Veronese Marie Josee
Mount Kenya University,
Kenya

George Gongera
University of Kenya,
Kenya

Emma Anyika
University of Kenya,
Kenya

An empirical evaluation of the comparative advantage of cost measures on performance of the telecommunication industry in Rwanda

Veronese Marie Josee, George Gongera and Emma Anyika

Abstract
Although tactical advantage may be gained by reducing price it is likely to be followed by competitors. In the long run, a low price-strategy cannot be pursued without a low-cost base. The key challenge is how costs can be reduced in ways which others cannot match such that a low-cost strategy might give a sustainable competitive advantage. The study aimed to assess the cost leadership strategy on organizational performance of the Telecommunication Industry in Rwanda. This study was guided by the following specific objectives: To compare the cost effect of hiring skills; sourcing for services; office space and telecom infrastructure on the performance of the telecommunication industry in Rwanda. The study was based on four theories namely; insider-outsider theory, agency theory, managerial risk aversion theory and information society theory. The study adopted a comparative research design based on secondary data of Mobile Telephone Network since the study is intended to gather quantitative data on cost leadership strategy on performance of the telecommunication industry in Rwanda. The population of the study was the three telecommunication industries in Rwanda in 2016. Simple random sampling was done to pick a sample for the study thus Mobile Telephone Network was picked. Secondary data for sixty data costs of the sample were aggregated for the four strategy variables for five years from 2012 to 2016. The data in this study was modeled around the modern interpretation of the classical Ricardian model for the following comparative variables, hiring expatriates verses working with only local experts, when outsourcing has been done verses when outsourcing has not been done, leasing verses constructing a building and sharing infrastructure verses not sharing infrastructure. These were compared for percentage cost saved as well as periods. Fundamentally the study concludes that expatriates should be hired for short periods only ideally to train the locals and commence high technology firms after which the locally trained experts who cost lesser can then be left to continue their respective jobs using skills learnt. Although outsourcing does not save cost over time it does so in the short term and thus can be used for situations that require to be done urgently and effectively thus cost effective. Leasing should be done in the initial stages where equipment is not much and less space is utilized but after several months when more space is needed and thus costly, building a permanent structure is advised. For the case of sharing infrastructure all the relative values were undefined thus comparative advantage could not be derived leading to the absolute advantage for infrastructure and the prudent to conclusion that sharing infrastructure is overwhelmingly favored and thus should be adopted. This is particularly good news for the telecommunication industry in Rwanda which has continuously relied on price leadership to market their commodities in Rwanda as the well determined cost saving strategies in the study shall encapsulate their markets not only in Rwanda but even across boundaries because they will lead to the adoption of prudent cost saving strategies leading to lower priced service provision.

Keywords: Empirical, cost measures, performance, telecommunication

1. Introduction
Globally, the Telecommunication industry has become a vital revenue generation sector. For instance, at the end of 2008, worldwide mobile service revenues stood at USD 912.1 billion; outperforming the respective revenues generated by the pharmaceutical, IT hardware and semi-conductor sectors. While software and services generated more revenue than mobile services, mobile surpassed this sector in terms of year-on-year growth, and was the only industry of the aforementioned five to register double digit growth of 17.4 percent in terms of overall revenue between 2007 and 2008. It is estimated that by the end of 2017, worldwide mobile subscribers will total 5.47 billion (International Telecommunication Union, 2014) [11].

Corresponding Author:
Veronese Marie Josee
Mount Kenya University,
Kenya

The Telecommunication industry has also gone through some significant and revolutionary changes in the past two decades the world over. The industry used to be regarded as a natural monopoly before 1980s. In telecommunications industry, this was mainly due to the exceptionally large infrastructure requirements of delivering the telephone services right into households. The monopolistic nature of the industry also meant that the provider could charge excessive prices and gain monopoly profits. Therefore, the need for price regulation also became apparent. It thus became commonplace, all over the world, to have a monopoly company owned by the state for providing telecommunication services (Graham, 2008) [8].

Due to the problems in state owned enterprises, there was every reason to reform them. A combination of restructuring, privatization and establishing regulatory mechanisms were adopted in reforming these public enterprises. The restructuring started in US in 1980s where the monopolist American Telephone & Telegraph was dismantled into a number of smaller companies. Competition was introduced into long distance communications and then to local communications. Further, companies were allowed to operate in both broadcast and communications markets simultaneously. The next country to follow was UK with the opening up of their market which was the monopoly of British Telecom. Many countries in the European Union thereafter followed suit (Buda, 2010) [5].

Economic environment is changing rapidly and this change is characterized by such phenomena as the globalization, changing customer and investor demands, ever-increasing product-market competition. To compete successfully in these environment organizations continually need to improve their performance by reducing costs, innovating products and processes and improving quality, productivity and speed to market (Barato, 2011) [2]. Low cost relative to competitors is the theme running through the entire overall cost leadership strategy and the objective is clearly overall industry cost leadership. Attaining cost leadership typically requires aggressive construction of efficient scale facilities and vigorous pursuit of cost reductions through experience, tight cost and overhead control, avoidance of marginal customer accounts, and cost minimization in areas like research and development, service, sales force, advertising (Dong, 2012) [7].

As suggested by Porter (2008) a low-cost position gives a firm a defense against rivalry from competitors, because its lower costs mean that it can still earn returns after its competitors have competed away their profits through rivalry. A low-cost position defends the firm against powerful buyers because buyers can exert power only to drive down prices to the level of the next most efficient competitor. Low cost provides a defense against powerful suppliers by providing more flexibility to cope with input cost increases.

The factors that lead to a low-cost position usually also provide substantial entry barriers in terms of scale economies or cost advantages. Finally, a low-cost position usually places the firm in a favorable position vis-à-vis substitutes relative to its competitors in the industry. More specifically, Barney *et al* (2008) [3] mean that there are six main cost advantages or, sources of cost advantages for firms that successfully adopt cost leadership: size differences and economies of scale, size differences and

diseconomies of scale, experience differences and learning-curve economies, differential low-cost access to productive inputs, technological advantages independent of scale and policy choices.

Companies operating in telecommunication all over the world have followed aggressively a cost leadership strategy that involves developing economies of scale and making consistent efforts to reduce operation costs. The surplus generated has been reinvested in building facilities of an efficient scale, purchasing modern business related equipment and employing the latest technology. The reinvestments made by the companies have helped them to maintain their cost leadership position. This study investigated the Rwanda Mobile Telecommunication cost reduction strategies that enable reduction of costs that will enable reinvestment of the savings made.

Rwanda's history of mobile telecommunication companies was pioneered by MTN Rwanda cell which received a license in 1998 to provide GSM services for both post and prepaid subscribers. After the MTN RWANDACELL and the RWANDATEL, many more companies have joined the telecommunication industry in Rwanda. The third mobile company to enter the mobile communications market was Millicom named TIGO (owned by Luxembourg). In 2011 Bharti Airtel (Indian owned) secured a license to provide 2G and 3G cellular services.

David Ricardo developed the classical theory of comparative advantage in 1817 to explain why countries engage in international trade even when one country's workers are more efficient at producing every single good than workers in other countries. The typical modern interpretation of the classical Ricardian model has been done recently by Krugman and others in 2008 [13]. In the interest of simplicity, it uses notation and definitions, such as opportunity cost, unavailable to Ricardo. This study adopts the typical modern interpretation of the classical Ricadian model to weigh the advantages of dual cost strategies to facilitate cost reduction in the Rwandan telecommunication industry

1.2 Statement of the Problem

An organizations strategy consists of the moves and approaches devised by management to produce successful organizational performance. There are several potential pitfalls when competing on price. Although tactical advantage may be gained by reducing price it is likely to be followed by competitors. In the long run, a low price-strategy cannot be pursued without a low-cost base. The key challenge is how costs can be reduced in ways which others cannot match such that a low-cost strategy might give a sustainable competitive advantage.

Considering strategies as a method of growth, most of Telecommunication industries in Rwanda have used both internal and external strategies that can be either intended or emergent but strategic management still remain the main issue of the day troubles for the most organizations managers. This led to far reaching problem such as huge unforeseen operating costs as well as shortages in good financial resources.

Companies compete for attracting customers and they think they can cover the territory with only high tariffs in order to recoup big investment they made for purchasing equipment, rent or real estate expenses, outsourcing experts, recruiting local staff, and gain satisfactory benefices. The

telecommunication industry in Rwanda faces many problems as no company in telecommunication is able to cover the whole country. Even in the areas that companies are able to operate, the cost of telecommunication and internet connection services is still too high.

Despite three telecommunications companies in Rwanda the cost of communication in the country is still very high as compared to other neighboring countries in the East African Region. Rwandan companies in Telecommunication industry gain huge market share by focusing on price leadership and pay little attention on how cost leadership strategy promotes organizational effectiveness and goal attainment. Therefore, it is against this background that this study was done in the area of cost leadership strategy which has not been fully explored.

In this context, MTN RWANDA was sampled and its cost strategies comparatively assessed with the aim of providing a critical analysis whose results are expected to inform policy and practice on organizations use and benefits of cost leadership strategy eventually delivering more affordable services to the consumers at a reasonable price and gain advantage over competitors by reducing operational costs.

1.3 Objectives of the Study
1.3.1 General Objective
The study aimed to assess the cost leadership strategy on organizational performance of Telecommunication Industry in Rwanda.

1.3.2 Specific Objectives
This study was guided by the following specific objectives. These are to:
i.   To compare the cost effect of hiring skills on performance of telecommunication industry in Rwanda.
ii. To compare the cost effect of sourcing of services on performance of telecommunication industry in Rwanda.
iii. To compare the effects of cost of office space on performance of telecommunication industry in Rwanda.
iv. To compare the cost effect of Telecom infrastructure on performance of telecommunication industry in Rwanda.

1.4 Research Questions
The study was guided by the following questions:
i.   What is the cost comparison of hiring skills or/and expatriates in the performance of telecommunication industry in Rwanda?
ii. What is the cost comparison of outsourcing or/and not outsourcing services in the performance of telecommunication industry in Rwanda?
iii. What is the comparison of cost of constructing or leasing offices in the performance of telecommunication industry in Rwanda?
iv. What is the cost comparison of Telecom infrastructure sharing or not sharing in the performance of telecommunication industry in Rwanda?

1.5 Assumption of the Study
i.   The economy is working at the level of full-employment
ii. The economy is and using its productive capacity fully
iii. The relative demand curve reflects substitution effects and decreasing with respect to relative charges

2. Literature Review
2. Introduction
The increasing importance of telecommunications in modern economies, and the sector's pace of development have ignited interest in understanding the cost leadership strategy in the telecommunication sector. Porter (2008) argued that superior performance can be achieved in a competitive industry through the pursuit of a generic strategy, which he defines as the development of an overall cost leadership, differentiation, or focus approach to industry competition.

2.1 Theoretical Framework
2.1.1 Agency Theory of Strategic Management
Initially, the agency theory proposed that the reputation-compensation scheme rewards imitation as compensation for an investor depends on how his or her performance compares to the performance of other investors, and whether deviations from consensus are costly (Scharfstein and Stein, 1990) [16]. However, this concept was later extended to explain the relationships between different organizations. This theory has been applied to outsourcing in order to interpret the relationship between the organization and the vendor. Outsourcing is a practice used by different companies to reduce costs by transferring portions of work to outside suppliers rather than completing it internally. The theory suggests that the use of continuous monitoring and the reinforcement of the ties between two organizations (Barney & Hesterly, 2015) [4] can address any problems which might arise (Arrow, 1985) [1]. In addition to relationship management, this theory has been used to explore the preparation phase and, in particular, the stage where the organization considers all potential vendors and decides on which type of relationship it wishes to develop with them. This study relates to the part of the theory which weighs the cost effective strategies be it the internally sourced or externally sort.

2.12 Theory of comparative advantage
The initial Ricardian theory of comparative advantage states that if countries specialize in producing goods where they have a lower opportunity cost then there will be an increase in economic welfare. This study utilizes the Ricardian theory and a typical modern interpretation of the classical Ricardian model by Krugman *et al* 2008 [13] to model effective cost strategies. In doing so decisions are made on the choice of the cost strategy that is effective.

2.2 Empirical Literature
Many organizations have tried to implement the Porter's generic strategy of Cost- Leadership but due to dynamic macro-environments the success rate has been at best minimal. There are several potential pitfalls when competing on price (Whittington, 2013) [18]. These are: Margin reduction. Although tactical advantage may be gained by reducing price it is likely to be followed by competitors. In the long run, a low price-strategy cannot be pursued without a low-cost base. However low cost alone is not a basis for advantage. Managers often pursue low-cost strategies that do not give them competitive advantage. The key challenge is how costs can be reduced in ways which others cannot match such that a low-cost strategy might give a sustainable competitive advantage (Whittington, 2013) [18]. Customers start to associate low price with low product and

service benefits. This can be countered by focusing in markets where low pricing is valued by customers but other features are not (Shanker, 2014) [17]. Cost reductions might result in an inability to pursue a differentiation strategy. According to Gumbus and Lyon (2012) [9] balance scorecards can be used to reflect the interdependence of different performance factors which together will determine success or failure in an organization. Some of the indicators for critical success factors are capacity utilization, process capability, leadership competence, rank in customer survey. The studies done so far do not use the classical Ricardian model or the modified version nor do they model cost strategies. This study has derived a unique model for comparing cost strategies in general and specifically those for hiring expatriates verses working with only local experts, outsourcing verses not outsourcing, leasing verses constructing office space and sharing infrastructure verses not sharing infrastructure.

2.3 Conceptual Framework
In this research the conceptual framework shows the relationship between the dependent variables and the independent variable. The figure below shows the research's conceptual framework which illustrates the relationship between the variables of the research. The independent variables are measurable indicators of Cost Leadership Strategy objectives relating to performance while the dependent variable in this research is the measurable indicator of Performance of Telecommunication Industry. The intervening variables were the hypothetical variables used to explain casual links between the dependent and independent variables and the moderating variables changed the otherwise established effect of the independent variable upon the dependent variable particularly as a controller of cost where the independent variables were a requirement for continuity for example the need for experts at the onset of the organizations.
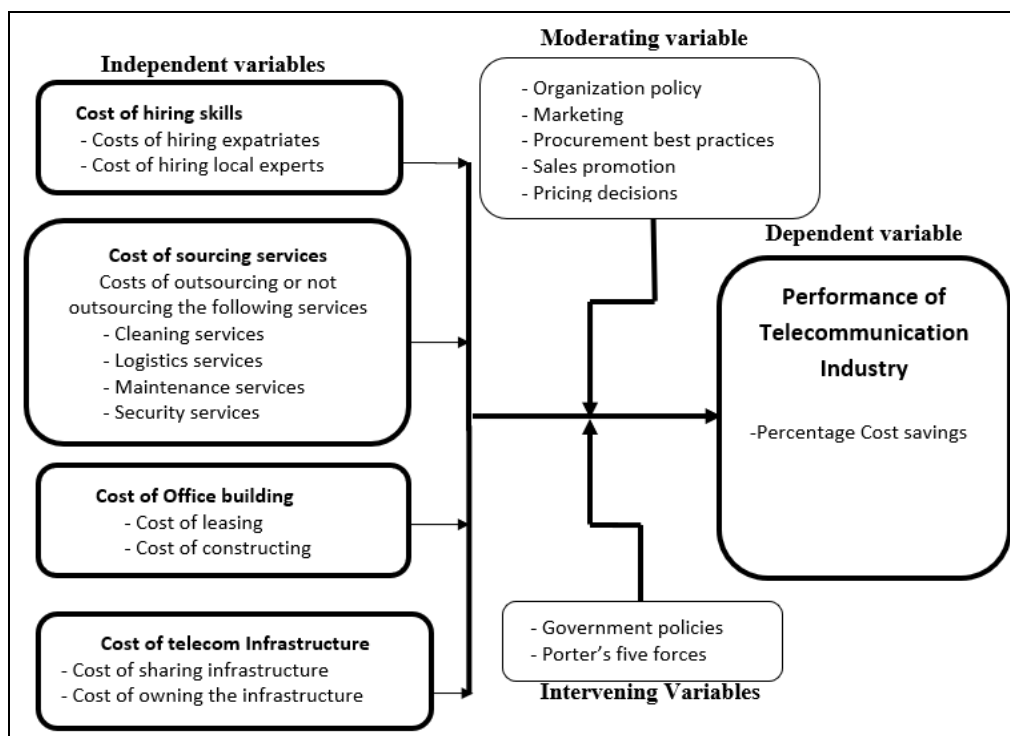
Fig 1: Conceptual Framework

3.0 Methodology
3.1 Data Analysis Methodology
The data was entered and analyzed using the classic Ricardo comparative advantage model (Ricardo 1819) where costs of providing the same utility is compared for different sources using a prior and relative methods. The research also used a typical modern interpretation of the classical Ricardian model (Krugman *et al* 2008) [13]. It uses notation and definitions such as opportunity cost, unavailable to Ricardo.

3.2 Modeling comparative costs strategies of MTN Rwanda
The data in this study is modeled around the modern interpretation of the classical Ricardian model as follows:
i.   Hiring expatriates verses working with only local experts
ii. When outsourcing has been done verses when

outsourcing has not been done
iii. Leasing verses Building
iv.   Sharing infrastructure verses not sharing infrastructure
v.   These are compared for percentage cost saved as well as period as follows:

These are compared for percentage cost saved as well as period as follows:
Given the Utility being compared be leasing verses building. Let the factor used for utility service or respectively.
Let the factor used for utility service or product be measured in Shillings S and per unit cost saved or period cost saved for leasing be αsc and αsp respectively. The total costs saved and period saved are Qs and Qp respectively. Per unit cost saved or period cost saved for constructing a building is represented by appending a prime $\alpha'sc$ and $\alpha'sp$ respectively.

3.2.1 Determination of Comparative advantage of leasing or building

To determine whether leasing a building is better than building That is αsc < α'sc and /or whether leasing has an absolute advantage over building.

Assume that leasing is more relatively cost saving That is given by αsc/ α'sc < αsp/ α'sp respectively and the relative total percentage cost saved and length of period cost is saved; = Tc /Tp will be determined uniquely by the intersection of relative demand Rc and Rp.

Assume that the relative demand curve reflects substitution effects and decreasing with respect to relative charges.

These are the resultant possibilities expected of the costs saved per given length of a period

i.   If Tc /Tp = αsc/ αsp < α'sc/ α'sp then leasing should be done for short periods for
ii.   If Tc /Tp < αsc/ αsp < αsc/ αsp then both leasing and building should be done periodically
iii. If αsc/ αsp < Tc /Tp = < α'sc/ α'sp then leasing will save cost as and building will save time too
iv.   If αsc/ αsp < α'sc/ α'sp < Tc /Tp then leasing and building are deemed to save costs
v.   If αsc/ αsp < α'sc/ αsp < Tc /Tp then leasing is cost saving and building time saving
vi.   And as long as the relative demand is finite the relative price is always bounded by the inequality αsc/ αsp < Tc /Tp = < α'sc/ α'sscs

The rest of the comparative variables are thus modeled

4. Data Analysis
4.1 Introduction

Using the method outlined in section 3 above data from the sampled Telecommunication industry was analyzed, interpreted and presented in the respective sections below.

4.2 Comparative Advantage Analysis
4.2.1 Aggregation of data

From section 3.2.1 i) if the subscripts are taken to be one month then the denominators become unitary and the total numerator will be equal to the monthly comparison thus enabling the enumeration of monthly periods when a strategy saves or does not save. When these periods are added for totals as in section 3.1 i.e. the total costs saved and period saved Qs and Qp respectively these are represented in the tables as total percentage costs saved and total length of period saved. When the averages are determined for opportunity cost comparison for totals as in sections 3.1.1 i)-v), then these are presented in the tables as relative percentage costs saved and relative length of periods saved. This is presented for the different strategies in tables in sections 4.1.2 to section 4.1.5 below. An online calculator Icalc (2019) was used to calculate and determine the comparative advantages for compared strategies in sections 4.1.2.2, 4.1.3.2, 4.1.4.2 and 4.1.5.2 which can also be done manually.

4.1.2 Comparative advantage analysis for hiring expatriates verses working with only local experts

**Table 1:** A table of comparison between hiring expatriates verses working with only local experts

	hiring expatriates	local experts
Total percentage cost saved	172	1350
Total length of period	10	50

4.1.2.1 Determining opportunity cost of hiring expatriates and working with only local experts

Table 2: A table of the opportunity cost of hiring expatriates verses working with only local experts

	Hiring expatriates	Local experts
Relative percentage cost saved	172/10	50/1350
Relative Length of period	10/172	1350/50

All the opportunity cost graphs were plotted online at Desmos (2020)
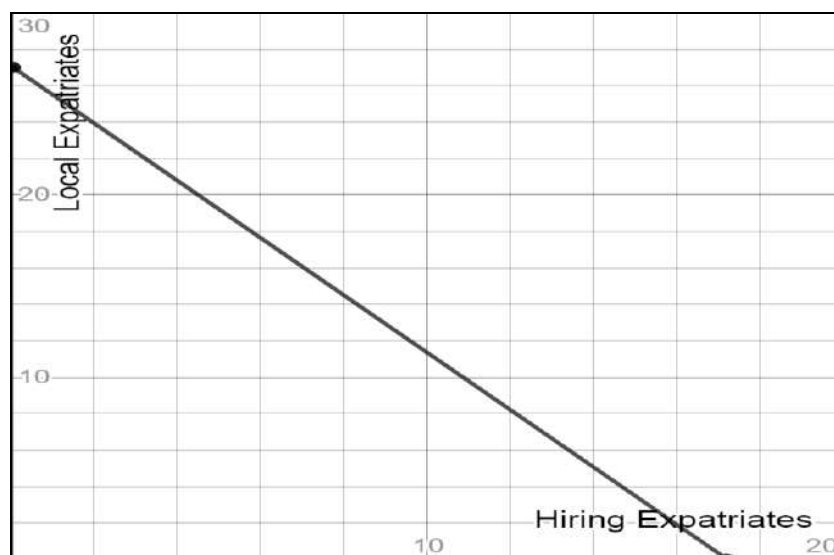
Fig 1: A figure of the opportunity cost of hiring expatriates verses working with only local experts

4.1.2.1.1. Estimating the cost saved per month by hiring expatriates

If the Cost saved in 10 months = 172%
Then Cost saved per months = 17.2%

4.1.2.1.2. Estimating the cost saved per month by hiring local experts

If the Cost saved in 50 months = 1350%
Then Cost saved per months = 1350/50 % = 27.5%

Thus the opportunity cost of saving cost per month will be higher for local experts than for hiring expatriates.

4.1.2.1.3. Estimating the time period of saving cost for hiring expatriates
If the 172% of cost is saved in 10 months
Then 1% of cost is saved in 10/172 months = 0.0581139 months

4.1.2.1.4. Estimating the time period of saving cost for hiring Local experts
If the 1350% of cost is saved in 50 months
Then 1% of cost is saved in 50/1350 months = 0.037037months
Thus opportunity time of period of saving cost is higher for hiring expatriates than local experts.

4.1.2.2 Comparative advantage calculation and determination of hiring expatriates verses local experts
Under comparative advantage a phenomenon cannot have all the advantages as much as possible In this case:
Hiring expatriates has a Comparative Advantage due to length of period, since it is 0.20 times better in reducing length of period taken and only 0.13 times better in Percentage cost saved local experts has a Comparative Advantage in producing Percentage cost saved, since it is 7.85 times better in producing Percentage cost saved and only 5.00 better in reducing length of period

4.1.3 Comparative advantage analysis for outsourcing verses not outsourcing
The data used in this section is mined from the appendix page 96

Table 3: A table of comparison between outsourcing and not outsourcing

	When outsourcing	Not outsourcing
Total percentage cost saved	2750	3154
Total length of period	36	24

4.1.3.1 Determining opportunity cost of outsourcing and not outsourcing

Table 4: A table of comparison between opportunity cost of outsourcing and not outsourcing

	When outsourcing	Not outsourcing
Relative percentage cost saved	2750/36	24/3154
Relative length of period	36/2750	3154/24
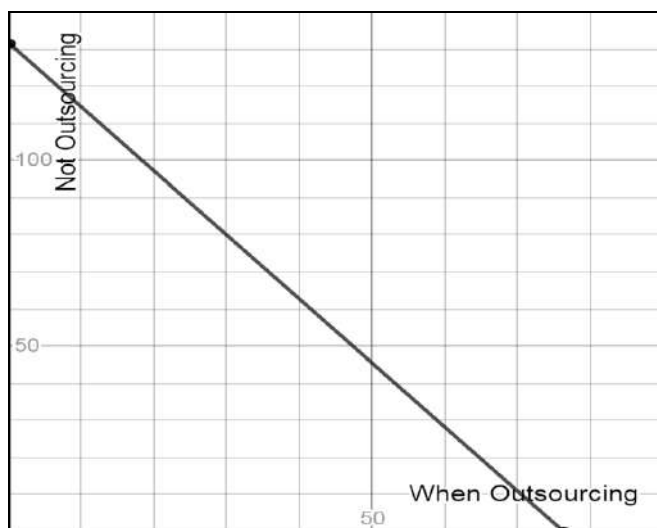
Fig 2: A figure of opportunity cost of outsourcing and not outsourcing

4.1.3.1.1. Estimating the Cost saved by outsourcing
If the Cost saved in 36 months = 2750%
Then Cost saved per months = 2750/36 % = 76.388

4.1.3.1.2. Estimating Cost saved not by outsourcing
If the Cost saved in 24 months = 3154%
Then Cost saved per months = 3154/24 % = 131.4167
Thus the opportunity cost of saving cost per month will be higher for outsourcing than not outsourcing since the cost

saved for outsourcing is lower than for not outsourcing

4.1.3.1.3. Estimating the time period of saving cost for outsourcing
If the 2750% of cost is saved in 36 months
Then 1% of cost is saved in 36/2750 months = 0.0581139 months

4.1.3.1.3. Estimating the time period of saving cost for not outsourcing
If the 3154% of cost is saved in 24 months
Then 1% of cost is saved in 24/3154 months = 0.007609 months
Thus the opportunity time of period of saving cost is higher for outsourcing than not outsourcing

4.1.3.2 Comparative advantage calculation and determination of outsourcing verses not outsourcing
Under comparative advantage a phenomenon cannot have all the advantages as much as possible. In this case;
Outsourcing has a Comparative Advantage due to length of period it takes to save cost, since it is 1.50 times faster than not outsourcing and only 0.87 times better cost saving
Not outsourcing has a Comparative Advantage in amount of percentage cost saved, since it is 1.15 times better in cost saved and only 0.67 faster

4.1.4 Comparative advantage analysis for Leasing verses constructing office space
The data used in this section is mined from the appendix page

Table 5: A table of comparison between leasing and constructing office space

	Leasing	constructing
Total percentage cost saved	429	86868
Total length of period	9	39

4.1.4.1 Determining opportunity cost of leasing and constructing office space

Table 6: A table of comparison between opportunity cost of leasing and constructing office space

	Leasing	Constructing office space
Relative percentage cost saved	429/9	39/86868
Relative length of period	9/429	86868/39
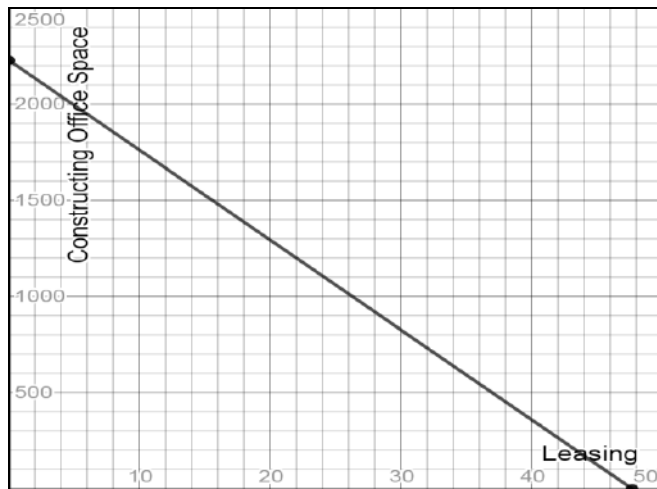
Fig 3: A figure of the opportunity cost of leasing and constructing office space

4.1.4.1.1. Estimating the Cost saved by leasing office space
If the Cost saved in 9 months = 429%
Then Cost saved per months = 429/36 % = 11.9167

4.1.4.1.2. Estimating the Cost saved by constructing office space
If the Cost saved in 39 months = 86868%
Then Cost saved per months = 86868%/39 % = 2227.3846
Thus opportunity cost of saving cost per month will be higher for leasing office space since the cost saved for Leasing is lower than that for Building

4.1.4.1.3. Estimating the time period of saving cost by leasing office space
If the 2750% of cost is saved in 36 months

Then 1% of cost is saved in 36/2750 months = 0.0581139 months

4.1.4.1.4. Estimating the time period of saving cost by constructing office space
If the 3154% of cost is saved in 24 months
Then 1% of cost is saved in 24/3154 months = 0.007609 months
Thus opportunity time of period of saving cost is higher for leasing than constructing office space

4.1.4.2 Comparative advantage calculation and determination for leasing than constructing office space
Under comparative advantage a phenomenon cannot have all the advantages as much as possible
Leasing has a Comparative Advantage due to length of period it takes to save cost, since it is 0.38 times better in saving time and only 0.00 times better in percentage cost saved constructing office space has a Comparative Advantage in percentage cost saved, since it is 202.49 times better in the cost saved and only 2.67 in length of period it takes to save

4.1.5 Comparative advantage analysis for sharing infrastructure verses not sharing infrastructure
The data used in this section is mined from the Appendix page

Table 7: A table of comparison between sharing infrastructure verses not sharing infrastructure

	Sharing	Not Sharing
Total percentage cost saved	20242	0
Total length of period	60	0

4.1.5.1 Determining opportunity cost of sharing infrastructure cost and not sharing infrastructure cost

Table 8: A table of comparison between opportunity cost of sharing infrastructure verses not sharing infrastructure

	sharing	Not Sharing
Relative percentage cost saved	20242/60	0/0
Relative length of period	60/20242	0/0

Fig 4: A figure of the opportunity cost of sharing infrastructure verses not sharing infrastructure

Note that there is no graph since the values for opportunity cost for not sharing is infinite

4.1.5.1.1. Estimating the Cost saved by Sharing
If the Cost saved in 60 months = 20242%
Then Cost saved per months = 29242/60 % = 337.3667

4.1.5.1.2. Estimating the Cost saved by not sharing infrastructure
If the Cost saved in 0 months = 0%
Then Cost saved per months = 0%/0% = infinite
Thus opportunity cost of saving cost per month will be higher for sharing since the cost saved is lower than that for not sharing

4.1.5.1.3. Estimating the time period of saving cost by sharing infrastructure
If the 20242% of cost is saved in 60 months
Then 1% of cost is saved in 60/20242 months = 0.0581139 months

4.1.5.1.4. Estimating the time period of saving cost by not sharing infrastructure
If 0% of cost is saved in 0 months
Then 1% of cost is saved in 0 months/ 0 months
Thus the opportunity time of period of saving cost is higher for not sharing than sharing

4.1.5.2 Comparative advantage calculation and determination for sharing verses not sharing infrastructure
Under comparative advantage a phenomenon cannot have all the advantages as much as possible
Sharing of infrastructure has a Comparative Advantage due to length of period it takes to save cost since it is 0.00 times faster to save cost than not sharing infrastructure and only 0.00 times better in percentage cost saved
Not Sharing has a Comparative Advantage in the amount of percentage cost saved, since it is 0.00 times better in cost saved and only 0.00 faster

5. Conclusion
5.1 Introduction
The chapter highlights the concrete results made and their usefulness and emphasizes the need to apply the major gains from the study and also makes recommendations for further research areas

5.2 Results
Cost has been known to be the driving force towards business successes and their estimation for control and also their comparison to enable the selection of the least cost functions is quite important for organization's cost effectiveness. Many new and midterm organizations which have not been in existence normally find it difficult to discern cost effective strategies and very often than not end up incurring costs that could have been easily avoided. This study has provided evidence of some of the cost effective strategies that may be adopted by organizations. By using comparative cost data for the Rwandan telecom giants MTN the study has been able to clearly isolate the cost effective strategies or not using the Ricardo comparative advantage model (Ricardo 1819) where costs of providing the same utility is compared for different sources using aprior and relative methods. The data was thus comparatively analyzed and opportunity costs saved and opportunity time saved per month determined as evidenced in chapter four above thus resulting in the following fundamental conclusions:

5.2.1 Hiring expatriates verses working with only local experts
In hiring expatriates verses working with only local experts the comparative advantage results in 4.1.2 supports the fact that expatriates would be hired for short periods only ideally to train the locals and commence high technology firms after which the locally trained experts who cost lesser can then be retained to continue in their respective positions applying the knowledge and skills acquired from the experts

5.2.2 Outsourcing verses not outsourcing
The results of comparative advantage in section 4.1.3 above supports the fact that although outsourcing does not save cost over time it does so in the short term and thus can be used for situations that require to be done urgently and effectively thus cost effective.

5.2.3 Leasing verses Construction of office space
In the comparative analysis of leasing verses construction of office space from section 4.1.4 above, leasing has an advantage initially thus would be done in the initial stages where the space required is not voluminous thus leading to less space being utilized but after several months when more space is needed and thus costly, constructing a permanent structure has a comparative advantage

5.2.4 Sharing infrastructure and not sharing infrastructure
In the comparison between the sharing infrastructure and not sharing infrastructure in section 4.1.5 the results indicate that for the case of not sharing infrastructure all the comparable values are undefined thus the two cases are not comparable thus the zero results for comparative advantage. It was thus prudent to conclude that sharing infrastructure is overwhelmingly favored and thus should be adopted

5.3 Finding
Most comparative cost analysis models determine the cost advantage of commodities across different countries. This study has generated a new model that compares costs saved by cost saving strategies as well as time periods within which this is saved for the same strategies resulting in sound results in chapter four and prudent conclusions in the sections 3.1.1 to 3.14 above. It is hoped that this new modeling method will ease the process of cost comparative analysis particularly in individual organizations as well as across board and enable prudence in determining the most cost effective strategies that not only save cost but also and /or saves time too. This is particularly good news for the telecommunication industry in Rwanda which has continuously relied on price leadership to market their commodities in Rwanda as the well determined cost saving strategies in the study shall encapsulate their markets not only in Rwanda but even across boundaries because they will lead to the adoption of prudent cost saving strategies leading to lower priced service provision

5.4 Recommendations for further research
The study recommends further research in comparing more

cost saving measures which will further shed light on the total cost saving of an organization since it was not possible to measure all of them. For example transport costs, marketing and research and innovation costs. The study also recommends future study to compare a lot of the costs between the companies since in this case only four cost strategies were comparable among the two different organizations.

References
1. Arrow KJ. The Economics of Agency. In J.W. Pratt und R.J. Zeckhauser, Principals and Agents: The Structure of Business, Boston, 1985, 37-51.
2. Barato M. The application of Cost, Differentiation & Hybrid Strategy in Business, 2011.
3. Barney J, Hesterley M. 'Firm resource and sustained competitive advantage', Journal of Management, 2008; 17:99-120.
4. Barney J, Hesterley M. Strategic Management and Competitive Advantage: Concepts, Pearson Educational Limited, 2015.
5. Buda A. Life-time of correlations and its applications Wydawnictwo Niezalezne: 2010; 1:5-21, December.
6. Desmos. PPF graph, 2020. https://www.desmos.com/calculator/e8tgy9k7wh
7. Dong S, XinXu S, Xiaoguo, Zhu K. Information Technology in Supply Chains: The value of IT enabled resources under competition. Journal of Information Systems Research. 2012; 20:18-32.
8. Graham B. The effects of an entrepreneurship programme on need for achievement and locus of control of reinforcement, International Journal of Entrepreneurial Behaviour and Research. 2008; 4(1):28-50
9. Gumbus A, Lyons B. The balanced scorecard at Philips Electronics, Strategic Finance, 2012.
10. Icalc. 2019. https://icalc.co.il/calculators/index.php/economics-calculators/134-comparative-advantage-calculator.html Free online calculators
11. International Telecommunication Union, Measuring the Information Society Report 2014
12. https://www.itu.int/en/ITU-D/Statistics/Pages/publications/mis2014.aspx
13. Krugman P, Obstfeld M. International Economics: Theory and Policy (2008 ed.). New York: Prentice Hall. 1988, 27-36.
14. Porter ME. Towards a dynamic theory of strategy, Strategic Management Journal. 2008; 12:95-117.
15. Ricardo D. On the Principles of Political Economy and Taxation (1 ed.), London: John Murray, retrieved 2012-12-07 via Google Books, 1817.
16. Scharfstein, David S, Jeremy C Stein. Herd Behavior and Investment. Amercian Economic Review. 1990; 80:465-479.
17. Shankar V, Bolton R. An Empirical Analysis of Determinants of Retailer Pricing Strategy. Journal of Marketing Science. 2014; 23:28-49
18. Whittington F. Entry Strategies for International Markets. Revised and expanded edition. Lexington Books, New York, 2013.