while 16.1 percent indicated that

improvement didn't take place at all. Only 9.7 percent indicated that SONY sugar firm improved on its management planning to a great extent, while 6.5 percent indicated to a very great extent. With a weighted mean of 2.5, it shows that SONY Sugar firm improved on its management planning to a less extent. Similarly, majority of the respondents at 29.0 percent indicated that the extent to which installation of intelligent control was done in SONY sugar was nil, 25.8 percent indicated a little extent, while 9.7 percent indicated moderate extent. Only 19.4 percent indicated a very great extent as 16.1 percent indicated a great extent. Largely, installation of intelligent control in SONY sugar processing plant was poor (mean = 2.5) as installation was done to a little extent.

It was also found that 51.6 percent of the respondents indicated that controlled planning on milling process took place in SONY sugar process firm to a little extent, while only 22.6 percent indicated that this happened in the firm to a great extent. The study found that 16.1 percent of the respondents indicate that controlled planning took place to no extent at all. However, 6.5 percent indicated moderate extent, while 3.2 percent indicated a very great extent. With a weighted mean of 2.4, it shows that controlled planning on milling process was generally done to less extent. When probed on the installation of impurities prevention system into the process, majority of the respondents at 32.3 percent indicated that the installation of impurities prevention system was done to a little extent, while 25.8 percent indicated to a moderate extent as 22.6 percent indicated no extent at all. Only 12.9 percent indicated that this was done to a great extent as another 6.5 percent indicating that installation was done to a very great extent. Overall, a weighted mean of 2.4 indicates that installation of impurities prevention system into the process in SONY sugar firm was done to a less extent.

On installation of digital signal processors, majority of the respondents at 35.5 percent revealed that SONY sugar firm embraced digital signal processors to a little extent, 29.0 percent indicated no extent at all, while 16.1 percent indicated moderate extent. Only 9.7percent indicated a great extent while another 9.7 percent indicated a very great extent. Overall, installation and application of digital signal processors in SONY sugar processing plant was poor (mean = 2.4) as installation was done to a little extent. Regarding machine repair schedule and programmes, the study found that 32.3 percent of this happens to a little extent, 29.0 percent indicated moderate extent, while 25.8 percent indicated to no extent. Only 12.9 percent indicated that machine repair practices and programmes were carried out to a great extent. Generally, (mean = 2.3) shows that machine repair schedule was conducted in SONY Firm to a little extent. When machines are not repaired or maintenance is not carried optimally, there is likelihood of breakdown and poor productivity, which will then adversely affect the financial performance of the firm.

4.7 Financial and Operational Performance of SONY Sugar Company

In assessing the financial and operational performance of SONY sugar, the study sought secondary data on profit/loss data for the last five years, net working capital for the last five years, and milled cane in tones for the last five years, total sugar sold for the last five years, and rendement rate for the last five years. Table 4.5 below shows the results regarding financial and operational performance of SONY sugar.

Table 4.2 Financial and Operational Performance of SONY Sugar Company

Measure Financial Performance	2016	2017	2018	2019	2020
Loss (KSh 000s)	1.15	0.88	0.30	2.11	1.35
Net working capital (KSh 000s)	2.30	1.82	3.61	3.61	4.47
Operational Performance					
Milled canes (tons)	560,385	757,143	602,711	420,973	420,486
Sugar sold (tons)	53,733	63,733	53,472	32,491	31,351
Rendement (percent)	9.06	8.88	8.91	7.56	7.42

Source: The Researcher (2022)

The study found that SONY sugar has been incurring financial losses for the last five years, with heaviest loss witnessed in 2019, where the company made a net loss of KSh 2.11. The firm has also been registering an increasing negative net working capital for the last five years with the highest negative amount being KSh. 4.47. Based on operational performance, the study revealed that the company has been registering a decline in tons of milled canes for the last five years, with least number of milled canes (420,486 tonnes) in 2020. Similarly, the firm has been recording diminishing tons of sugar sold and hence rendement rate has also been declining for the past five years.

4.8 Operational Risks and Organizational Performance of SONY Sugar

In order to determine the connection between operational risks and organizational performance of SONY sugar, a correlation analysis was done. The correlation summary results are shown in Table 4.6 below.

Table 4.1 Correlation Results

		Profit	Rendement	Operational Risks	Operational Risk Mitigation Measures
Profit	Pearson Correlation	1			
	Sig. (2-tailed)				
	N	31			
Rendement	Pearson Correlation	.484	1		
	Sig. (2-tailed)	.000			
	N	31	31		
Operational risks	Pearson Correlation	-.516	-.671	1	
	Sig. (2-tailed)	.000	.000		
	N	31	31	31	
Operational risk mitigation measures	Pearson Correlation	.634	.633	-.584	1
	Sig. (2-tailed)	.000	.000	.000	
	N	31	31	31	

Source: Research Findings (2022)

Table 4.6 above shows that rendement as an operational performance indicator ($r = .484$, $p<0.05$) had a moderate positive and significant relationship with financial performance (profitability) of SONY sugar. The study also found that operational risks ($r=- 0.516$, $p<0.05$) had moderate but negative relationship with financial performance

(profitability) of SONY sugar and also had moderate but negative relationship (r=-0.671, $p<0.05$) with rendement rate of the firm (yield). Operational risk mitigation measures were also found to be strongly and positively correlated with the profitability of the firm (r= 0.634, $p<0.05$), as well as with rendement (r= 0.633, $p<0.05$). However, it had moderate but negative relationship with the operational risks (r=-0.584, $p<0.05$). These findings concur with that of Onsongo, Muathe and Mwangi (2019) who carried out a study on organizational size and operational risks and how these two variables influence fiscal performance of the banks in NSE and found that operational risks negatively and significantly affected bank performance as measured through ROA.

4.9 Discussions of the Results

In investigating how operational risks influence organization performance (financial and operational performance of SONY sugar) the study found that milling hydraulic pressure of SONY sugar plant was unstable to a great extent. On the extent at which the steam pressure was low, the study found that low stream pressure was prominent in the sugar processing plant which would also compromise the quality of sugar and hence financial performance.

Regarding the extent at which optimum temperature was not reached, it was found that optimum temperature for good production quality of sugar that would also enhance financial performance of the sugar firm was mostly not reached. It was also found that generally, the firm lacked intelligent control system in the plant operations for good production quality of sugar that would also enhance financial performance. On the extent at which there was increased operational errors, the study found that SONY sugar witnessed operational errors to a large extent which influenced quality production and

financial performance. Similarly, Zainuddin, et el. (2020) found that risks grouped as high category of risks were caused by selecting certain sugarcane variants, and these risks were sugar price risks, production risks and quality risks. The study further found that risk management approaches had the potential of lessening risks as a result of using superior variety when conducting sugarcane variant selection.

The study also found that, there were rampant cases of unapproved workarounds in SONY sugar and on digital signal processors and established that the sugar processing firms did not adequately incorporate ICT in its operation and this could as well slow down its operations and negatively affect its financial performance. Similarly, on skilled personnel, the study found that SONY sugar had low skilled personnel to a reasonable extent as well as unhealthy for its operations, which would then consequently influence its productivity and financial performance.

The study also established that there were cases of failure in monitoring of process parameters to a great extent as well as insufficient feed forward control and monitoring system. Further, the study established that to a great extent, SONY sugar experienced damages on milling roll as indicated by majority of the respondents, showing that the sugar firm experienced a rampant milling roll damage and this could lead to interruption of production, poor productivity and hence low financial performance.

In addition, the study sought to assess the extent at which operational risk mitigation measures were adopted by SONY sugar. It was found that controlled planning on milling process took place in SONY sugar process firm to a little extent. On machine repair practices and programmes, the study established that machine repair schedule

was conducted in SONY sugar to a little extent. When machines are not repaired or maintenance is not carried optimally, there is likely hood of breakdown and poor productivity, which will then adversely affect the financial performance of the firm. It was also found that hauling SOP implementation, reward and punishment was practiced in SONY sugar processing firm to a considerable extent. This finding was in agreement with that of Islam, Tedford and Haemmerle (2008) who also carried out an analysis of operational risks practiced in SMEs in New Zealand, and found that absenteeism, unforeseen faulty products, machine breakdown, auxiliary equipment fault, and material scarcity were found to be the major internal disturbances among manufacturing SMEs in New Zealand.

On replacement of mill roll with appropriate standard quality, the study found that replacement of mill roll with appropriate standard quality was practiced in SONY sugar to a considerable or less extent and, SONY firm improved on its management planning to a less extent. The study also found that overall, improved communication between production and hauling in SONY sugar was to moderate extent. On quality control of bagasse through milling control in SONY sugar, the study found that quality control of bagasse through milling control when not optimally done would compromise productivity and ultimately financial performance of the firm. Similarly, Mulu (2013) found that available strategies, company policies, governance determined or predicted operational risks and losses of the firms. It was also found that for every unit rise in governance, there would be a proportional decline in operational risks and losses.

When probed on the installation of impurities prevention system into the process, majority of the respondents indicated that installation of impurities prevention system

into the process in SONY sugar was done to a less extent. Similarly, on installation of digital signal processors, installation and application of digital signal processors in SONY sugar processing plant was found to be poor. Majority of the respondents also confirmed that installation of intelligent control in SONY sugar processing plant was poor as installation was done to a little extent. These finding concur with that of Wibowo, et al. (2017) who also carried out a study to examine operational risks management that was practiced in sugar production firms in Indonesia, and also found that Indonesian sugar mills lacked programmes and strategies for decreasing the level of losses to less than 2 percent which is the recommended level.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The chapter provides a summary of the analysis of findings with conclusions and recommendations drawing relevant implications of the results. Limitations and areas that require further research are also discussed in detail in this chapter.

5.2 Summary

This study examined operational risks' impact on SONY sugar's organizational performance. From descriptive statistics, the study found that SONY sugar plant's milling hydraulic pressure was unstable, and that the sugar processing plant's low steam pressure would damage sugar quality and overall organization performance. Optimal temperature for good sugar production quality and financial performance of the sugar firm was not obtained. The corporation lacks a modern plant control system for good sugar production quality. The study also indicated that SONY sugar's operational faults affected quality output and organization performance.

The study also identified frequent unauthorised workarounds in SONY sugar and on digital signal processors, the study found that sugar processing enterprises did not appropriately utilize ICT in their operations, which might slow down their operations and negatively influence their operational performance. The findings further indicated that SONY sugar had low-skilled employees, had incidences of failed process parameter monitoring and insufficient feed forward control monitoring. The company also faced widespread milling roll breakage, which could cause production interruptions, poor productivity, and poor organization performance.

In assessing the mitigation of the operational risks, the firm has limited machine repair schedule, poor serving or maintenance of the milling machines thereby causing frequent breakdowns and general poor performance of the organization. Similarly, SONY sugar processing unit had poor Digital Signal Processor installation and the plant's intelligent control installation was also not satisfactory. Correlating the operational risks mitigation measures and sugar firms' financial and operational performance showed a moderately positive and significant association. On the other hand, operational risks exhibited a negative and significant association with firm’s profitability and yield rate (yield).

5.3 Conclusion

From the study findings, the study concludes that SONY sugar plant has unstable milling hydraulic pressure hence low steam pressure that would negatively impact on the quality of the sugar. Besides, in most cases, the firm is also not attaining optimum temperature necessary for good sugar production quality. The sugar plant also lacked an intelligent control system and inadequate incorporation of ICT into the operations for monitoring plant operations. Lack of proper control system and insufficient incorporation of ICT into the system increases operational errors, slow down operations and causes inadequate feed forward control and monitoring. SONY sugar plant also frequently suffers from milling roll damage resulting in production interruptions, decreased productivity, and a decrease in overall financial performance.

In terms of mitigation measures the sugar plant has poor framework or structures that would help in mitigating or reducing the operational risks. In fact, the plant has improper structure for regulation of the planning on the milling process and limited

number of machine repair and maintenance schedules. When machines are not serviced or maintained properly, there is a greater likelihood of breakdowns and decreased production capacity. The plant doesn't have also proper mechanism and programs for replacement of mill roll with appropriate standard quality, have no proper implementation structure for impurity prevention system into the process and inadequate installation and deployment of digital signal processors in the SONY sugar processing plant. Operational risks mitigation measures and sugar firms' financial and operational performance showed a moderately positive and significant association, while on the other hand, operational risks exhibited a negative and significant relationship with firm's profitability and yield rate (yield).

5.4 Recommendations

The study recommends proper risk management and mitigation measures to be put in place by the sugar milling plant to increase the efficiency of operations. This can be done by performing repairs and replacement of the obsolete equipment whose efficiency has decreased with standard modern machinery. The entire sugar mill management should be devoted to improving the performance of the sugar mills through conducting overall mill audit right from steam generating station, grinding station and processing station to find out the sources of sugar loss and sugar mill inefficiency.

A programme should be in place at the sugar mills with the goal of reducing losses to the absolute minimum (less than 2 percent). Suggested programmes that sugar mills can implement are the acceleration programme, whose aim is to increase sugar production in mills by improving their performance or efficiency through the

rehabilitation and/or upgrading of factory technology or the replacement of old equipment or machinery, milling capacity optimization, and a reduction in the number of hours during which the milling machine is not operational.

5.5 Limitations of the Study

In conducting this study, some of the respondents were not readily willing to offer the needed information due to the nature of the study, where some data were so sensitive, especially those touching on the financial health of the firm. However, the researcher addressed this challenge by explaining to the respondents the intention of the study and assuring them of their confidentiality of information and withholding of identity in line with ethical behaviours.

5.6 Areas for Further Research

Future studies should be conducted on other constructs of financial performance such as Return on Asset (ROA), return on equity (ROE) and return on investment (ROI). Future studies should also look at how operational risks influence organizational performance in other sugar processing firms in Kenya before generalisation is made.

REFERENCES

Ambetsa, F. L., Mwangi, S. C., & Ndirangu, S. N. (2020). Technical efficiency and its determinants in sugarcane production among smallholder sugarcane farmers in Malava sub-county, Kenya. *African Journal of Agricultural Research,* 15(3); 351-360.

Bai, Y., & Jin, W. L. (2016). *Marine structural design (Second Edition)*. Retrieved from https://www.sciencedirect.com/book/9780080999975/marine-structural-design.

Birgen, Y., & Bogonko, J. B. (2018). Effect of price interventions on financial performance of Mumias Sugar Company. *International Academic Journal of Economics and Finance*, 3(2); 292-308.

Canadian Institute of Actuaries. (2014). *Research paper on operational risk*. Operational Risk Subcommittee of the Research Committee.

Chalupka, R., & Teply, P. (2008). *Operational risk management and implications for bank's economic capital: A case study* (Unpublished working paper, Charles University in Prague).

Chartered Institute of Management Accountants. (2008). *Operational risk*. Topic Gateway Series, 51. London, United Kingdom.

Cipriano, N. A., Zulkeflee, N. N., Amran, F., & Shahudin, H. A. (2018). Operational risk and its determinants among five companies in manufacturing industry in Germany. *Munich Personal RePEc Archive,* 87013.

Coleman, R. (2018). *Operational risk*. Retrieved from https://www.researchgate.net/publication/227576075.

Crosby, P. B. (1979). *Quality is free: The art of making quality certain*. McGraw-Hill

Dogbe, E. S., Mandegari, M. A., & Gorgens, J. F. (2017). Exergetic diagnosis and performance analysis of a typical sugar mill based on Aspen plus simulation of the process. *Energy,* 145(2018); 614-625. Retrieved from https://www.elsevier.com/locate/energy.

George, M. L. (2003). *Lean six sigma for service*. McGraw- Hill

Girling, P. X. (2013). *Operational risk management: A complete guide to a successful operational risk framework*. Wiley Finance Series, Hoboken, New Jersey.

Gongera, G. E., Ouma, B. O., & Were, J. N. (2013). Effects of financial risks on profitability of sugar firms in Kenya. *European Journal of Business and Management,* 5(3); 152-160.

Gourier, E., Abbate, D., & Farkas, W (2009). Operational risk quantification using extreme value theory and copulas: from theory to practice. *The Journal of Operational Risk,* 4(3); 1-24.

Hemrit, W., & Arab, M. B. (2012). The major sources of operational risk and the potential benefits of its management. *Journal of Operational Risk,* 7(4); 71-92.

Islam, M. A., Tedford, J. D., & Haemmerle, E. (2008). Managing operational risks in small-and medium-sized enterprises engaged in manufacturing- an integrated approach. *International Journal of Technology, Policy and Management,* 8(4); 421-434.

Jarrow, R. A. (2006). *Operational risk* (Unpublished Paper, Cornell University, Ithaca, New York).

Jongh, E. D., Jongh, D. D., Jongh, R. D., & Vuuren, G. V. (2013). A review of operational risk in banks and its role in the financial crisis. *South African Journal of Economic and Management Sciences,* 16(4); 1-2.

Kenya Anti-Corruption Commission. (2010). *Review of the policy, legal and regulatory framework for the sugar sub-sector in Kenya: A case study of governance controversies affecting the sub-sector.* Research and Policy Department, Directorate of Preventive Services.

Kenya National Assembly. (2015). *Report of the departmental committee on agriculture, livestock and co-operatives on the crisis facing the sugar industry in Kenya*. Nairobi Kenya, eleventh parliament, third session.

Kessler, A. M. (2007). *A systemic approach framework for operational risk* (Unpublished Doctoral Dissertation, Stockholm University, SE-164 40 Kista, Sweden).

Kuria, S. N. (2016). *Effectiveness of operational risk management practices: A case of co-operative bank* (Unpublished Masters Thesis, United States International University, Africa).

Lainhart, J. W. (2001). *Cobit management guidelines: IT governance forum trust and understanding for the business and the board.* ITGI, Paris.

Magnou, G. (2017). An application of extreme value theory for measuring financial risk in the uruguayan pension fund. *Compendium ISSN Impresa,* 4(7); 1-19.

Mati, B. M., & Thomas, M. K. (2019). Overview of sugar industry in Kenya and prospects for production at the coast. *Agricultural Sciences,* 10, 1477-1485. Retrieved from https://doi.org/10.4236/as.2019.1011108.

Ministry of Agriculture. (2019). *Report on livestock, fisheries and irrigation in Kenya.* Research and Policy Department, Nairobi Kenya.

Mugenda, N. G., Momanyi, G., & Naibei, I. K. (2012). Implications of risk management practices on financial performance of sugar manufacturing firms in Kenya. *An International Journal of Arts and Humanities,* 1(1); 14-29.

Mulu, W. K. (2013). *Determinants of operational risks and losses in manufacturing firms in Kenya* (Unpublished Masters Thesis, University of Nairobi).

Muriithi, J. G. & Waweru, K. M. (2017). Operational risk, bank size and the financial performance of commercial banks in Kenya. *Journal of Finance & Banking Studies,* 6(3); 39-50.

Nyaga, M. B. (2017). *Quality management and operational risk management in commercial banks in Kenya* (Unpublished Masters Thesis, University of Nairobi).

Ojera, P. B., Bulitia, M. G., & Ogutu, M. (2017). Interactive control systems and strategic orientation on competitive position of sugar firms in western Kenya. *International Journal of Business and Management Invention,* 6(4); 79-93.

Onsongo, S., Muathe, S., & Mwangi, L. (2019). Firm size, operational risk and performance: Evidence from commercial and services companies listed in Nairobi Securities Exchange. *International Journal of Current Aspects,* 3(6); 372-379. https://doi.org/10.35942/ijcab.v3iVI.93

Owiye, P. O., Naibei, I. K., & Momanyi, G. (2016). Effect of trade liberalization on performance of sugar firms in Kenya: The case of government-owned firms. *European Scientific Journal, 12(13),* 306-320. DOI: 10.19044/esj.2016.v12n13p306

Pakhchanyan, S. (2016). Operational risk management in financial institutions: A literature review. *International Journal of Financial Studies, 20*(32); 1-21.

Reim, W., Parida, V., & Sjodin, D. R. (2016). Risk management for product-service system operation. *International Journal of Operations & Production Management, 36*(6); 665-686.

Software Engineering Institute. (2002). *Capability maturity model integration, version 1.1.* Carnegie Mellon University, Pittsburgh.

Sugar Campaign for Change. (2020). *A summary of the recommendations of the sugar industry task force appointed by the minister of agriculture on 27 March 2003 and checklist to assess the performance of the government in implementing the recommendations of the sugar industry task force.* Retrieved from www.kenyalink.org/sucam.

Sugar Annual Report. (2020). *COVID-19 to slow Kenya's sugar production and trade.* United States Department of Agriculture, Foreign Agricultural Service, Nairobi Kenya.

Waswa, C. W., Mukras, M. S., & Oima, D. (2018). Effect of competitiveness on financial performance of the sugar industry in Kenya. *International Journal of Education and Research, 6*(6); 1-14.

Zainuddin, A., Magfiroh, I. S., Setyawati, I. K., & Rahman, R. Y. (2020). Operational risk analysis and management strategies of sugarcane producer in selecting varieties: Failure mode and effect analysis approach. *E3S Web of Conferences,* 142(06008). Retrieved from https://doi.org/10.1051/e3sconf/202014206008.

Zainuddin, A., Setyawati, I. K., & Wibowo, R. (2017). Operational risk management of sugar production due to the magnitude of losses: Case study of PT Perkebunan Nusantara X. *Indonesian Journal of Business and Entrepreneurship,* 3(3). DOI: http://dx.doi.org/10.17358/IJBE.3.3.153.

APPENDICES

Appendix I Letter of Introduction

Dear Respondent

You are invited to participate in an informational interaction on my research titled: "*Operational Risks and Financial performance of Sugar Manufacturing Companies – A Case Study of South Nyanza Sugar Company.*" I am humbly requesting you to support me by answering the enclosed questionnaire. The information you provide will be treated with utmost confidentiality and will be used for academic purposes alone, thank you. Kindly read the information provided below and fill and sign the provided spaces if you agree to participate in the project.

PARTICIPANTS' INFORMED CONSENT

I, the undersigned, confirm that:

1. I have read and understood the information about the project, as provided above and I voluntarily agree to participate in the project.
2. I understand I can withdraw at any time without giving reasons and that I will not be penalised for withdrawing nor will I be questioned on why I have withdrawn.
3. If applicable, separate terms of consent for interviews, audio, video or other forms of data collection have been explained to me.
4. The Researcher and I have agreed to sign and date this informed consent form.

Participant:

_____	_____	_____
Name of Participant	Signature	Date

Researcher:

	_____	_____
_____		
Name of Researcher	Signature	Date

Appendix II Respondents Questionnaire

This questionnaire targets the employees of South Nyanza Sugar Company. The purpose of the questionnaire is to collect data for the study "Operational Risks and Financial performance of Sugar Manufacturing Companies – A Case Study of South Nyanza Sugar Company". Please tick in the appropriate boxes and fill the blank spaces where necessary. In-case the answer does not fit in the space provided, kindly use the blank space at the back of the questionnaire. Your participation, honesty and objectivity will be highly appreciated.

Section A Characteristics of Respondents

1. Department (Optional)……

2. Gender

Male	[ ]	Female	[ ]

3. Age bracket in years

25-30	[ ]	31-35	[ ]
36-40	[ ]	41-45	[ ]
46-50	[ ]	51 and above	[ ]

4. Highest level of education

Primary level	[ ]	Secondary level	[ ]
College level	[ ]	Graduate level	[ ]
Post graduate level	[ ]	Any other (Specify)……	

5. How long have you been in this position?

Less than 1 year	[ ]
1-5 years	[ ]
6-10 years	[ ]

Above 10 years [ ]

Section B Operational Risks Faced by Sugar Manufacturing Companies in Kenya

7. To what extent does your organization face the following operational risks? Tick as appropriate using the following Likert scale of 1-5 where: 1 = No Extent; 2 = Little Extent; 3 = Moderate Extent; 4 = Large Extent; 5 = Very Large Extent

	Operational Risks	**Respondents Ratings**				
		1	**2**	**3**	**4**	**5**
1.	Milling hydraulic pressure is unstable					
2.	Steam pressure is low					
3.	Optimum temperature is not reached					
4.	Lack of intelligent control					
5.	Increased operational errors					
6.	Unapproved workarounds					
7.	Lack of digital signal processors					
8.	Low skilled personnel					
9.	Unhealthy machines					
10.	Failure in monitoring of process parameters					
11.	Lack of feedforward control system					
12.	Damage on milling roll					

What other operational risks does your organization face?

.....
.....
.....
.....

Section C Determining Possible Mitigation Measures for Operational Risks in Sugar Manufacturing Companies

8. To what extent are the following mitigation measures for operational risks applied in your organization? Tick as appropriate using the following Likert scale of 1-5 where: 1 = No Extent; 2 = Little Extent; 3 = Moderate Extent; 4 = Great Extent; 5 = Very Great Extent

Operational Risk Mitigation Measures	Respondents Ratings				
	1	2	3	4	5
Controlled planning on milling process					
Machine repair schedule					
Hauling SOP implementation, reward and punishment					
Replacement of mill roll with appropriate standard quality					
Improved management planning					
Improved communication between production and hauling units					
Quality control of bagasse through milling control					
Installation of impurities prevention system into the process					
Installation of digital signal processors					
Installation of intelligent control					

9. What other operational risk mitigation measures are applied in your organization?

.....

.....

Section D Financial Performance

Measure	2016	2017	2018	2019	2020
Profit (Loss)					
Turnover					
ROE					
ROA					

THE END

Thanks for your participation