Global Scientific JOURNALS

GSJ: Volume 9, Issue 10, October 2021, Online: ISSN 2320-9186

www.globalscientificjournal.com

ROLE OF SMALL SCALE MINERS TOWARDS PERFORMANCE OF MINING PROJECTS IN RWANDA

CASE OF PIRAN RWANDA Ltd MINING PROJECTS

Dissertation submitted to the University of Kigali, School of Postgraduate studies in partial fulfilment of the requirements for the award of a Master's of Science Degree in Project Management

.BY:

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Kigali, September 2021

DECLARATION

I declare that this Dissertation titled as: "*The role of small scale miners towards performance of mining projects in Rwanda; the case of Projects of Piran Rwanda Ltd "*; is my own work and has never been submitted for any degree or examination in any other higher learning institution and that all the sources I have used or quoted have been indicated and acknowledged by complete references.

RYUMUGABE Sam

Date ……/……/……..

Signature…….

APPROVAL

I, **Hon. Dr. Gamariel MBONIMANA, PhD** confirm that this Dissertation was done by RYUMUGABE Sam and has been carried out under my guidance and supervision and so is submitted with my approval.

Supervisor: Hon. Dr. Gamariel MBONIMANA, PhD.

Date ……/……/…….

Signature…….

ACKNOWLEDGEMENTS

Special thanks to the Almighty God for his blessings; Heartfelt thanks goes to my enthusiastic supervisor Hon. Dr. Gamariel MBONIMANA, PhD for his selfless support his efforts and professional guidance, assistance, time and encouragement he accorded to me throughout this research study. The completion of this study would have been not possible if not dependent on the steadfast support and encouragement of my wife and Son. They hence paid equal contribution to the study for which i always feel profound gratitude in my heart. My appreciation also goes to my colleagues (classmates) whom we shared everything and made the work so enjoyable and worth doing, appreciation goes to UoK's staff management and all lecturers, for their special support and advices towards the success of this study; to entire respondents who have offered me the useful information including their time. Finally, I would like to acknowledge the authors who are listed in the reference section of this work, whose works have served as important input to this study.

LIST OF ABBREVIATIONS AND ACRONYMS

AMDC : Africa Minerals Development Centre

ANOVA : Analysis of Variance

AR^2 : Adjusted Regression Squared

ASM : Artisanal and Small-Scale Mining

CDPT : Critical Development Planning Theory

DRC : Democratic Republic of Congo

EHS : Environment, health and safety

ILO : International Labor Organization

OECD : Organization for Economic Cooperation and Development

R^2 : Regression Squared

SPSS : Statistical Package for Social Sciences

UoK : University of Kigali

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ABSTRACT

The cornerstone of effective performance towards different projects bridges the gap between management and the Board of Directors, assesses the ethical climate and the effectiveness and efficiency of operations and overall best projects practices. ASM relies on a mostly unskilled workforce using rudimentary tools and techniques. Unsurprisingly, its environmental and safety practices tend to be very poor. This study therefore focused on the role of small scale miners (ASM) on perfomance of mining projects in Rwanda. Case study of Piran Rwanda ltd mining projects from 2015 to 2020. The specific objectives are: «to determine the effects of operational incentivesto small scale miners on performance of mining projects; to assess the effects of capacity building to small scale miners on performance of mining projects and to analyse the effects of market price determination (access to markets) to small scale miners on performance of mining projects ». The researcher used related theories as Development Planning Theory. The research used the total population of 114 participants and then sample size of 89 respondents as employees of Piran Rwanda Ltd were chosen in order to provide information through simple random sampling technique, where research tools are questionnaire, interview and documentation techniques. Therefore, the data were tested through SPSS. The R2 equals to 0.969 (96.9%) and Adjusted R2 equals to 0.965 (96.5%), show the goodness of fit of the estimated model. Up to 96.9% of long-run appreciation in performance of mining projects of Piran Rwanda Ltd is influenced by changes in operational incentives; capacity building; market price determination as implemented by mining projects of Piran Rwanda Ltd. Therefore, the researcher can conclude by saying that the research hypotheses including: "H1: operational incentives has statistical effects towards performance of mining projects of Piran Rwanda Ltd; H2: capacity building has statistical effects towards performance of mining projects of Piran Rwanda Ltd and H3: market price determination has statistical effects towards performance of mining projects of Piran Rwanda Ltd"; all were tested; verified and then they are confirmed referring to the statistical (regression analysis) findings and then according to the research, the correlation of 0.916 (91.6%) is located in the interval [0.75 - 1.00], categorized as positive and very high correlation; this leads to confirm that there is significant relationship between small scale miners with its observed indicators (factors) and performance of mining projects of Piran Rwanda Ltd.

CHAPTER ONE

GENERAL INTRODUCTION

1.1. Background of the study

Artisanal and small-scale mining is recognized as a considerable source of revenue for millions of people in about 80 countries worldwide. ASM takes place in diverse regions of the world, mostly in the global South, Sub-Saharan Africa, Asia, Oceania, Central and South America. The term “artisanal and small-scale” has been defined in various ways, often characterized in terms of the number of miners, the production capacity of a mine, the level of mechanization or size of capital investments. Artisanal and small-scale mining (ASM) has benefited from a body of research spanning decades, despite an ongoing lack of understanding and statistical data for the sector. The existing literature, both academic and grey, has brought some consensus on key issues surrounding the sector, in many cases repeating similar findings and at times updating facts (ILO, 2017).

In the last two decades, several international organizations have been working towards better integrating ASM into global economies, developing more responsible extraction and sourcing practices to support more sustainable development. These include Fair Trade Mining Standards, the Alliance for Responsible Mining (ARM)’s Fairmined Standards, the Organization for Economic Co-operation and Development (OECD) Responsible Sourcing Guidance, and the Global Mercury Partnership. To reduce the negative impacts of the activity, however, all stakeholders (such as donors, national policy-makers) must work collaboratively, take bottom-up approaches (i.e., directly involving miners and their communities), and propose gender-based solutions (e.g., through microfinance). It is also necessary to replace negative terms such as “conflict mineral areas” that stereotype and negatively affect ASM activities, since firms tend to avoid sourcing from such countries in order to protect their reputations (OECD, 2017).

Around the globe, there are various ASM public and private projects focused on a wide variety of things and are comprehensive and successful projects. The company contracts out labor for specific projects, certain delays may occur as a result of the contracted work, causing the project

to become successful. These situations are often difficult for an organization to anticipate and overcome and may require the organization to wait the success (Benmerikhi, 2019).

The proper ASM project performance is managed by effective planning in all phases and components of effective project are necessary to avoid re work which in turn leads to project performance in project completion. Wideman (2017) concludes that the success of the execution phase of the project is highly depended upon the quality of planning in the prior planning phase. Wambugu, (2015) observes that planning affected the timely completion of projects and that the quality and importance of operational incentives had been considered a major cornerstone of every successful project. The comprehensive site investigation helps in sound planning which in turn helps in clarifying the scope and developing a thorough understanding. This also helps minimize change of scope during construction. The accurate construction planning is a key determinant in ensuring the delivery of the project on schedule and within budget.

In Africa, the institutions and group of companies in different countries including Tunisia, Kenya, Nigeria, Maroc, South Africa and Rwanda, ASM project managers involve step to their communication framework; ASM project managers are about a continuous relationship maintained and strengthened over a period longer than a project, program or year. It is often about a relationship that continues until a definite decision brings it to an end. When institutions prepare their annual communication plan, review all the key individuals and groups of ASM project managers who institutions believe are likely to remain important to institutions over the longer term regardless of their relevance in the forthcoming year. It is harder for them to publicly criticize institutions when institutions have gone to the effort of maintaining a direct dialogue with them, which is in effect a continuing relationship with them. Organization’s ability to offer consistent quality and compete largely depends on its access to quality products and services; as market factors change, organizations also need to change. This is particularly true in competitive and globalized markets. Projects are constantly under pressure to find ways to cut material and production costs through engaging in strategic supplier selection process and evaluation (Weber, 2016).

Piran Resources has secured a 25-year mining licence in eastern Rwanda for two concessions, Musha and Ntunga. The company defined a maiden JORC Resource of 10Mt in Q1 2019 and is

carrying out further exploration and trial mining in order to further expand the resource size. In 2018, drilling was completed in two phases. Following 16,000 meters of diamond, reverse circulation, air-core, and sonic drilling in 2018, the assays results indicated economic quantities of tin (intercepts of >1% Sn) and tantalum, with lithium at depth, and significant further resource potential at both concessions. Over the next 18 months, the company will focus on determining the scale-up potential of the high-grade quartz vein operations (through a combination of trail mining and further exploration work) as well as understand the wider potential of the mineralised belt, including potential for a large scale, open pit Sn-Ta-Li operations (Piran Rwanda Ltd, 2019).

Tin and tantalum have strong long-term fundamentals on the back of both established consumption, predominantly into electronics, and increasing demand from new technology uses including batteries and magnets for robotics. Piran's intention is to create a sustainable, long term, commercial operation in Rwanda and look to use this as a platform to further grow the business in Rwanda and in the region. Rwanda is one of the fastest growing and most stable economies in Africa with significant mineral resource potential. The country encourages responsible foreign investment and has prioritized the development of the mining sector. Piran Resources is part of the Pella Resources group, an Africa-focused natural resource and energy group with a 20-year track record in exploration and mine development (Piran Rwanda Ltd, 2019).

1.2. Problem statement

The cornerstone of effective performance towards different projects bridges the gap between management and the Board of Directors, assesses the ethical climate and the effectiveness and efficiency of operations and overall best projects practices. In many organizations, ASM project managers' involvement acts as an important tool to the employees and is seen as a deductive and seeks for project delay committed by both management and employees. ASM project managers' involvement is applied in such organizations in order to prevent the mismanagement of resources and project delay in business cycle. Poor management and communication are some of the problems impact on project success. When staff lacks a clear understanding in the segmentation of duties, they do not follow the good management in place or they may exceed the project

success' intent, this limits flexibility and lowers performance. Indeed lack of a proper project success function in institutions continues to be a big challenge that has made organizations fail to achieve their intended objectives of being going concerns making surplus, delivering services to the public and satisfying the needs of all partners.

ASM relies on a mostly unskilled workforce using rudimentary tools and techniques. Unsurprisingly, its environmental and safety practices tend to be very poor. For example, dust and fine particles resulting from blasting and drilling cause respiratory illnesses. It also degrades crops and farmlands, resulting in lost production. Streams and rivers often become polluted near ASM sites, which make water unsafe for drinking and can also affect fish stocks previously relied upon for food. Moving people straight out of ASM into other sectors is not a realistic strategy, as there are typically few other employment opportunities. Programs aiming to encourage more income-generating activities along the ASM supply chain such as gemstone cutting and polishing have shown positive results. ASM need to be seen as complementary, as opposed to two activities that are fundamentally at odds. Many families turn to ASM to supplement their farming earnings and invest in farming and farm inputs.

Mining could generate secondary activities and provide markets for mining products. Infrastructure built to access mines could encourage ASM development. Local infrastructure should be built or improved and this should meet local development needs in sectors other than mining but again the investments in infrastructure are rudimentary. With the continuing arrival of more Asian miners the potential benefits are high for both increasing the level of economic activity and also for the transfer of technology to local workers.

There was limited application of mechanized mining in Rwanda with disparate, non-commercial artisanal operations between 1985 and the issuance of licences to Piran Resources. Rwanda has an excellent business framework and actively encourages foreign investment. Piran is pleased to be an early entrant into Rwanda and looks forward to making a long-standing contribution to their mining sector and wider economy.

1.3. Objectives of the study

1.3.1. General objective of the study

The main aim of the research is to assess the role of small scale miners towards performance of mining projects in Rwanda, taking a reference Piran Rwanda Ltd mining projects during the period from 2015 up to 2019.

1.3.2. Specific objectives

a. To determine the effects of operational incentives to small scale miners on performance of mining projects of Piran Rwanda Ltd.
b. To assess the effects of capacity building to small scale miners on performance of mining projects of Piran Rwanda Ltd.
c. To analyse the effects of market price determination on performance of mining projects of Piran Rwanda Ltd.

1.4. Research questions

a. What are the effects of operational incentives on performance of mining projects of Piran Rwanda Ltd?
b. What are the effects of capacity building on performance of mining projects of Piran Rwanda Ltd?
c. What are the effects of market price determination on performance of mining projects of Piran Rwanda Ltd?

1.5. Significance of the research

This research is significantly presenting the interest toward different aspects such as academic and scientific interest and then the interest for ASM project. This research will enable the researcher to put into practice the applied studies observed by the reality. This study will allow the researcher to acquire the knowledge and skills in domain of project management. In addition, this study will enable the researcher to fulfill the necessary requirements for the award of Master's Degree in Project Management as part of academic regulations of University of Kigali.

The study further will be served as guideline by future researchers who will be interested in advancing the research on the related subject.

1.6. Scope of the study

This research project indicates the study limits including time scope; domain (content) scope and geographical scope, as follows:

1.6.1. Time scope

This study will be considered for the period from 2015 to 2019.

1.6.2. Content scope

The domain of this study will be based on project management.

1.6.3. Geographical scope

The information of this study will be collected in Piran Rwanda Ltd located at Rwamagana District of Eastern Province.

CHAPTER TWO

2.0. LITERATURE REVIEW

This chapter reviews the literature to the study, where the meaning of key terms, the related theories, the empirical review, research gap analysis and the conceptual framework are presented as follows:

2.1. Concepts of key terms

Under this section, the researcher reviews the conceptual literature of key terms in order to present the their meaning, thus that are including operational incentives, capacity building; market price determination and performance of mining projects, as follows:

2.1.1. Operational incentives

The operational incentives are compensation that is above and beyond the normal facilities expectations of its recipient. Companies may award extra facilities to both entry-level employees and to senior-level executives. The facilities are traditionally given to exceptional workers; employers sometimes dole out bonuses company-wide to stave off jealousy among staffers. The operational incentives may be dangled as facilities to prospective employees and they can be given to current employees to reward performance and increase employee retention. Companies can distribute facilities to its existing shareholders through a facility issue, which is an offer of free additional shares of the company's stock (Tiede, L., 2018).

2.1.2. Capacity building

Capacity building is the process by which individuals, projects and organizations obtain, improve, and retain the skills, knowledge, tools, equipment and other resources needed to do their jobs competently. It allows individuals and organizations to perform at a greater capacity including larger scale, larger audience, larger impact, etc (Allison R., 2017).

2.1.3. Market price determination

Market price determination is the process whereby the business actors set the price at which it will sell its products and services, and may be part of the business's marketing plan. In setting prices, the business will take into account the price at which it could acquire the goods, the manufacturing cost, the market place, competition, market condition, brand, and quality of product. Market price determination can be a manual or automatic process of applying prices to purchase and sales orders, based on factors such as: a fixed amount, quantity break, promotion or sales campaign, specific vendor quote, price prevailing on entry, shipment or invoice date, combination of multiple orders or lines, and many others. Automated market price determination systems require more setup and maintenance but may prevent pricing errors. The needs of the consumer can be converted into demand only if the consumer has the willingness and capacity to buy the product (Smith, T., 2019).

2.1.4. Performance of mining projects

Performance of mining projects is an achievement of efforts and duties planned, organized, and managed from the top, to increase contract effectiveness through planned interventions in the contract's rules and regulation "processes," using behavioral knowledge. The performance of mining projects is the study of successful project change and performance which realized that projectl structures and processes influence worker behavior and motivation. The performance of mining projects comprises the actual output or results of a project as measured against its intended outputs (or goals and objectives). The term project effectiveness is broader; specialists in many fields are concerned with performance of mining projects including strategic planners, operations, finance, legal, and organizational development (Zweney, 2017).

2.2. Theoretical framework

This section presents the theories related to the variables and views of the study, as follows:

Development Planning Theory

Development Planning Theory may be conceptualized broadly under a contemporary triplet of labels: rational, communicative, and critical, which corresponds loosely to a topology of

Development Planning Theory addressing three normative issues: ‘What is planning's purpose?’, ‘What constitutes good planning process?’ and ‘What constitutes good planning?’ (Yiftachel, 1989). This article is principally concerned about the latter question. Critical Development Planning Theory (CDPT) engages with questions of power, equity, language, knowledge construction, and related issues so as to test “professional concepts, models and ‘gospels’ against their real world material and discursive consequences” (Yiftachel and Huxley, 2014).

Spatial and related types of planning, by their very nature, are largely apparatus of state government and governance; hence, CDPT inherently tends to interrogate the role of the state and its overarching constituting ideology to evaluate who benefits and loses through the application of planning's diverse activities. CDPT might be further deconstructed under a range of categories attributable to the diverse fields of thought that have been applied to its theorization over the last several decades. Vastly simplified and aggregated, these include structuralist political economy, liberal pragmatism, poststructuralism, as well as a range of interrelated contemporary critiques of neoliberalism, with this last category largely emerging in the new millennium and yet to effectively formulate a singular overarching definitive label. This theory will briefly consider separately each of these categories of thought, which have sequentially evolved over the last four decades in CDPT, even though, in actuality, they often tend to overlap in their application and blur in their temporality. The article will then conclude with a consideration as to why CDPT has continued to evolve over this period and suggest that this is because it provides an important and necessary ethical consciousness for planning that helps to provide a reflective “humanist philosophy to guide planners in their work (Friedmann, 2018).

2.3. Empirical review

Most studies that provide numbers of ASM operators and people dependent on the activity are using estimates that are 5 to 20 years old. Studies of African countries with ASM are the most complete; there are estimates on almost all countries that are known to have ASM operations except four. In Asia, 15 countries do not have estimates despite being likely to have ASM activities; the same is true of five countries in Latin America. So, compared to Africa, the ASM population in Asia and Latin America remain relatively understudied. The three regions have commonalities in terms of the poverty-driven nature of ASM and the way in which communities

may combine ASM with other livelihood activities, such as agriculture, to supplement their incomes. There are also regional differences between the three continents (Hentschel, 2013).

In the Asia/Pacific region, multicultural aspects and cultural rights predominate; while in the Latin American/Caribbean region, environment, indigenous rights and legal aspects are the key issues." There are also differences in terms of women's participation in ASM. According to Hinton et al. (2014), less than 10 per cent of women directly participate in ASM in Asia; between 10 and 20 per cent in Latin America; and between 40 and 50 per cent in Africa. In some regions, female miners can even represent 60 to 100 per cent of the ASM mining force; for example, the proportion in Guinea is as high as 75 per cent.

The reasons for mining labour in ASM also vary depending on the region. According to Buxton (2013), mining labours are commonly involved in Latin America as part of a "long ASM tradition"; whereas in Asia, there is less child labour due to private sector involvement in ASM. However, the number might not be clear in South Asia, where child labour is often seen as part of mining labour's marginalization. In Africa, as in Latin America, mining labours are also commonly involved in ASM, but more because of the socioeconomic context characterized by civil war, conflicts, weak social institutions and government, and forced labour (Buxton, 2013). It is therefore essential to understand the specifics of ASM in each site and country.

The most recent publications agree that there are about 9 million ASM operators in Africa and about 54 million people whose livelihoods depend on the sector (Ledwaba & Nhlengetwa, 2016). The Africa Minerals Development Centre (AMDC) considers this a "conservative estimate," citing an important lack of data on ASM, as the activity is often informal and mostly operates illegally in several African countries (AMDC, 2015). The research acknowledges that ASM is both complex and highly important for the economies of at least 23 countries in sub-Saharan Africa, especially in rural contexts. In 2011, according to the data provided by Hilson and McQuilken (2014), the number of people dependent on ASM activity in Africa was between four and 12 times the number of ASM operators, but mostly around six times the ASM miner population (e.g., in the Central African Republic, Chad, Côte d'Ivoire, DRC). In 2013, women represented between 5 per cent (in South Africa) and 50 per cent (in Mali) of the total mining population, and up to 75 per cent in Guinea (Hentschel, 2015; Hinton et al., 2015). In most cases men and women have different tasks along the mineral processing chain, with men being more

present in the extraction phase, and women in mineral processing and the delivery of auxiliary services (Armah et al., 2016).

At least four countries are known or likely to have ASM activities, but no estimates are available. As Hilson (2019) noted, there is an issue of the currency of data in African ASM however, this should not mask the sector's fast-growing livelihood significance in rural sub-Saharan Africa, including Burkina Faso, Mali, Sierra Leone and Tanzania. While gold is the focus of most of these ASM operators, other commodities (mainly gemstones and diamonds) also engage a significant number of people in countries like the DRC, Madagascar and Sierra Leone.

ASM in sub-Saharan Africa is often believed to be a "rush-type" activity, characterized as chaotic and entrepreneurial-driven, where miners are "fortune-seekers" (Hilson, 2019). It is also often seen as a "distress-push" type of activity where miners are looking to alleviate their poverty and work in ASM to complement revenues from farming (Hilson, 2019). However, it is impossible to generalize since mining activities in Africa are very diverse, with varying commodities, linkages with other activities, seasonality, migration, level of engagement and so on. For example, Hilson (2016) shows the seasonal nature of ASM and farming, ASM linkages in selected sub-Saharan countries such as Ghana, Liberia, Malawi, Mali, Mozambique, Sierra Leone and Zimbabwe. Persaud et al. (2017) use the case of Senegal to highlight the importance of understanding the dynamics between ASM, as these activities are significantly impacted by season.

Various minerals are extracted in Africa, as in Tanzania, where there are more than one million ASM operators, two thirds are gold miners (Bryceson & Geenen, 2016). In the DRC, where about two million people directly depend on ASM, miners work mainly on gold, cassiterite, coltan and diamond extraction (Bryceson & Geenen, 2016). In DRC, cobalt mining is increasingly important due to market demand for electronics and electric vehicles batteries (RCS Global, 2017). The observers note that in some countries, while ASM is contributing to the economy and rural employment, it has a significant negative impact on the environment. Environment, health and safety (EHS) conditions are poor; crops and farmland are degraded, affecting food production; and streams and rivers are polluted, resulting in costly water treatment to make it safe to drink. Although each ASM site has specific characteristics, some common

factors can accentuate the general EHS impacts of ASM activities. These include lack of mechanization, use of rudimentary techniques, low levels of occupational health and safety (OHS) practices, lack of a skilled workforce, lack of social security and lack of awareness about EHS issues.

The use of hazardous substances for mining puts the health of miners and their communities at risk they are exposed, for example, to mercury, zinc vapour, cyanide, or other acids (Obiri et al., 2010). This is a particular concern in gold mining, where mercury is frequently deployed and cyanide use is growing. Mercury can be inhaled, swallowed or absorbed through the skin, but the health consequences are usually not immediate (Armah et al., 2016). Inhaling dust and fine particles from blasting and drilling processes can cause respiratory diseases such as silicosis or pneumoconiosis in men and women, and in the mining labours who often accompany their parents (Armah et al., 2016). According to the authors, a lack of ear protection to filter noise from equipment like drills or crushers can cause temporary or permanent hearing loss and speech interference. Most OHS risks in sub- Saharan Africa are borne by women, due to the division of tasks between male and female miners.

Since research on chemical use in ASM is focused on gold mining, this section mainly addresses the use of mercury and cyanide in artisanal and small-scale gold mining (ASGM). As underlined by Spiegel et al. (in press), ASGM usually consists of two types: hard rock gold mining (primary ore) and alluvial gold mining. Both mining types involve different types and grades of different technologies, different mercury uses and different socioeconomic characteristics. Mercury is more frequently used in hard rock gold mining than in alluvial gold mining, but in both cases resulting in serious environmental pollution and human diseases.

According to Hilson and McQuilken (2014), it was not until the late 1990s that donor support for ASM in sub-Saharan Africa had a livelihoods dimension. This is potentially linked to the emergence of the sustainable livelihoods approach, a popular method used by aid agencies in the 1990s particularly the United Kingdom’s Department for International Development (DFID) (Morse et al., 2019). In 2018, the United Nations Economic Commission for Africa (UNECA) reported an increasing number of people turning to ASM as an alternative livelihood. In many cases this was driven by growing economic crises; the effects of structural adjustment, particularly in sub-Saharan Africa, where unemployment increased; redundancies in large-scale

mining due to declining mineral prices; and decreasing rural livelihood choices, chiefly in areas affected by man-made and natural disasters (Hilson & McQuilken, 2014).

A number of governments and donors have implemented alternative livelihood projects in an attempt to diversify the economies of rural communities dependent on illegal artisanal mining for sustenance (Hilson & Banchirigah, 2019). Alternative livelihood programs have also been popular among mining companies as part of their efforts to curb illegal mining on or near their concessions (Aryee et al., 2013). For example, Banchirigah (2018) provides some details of programs implemented by Anglo-Gold Ashanti in Ghana, including vegetable farming, snail cultivation and grasscutter rearing, as well as assistance in account-keeping and conflict management, water management and environmental sanitation, and teacher training. Other principal large-scale operators have implemented similar programs.

Aryee et al. (2013) reference a study undertaken by Ghana's Minerals Commission that identifies a number of alternative livelihood or local economic development projects operated by mining companies like AGC (Bibiani) Limited, Resolute Amansie Limited, Abosso Goldfields Limited, Bogoso Gold Limited and Satellite Goldfields Limited in their respective communities.

More recently, the government of Ghana has announced a five-year Multilateral Mining Integrated Project an "alternative livelihood programme for illegal miners," expected to cost USD 10 million (Adogla-Bessa, 2017). However, the focus of the program appears to be on applying technology, law enforcement and supervision rather than fostering alternative livelihoods. That said, the program includes a rehabilitation component the ministry will engage small-scale miners and youth in tree-planting activities to reclaim land that has been destroyed through ASM. It remains to be seen whether it has drawn on lessons from previous alternative livelihood programs, many of which have not been successful.

Hilson and Banchirigah (2019) argue that there is little evidence to show that alternative livelihood programs are slowing the growth of ASM. The authors claim that in sub-Saharan Africa, alternative livelihood programs have mainly been agrarian-based. They question the viability of these programs, given that in many contexts ASM itself is the alternative livelihood to agriculture. Many smallholder farming activities have become unviable for reasons that include the structural adjustment programs introduced across sub-Saharan Africa from the late

1970s to 1990s, and associated changes, including a decline in value of many export crops and removal of subsidies on inputs such as fertilizers (Banchirigah & Hilson, 2018; Tschakert, 2019). Tschakert's study concludes that the alternative livelihood options and local market opportunities that would be attractive to miners in southwest Ghana are sparse, particularly for women. Income-generating activities that would be available to miners are often less lucrative; would require start-up funding or access to land (poultry and cocoa farming, taxi driving, bartending); or are "simply beyond the reach of a group with a relatively low education level (Tschakert, 2017).

Policy-makers have placed "little value on the prevailing pattern of de-agrarianisation unfolding in sub-Saharan Africa" and failed to "concede that the rapid growth of ASM in sub-Saharan Africa is, in large part, a response to the unviable state of smallholder farming. In Sierra Leone, Maconachie and Hilson (2011) observed a lack of in-depth knowledge among government officials on alternative livelihoods and the strategies around them. Banchirigah (2018) argues that governments and companies tend to assume that all miners will pursue alternative income-generating activities if they are available, which is not the case.

There is a body of work on livelihood diversification in sub-Saharan Africa showing that while the wealthy are able to diversify into lucrative non-farm activities, poor people tend to get stuck in an "asset poverty trap" that prevents them from doing so (Fisher, 2007). For example, Yakovleva (2017) investigated female participation in ASM in the Birim North District in the Eastern Region of Ghana. She found that a large proportion of women in ASM used to be involved in petty trading and struggled due to financial constraints, despite having "skills in various trades such as in knitting, sewing, hairdressing, baking, palm oil production and other food processing" (Yakovleva, 2017). Similarly, many former farmers in Madagascar have abandoned farming in favour of artisanal ruby and sapphire mining and its various linked opportunities in Ilakaka and Sakaraha, such as "driver, translator, security guard, middlemen; bars/restaurants owner, and suppliers of water, petrol and entertainment to mining areas" (Cartier, 2019). Therefore, it is important to recognize the economic dynamics behind that alternating between livelihood sources, given the push factors to ASM and its enticingly disproportionate financial gains.

Donors or companies developing alternative livelihood schemes must attempt to understand the needs of beneficiaries, taking account of traditional economic activities and labour migration, and building on existing knowledge: according to Ofei-Aboagye et al., (2014). Schemes involving complete re-skilling and/or importation of skills cannot be expected to be assimilated and taken up immediately." Perks (2017) argues that a significant number of miners in the Democratic Republic of Congo would face barriers even if they tend to readily "exit and re-orientate their skills, networks and experience towards other economic activities.

District Assembly officials in Ghana have indicated that alternative livelihood programs should be linked to their own poverty reduction schemes and plans; in other words, LSM companies and donors implementing alternative livelihoods schemes should work together with local government (Ofei-Aboagye et al., 2014). This would ensure alignment with local needs, priorities and strategic plans, thereby gaining local buy in which is crucial for the successful implementation of diversified livelihood schemes.

More recently, the concept of diversified livelihoods has been fostered by some groups working with these types of programs in ASM. This recognizes that attempting to move people straight out of ASM into other livelihoods is not a realistic approach, given the lack of alternative employment opportunities, and that most alternative livelihood programs have not been successful. Value addition or "beneficiation" programs to encourage diversified income-generating activities as part of the ASM supply chain have also shown promise, as opposed to trying to divert miners into alternative livelihoods. Some examples are provided in the following sections.

Reardon (1997) pointed to evidence of households or communities earning income from off-farm activities to pay for farm inputs. The International Institute for Environment and Development (IIED) Issue Paper Artisanal and Small-Scale Mining and Agriculture: Exploring Their Links in Rural sub- Saharan Africa (Hilson, 2016) provides several examples of studies showing the synergies between ASM and farming in sub-Saharan Africa and how these linkages can provide a platform for wealth creation.

According to Hilson (2016), policies and institutions need to recognize and respond to the complementarities and linkages between ASM, rather than one or the other as alternatives. This

is particularly the case in sub-Saharan Africa, where an alternative livelihoods agenda has been promoted that focuses on moving people away from informal ASM to farming. This agenda has failed to recognize that "a great number of these individuals are already involved in various agricultural activities" (Hilson, 2016). Lahiri-Dutt's (2018) research into gender and livelihood issues in small mines and quarries in South Asia also presents ASM as providing an additional source of income to what miners receive from subsistence agriculture.

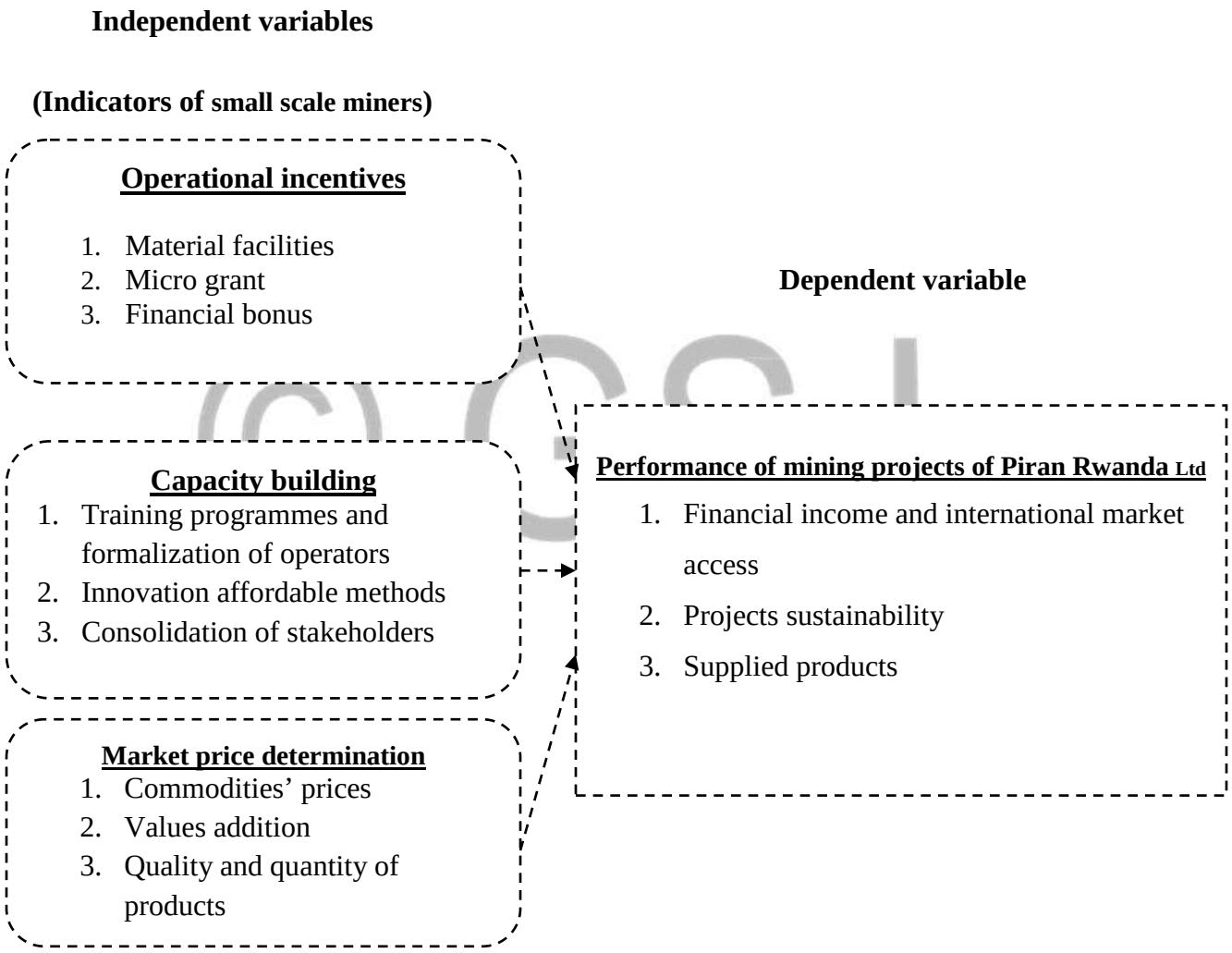
Other examples include Hilson and Garforth's (2013) research conducted in Ghana's Eastern Region highlighting the interdependence between ASM and smallholder farming, by showing that families often turn to galamsey to supplement their farming incomes and to purchase agricultural inputs. Hilson et al. (2013) found that ASM has injected considerable wealth into many of Ghana's northern localities, in the process helping to stabilize their economies and alleviate the hardships of tens of thousands of farm-dependent families. Hilson and Van Bockstael's (2012) research investigating the changing livelihood dynamics in diamond-rich territories of rural Liberia found that "many farm families are using the rice harvested on their plots to attract and feed labourers recruited specifically to mine for diamonds." Jaques et al. (2016) point to the complementarity between ASM and farming as creating significant wealth in Burkina Faso, albeit mostly for pit owners who have the business prowess.

Other authors who have supported this idea include Cartier and Bürge (2011), who examine the catalyzing role of ASGM income in reinvigorating non-mining activities such as agriculture and processing and service-oriented industries in Sierra Leone, thereby reducing vulnerability and reliance on elites. Kamlongera (2011) investigates the linkages between subsistence agriculture. ASM in rural Malawi, sharing perspectives from miners themselves on the contribution of both sectors to their livelihoods. Kwai and Hilson (2010) found that a growing number of smallholder farmers in the Mbeya regions of southern Tanzania are turning to ASM for employment and financial support. Maconachie et al. (2006) found linkages between mining and agriculture in many mining communities resulting from the emergence of mining, which in turn created markets for local produce.

Hinton et al. (2013) provide a positive example from the Tapajo's region in Brazil, where ASGM helped small entrepreneurs to invest in cattle farming, palm tree and acacia nut production. ASGM also led to the construction/upgrade of roads to support the transportation of agricultural

products (where previously air was the only means of transport). In Ghana, infrastructure in many rural areas in the Western Region has been attributed to ASM. In fact, research across the region suggests that profits from ASM are invested into local infrastructure and business, but more quantitative/empirical research into this area would be worthwhile.

2.4. Conceptual framework



Source: Researcher; April 2021

2.5. Research gap analysis

There has never been a comprehensive study on the role that small scale miners could play in achieving the proper performance of mining projects globally. So many scholars and international organizations highlight the need to incorporate the ASM into mining operations but no tangible study has been conducted. In Rwandathere are limited models where small scale miners are incorporated into the mining projects like that of Piran Rwanda ltd and this has been the reason as to why this study has been considered key to address the gap. Therefore, the researcher read many books talking about artisanal and small scale miners' projects and their contribution and role on their performance but none combined all three indicators that lead to the performance of these projects, whichinclude but not limited to operational incentives; capacity building and market price determination then the researcher found that that previous researches were biased; it's why he was interested to work on this study named as:***"The role of small scale miners towards performance of mining projects in Rwanda, the case of Piran Rwanda Ltd mining projects"***.

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter is about the overall approach to the research process, from the rational foundation of the study to the collection and analysis of the data collected about small scale miners and performance of mining projects in Rwanda, with reference of projects of Piran Rwanda Ltd. The chapter explains how the researcher will collect the data, the nature of data that will be collected, where data will be collected and how they will be analyzed. It presents the methods and methodological techniques and approaches that will be applied in data collection and sampling techniques.

3.1. Research design

Research design is a specification of methods and procedures for acquiring the information needed. According to Grinnell (2010), defined research design as the process of the study, the problem formulation through dissemination of findings. This study aims to explore the role of small scale miners on the performance of mining projects in Rwanda with reference to Piran Rwanda ltd mining projects. The survey and questionnaire design will be used in this study by describing collected data that will be obtained from Piran Rwanda Ltd key tagreted respondents; and then the descriptive analytical design will be utilized in order to interpret data.

3.2. Population and sample size of the study

The entire population of the study who are supposed to provide information data related to the objectives of the study is based on 114 employees (staff) of Piran Rwanda Ltd. Before identifying the respondents to this research, it is necessary to indicate how the sample size is determined. The sample size of the study is calculated using the following formula invented by YAMEN Taro in 1967; this formula is used in order to calculate the sample sizes and it is shown below:

$$n = \frac{N}{1 + N(e)^2}$$

Where n is the sample size, N is the population size, and e is the marginal error of 5% through level of confidence of 95%. Thus, this formula is applied to the above sample.

$$n = \frac{114}{1 + 114(0.05)^2} = \frac{114}{1.285} = 88.714 \cong 89$$

Therefore, for the case of this study, the sample size is 89 respondents including staffs (employees) of Piran Rwanda Ltd, then the current researcher will choose the sample size of population to be questioned through simple random sampling technique.

Table 3.1: Target population and sample size

The rule of three formula for stratified sampling is as follows (Cohen, 2003); $\left[\boldsymbol{a} = \boldsymbol{n} * \left[\frac{\boldsymbol{b}}{\boldsymbol{c}}\right]\right]$

Where: a is stratified sample size; **b** is sample size in target population; **c** is total population size and then **n**=sample size

Categories of staff	Population	Calculations	Sample size	Sampling method
Administration and finance department	15	$\left[\boldsymbol{a} = 89 * \left[\frac{15}{114}\right]\right]$	12	Randomly
Mining department	36	$\left[\boldsymbol{a} = 89 * \left[\frac{36}{114}\right]\right]$	28	Randomly
Engineering and maintenance department	30	$\left[\boldsymbol{a} = 89 * \left[\frac{30}{114}\right]\right]$	23	Randomly
Health and safety department	17	$\left[\boldsymbol{a} = 89 * \left[\frac{17}{114}\right]\right]$	13	Randomly
Security department	16	$\left[\boldsymbol{a} = 89 * \left[\frac{16}{114}\right]\right]$	13	Randomly
Total	**114**	----------	**89**	Randomly

Source: Piran Rwanda Ltd; Documentation, April 2021

3.3. Data collection techniques

This section is aiming to show the research collection techniques of the study including questionnaire, interview and documentation research techniques as follows:

3.3.1. Questionnaire technique

The questionnaire helped researcher as main means of communication between researcher and respondents. Questionnaire will include the series of questions about issues that are expected of the respondents' information, where these types of questions will be distributed by the researcher among respondents in order to collect the written and quantitative data (information).

3.3.2. Interview technique

According to Krlinger (2017), interview is a conversation from which the researchers try to get information to the interviewees. Qualitative questions will be asked in relation with the research objectives and this will help the researchers to get direct information from respondents; therefore, this technique will allow the researcher to collect information through oral communication with selected respondents.

3.3.3. Documentation technique

According to Paige (2012) documentation is a system which formally acknowledges the sources consulted for the research. According to Robert (2014) said that, one of the basic advantages of document studies is to explore the sources more fully in order to obtain additional information on an aspect of the subject. This is the extensive study and review of published documents, reports, magazines, journals and policy reports related to the topic. This is important because it reviews the literature and tries to locate global perspectives in order to make a comparative framework for analysis and evaluation for readers; therefore, the researcher will use this documentary technique in order to conduct and get secondary data.

3.4. Validity and reliability of the study

Pilot studies allowed the researcher to identify potential problems in the proposed study. A pilot study is the process of carrying out a preliminary study, going through the entire research procedure with a small sample of questions. The testing of data will be conducted to respondents during four weeks before to test the reliability and validity of the research questions. The aims are to test whether the designed questions are logical and contextual, if questions are clear and easy to understand, whether the stated responses are exhaustive and how long it takes to complete the interview questions. Therefore, the pre-test also will allow the researcher to check on whether the data that will be collected can easily be processed and analyzed. Any question which is found ambiguous or interpreted differently during the pre-testing is rephrased so that it can have the same meaning to all respondents.

3.5. Data processing methods

Normally, data that was collected from respondents will be in a row form, which are easy to interpret and analyze for conclusions. Data processing will be used to transform the respondent's views into meaningful test. On this note, statistical method; editing; coding and tabulating of data will be applied in order to be able to handle it easily.

3.5.1. Statistical method

The researcher focused on statistical inference and also gives special emphasis to establish as well as emerging applied areas. The statistical method will offer the opportunity to measure and quantifies the results of research. This method is the one which will facilitate the researcher in quantifying and numbering the results of the research and presetting information in the tables. Therefore, the collected data will be analysed through Statistical Package for Social Science (SPSS), in order to test link among variables.

3.5.2. Editing

Mabaaga (2019) defined editing as the process whereby errors in completed interview, schedule and the mail questions are identified whenever possible. For some unclear responses, the researcher will have to go back to the respondents so as to make them clarify their responses.

3.5.3. Coding

According to Kakooza (2011), coding refers to the assigning of symbol or a number to a response for identification purpose. This will be used in order to summarize data by classifying different responses, which will be made into categories for easy interpretation and analysis.

3.5.4. Tabulation

Frequency distribution tables were used after editing and coding of data. Tables will be constructed according to the main themes in the questionnaire to summarize all the findings of the study.

3.6. Data analysis

Statistics analysis is a set of mathematical methods which, from the collection and analysis of real data. The statistical, analytical, descriptive and synthetical research methods for data analysis will offer the opportunity to measure and quantifies the results of research; therefore, these research analyses will facilitate in quantifying and numbering the results of the research and presenting information in the tables. In order to make effective measurement of variables; it is required to present the regression analysis model through ANOVA table that will be provided by SPSS and researcher will use by calculating; analyzing and interpreting the relationship among variables through the collected data by showing the mean and standard deviation, as follows:

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon t$

Y = Performance of Mining Projects of Piran Rwanda Ltd (PMP) as dependent variable

Indicators of small scale miners as independent variable including:

X_1 = Operational incentives (OI)

X_2 = Capacity building (CB)

X_3 = Market price determination (MPD)

$\beta_1; \beta_2 \; and \; \beta_3$ = Slope or coefficient of estimates.

β_0 = Constant

ε_t = Error term

And then the real equation will become

$PMP = \beta_0 + \beta_1 OI_1 + \beta_2 CB_2 + \beta_3 MPM_3 + \varepsilon$

3.7. Limitations of the study

During research, researchers have to use their time for collecting the information from the various sources, there is a problem related to libraries which researchers generally face. A researchers can't find the data for the research because of lack of free available services related to computerization in public libraries, so this is also one of the problems that are faced by researchers. Library management and functioning are not satisfactory at many places and much of the time and energy of researchers are spent in tracing out the books, journals, reports, etc. All possible efforts are made in this direction so that efficient secretarial assistance is made available to researchers and that too well in time. There are also the difficulties of timely availability of published data from various agencies such public or private. The collection of primary data by using questionnaire and interview tools will be complicated due to the pandemic of COVID-19 that caused the limitations of several activities and services.

3.8. Ethical considerations

In conducting the research, there are some ethics that were considered, the adherence to ethical consideration will help the researcher to have smooth process in data collection. In conducting this research, the researcher will consider the own ethics in order to establish relation with the respondents and there is information of consent in doing research, the researcher has gotten permission from the respondents to participate in the research. The researcher will request the organization management in order to allow their members to participate in the interview which is required authority letter. Confidentiality and privacy are the key issues to be observed where researcher will observe the respondents confidentiality during the interviewing process. Researcher will allow the respondents to feel free when collecting the data, mentioning names might look like coercing the respondents are avoided.

CHAPTER FOUR

RESEARCH FINDINGS AND ANALYSIS

This chapter shows the findings of the research and linked information that was collected in relation with research questions. In addition, this chapter presents statistical analyses which were done using Statistical Package for Social Sciences (SPSS) 23rd version and interpretations of demographic profile of respondents, perceptions of respondents on independent variable which is small scale miners composed by operational incentives; capacity building; market price determination and perceptions of respondents on performance of mining projects of Piran Rwanda Ltd composed by financial income & international market access; projects sustainability and supplied products. This chapter also shows the relationship between small scale miners and performance of mining projects of Piran Rwanda Ltd by testing research hypotheses using statistical regression analysis.

4.1. Demographic profile of respondents

This study concerned 89 participants as sample of respondents who were supposed to respond on different aspects on the effects of small scale miners on performance of mining projects of Piran Rwanda Ltd. The respondents were employees and subcontractors of Piran Rwanda Ltd. The demographic profile of the respondents covers their gender, age, marital status, education level, as follows:

4.1.1. Gender of respondents

The following table discusses the distribution of respondents by gender, where the table indicates how Mining projects of Piran Rwanda Ltd has respected and made in action the government policy related to the gender policy implementation:

Table 4.1: Distribution of respondents by gender

Gender of respondents	Number of respondents	Percentages
Male	56	62.9**%**
Female	33	37.1**%**
Total	**89**	**100 %**

Source: Researcher; Field Data, April 2021 (from SPSS)

According to table number 4.1 that generated respondents according to their gender (sex) where in mining projects of Piran Rwanda Ltd, the male gender is represented by 56 respondents making it 62.9% and 33 respondents were female gender making 37.1% of all respondents.

This gives a clear picture in the first place of how male and female well represented work together towards a common goal and successfully delivers on key mining projects in place. Eventhough the male gender still dominates, all operational incentives, capacity building plans, access to international markets are equally shared and deliver best on the performance of all mining projects in place

4.1.2. Education level of respondents

The following table analyzes the education level of respondents, and is meant to analyze the level of understanding based on academic level on mining projects which in the end affects the overall performance of mining projects of the company. Their education levels is presented as follows:

Table 4.2: Distribution of respondents by education level

Education of respondents	Number of respondents	Percentages
Technical skills and knowledge	27	30.3%
Secondary level	21	23.6%
Bachelor's degree	34	38.2%
Masters' degree	7	7.9%
Total	**89**	**100 %**

Source: Researcher; Field Data, April 2021 (from SPSS)

According to table 4.2 above that shows the education level of respondents, working on mining projects of Piran Rwanda Ltd, 7 respondents have masters' degree making it 7.9% of all respondents, those with bachelor's degree are 34 employees in different domains representing 38.2% of all respondents. Respondents who have secondary level of education are 21 employees representing 23.6% and those with technical skills (mining, mechanical, electrical technicians are 27 workers representing 30.3%. Since the majority of the respondents have a bachelor's degree level, the Researcher believes that the team is significantly qualified enough to deliver reliable sources of information in the researcher's questionnaire and Researcher believes that their responses are reliable.

4.1.3. Marital status of respondents

The following table analyzed the marital status of respondents, as follows:

Table 4.3: Distribution of respondents by marital status

Marital status of respondents	Number of respondents	Percentages
Single	32	35.9%
Married	57	64.1%
Total	**89**	**100 %**

Source: Researcher; Field Data, April 2021 (from SPSS)

According to table number 4.3 that shows the marital status of selected respondents in mining projects of Piran Rwanda Ltd, where the requested respondents are classified according to their marital status where 32 respondents among them representing 35.9% of all respondents are single and 57 respondents as employees of mining projects of Piran Rwanda Ltd are married and they make 64.1% ; therefore this indicates that in mining projects of Piran Rwanda Ltd the married employees dominated and this means that they are ready to work carefully on the performance of mining projects of Piran Rwanda Ltd and in different activities through the implementation of operational incentives; capacity building; market price determination.

4.1.4. Age of respondents

The following table shows the age of respondents, where this table shows the maturity of respondents thus they provide the specific and positive harvest:

Table 4.4: Distribution of respondents by age

Age of respondents	Number of respondents	Percentages
21-30	23	25.9%
31-40	34	38.2%
41-50	32	35.9%
Total	**89**	**100%**

Source: Researcher; Field Data, April 2021 (from SPSS)

According to table number 4.4 that shows the age of respondents working on Piran Rwanda ltd mining projects where 23 respondents were aged between 21-30 years old and representing 25.9% of all respondents and 34 employees were between 31-40 years old representing 38.2% of all respondents, and 32 respondents were between 41-50 years old representing 35.9% of all respondents. Therefore, this indicates that the employees and other key stakeholders especially Service providers working on mining projects of Piran Rwanda Ltd are mature enough to give the meaningful information required in this research and this helped the researcher in finding the data related to the role that ASM plays when given operational incentives; capacity building; market price determination on the performance of mining projects of Piran Rwanda Ltd.

4.2. Presentation of findings related to the research objectives of the study

This section helps in answering the questions of the research concerning the rolethat ASM play when given operational incentives; capacity building; access to market/ market price determination towards the performance of mining projects of Piran Rwanda Ltd; and then the questions deal with the perceptions of the surveyed respondents on the designed questions; hence the results (findings) are documented in the following tables:

4.2.1. The effects of operational incentives on performance of mining projects of Piran Rwanda Ltd

The following table number 4.5 represents the perceptions of respondents related to the first research objective by showing the factors that determine the effects of operational incentives to Small scale miners on performance of mining projects of Piran Rwanda Ltd:

Table 4.5: The effects of operational incentives to small scale miners on performance of mining projects of Piran Rwanda Ltd

Views of respondents	Mean		Std Deviation	
	Statistical range	Results of the mean	Statistical Scales	Results of Std Deviation
The material facilities to small scale miners influence performance of mining projects of Piran Rwanda Ltd	4.71	Very strong	.951	Positive and very high correlation
The micro grant to small scale miners influences performance of mining projects of Piran Rwanda Ltd	4.72	Very strong	.956	Positive and very high correlation
The financial bonus to small scale miners influences performance of mining projects of Piran Rwanda Ltd	4.14	Strong	.734	Positive and high correlation
Overall of mean	4.286	Strong	--------	--------

Source: Researcher; Field Data, April 2021 (from SPSS)

The table 4.5 shows the results about 5 items that were assessed about effects of operational incentives on performance of mining projects of Piran Rwanda Ltd. The results showed an overall strong mean of 4.286 meaning that operational incentives provided to small scale miners working onmining projects of Piran Rwanda Ltd, is strong. The first item showed that the material facilities given to small scale miners influence performance of mining projects of Piran Rwanda Ltd, and it proves that respondents strongly agreed with mean of 4.71 and positive and very high correlation standard deviation of .951; the second item showed that the micro grant to small scale miners influences performance of mining projects of Piran Rwanda Ltd, and it proves that respondents strongly agreed with mean of 4.72 and positive and very high correlation standard deviation of .956; the third item showed that the financial bonus provided to small scale miners influences performance of mining projects of Piran Rwanda Ltd, and it proves that

respondents are only agreed with mean of 4.14 and positive and very correlation standard deviation of .734. Therefore, this means that the majority of respondents strongly agreed that all above mentioned items are key components of operational incentives applied to deliver best onmining projects of Piran Rwanda Ltd and that influence their general projects performance.

4.2.2. The effects of capacity building of small scale miners on performance of mining projects of Piran Rwanda Ltd

The following table number 4.6 provides the perceptions of respondents related to the second research objective by showing the factors that assess the effects of capacity building to small scale miners on performance of mining projects of Piran Rwanda Ltd:

Table 4.6: The effects of capacity building of small scale miners on performance of mining projects of Piran Rwanda Ltd

Views of respondents	Mean		Std Deviation	
	Statistical range	Results of the mean	Statistical Scales	Results of Std Deviation
The small scale miners training programmes and formalization of influence performance of mining projects of Piran Rwanda Ltd	4.51	Very strong	.934345	Positive and very high correlation
The innovation of affordable methods to small scale miners influence performance of mining projects of Piran Rwanda Ltd	4.99	Very strong	.981144	Positive and very high correlation
The consolidation of small scale miners influences performance of mining projects of Piran Rwanda Ltd	4.45	Very strong	.926425	Positive and very high correlation
Overall of mean	4.175	Strong	--------	--------

Source: Researcher; Field Data, April 2021 (from SPSS)

The table 4.6 assesses to the effects of capacity building of small scale miners on performance of mining projects of Piran Rwanda Ltd. In general, the majority of employees confirmed as it was approved by an overall trend to strong with mean of 4.175. Therefore, the first item as the training programmes and formalization of small scale miners influence performance of mining projects of Piran Rwanda Ltd presented with a mean of 4.51 (strongly agreed of respondents) and standard deviation of .934345 recognized as positive and very high correlation. The second item as the innovation of affordable mining methods to small scale miners influence performance of mining projects of Piran Rwanda Ltd presented with a mean of 4.99 (strongly agreed of respondents) and standard deviation of .981144 recognized as positive and very high correlation. The third item as the consolidation of stakeholders (small scale miners) influences performance of mining projects of Piran Rwanda Ltd presented with a mean of 4.45 (strongly agreed of respondents) and standard deviation of .926425 recognized as positive and very high correlation. Therefore, this means that the majority of respondents strongly agreed in accord that all above mentioned items are key components of capacity building applied in mining projects of Piran Rwanda Ltd and they affect their general projects performance.

4.2.3. The effects of market price determination to small scale miners on performance of mining projects of Piran Rwanda Ltd

The following table number 4.7 provides the opinions of respondents related to the first research objective by showing the factors that analyze the effects of market price determination to small scale miners on performance of mining projects of Piran Rwanda Ltd:

Table 4.7: The effects of market price determination (access to international market) on performance of mining projects of Piran Rwanda Ltd

Views of respondents	Mean		Std Deviation	
	Statistical range	Results of the mean	Statistical Scales	Results of Std Deviation
The commodities' prices influence performance of mining projects of Piran Rwanda Ltd	4.32	Very strong	.91803	Positive and very high correlation
The value addition				

influence performance of mining projects of Piran Rwanda Ltd	3.97	Strong	.74418	Positive and high correlation
The quality and quantity of products influence performance of mining projects of Piran Rwanda Ltd	4.78	Very strong	.94312	Positive and very high correlation
Overall of mean	4.35	Very strong	--------	--------

Source: Researcher; Field Data, April 2021 (from SPSS)

The table 4.7 shows the results about 3 items that were assessed about the effects of market price determination to small scale miners on performance of mining projects of Piran Rwanda Ltd. The results showed an overall strong mean of 4.35 meaning that market price determination or facilitation of small scale miners to access the international market are very strong. The first article as the commodities' prices influence performance of mining projects of Piran Rwanda Ltd because the higher the commodities prices on the market the higher the chances of performing far better on mining projects to yield more materials to the market, and it proves that respondents strongly agreed with mean of 4.32 then for positive and very high correlation with standard deviation of .91803; the second article showed that the value addition of materials produced influence performance of mining projects of Piran Rwanda Ltd, simply because the materials are generated at a very high quality standards which give a very high yield in return and it is approved by respondents that only agreed with mean of 3.97 with positive and high correlation of standard deviation as .74418; the third article as the quality and quantity of products influences performance of mining projects of Piran Rwanda Ltd, and it proves that respondents strongly agreed with mean of 4.78 and positive and very correlation standard deviation of .94312.

Therefore, this means that the majority of respondents strongly agreed in accord that all above mentioned items are key components of market price determination applied in mining projects of Piran Rwanda Ltd and they affect their general projects performance.

4.2.4. The key determinants of better performance of mining projects of Piran Rwanda Ltd throughsmall scale miners involvement in Mining projects

The following table 4.8 offers the attitudes of respondents related to the determinants that provide the level of performance in mining projects of Piran Rwanda Ltd:

Table 4.8: The determinants of performance level in mining projects of Piran Rwanda Ltd

Views of respondents	Mean		Std Deviation	
	Statistical range	**Results of the mean**	**Statistical Scales**	**Results of Std Deviation**
The financial income and international market access determines the performance of mining projects of Piran Rwanda Ltd	4.31	Very strong	.927672	Positive and very high correlation
The projects sustainability determines the performance of mining projects of Piran Rwanda Ltd	4.03	Strong	.703962	Positive and high correlation
The supplied products determine the performance of mining projects of Piran Rwanda Ltd	4.06	Strong	.708724	Positive and high correlation
Overall of mean	**4.025**	Strong	------	------

Source: Researcher; Field Data, April 2021 (from SPSS)

The table 4.8 shows the results about three parameters that were studied about the determinants that affect the level of performance in mining projects of Piran Rwanda Ltd. The results showed an overall strong mean of 4.025 that provides the strong approximation. The first spot showed that the financial income and international market access determines the performance level of mining projects of Piran Rwanda Ltd, and it is proved by respondents who strongly agreed about that statement with mean of 4.31 respected by positive with very high correlation standard deviation of .927672; the second item showed that the projects sustainability determines the performance level of mining projects of Piran Rwanda Ltd, and it is supported by respondents who agreed about that statement with mean of 4.03 respected by positive and high correlation

standard deviation of .703962; the third item showed that the supplied products determine the performance of mining projects of Piran Rwanda Ltd, and it is confirmed by respondents who agreed witht that statement with mean of 4.06 and it is representinga positive and high correlation as standard deviation of .708724.

4.3. Hypotheses testing

4.3.1. Estimated research hypotheses

H_o: There is no relationship between small scale miners and performance of mining projects of Piran Rwanda Ltd.

H_1: There is significant relationship between small scale miners and performance of mining projects of Piran Rwanda Ltd.

Table 4.9: Presentation of regression summary

Model		Unstandardized Coefficients		Standardized Coefficients	95% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta	Lower Bound	Upper Bound	Tolerance/ Sig.	F
1	Constant	-3.345	.000	--------	-3.345	-3.345	-------	---------
	Operational incentives	.133	.000	.303	.133	.133	.183	5.460
	Capacity building	.112	.000	.275	12.380	12.380	.197	5.064
	Market price determination	.113	.000	.302	.113	.113	.293	5.311

Dependent variable: performance of mining projects of Piran Rwanda Ltd.

Based on the model coefficient result the model becomes:

$$\textbf{Log PMP= -3.345+0.133OI}_{t1}\textbf{+0.112CB}_{t2}\textbf{+0.113MPD}_{t3}+\varepsilon_t;$$

Considering other variables stay constant then

The change of one percent (1%) of operational incentives leads to 13.3% change of performance of mining projects of Piran Rwanda Ltd;

The change of one percent (1%) of capacity building leads to 11.2% change of performance of mining projects of Piran Rwanda Ltd;

The change of one percent (1%) of market price determination leads to 11.3% change of performance of mining projects of Piran Rwanda Ltd;

Table 4.10: Presentation of Coefficient Correlations (Model)

Model			H_1	H_2	H_3
1	**Correlations**	Operational incentives of small scale miners	.820	.808	.823
		Capacity building to small scale miners	.808	.801	.885
		Market price determination	.823	.885	.853
	Covariance	Operational incentives	0.0374	.000	.000
		Capacity building	.000	0.0004	.000
		Market price determination	.000	.000	0.0010

Dependent Variable: performance of mining projects of Piran Rwanda Ltd

The coefficient correlations among variables (independents) in model are presented by fitness of probabilities as well as P_1 equals to 0.0374; P_2 equals to 0.0004 and P_3 equals to 0.0010.

Table 4.11: ANOVA table

Model		Sum of Squares	Df	Mean Square	R-Squared	Adjusted R-Squared	F	Sig.
1	Regression	1.614	4	4.35025	**0.969**	**0.965**	.1045274	.000000
	Residual	.000	0	-------	-------	-------	-------	-------
	Total	1.614	4	-------	-------	-------	-------	-------

a. Predictors: (Constant), operational incentives; capacity building; market price determination.

b. **Dependent Variable**: performance of mining projects of Piran Rwanda Ltd

For testing whether variables are correlated or not; it's better to find the division and variation of Sum of Squares which is equal to 161.4%. Therefore, the variables are significantly correlated at regressive level.

R-squared: R^2 =0.969

Adjusted R-squared: Adjusted R^2=0.965

R^2 = 0.969 and Adjusted **R^2 = 0.965**, show the goodness of fit of the estimated model. Up to 96.9% of long-run appreciation in performance of mining projects of Piran Rwanda Ltd is influenced by changes in operational incentives; capacity building; market price determination as implemented by mining projects of Piran Rwanda Ltd.

4.4. Relationship between small scale miners and performance of mining projects of Piran Rwanda Ltd

The purpose of this section is to find if there is a relationship between small scale miners and the performance of mining projects of Piran Rwanda Ltd where the statistical (numeric) data allow researcher to highlight the direct relationship between variables, as follows:

Table 4.12: The correlation between small scale miners and performance of mining projects of Piran Rwanda Ltd

Spearman's coefficient Correlation			Small scale miners	Performance of mining projects of Piran Rwanda Ltd adoption
Spearman's coefficient Correlation	Small scale miners	Correlation Coefficient	1.000	.916*
		Sig. (2-tailed)	.	.000
		N	89	89
	Performance of mining projects of Piran Rwanda Ltd	Correlation Coefficient	.916*	1.000
		Sig. (2-tailed)	.000	.
		N	89	89

Source: Researcher; Field Data, April 2021 (from SPSS)

Legend:

[-1.00 - 0.00 [: Negative correlation;

[0.00 - 0.25 [: Positive and very low correlation;

[0.25 - 0.50 [: Positive and low correlation;

[0.50 - 0.75 [: Positive and high correlation and

[0.75 - 1.00] : Positive and very high correlation.

The variation of Spearman Coefficient correlation is between -1 and 1. Spearman Coefficient correlation is significant when it is equal or greater than 0.01. According to the research, the correlation of 0.916 (91.6%) is located in the interval [0.75 - 1.00] categorized as positive and very high correlation. As the significant level is at 0.01 (1%), the p-value of 0.000 (i.e. 0.0%) is less than 1%. This confirms that there is a significant relationship between small scale miners with its observed indicators (factors) and performance of mining projects of Piran Rwanda Ltd.

5.0. CHAPTER FIVE

SUMMARY; CONCLUSION AND SUGGESTIONS

This chapter presents the summary of the previous four chapters; concluded on the whole study and gives suggestions related to the understanding the role of small scale miners to the performance of mining projects of Piran Rwanda Ltd.

5.1. Summary of major findings

Under this section, the researcher would like to make out the summary of findings provided by respondents from the field basing on research objectives.

5.1.1. The effects of operational incentives to small scale miners on performance of mining projects of Piran Rwanda Ltd

The results about effects of operational incentives to small scale miners on performance of mining projects of Piran Rwanda Ltd, showed an overall strong mean of 4.286 meaning that if operational incentives are provided to small scale miners working onmining projects of Piran Rwanda Ltd, there is a strong relationship on performance of mining projects. The first item showed that the material facilities influence performance of mining projects of Piran Rwanda Ltd, and it proves that respondents are strongly agreed with mean of 4.71 and positive and very high correlation standard deviation of .951; the second item showed that The micro grant influences performance of mining projects of Piran Rwanda Ltd, and it proves that respondents

are strongly agreed with mean of 4.72 and positive and very high correlation standard deviation of .956; the third item showed that the financial bonus influences performance of mining projects of Piran Rwanda Ltd, and it proves that respondents are only agreed with mean of 4.14 and positive and very correlation standard deviation of .734.

5.1.2. The effects of capacity building of small scale miners on performance of mining projects of Piran Rwanda Ltd

In general, the majority of employees confirmed as it was approved by an overall tend to strong with mean of 4.175. Therefore, the first item as the training programmes and formalization of operators influence performance of mining projects of Piran Rwanda Ltd presented with a mean of 4.51 (strongly agreed of respondents) and standard deviation of .934345 recognized as positive and very high correlation. The second item as the innovation affordable methods influence performance of mining projects of Piran Rwanda Ltd presented with a mean of 4.99 (strongly agreed of respondents) and standard deviation of .981144 recognized as positive and very high correlation. The third item as the consolidation of stakeholders influences performance of mining projects of Piran Rwanda Ltd presented with a mean of 4.45 (strongly agreed of respondents) and standard deviation of .926425 recognized as positive and very high correlation.

5.1.3. The effects of market price determination on performance of mining projects of Piran Rwanda Ltd

The table 4.7 shows the results about 3 items that were assessed about the effects of market price determination on performance of mining projects of Piran Rwanda Ltd. The results showed an overall strong mean of 4.35 meaning that market price determination provided by Mining projects of Piran Rwanda Ltd, are very strong. The first article as the commodities' prices influence performance of mining projects of Piran Rwanda Ltd, and it proves that respondents are strongly agreed with mean of 4.32 then for positive and very high correlation with standard deviation of .91803; the second article showed that the values addition influence performance of mining projects of Piran Rwanda Ltd, and it is approved by respondents that are only agreed with mean of 3.97 with positive and high correlation of standard deviation as .74418; the third article as the quality and quantity of products influences performance of mining projects of Piran

Rwanda Ltd, and it proves that respondents are strongly agreed with mean of 4.78 and positive and very correlation standard deviation of .94312.

5.2. Conclusion

Piran Rwanda ltd model of intergrating the small scale miners in their mining projects was proven effective provided that the parameters studied in this research are implemented. The results about three parameters that were studied about the determinants that afford the level of performance in mining projects of Piran Rwanda Ltd, showed an overall strong mean of 4.025 that provides the strong approximation. The first spot showed that the financial income and international market access determines the performance level of mining projects of Piran Rwanda Ltd, and it is proved by respondents who strongly agreed about that statement with mean of 4.31 respected by positive with very high correlation standard deviation of .927672; the second item showed that the projects sustainability determines the performance level of mining projects of Piran Rwanda Ltd, and it is supported by respondents who were agreed about that statement with mean of 4.03 respected by positive and high correlation standard deviation of .703962; the third item showed that the supplied products determine the performance of mining projects of Piran Rwanda Ltd, and it is confirmed by respondents were agreed about that statement with mean of 4.06 and it is respected by positive and high correlation as standard deviation of .708724.

The R^2 equals to 0.969 (96.9%) and Adjusted R^2 equals to 0.965 (96.5%), show the goodness of fit of the estimated model. Up to 96.9% of long-run appreciation in performance of mining projects of Piran Rwanda Ltd is influenced by changes in operational incentives; capacity building; market price determination as implemented by mining projects of Piran Rwanda Ltd.

Therefore, the researcher can conclude by saying that the research hypotheses including: "H_1: operational incentives has statistical effects towards performance of mining projects of Piran Rwanda Ltd; H_2: capacity building has statistical effects towards performance of mining projects of Piran Rwanda Ltd and H_3**:** market price determination has statistical effects towards performance of mining projects of Piran Rwanda Ltd"; all were tested; verified and then they are confirmed referring to the statistical (regression analysis) findings and then according to the

research, the correlation of 0.916 (91.6%) is located in the interval [0.75 - 1.00], categorized as positive and very high correlation; this leads to confirm that there is significant relationship between small scale miners with its observed indicators (factors) and performance of mining projects of Piran Rwanda Ltd.

5.3. Suggestions

5.3.1. Suggestions to Mining projects of Piran Rwanda Ltd

Small scale miners (or simply ASM) should not be neglected at all levels of mining projects starting from prospection, exploration, prefeasibility studies, mining, and closure if there is a need for success of mining projects but rather there is a need to support them in the areas of weakness by providing all facilities possible to deliver on the mining projects. To allow projects actors learn from each other's experiences, building on expertise and knowledge;

1. To ensure the security in small scale miners services as most if not all users expect it;
2. To reveal professional mistakes and offers paths for learning and improvements;
3. To provide a way to assess the financial crucial link between implementers and beneficiaries on the ground and decision-makers;
4. To sensitize mining operators especially the large scale mining companies to empower small scale miners and be able to deliver best quality services by engaging them in the first place through public consultation at all levels and include them in the dialogue prior commencing their operations5.3.2. Suggestions to further researchers.

5.3.2. Suggestions to further Researchers at large

The current researcher would like to provide the partial suggestions regarding to further researchers willing to carry out their researches, thus they are suggested to take reference to this research project in order to improve their researches and information as findings. Therefore, the future researchers are suggested to work on the following research topics:

1. The impact of operational incentives towards performance of mining projects in Rwanda.
2. Assessment of the influence of capacity building implementation on performance of mining projects in Rwanda.

3. Factors affecting market price determination on performance of mining projects in Rwanda.

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APPENDICES

APPENDIX 1: COVER LETTER

Dear Respondent,

I, RYUMUGABE Sam; student at the University of Kigali; in postgraduate program, Master of Project Management; as part of the academic requirements, I have undertaken a research project entitled:"***The role of small scale miners towards performance of mining projects in Rwanda, the case of projects of Piran Rwanda Ltd***".

With reference to this project, there are questions which have been designed for the collection of data that will lead to the successful completion of the study. Therefore I kindly request you to fill this questionnaire, your views on various aspects of this study will be of great value to it, and all information you furnish in response to this questionnaire will be treated with confidentiality. Please spare few minutes to answer it and you may feel free when answering the questions. I kindly respect your significant collaboration.

Thank you for your cooperation.

Names: RYUMUGABE Sam

Date: ……/……./ 2021 and **Signature**:……

APPENDIX 2: QUESTIONNAIRE

Instructions: 1} Tick in brackets the answer related to the true information

2} So, kindly grade by order of importance form: Strongly Agree (SA); Agree (A); Neutral (N); Disagree (D) and Strongly Disagree (SD)

SECTION ONE: GENERAL IDENTIFICATION OF RESPONDENTS

Q_1: Gender of respondent

Male……[ ]

Female…..……[ ]

Q_2: Education level of respondent

Secondary level.. ……[ ]

Bachelor level……..…[ ]

Master level……..…[ ]

PhD level…….[ ]

Q_3: Marital status of respondent

Single……..….[ ]

Married……..…..[ ]

Widower…….....[ ]

Divorced…….....[ ]

Q_4: Age of respondent

Below 20 years old.....[ ]

Between 21 -30 years old ……. [ ]

Between 31-40 years old …….. [ ]

Between 41-50 years old …….. [ ]

51 and above years old ……..... .[ ]

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SECTION TWO: QUESTIONS RELATED TO THE RESEARCH OBJECTIVES OF THE STUDY

Q_5: The following items are the indicators that determine the effects of operational incentives on performance of mining projects of Piran Rwanda Ltd:

The items	SA	A	N	D	SD
i. Basing on operational incentives; the material facilities influence performance of mining projects of Piran Rwanda Ltd					
ii. Basing on operational incentives; the micro grant influences performance of mining projects of Piran Rwanda Ltd					
iii. Basing on operational incentives; the financial bonus influences performance of mining projects of Piran Rwanda Ltd					

Q_6: The following items are the indicators that assess the effects of capacity building on performance of mining projects of Piran Rwanda Ltd:

The items	SA	A	N	D	SD
i. Basing on capacity building; the training programmes and formalization of operators influence performance of mining projects of Piran Rwanda Ltd					
ii. Basing on capacity building; the innovation affordable methods influence performance of mining projects of Piran Rwanda Ltd					
iii. Basing on capacity building; the consolidation of stakeholders influences performance of mining projects of Piran Rwanda Ltd					

Q_7: The following items are the indicators that analyse the effects of market price determination on performance of mining projects of Piran Rwanda Ltd:

The items	SA	A	N	D	SD
i. Basing on market price determination; the commodities' prices influence performance of mining projects of Piran Rwanda Ltd					
ii. Basing on market price determination; the values addition influence performance of mining projects of Piran Rwanda Ltd					
iii. Basing on market price determination; the quality and quantity of products influence performance of mining projects of Piran Rwanda Ltd					

Q_8: The following items are the indicators that prove and determine the performance of mining projects of Piran Rwanda Ltd:

The items	SA	A	N	D	SD
The financial income and international market access determines the performance of mining projects of Piran Rwanda Ltd					
The projects sustainability determines the performance of mining projects of Piran Rwanda Ltd					
The supplied products determine the performance of mining projects of Piran Rwanda Ltd					

Thank you for your valuable collaboration and time in answering to these questions.

RYUMUGABE Sam

APPENDIX 3: RESEARCH BUDGET

Articles	Amounts of costs (Rwfr)
Academic research fees	350 000
Printing and binding	60 000
Communication and transports	40 000
Foods and drinks	100 000
Unpredicted costs	50 000
Total	**600 000**

APPENDIX 4: RESEARCH TIMELINE

ACTIVITIES	MONTH OF THE YEARS (2020 and 2021)																			
	December 2020				January 2021				February 2021				March 2021				April 2021			
Number of Weeks	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Introduction																				
Literature Review																				
Chapter three																				
Correction of research proposal																				
Submission and presentation of research proposal																				
Data collection; Data analysis and Processing																				
Submission of draft copy																				
Presentation and end of the research project																				