

Power Rationing: A Lethal Phenomenon Culminating the Dwindling Performance of Micro and Small Enterprises in Moshi Town Tanzania

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Abstract:

Micro and Small Enterprises (MSEs) 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 phenomenon on the performance of MSEs. The study was undertaken by using a cross sectional research design whereby judgemental sampling technique was used to purposively pick a sample of 32 MSEs while questionnaires, interviews and documentary review were used to collect data. Data were analysed qualitatively and quantitatively. Findings revealed that presence of power rationing results into decline in MSEs productivity which in turn led to poor performance due to inability to provide the required customer service level. Also, statistics show that a decline in productivity and loss of income are positively correlated because without products to sell MSEs are not getting business income. Therefore, it is concluded that power rationing highly impairs the

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performance of MSEs as it affects productivity, incomes and profits. Hence, it is recommended that MSEs should consider using alternative sources of power such as solar power and where necessary share funds to buy power backup generators.

Key words: Power Rationing, Performance, Micro and Small Enterprises

1.0 BACKGROUND

Electricity shortfalls have occurred in nearly every part of the world and will likely continue to occur as political, regulatory and financial hurdles make it difficult for government and energy utilities to invest the estimated USD 16.6 trillion needed to meet projected 2% annual electricity demand growth over the next 25 years (International Energy Agency, 2010d). Shortages in energy supply result into power rationing options as coping strategies and when prolonged can reduce economic competitiveness by creating uncertainty in electricity supply and increasing electricity costs. The impact of an electricity shortfall on an economy can be high. Power rationing cost the Pakistani economy several USD billion in 2007 alone (Burki, 2009). Power outages resulting from the 2009-10 electricity shortfall in Ethiopia led to an estimated Gross Domestic Product (GDP) loss of 1.5% (Tsehaye, Tamiru and Engida, 2010). Canada's total GDP in August 2003 fell 0.7% following the summer blackout in Ontario (Statistics Canada, 2003). Furthermore, the environmental impacts of a prolonged rationing can also be significant as consumers often invest in expensive on-site electricity generation produced by air-polluting fuels such as diesel (ESMAP, 2010).

In Tanzania the impact of power rationing on the economy is devastating as the rampant power outages have affected production activities as 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 Micro, Small and Medium Enterprises (MSMEs) like kiosks, super markets, barber shops and stationery shops has been enormous. Nearly three-quarters of Tanzanian entrepreneurs identified insufficient 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 MSEs experience several problems whereby some of them are due to lack of connection materials like fuses, cables, poles and transformers from electric supply utility; complicated and expensive tariff structure; illegal connection; vandalism of cables and theft of cooling transformer oil.

These results into low voltage, power fluctuation and power rationing which in return lead to low production, poor provision of services and low incomes for MSEs such as stationeries, hairdressing and hair cutting salons, grain milling and welding which are in need of electricity for service provision. Nonetheless, in other countries such as Ghana, Frederick and Selase (2014) found out that power rationing has a huge impact on the production trend which reflects a huge fall in profits for those MSEs. This is because, all things being equal, sales should result in profit and where sales is zero, then profits are erased. On the whole, a fall in production results in decreased sales and consequently reduced profit margins for MSEs. Also, in terms of service delivery, it was established that when power was inconsistent, the number of served customers was reduced considerably accounting for 24.25% reduction in service delivery. Hence, all these affect the performance of enterprises in terms of their ability to provide customer services effectively, reduced sales and profitability. Therefore, the study objectives were focused on determining the consequences of power rationing on the productivity of Micro and Small

Enterprises and to examine the influence of power rationing on the sales performance of Micro and Small Enterprises.

2.0 LITERATURE SYNTHESIS

2.1 Operational Definitions

Micro and Small Enterprises

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 from Tshs. 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). There are varieties of MSEs 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. MSEs such as brick burning, local beer brewing, salt drying, fish drying and charcoal production depend on biomass fuels as a source of power. Other MSEs 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 study focused on those MSEs depending on electrical power for production and serving customers.

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 (2007) to include individual characteristics, parental influence, business motivation and goals, business strategies, goals and motives, networking, entrepreneurial orientation and other environmental factors. In the context of this study performance is referred as the ability of the MSEs to produce effectively and efficiently, meet customer orders and achieve profitability over time through generating desired incomes.

2.2 Power Rationing and Rationing Strategies

Rationing allows officials to influence electricity consumption in a very direct way, by controlling the amount or timing of energy supply or obliging consumers to control their consumption subject to penalties. Rationing can be specific, e.g. administrators decide which users will cut back, when and by how much (ESMAP, 2010), or more general, e.g. an entire geographic area, economic activity or load type is targeted. Rationing can be voluntary, although it is usually mandatory, and different approaches can be used for different consumers (residential, commercial, industry, public sector, etc.). To maximise efficiency and cost effectiveness, rationing should provide an incentive for consumers to reduce their lowest-value consumption (ESMAP, 2010). Price signals are often used simultaneously with rationing. In short, rationing is a flexible tool that can be tailored to help alleviate many energy-shortfall situations.

Because rationing strategies affect economic activity and livelihoods, they all have some level of negative effects on consumers and the economy. However, some rationing strategies are more desirable than others. Consumption rationing via quotas or entitlements is a commonly accepted

approach because it is easy to understand and largely equitable. Under consumption rationing, an entire class of end-users (e.g., households or businesses) are required to reduce their consumption by the same amount, subject to penalties. Another rationing strategy – block load shedding - is commonly implemented but should be avoided. Load shedding is easy to implement and can prevent system collapse by cutting off electricity to blocks of customers. However this form of rationing causes economic losses, reduces reliability and damages customer morale (Heffner, 2009). Reliance on load shedding also has negative environmental impacts, as it often forces customers to invest in polluting and expensive diesel-generated back up power supplies. Pasquire (2011) noted the following advantages and disadvantages of each power rationing strategy:

Table 1: Power Rationing Strategy Details

Ration Strategy	Advantages	Disadvantages
Block Load shedding	<i>Easy to implement</i>	<i>Unpredictable, inefficient unpopular</i>
Consumption rationing via quotas or entitlements	<i>Largely equitable, easy to implement and explain</i>	<i>Inefficient, potentially harmful to vulnerable groups</i>
Market based rationing (quota and trade)	<i>Efficient, sustainable, minimises economic impact of shortfalls</i>	<i>More difficult to implement, requires strong leadership and good technical capacity</i>
Incentive/reward schemes	<i>Efficient, sustainable, encourages investment</i>	<i>More expensive in the short run</i>

2.3 Power Supply and MSEs Operations

In both urban and rural areas of developing countries, MSEs are often constrained by lack of infrastructure, communications, and financial investment resources. Without these services, MSEs cannot function effectively, and their contribution to economic and social development is limited. Given the significant contribution of MSEs 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 (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 MSEs 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 MSEs and absence of it can cause pandemonium that have a direct or indirect impact on the performance of MSEs in terms of serving customers, sales volume and profitability.

2.4 Power Rationing and MSEs Performance

The occurrence of power rationing deprives MSEs 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 MSEs fail to reach their projected sales volume. Reduced sales volume translates into reduced business income because MSEs are unable to meet customer demand and perform well in the market as observed by Sing'andu (2009). Therefore, in order to protect their business

and persistent fall in production, MSEs 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 MSEs performance financially and non-financially (Sing'andu, 2009). Therefore, based on the discussed literature it was assumed that:

A₁: There is a significant relationship between power rationing and decline of production in the MSEs

A₂: Power rationing highly affects MSEs' sales and ability to serve customers

A₃: Loss of income highly affects profitability of MSEs' as a result of power rationing

3.0 METHODOLOGICAL UNDERPINNINGS

The study was undertaken by using a cross sectional research design which allowed researchers to collect adequate data (regarding MSEs operations between 2013-2015) from a sizeable population in a highly economical way while allowing easy comparisons to be made as observed by Saunders and Lewis (2012). The study was done at Moshi Town that 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 size constituted of purposively 32 selected MSEs and judgemental sampling technique was used to approach owners as well as employees of identified MSEs

dealing with printing and copying, food vending, retail shop, grain milling, barbershop and female beauty salons.

Multiple methods of data collection were used to collect data (triangulation) which 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 respondents. The designed questionnaire was pre-tested before actual data collection to determine its suitability and enhance validity while adjustments were made in some doubted questions. Also, un-structured interviews were organised and conducted with the owners of MSEs to collect qualitative primary data. Furthermore, various documents relating to MSEs operations, policies, performance, power supply and rationing were reviewed to find secondary data for justifying research objectives and assumptions. Cronbach's Alpha as a measure of internal consistency (i.e. coefficient of reliability) was used to test reliability and the study had an alpha 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 interpretive qualitative approach while quantitative analysis involved the use of mean and standard deviation, cross tabulation, correlation and regression.

4.0 RESULTS AND DISCUSSIONS

4.1 Power Rationing Frequency and Decline in Production

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 Tanzania Electricity Supply Company (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 on occurred more than 31 times. The frequency of occurrence was high due to shortage of water in the power generation dams and as a result TANESCO had to ration power in order to circumvent the problem of total blackout in the country. Despite of the high frequency of occurrence, 53% of respondents pointed out that on average power rationing lasted for 6 hours per day. This was supported by TANESCO statistics of November 2013 which indicated that 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 per day. This highly affected the operation of most MSEs in the areas that depended on power/electricity to run their production equipments or support service provision to customers. Mostly, MSEs in the categories of Barbershops, Female Hair Dressing Salon, Grain Milling, Retail Shops, Printing and Photocopying were affected due to absence of power and as a result they had low production or sales due to low customers turn out.

Through cross-tabulation of MSE category and percentage of production loss findings from show that MSEs dealing with printing and photocopying, female hair dressing salon, barbershop and grain milling had a high percentage (50% to 60%) of declined production as they highly depend on power availability to produce and provide services to customers. During the interview respondents pointed out that without power they could not perform printing, photocopying, hair dressing, hair cut or grain processing services. Other MSEs dealing with food vending and retail shops had loss in production below 50% (ranging from 30% to 40%) because they do not depend much on power to produce or provide services. Therefore, those MSEs 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. In order to test the supposed assumption that “*there is a significant relationship between power rationing and decline of production in the MSEs’ operations*” correlation coefficient was used and the test had a value of $r = + 0.83$ and $r^2 = 0.69$ which entails a strong positive relationship between power rationing and decline in production. Hence, the assumption was accepted meaning that the longer the duration of power rationing the more MSEs were losing production. Likewise, the findings correspond with those of Sing’andu (2009) where the test on the length of load shedding and decline in production had $r = + 0.85$ and $r^2 = 0.72$. Furthermore, Frederick and Selase (2014) also found out that power rationing has a huge impact on the production trend which reflects a huge fall in profits for Small and Medium Enterprises results in decreased sales and consequently reduced profit margins for enterprises. Also, in terms of service delivery, it was established that when power was inconsistent, the number of served customers was reduced considerably accounting for 24.25% reduction in service delivery. Therefore, power rationing affects the performance of enterprises in terms of their ability to produce, provide customer services and profitability.

4.2 Power Rationing and Sales Volume

The surveyed MSEs use power to for several purposes including preparation of products for selling to customers, powering commodities storage facilities, lighting, commodities processing and enhancing service provision. With this regard, respondents were asked to give their response as to whether they have lost products due to poor storage or lost some customers waiting to be served as a result of power rationing. Findings shows that 46.8% of respondents agreed to have lost products due to absence of power while 53.1% disagreed. Those agreed when interviewed pointed out that they have lost some products due

to poor storage that led to deterioration of food products. Absence of power affects the performance of cooling devices which led to food vending and retail shops to lose perishable products such as vegetables. Printing and photocopying MSEs were affected as the work in progress was lost in some cases or damaged. On the other side some MSEs dealing with hair dressing and hair cutting have never lost products due to nature of business and operations.

Regarding loss of customers, 81% of MSEs owners agreed to have lost customers while 9% had not lost customers. The loss of customer was highly attributed to presences of power rationing among other factors. MSEs dealing with hair dressing, hair cutting, grain milling, printing and photocopying lost a lot of customers because without power they can serve very few customers. It was observed that most of them did not had power backup in case of power absence, hence, remained idle while customers walked away without being served. On the contrary, MSEs which had not lost customers during power blackout are those which were in a position to continue offering some services to customers. Mostly, these were MSEs in the category of retail shop and food vending whereby they were in a position to continue offering some services to customers even when there was no power.

On average, 24 surveyed MSE had lost some customers at the time of power rationing however, the magnitude differs depending on the nature of the business. Little secondary data was available but primary data shows that MSEs in the category of printing and photocopying, ladies hair dressing and barbershop lost up to 20 customers (forming 37.5%) per event of power rationing as their activities highly depends on adequate power supply. On the other hand the remaining MSEs (retail shops and food vending) suffered an average of 15 customers (forming 62.5%) depending on the type of services requested. Therefore, the assumption that *“Power rationing highly affects*

MSEs' sales and ability to serve customers" is accepted as it has been shown by the findings whereby the longer the duration of power rationing some MSEs lost products and customers which impaired sales in return. Similar findings were observed by Maleko (2005) and Frederick and Selase (2014) when assessing the impact of electricity on the performance of microenterprises. They found out that the combined loss of customer accounts for 24.25% reduction in service delivery.

4.3 The effects of Power Rationing on MSEs' Income and Profitability

Power rationing caused some MSEs to lose customers which in turn resulted into declined income which had a great impact on the MSEs profits during the entire power rationing period. Profit is an output of income hence, as long as the selected MSEs were losing incomes their profits were declining too. Statistics show that MSEs that lost 10% of income include (2 food vending kiosks), 20% include (1 stationery, 1 photocopying and printing, 1 food vending and 2 retail shops), 30% include (1 stationery, 2 photocopying and printing, 1 hair dressing, 1 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).

The owners of stationery, photocopying and printing MSEs 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 can not work without power supply. Hence, MSEs without power backup were completely off service and customers walked away to be served by other MSEs 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. Analysis depicts a statistically significant relationship among productivity and loss of income due to a strong positive correlation coefficient ($r = + 0.72$) and a significant p value (0.001). 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 MSEs 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 MSEs were experiencing power rationing, the higher their productivity dropped, incomes declined and vice versa.

The results of a test of the assumption that “*loss of income highly affects profitability of MSEs’ as a result of power rationing*” show a p value of 0.028 (i.e < 0.05) which statistically indicates a significant relationship between loss of income and profitability. Hence, the assumption was accepted meaning those MSEs which lost part of their incomes due to power rationing also experienced a decline in profit levels as there was inadequate income to justify the costs of operations incurred including purchase of power back-up generators. Similar finding were found by Frederick *et al* (2014) whereby there was

a significant relationship between frequent (announced) power fluctuation and profitability in terms of Return on Asset (ROA). The relationship was significant at p-value ($r = 0.004$) was less than 0.05 implying that the more frequent the power fluctuations, the lower the ROA of SMEs.

5.0 CONCLUSION

The occurrence of power rationing has led to a decline in production in general as MSEs 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 production among MSEs. Also, it was determined that power rationing has an impact on the sales volume of MSEs as it has caused them to loose customers and products. On the other side power rationing has a great effect on the financial performance of the MSEs which is reflected in the business incomes and profitability. During power absence MSEs were not producing, customers went away while other MSEs incurred additional expenses to purchase power backup generators. All these reduced business incomes and increased expenditure which in return cause declined business profits. Therefore, it is concluded that power rationing has an impact on operations which culminated the dwindling performance of MSEs in terms of production, sales, incomes and profits.

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