POWER RATIONING DILEMMA: A BLOW TO SMALL & MEDIUM ENTERPRISES (SMEs) PERFORMANCE IN MOSHI MUNICIPALITY, TANZANIA

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POWER RATIONING DILEMMA: A BLOW TO SMALL & MEDIUM ENTERPRISES (SMEs) PERFORMANCE IN MOSHI MUNICIPALITY, TANZANIA

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Abstract

Small and Medium Enterprises (SMEs) experience several challenges in their operations including power fluctuation and power rationing which in return lead to low production, poor provision of services and low incomes. Based on that, the study generally aimed at assessing the impact of power rationing dilemma on the performance of SMEs. The study was undertaken by using a survey research design whereby purposive and random sampling techniques were used to pick a sample of 28 SMEs while questionnaires, interviews and documentary review were used to collect data. Data were analysed through applying interpretive and reflexive qualitative approaches while quantitative techniques involved utilisation of descriptive statistics, cross tabulation, correlation and linear regression models. Findings revealed that presence of power rationing results into decline in SMEs productivity as was hypothesised which in return led to poor performance due to inability to provide the required customer service level. Also, that a decline in productivity and loss of income are positively correlated because without products to sell SMEs are not getting business income. Therefore, it is concluded that power rationing has an impact on the performance of SMEs as it affects productivity, incomes and profits.

Hence, it is recommended that SMEs should consider using alternative sources of power such as solar power, biogas, and where necessary share funds to buy power backup generators.

Keywords: Power Rationing, SMEs Performance, Productivity and Business Income

INTRODUCTION

Tanzania's economy has been growing steadily at a rate of 6% annually for the last 12 years and this growth pattern clearly indicates an increase in demand for power which is an integral part of any economy. However, investments into this sector may have been neglected by the Government, causing frequent power cuts and power rationing (Admin, 2011). The trend of most Governments in emerging economies seem to be more of reactive in nature as opposed to anticipatory in dealing with power generation. This phenomenon has become a norm and the effects have tremendous negative impact to the productivity of the economic sectors.

Statistics compiled by Southern Africa Power Pool (SAPP) in 2008 showed that power demand in the Southern Africa Development Community (SADC) region has increased at a rate of 3% per annum over the last 15 years. However, there has not been corresponding investments in generation and transmission infrastructure to match increase in demand. Consequently, generation surplus has been diminishing steadily over the past few years leading to excessive power cut offs and rationing as a recovery technique (Chirwa and Sinyangwe, 2008).

The impact of power rationing on Tanzania's economy is devastating. The rampant power outages have affected production and industries and business go for long hours without power. The total cost of production has also increased as industries spend a lot of money on petroleum fuel to run generators for power (Dalali, 2011). The cost of power outage to SMEs like kiosks, super markets, barber shops and stationery shops has been enormous. Nearly three-quarters of Tanzanian entrepreneurs identified electrical power as the most serious constrain on doing business, compared to the average for African countries of 20 percent (Cooksey, 2011).

Maleko (2005) confirmed that SMEs experience several problems as a result of power rationing and in return they have led to low production, poor provision of services and low incomes for SMEs such as stationeries, hairdressing salons and grain milling which are in need of electricity for service provision.

In November 2013, there was a chronic power rationing in Moshi Municipality and Tanzania Electricity Supply Company (TANESCO) statistics indicated that on average there was a consistent power rationing of 8 hours three times a week ranging from 06:00 to 14:00 or 14:00 to 22:00. These power shortages and poor-quality electricity services exacted an enormous toll on economic development and constrain many of the services on which SMEs

rely upon. Therefore, the power rationing dilemma has been a major blow to the performance of SME which in return hinders the contribution of the SME sector to the economy in terms of employment creation, provision of daily necessities and poverty reduction.

Objective and Hypotheses

The main objective of this study was:

To assess the impact of power rationing on the performance of selected Small and Medium Enterprises.

Based on the objective, the following hypotheses were developed and tested:

H_{A1}: There is a significant relationship between power rationing and decline of productivity in the SMEs operations

H_{A2}: Decline in productivity and loss of income are independent of each other as a result of power rationing

LITERATURE REVIEW

Power/electricity rationing

It is an intentionally engineered electrical power shutdown where electricity delivery is stopped for non-overlapping periods of time over different parts of the distribution region. Normally, power rationings are last-resort measures used by an electric utility company to avoid a total blackout of the power system. They are a type of demand response for a situation where the demand for electricity exceeds the power supply capability of the network (Edison Electric Institute, 2013). Rolling blackouts may be localised to a specific part of the electricity network or may be more widespread and affect entire country due to insufficient generation capacity or inadequate transmission infrastructure to deliver sufficient power to the area where it is needed.

Power is a prerequisite for proper functioning of nearly all sub-sectors of the economy. It is an essential service, whose availability and quality determines success or failure of development endeavours (URT, 2003). This argument is valid particularly when we consider supply of energy to small and large firms/businesses dealing with service provision and manufacturing, where power is used as an input in the operations/production process rather than a final consumption service. Hence, a temporary stoppage of power can lead to relative chaos. While a loss of power in smaller scale settings may not be life threatening but can result in lost data, missed deadlines, decrease in productivity or loss of revenue.

Small and Medium Enterprise

There is no consensus of SME definition as various countries had definitions depending on the phase of economic development and their prevailing social conditions. In this, various indexes are used by countries to define the terms such as number of employees, invested capital, total amount of assets, sales volume (turn over) and production capability. For instance in Nigeria a small scale business is defined as an enterprise that has a capital outlay of between N1.5million and N 50million including working capital but excluding cost of land, and a workforce of between 11-100 employees (National Council for Industry, 2002). Generally, these enterprises engage in the production of light consumer goods that are primarily related to food and beverages, clothing, electrical parts, automotive parts, manufacture, leather products, soap and detergents and woodworks (Olabilis, 2011).

In the context of Tanzania, microenterprises are those engaging up to 4 people, in most cases family members or employing capital amounting up to Tshs. 5 million. The majority of microenterprises fall under the informal sector. Small enterprises are mostly formalized undertakings engaging between 5 and 49 employees or with capital investment fromTshs.5 million to Tshs. 200 million. Medium enterprises employ between 50 and 99 people or use capital investment from Tshs. 200 million to Tshs. 800 million (URT, 2002). For this study the SME definition basing on the Tanzanian context will be adopted though out.

Performance

Global Entrepreneurship Monitor (2004) defined performance as the act of performing or doing something successfully using knowledge as distinguished from merely possessing it. However, performance seems to be conceptualised, operationalised and measured in different ways thus making cross-comparison difficult. The most comprehensive summary of factors influencing performance was noted in a literature review by Theo *et al* (2007) to include individual characteristics, parental influence, business motivation and goals, business strategies, goals and motives, networking, entrepreneurial orientation and other environmental factors.

However, Thibault *et al* (2002) suggest that factors influencing business performance could be attributed to personal factors and business factors such as amount of financing, use of technology, age of business, operating location, business structure and number of full-time employees which are important factors in examining the performance of small scale business operators. In this study performance is referred as the ability of the SMEs to produce, meet customer orders and achieve profitability over time through generating desired incomes.

Nature of SMEs in Tanzania

There are varieties of SMEs in Tanzania that can be distinguished according to the nature of activities and type of energy services they use for production or performing their services. SMEs such as brick burning, local beer brewing, salt drying, fish drying and charcoal production depend on biomass fuels as a source of power. Other SMEs like retail shops, salons, restaurants and bars, wood processing, welding, depend on electricity services for lighting, refrigeration, entertaining customers, cooking/baking, grain grinding and oil processing (Sawe, 2004).

The SMEs in Tanzania are characterised by very low productivity, poor infrastructure, inadequate power supply, low capital, poor market access, high prices of inputs and shortage of water (Kazungu, Ndiege, Mchopa & Moshi, 2014). Most are self-employed and located at home due to lack of designated work premises and not linked to modern sector (larger enterprise) because of people's ignorance of regulations. This means that they do not go through business formalities such as registration, keeping accounts and even paying taxes (Maleko, 2005).

Also, they use traditional and inefficient technologies in production. Furthermore, in rural areas SMEs are characterised with the problem of accessing and using electricity services and power rationing. This is due to lack of connection materials like fuses, cables, poles and transformers from electric supply utility; complicated and expensive tariff structure for rural people; illegal connection and vandalism of cables, theft of cooling transformer oil which result low voltage and fluctuation of power.

There are microenterprises which are seasonal in the sense that their lifetime depends on situation in other sectors such as agriculture. When there is a good harvesting period many enterprises of this nature are established and buy grains from farmers for processing example for local beer making. Some existing documentation support the argument by saying that micro-enterprises are neither registered nor licensed (Sawe, 2004). They are home-based activities and have been established for the reasons of survival rather than with a longer-term plan for growth.

Power generation and rationing situation in Tanzania

Tanzania generates its power using hydro-plants located in Mtera, Kidatu, Kihansi, Pangani, Hale, *Nyumba ya Mungu* and Gas plants located in Ubungo with gas produced from Songo Songo. The current capacity of electricity produced by the power generation plants stands at 500 Megawatts (MW) as opposed to 833MW required by the demand and Tanzania's economy size (Confederation of Tanzania Industries, 2011).

Since January 2011 to date, the power supply in the country has not been stable with constant power interruptions or disruptions due to factors which can be avoided. One potential

reason for this challenge is ever increasing demand for electricity due to the expanding economy size of Tanzania. It is also not surprising to see acute power crisis is due to the fact that all the power plants are not operating at full capacity or at a least efficiency levels. For example, Symbion, formerly Dowans, with capacity of 112 MW is currently producing 30 MW due to lack of adequate gas (Admin, 2011).

According to Confederation of Tanzania Industries (*i bid*) the major root causes (direct and indirect) of the challenge of electricity rationing in the country include policy hindrance as the country's energy policy does not explicitly provide enforceable provision to assure electricity supply; poorly coordinated policies that hinder private investors' effective participation in the energy sector to compete well with the overwhelming TANESCO (Tanzania Electricity Supply Company) monopoly, worn out infrastructure and vandalism on the power infrastructure, insufficient production without any reserve margin for any emergency and overdependence on hydro-power production which is susceptible to weather changes.

The power supply-SME Nexus

In both urban and rural areas of developing countries, SMEs are often constrained by lack of infrastructure, communications, and financial investment resources. Without these services, SMEs cannot function effectively, and their contribution to economic and social development is limited. Given the significant contribution of SMEs to worldwide job creation and income growth, it is crucial that infrastructure services be targeted to support these enterprises. Access to reliable, affordable energy services is vital for SMEs to operate efficiently and profitably, yet such access does not exist in many countries as observed by United States Agency for International Development (USAID 2006).

Basically, SMEs require a range of modern energy services to function efficiently and profitably. Electricity is needed to power tools, appliances, and productive equipment, and modern fuels are needed for heating, food processing, and transportation. In cities, SMEs need energy to operate shops, restaurants, hotels, small manufacturing operations and service industry applications. Better access to energy opens up broad opportunities for income-producing activities (Maleko, 2005). Dependably, power availability contributes to SMEs development through increasing productivity through mechanisation/automation, improving food preservation, promoting communication, increasing operating hours, entertaining customers and improving working hours. Hence, power is an important aspect in the operations of SMEs and absence of it can cause pandemonium that have a direct or indirect impact on the performance of SMEs in terms of serving customers, sales volume and profitability.

The effects of power rationing on the performance of SMEs

The occurrence of power rationing deprives SMEs electricity for running their operations effectively and as a result, production does not take place properly as there is no power to drive power depending productive equipment and other facilities. Hence, repeated power rationing eventually leads to a decline in production and consequently SMEs fail to reach their projected sales volume. Reduced sales volume translates into reduced business income because SMEs are unable to meet customer demand (Sing'andu, 2009).

Therefore, in order to protect their business and persistent fall in production, SMEs are forced to use alternative power sources such as solar energy, standby generators and other fuel or gas powered equipment (Maleko, 2005). Also, they tend to work on overtime basis in order to recover the lost production. However, the use of these alternatives results into an increase in production costs which negatively affects SMEs productivity. A combination of reduced income and increase in production costs ultimately results in reduce profits which in return impair SMEs performance financially and non-financially (Sing'andu, 2009).

METHODOLOGY

A survey research design was adopted to allow the collection of adequate data from a sizeable population in a highly economical way. The design was also flexible in data collection as multiple methods were used. The sample composed of 28 SMEs with access to grid power from TANESCO located in Moshi Municipality (the municipality is situated under the Southern slopes of Mt. Kilimanjaro which lies approximately 3°18 south of Equator and 37°20 east of Greenwich). The sample was drawn by using cluster sampling technique and constituted SMEs dealing with selling stationeries, providing printing and photocopying services, food vending kiosks, grocers, retail shops, grain milling, tailoring shops and hair dressing salons.

The study made use of multiple methods in gathering data. The use of multiple methods (triangulation) enabled the researcher to collect different types of data, see things in different perspectives which enhanced validity and supplement the weaknesses of one method through using other alternative methods. A survey questionnaire containing pre-coded open ended and closed ended questions was designed and distributed to the selected sample basing on research questions and frame of reference. The designed questionnaire was pre-tested before actual data collection to determine its suitability and changes were made in order to collect reliable data.

Structured and un-structured interviews were organised and conducted with the owners of SMEs and Staff. Interviews were used to collect primary data because of flexibility and less time consuming which allowed researchers to be responsive to situational issues. Also, various documents relating to SMEs operations, policies, performance, power supply and rationing were

reviewed to find secondary data for justifying research objectives and hypotheses. Data was collected successfully from all selected 28 SMEs located in Moshi Municipality that had access to and used grid power/electricity services either for production purposes or providing services. A response rate of 100% was observed.

To ensure validity the study was carried out in such a way that there was consistency between theory and practice through careful design of directions for measurements without variation. On the other side, Cronbach's alpha as a measure of internal consistency (i.e. coefficient of reliability) was used and the study had a reliability scale of 0.75 which proves it to be statistically reliable as proposed by George and Mallery (2003). The analysis of data involved the use of qualitative techniques in terms of interpretive and reflexive approaches while quantitative techniques made use of descriptive statistics (in terms of frequencies, descriptive and cross tabulation), linear regression and correlation techniques.

Correlation equation:

$$r = \frac{n\sum XY - \sum X \sum Y}{\sqrt{[n\sum X^2 - (\sum X)^2][n\sum Y^2 - (\sum Y)^2]}} \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\text{ (i)}$$

Regression equation:

$$INCLOSS = \alpha + \beta_1 PROD + \beta_2 COS + \varepsilon \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(ii)$$

RESULTS AND DISCUSSION

SMEs Profile

The 28 SMEs had different characteristics in terms of ownership, capital structure, number of employees, business specialisation and duration of business experience. The information is presented below:

Table 1: Preliminary SMEs Profile

Variable	Attributes	Frequency (n=28)	Percentage (%)
Amount of Capital Invested	1-2 million	14	50
	3-4 million	10	35.7
	5 million	4	14.3
Number of Employees	1-3 employees	10	35.7
	4-6 employees	16	57.2
	7-10 employees	2	7.1
Nature of Ownership	Male	8	28
	Female	14	50
	Male & Female	6	12

The preliminary profile of the surveyed SMEs shows that most of them (85.7%) have the capital of 1-4million and 1-6 employees (92.9%) which fit the category of SMEs as defined by the Small and Medium Enterprises Development Policy of 2002. The amount of capital invested had an impact on the use of alternative sources of power to avert the consequences of power rationing to the business. Among the SMEs, only 5 of them managed to buy power backup generators as their capital (4-5million) was enough to allow them to buy and operate the generators.

Power rationing and productivity

Power rationing occurrence results into stoppages of some production equipments which affect productivity. Last year there has been a series of rolling blackouts as shown by TANESCO statistics of November 2013. Nonetheless, statistics from the field show that majority of respondents (64.3%) commented that over the past two years power rationing has occurred more than 31 times.

The frequency of occurrence was high due to shortage of water in the dams for power generation and as a result there was power rationing in order to circumvent the problem of total blackout in the Region. Despite the high frequency of occurrence, 14 respondents (50%) pointed out that on average power rationing lasted for 6 hours per day. This is supported by TANESCO statistics of November 2013 which indicates that the Municipality had a consistent power rationing of 6-8 hours three times a week ranging from 06:00 to 14:00 or 14:00 to 22:00 per day.

This highly affected the operation of most SMEs in the areas that depended on power/electricity to run their production equipments or support service provision to customers such as Barbershops, Hair Dressing, Grain Milling, Photocopying and Printing, Grocers and Food Vending. Due to absence of power SMEs had low productivity (their productivity was declining) depending on the nature of the business as shown in Table 4.3.

Table 2: SME Specialisation * Productivity Loss Cross-tabulation

SME Business Specialisation	Productivity Loss	SME Count
Stationery	50%	4
Photocopying and Printing	60%	6
Hair Dressing	50%	3
Barbershop	60%	1
Grain Milling	50%	1
Food Vending	30%	7
Retail Shop	30%	4
Grocer	40%	2
TOTAL		**28**

As shown in the table 2, SMEs dealing with photocopying and printing, stationery, hair dressing, barbershop and grain milling had a high percentage (50%-60%) of declined productivity because they depend highly on power availability in order to be able to provide services to customers. When interviewed respondents pointed out that without power they can not print or photocopy works, dress hairs, cut hair or process the grains. Other SMEs dealing with food vending, retail shops and groceries had loss in productivity below 50% (ranging from 30% to 40%) because they do not depend much on power to produce.

Therefore, those SMEs highly depending on power remained idle without producing for the entire rationing period until the power came back This means that longer duration of power rationing causes more decline productivity in return as it was hypothesised earlier that "*there is a significant relationship between power rationing and decline in productivity*". In order to determine the significance on this relationship a correlation coefficient (r) and coefficient of determination (r^2) were used. Power rationing was considered to be independent variable (X) while decline in productivity be dependent variable (Y). Productivity was determined in terms of the production trend before power rationing and after power rationing during operational hours. Data is captured in Table below:

Table 3: Average power rationing duration and decline in productivity

Duration of power rationing (in hours) X	6	6	6	6	6	4	5	5
Decline in productivity (in %) Y	50	60	50	60	50	30	30	40

The test had a value of r = + 0.87 which entails a strong positive relationship between power rationing and decline in productivity. Therefore, the hypothesis is accepted as the longer the duration of power rationing the more SMEs were losing productivity regardless of their business specialisation area. Also, the test had r^2 = 0.76 value which implies that 76% of SMEs decline in productivity was contributed by absence of power for a period of 4 to 6 hours per day. The findings coincide with those of Sing'andu (2009) where the test on the length of load shedding and decline in production had r = + 0.85 and r^2 = 0.72. Hence, presence of power rationing results into decline in SMEs productivity as it was hypothesised which in return leads to poor performance due to inability to provide the required customer service level.

Power rationing and Business Income

Most of the SMEs lost some customers at the time of power rationing which implies that part of their business income was lost too as customers were not served. To determine the average amount of income lost, responses are presented in table 4.

Table 4: Amount of Income Lost * SME Specialisation Cross-tabulation

SME Specialisation	10 Percent	20 Percent	30 Percent	40 Percent
Stationery	0	1	1	2
Photocopying and Printing	0	1	2	3
Hair Dressing	0	0	1	2
Barbershop	0	0	0	1
Grain Milling	0	0	0	1
Food Vending	2	1	0	4
Retail Shop	0	2	2	0
Grocer	0	0	1	1

Statistics show that SME that lost 10% of income include (2 food vending kiosk), 20% include (1stationery, 1 photocopying and printing, 1 food vending and 2 retail shops), 30% include (1 stationery, 2 photocopying and printing, 1 hair dressing, I grocer and 2 retail shops) and with 40% loss include (2 stationery, 3 photocopying and printing, 2 hair dressing, 1 barbershop, 1 grain milling, 4 food vending and 1 grocer).

Stationery, photocopying and printing SMEs with 40% income loss when interviewed pointed out that the loss of income is highly contributed by inability to process customers work relating to typing, printing, scanning and photocopying. The production tools of such services are electric devices that cannot work without power supply. Hence, SMEs without power backup were completely off service and customers walked away to be served by other SMEs with power back up at the time of rationing. Likewise, researchers observed that hair dressing saloons and barbershop with 30% to 40% income loss were in a similar position of not being able to serve some customers as their electric equipments such as hand dryers, overhead dryers and hair cutting machines could not function because of power absence.

Similarly it was observed that food vendors and grocers with 40% income loss had a challenge of keeping products that needed cooling or refrigeration to preserve the quality until served to customer. Due to lack of power, food vendors had to throw away some rotten vegetables and fruits as a result of not being able to store them properly and preserve its quality. Grocers had the same problem with the perishable canned or bottled products such as fresh milk, yoghurt and vegetable that could not be preserved without power.

Moreover, the study went further to determine the significance of the relationship between decline in productivity and loss of business income among the SMEs. The study hypothesised that "*decline in productivity and loss of income are independent of each other as a result of power rationing".* The linear regression analysis technique was used to test the

hypothesis where productivity loss was considered to be the predictor while loss of income was a dependent variable. The output of analysis is presented in Table 5, 6 and 7 below.

Table 5: Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.72[a]	.518	.459	.75836

a. Predictors: (Constant), Productivity
b. Dependent Variable: Income Loss

Table 6: ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	13.726	1	13.726	23.866	.000[a]
	Residual	14.953	26	.575		
	Total	28.679	27			

a. Predictors: (Constant), Productivity
b. Dependent Variable: Income Loss

Table 7: Coefficients[a]

Model		Unstandardised Coefficients		Standardised Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	1.417	.374		3.786	.001
	Productivity	.648	.133	.72	4.885	.000

a. Dependent Variable: Income Loss

Analysis shows *r = + 0.72, p = 0.001 and 0.000* depicting a statistically significant relationship among the variables due to a strong positive correlation coefficient and a significant *p value (< 0.05)*. Hence, the hypothesis "*decline in productivity and loss of income are independent of each other as a result of power rationing*" is rejected because statistics show that a decline in productivity and loss of income are positively correlated.

Decline in productivity cause a decline/loss of income and further relationship can be established basing on the equation y = 0.648 (x) + 1.47 where **y** is the amount of predicted income loss basing on productivity (**x**). For example, if the SME experienced 40% productivity decline then the expected loss of income was 27.39% while for 50% productivity decline then 33.87% of income would have been lost. This shows that the longer SME were experiencing power rationing, the higher their productivity dropped, incomes declined and vice versa.

CONCLUSION

The occurrence of power rationing has led to a decline in production in general as SMEs were not in a position to produce and the longer the duration of power rationing the higher the enterprises were losing productivity as they were in no position to run production equipments. Therefore, there is a significant relationship between power rationing occurrence and decline in productivity among SMEs. Also, it was determined that power rationing has an impact on the SMEs business incomes and profitability. During power absence SMEs were not producing, customers went away while other SMEs incurred additional expenses to purchase power backup generators. All these reduced business incomes and increased expenditure which in return was reflected with declined business profits. Therefore, it is concluded power rationing has an impact on the performance of SMEs as it affects SMEs productivity, sales volume, incomes and profits.

Limitations of the Study

The study faced a number of limitations including limited secondary data regarding business records for some SMEs, fear of some respondents to fill the questionnaires or be interviewed and late return of questionnaires by some respondents. In order to overcome the observed limitations, researchers had to rely on other sources of data such interview and questionnaires in the absence of business records; make close follow up with respondents who claimed to be busy to fill the questionnaires and provided assurance for confidentiality to respondents who feared to respond.

Scope of future Research

The study focused on power rationing dilemma and the performance of Small and Medium Enterprises, hence, researchers recommend future studies should be done on Power Management in SMEs operations, Diffusion of Power Generation Technologies in SMEs operations and the use of Alternative Power Source in SMEs operations. These will yield more productive findings that will help SMEs to prosper domestically and beyond borders.

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