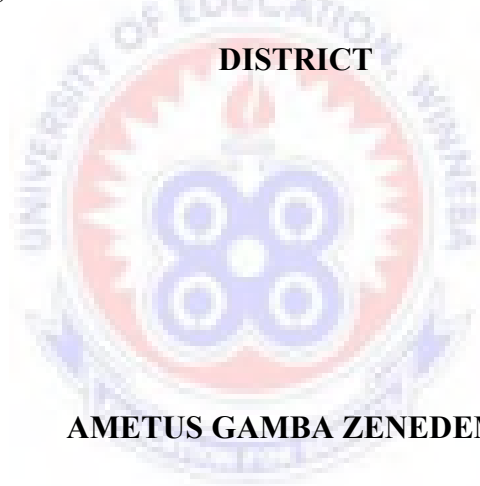


**UNIVERSITY OF EDUCATION, WINNEBA**  
**COLLEGE OF TECHNOLOGY EDUCATION, KUMASI**

**THE IMPACT OF SMALL-SCALE WELDING INDUSTRIES ON RURAL  
DEVELOPMENT; PROSPECTS AND CHALLENGES IN NADOWLI KALEO  
DISTRICT**



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**190013613**

**DESSERTATION SUBMITTED TO THE DEPARTMENT OF MECHANICAL  
TECHNOLOGY, UNIVERSITY OF EDUCATION, WINNEBA IN PARTIAL  
FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF  
MASTER OF MECHANICAL TECHNOLOGY EDUCATION**

**JUNE, 2020.**

## DECLARATION

### STUDENT'S DECLARATION

I **AMETUS GAMBA ZENEDEME** declare that, this dissertation is the result of my own original research, except for the references from other people's work which have been cited and acknowledged accordingly, and that no part of it has been presented for another award of degree in this university or elsewhere.

Signature: ..... Date: .....

### SUPERVISOR'S DECLARATION

I declare that, the preparation of this dissertation was supervised in accordance with the guidance and supervision of project work laid down by the University of Education, Winneba.

Signature: ..... Date: .....

**DR. SHERRY K AMEDORME**

## **DEDICATION**

I dedicate this piece of work to Almighty God who saw me through it all, and my late FATHER, my wife and my two lovely kids, ENOCH and CLAVIS.



## ACKNOWLEDGEMENT

I wish to thank all those who helped me in many diverse ways to come out with this dissertation. My esteem thanks goes to the almighty God the most Gracious and merciful, for his absolute guidance and protection throughout this programme.

I wish to express my profound gratitude and appreciation to the following persons: DR. SHERRY K. AMEDORME my supervisor who devoted time to go through my scripts to offer useful suggestion and advice to enable the completion of this dissertation. The Headmaster of WA Technical Institute for granting me permission to undertake the programme.

May the gentle souls my late father and siblings rest in peace. Mr. MALIK sundong MAD. JUSTINA BRAIMAH Mother, My wife madam DORIS DOMONINGE and my two lovely kids ENOCH and CLAVIS whose prayers kept me hopeful that all shall be well.

Finally, THOSE for lack of space and time cannot remember mention them here, all I say may God bless you.

## ABSTRACT

This study sought to investigate into the impact of small-scale welding industries on rural development, the prospect and challenges in NADOWLI KALEO district of the Upper West region. The population of the study consisted of members with electricity in their homes in some selected communities in the NADOWLI KALEO districts. Convenient sampling was used to select members of the sample frame. Two sampling techniques were employed in collecting the data. Thus, probability sampling and non-probability sampling. Purposive sampling technique was used to select particular sample participants from 20 communities who are involved in welding activities. The researcher used instruments like questionnaire, informal interview, focus group discussion and personal observation. In the analysis of data, the responses were presented using tables and figures. The evidence of the impact of small-scale welding industries included, employment, economic growth, entrepreneurial development, and poverty alleviation. The study also revealed some challenges facing the small-scale welding industries which included financial problems, management issues, socio-cultural problems, inadequate basic infrastructure and multiple taxation.

Finally, some suggestions and recommendations have been made at the end of the findings and these include, motivation of the unemployed youth to go into small scale welding by government, taxation and other militating factors be relaxed if not completely removed and internal and external factors to be put in check. These will help stakeholders in their efforts to put structures in place to facilitate the activities of small-scale welding industries.

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## **CHAPTER ONE**

### **INTRODUCTION**

The study generally looks at the impact of small-scale welding industries on rural development across the entire world but with emphasis on sub-Saharan Africa, Ghana and Nadowli Kaleo district to be precise. This chapter contains the background to the study, the problem statement, research questions, and research objectives. It also outlines the significance of the study, the research methodology, the scope of the study as well as the structure of the dissertation.

#### **1.1 Background to Study**

According to Kombo A.etal (2011) small and medium scale industries (SSIs) are generally regarded as the engine of economic growth and equitable development in developing economies. They are labour intensive, capital saving and capable of helping create most of the one billion new jobs the world will need by the end of the century. They are also perceived as the key to economic growth, poverty alleviation and employment generation. But their unimpressive performance in employment generation in recent years has generated a lot of research interests on their challenges and prospects.

After Nigeria's independence in 1960, much emphasis has been laid on the growth of small and medium scale industries as a means of reducing the incidence of poverty and unemployment in the country. Since the adoption of the economic reform programme in 1986, there has been a decisive shift from grandiose, capital intensive and large scale industrial projects based on import substitution to small scale industries with immense potentials for developing domestic linkages for sustainable industrial development.

Apart from SSEs potential for self-reliant industrialization using local raw materials, they are in a better position to boost employment, guarantee even distribution of industrial development and facilitate the growth of non-oil exports. Fissaeha. Y. (1991) states that SMEs employ 22% of the adult population in developing countries while Fabayo. J. A (1989) observed that small firms are major source of employment opportunities for a wide cross-section of the workforce: the young, old part-time workers and the cyclically unemployed. Kombo, et al,(2011) submitted that “SMEs have contributed greatly to the growth of Kenyan economy, accounting for 12-14% of GDP, through creating employment opportunities, training entrepreneurs, generating income and providing a source of livelihood for the majority of low income households in the country”.

Hence, promotion of such enterprises in developing economies like Ghana will bring about great distribution of income and wealth, economic self-dependence, entrepreneurial development and a host of other positive economic uplifting factors. Small scale enterprises are veritable engines for attainment of national objective in terms of employment generation at low investment cost, development of entrepreneurial capabilities and indigenous technology. They reduce the flow of people from rural to urban areas and can easily be established with minimal skill. They also contribute substantially to the country’s gross domestic product, export earnings and development of employment opportunities (Aremu, M. A. 2004).

## **1.2 Problem Statement**

In the 1985 Ghana established national board of small-scale industries (NBSSI) as an apex body for the development of small-scale industries in Ghana. However, these industries have played so many roles, like other countries of the world, SSIs in Ghana have the tendency to serve as sources of livelihood to the poor, create employment

opportunities, generate income and contribute to economic growth.

Still to create room for development of small-scale industries in Ghana, government established national board for small scale industries (NBSSI) in 1985 under act 434 of 1981 as an apex body for the development of small scale industries. However, in order to create a single dynamic and integrated organization adequately capitalized and capable of responding to the needs of small enterprise sector, the government merged the Ghanaian enterprise commission (GEDC) and cottage industries division of the department of rural housing and cottage industries (DRHCI) with the board in 1994 the board provide financial and non-financial services to potential entrepreneurs in the manufacturing and service sector.

Most SSWIs in Ghana die within their first five years of existence, a smaller percentage goes into extinction between the sixth and tenth year while only about five to ten percent survive, thrive and grow to maturity. Many factors have been identified contributing to this premature death of SSWIs. Key among them include: insufficient capital, irregular power supply, infrastructural inadequacies (water, roads etc.), lack of focus, inadequate market research, over-concentration on one or two markets for finished products, lack of succession plan, inexperience, lack of proper book keeping, lack of proper records or lack of any records at all, inability to separate business and family or personal finances, lack of business strategy, inability to distinguish between revenue and profit, inability to procure the right plant and machinery, inability to engage or employ the right caliber of staff, cut-throat competition.

It is observed that most of the problems of SSWIs are external to it, among them are those related to capital shortage, taxation and regulations, product liability patent and franchising abuses. The internal problems of SSWIs in Ghana include: inadequate working capital, stiff competition from larger companies, difficulties in sourcing raw

materials, low capacity utilization, lack of management strategies, poor educational background of operators, and huge financial problems while the external problems included: policy inconsistencies, multiple taxation, harsh regulatory requirements and trade groups. It is also important to note that SSWIs in Nadowli Kaleo district are not immune from the aforementioned challenges in their day to day operations hence it is imperative to investigate the impact of Small Scale Welding Industries on rural development, prospects and challenges.

### **1.3 Research Questions**

The research found answers to the following questions:

1. What are the types/kinds of welding industries in the Nadowli Kaleo District?
2. What are the challenges that face welding industries in ensuring rural development?
3. What are the prospects of the welding industry in the Nadowli Kaleo District?

### **1.4 Research Objectives**

Generally, the research objective sought to investigate and assess the prospects and challenges of small scale welding on rural development in the Nadowli Kaleo District.

#### **1.4.1 Specific Objectives**

1. To identify the various types of welding industries in the Nadowli Kaleo District.
2. To examine the challenges faced by welding industries in ensuring rural development.
3. To investigate the prospects of welding industry in Nadowli kaleo District.

### **1.5 Significance/Relevance of the Study**

The researcher hopes that the findings of the study will go a long way to improve the performance of small-scale welding industries in Ghana.

In the first place, the findings will be useful to the ministry of finance in formulating a policy action plan to address the challenges facing small-scale industries in Ghana. Similarly, the recommendations will provide useful suggestions to the players to enable them to deal with challenges facing small-scale industries. The study will also go a long way to outline the prospects of small-scale welding industries and the impact of these industries on rural development.

Furthermore, the outcome of the study may become a very resourceful reference material to various stake holders in the economy and readers who have general interest in gaining more knowledge about the impact of small-scale welding industries on rural development. Specifically, financial institution and investors will find the information useful when developing programmes to suit the growth of small-scale industries. Finally, the study results and recommendation may provide useful information to scholars and land owners to provide lands for siting of small-scale industries on rural areas.

### **1.6 Method of Data Analysis**

Both quantitative and qualitative methods were used to analyze data collected from the field. Impact measuring tools have been employed to determine the influence of the various indicators. Descriptive statistics and Statistical packages such as SPSS and Excel were vigorously employed to describe and analyze data collected respectively.



### **1.7 Scope of the Study**

The scope of the study covered two dimensional areas: theory and Geography.

- **Theoretical limit**

The study covered extensive literature on the various small scale welding policies implemented around the world. It considered various policies, programmes and projects implemented in Ghana and the Nadowli Kaleo district particularly. Journals, Articles and conference papers regarding socio economic activities, indicators and impacts have all been contacted as well.

- **Geographical limit**

Geographically, the study holistically looked at small scale welding across the entire Ghana placing emphasis on rural communities that have been connected to the national grid. The study also looked into the various kinds of welding industries projects that have been spread across the country. It has narrowed down its study area to the Nadowli Kaleo District in the upper west region concentrating on the study communities.

### **1.8 Limitation of the Study**

Certain weakness of the study could influence the results of its generalization but which the researcher had little or no control over. These weaknesses include;

- Luck of registration of members of small-scale welding industries under the national board of small-scale industries made it difficult to discover some industries in the district
- Time was another problem to the researcher because the researcher combining normal class room work with the dissertation was not an easy task. This actually affected the researcher to carry out detail and extensive work.

- Finally, although the topic under study was serious issue for economic development, materials on existing literature was a problem. Most of the existing literature were foreign materials

### **1.9 Structure of the Dissertation**

The dissertation is structured into five chapters. Chapter one of the study consist of the introduction which have constituted the background of the study, problem statement, research questions, objectives, significance of the study, methodology and organization of the study. Chapter two is treated as literature review. Here, the study reviewed literature on the impacts of small scale welding, the different ways of welding industries, challenges facing welding industries and prospects of the welding industry, the specific programmes and projects that have been carried out in the Nadowli Kaleo district.

A complete profile of the study area (Nadowli Kaleo District) has been provided under chapter three. In this chapter, areas of concern included demographic characteristics, socio-economic characteristics, livelihood economic activities and other sectors relevant to the study. Detailed analysis and presentation of data is treated in Chapter four (4). The final chapter as chapter five contains summary of key findings, conclusion and recommendations of the analyzed data.

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.0 Introduction

This chapter examines existing literature on the impact of small scale welding industries across the world, definition of terms etc. It cross examines the concept of small scale welding industries in relation to socio-economic development of rural society. The chapter further reviews research works on new thinking on socio-economic development, the various kinds of small scale industries, factors facing welding industries and prospects of welding industries.

#### 2.1 Definition of Welding

The fusing of the surfaces of two work pieces to form one, is a precise, reliable, cost-effective, and “high-tech” method for joining materials. No other technique is as widely used by manufacturers to join metals and alloys efficiently and to add value to their products. Most of the familiar objects in modern society, from buildings and bridges, to vehicles, computers, and medical devices, could not be produced without the use of welding. (American Welding Society, Vision for the Welding Industry, 2008).

Welding goes well beyond the bounds of its simple description. Welding today is applied to a wide variety of materials and products, using such advanced technologies as lasers and plasma arcs. The future of welding holds even greater promise as methods are devised for joining dissimilar and non-metallic materials, and for creating products of innovative shapes and designs.

The welding industry consists of the “users” of welding techniques as well as the companies, universities, and other organizations that provide the equipment, materials,

processes and support services for welding. All branches of the industry look for improvements in their operations by 2020, and should find their interests.

Welding is a joining process that produces a local coalescence of materials by heating, by applying pressure, or both. In essence, the welding process fuses the surfaces of two distinct elements to form a single unit. It encompasses a broad range of joining techniques that include fusion welding, solid state welding, weld bonding, diffusion welding, brazing, and soldering.

Welding is a skill or process that is used widely across several occupations and industries. The Department of Labor's Occupational Outlook Handbook indicates that more than 462,000 Americans were employed as welding, soldering, and brazing workers in 2006. However, this figure does not provide a complete picture of the number of 'welders' because it does not include occupations for which welding is an important skill, such as ironworkers, boilermakers, and pipefitters.

That 'welding' is a skill applied in more than 25 trades or occupations and a process utilized in many industries makes it difficult to evaluate the Welding Industry using traditional sources of labor market information. Since the primary purpose of this study is to determine the demand for workers skilled in the welding craft, data about the occupations and industries that require qualified or certified welding skills was gathered and analyzed. Most of this data comes from federal and state statistical agencies and is codified in two systems: the Standard Occupational Classification (SOC) and the North American Industry Classification System (NAICS).

### **Industries**

The manufacturing or technical productive enterprises in a particular field, country, region, or economy viewed collectively, or one of these individually. A single industry is often named after its principal product; for example, the auto industry. For statistical

purposes, industries are categorized generally according to uniform classification code such as Standard Industrial Classification (SIC).

Any general business activity or commercial enterprise that can be isolated from others, such as the tourist industry or the entertainment industry.

## **2.2 The Growth of a Start-Up and Its Industry**

According to Ralph Wanger (2007) the growth of a start-up depends less on an entrepreneur's talent than on the business he chooses. Sorry to deflate some egos here, but the industry you choose to start your company has a huge effect on the odds that it will grow. Over the past twenty years or so, about 4.2 percent of all start-ups in the computer and office equipment industry made the Inc. 500 list of the fastest growing private companies in the U.S. 0.005 percent of start-ups in the hotel and motel industry and 0.007 percent of start-up eating and drinking establishments made the Inc. 500. That means the odds that you will make the Inc 500 are 840 times higher if you start a computer company than if you start a hotel or motel. There is nothing anyone has discovered about the effects of entrepreneurial talent that has a similar magnitude effect on the growth of new businesses.

## **2.3 Glamorous Businesses versus Dull Businesses**

Glamour has nothing to do with a niche's appeal. A dull business run by a good businessman is far better than a glamorous business with mediocre management. And even if the glamorous business is run by a genius, often, in that kind of industry, its competitors are also geniuses, so nobody has an advantage, as I've commented about high-tech companies. (Scott Shane, 2008).

## **2.4 Rural development**

Rural development has always been an important issue in all discussions pertaining to economic development, especially of developing countries, throughout the world. In the developing countries and some formerly communist societies, rural mass comprise a substantial majority of the population. Over 3.5 billion people live in the Asia and Pacific region and some 63% of them in rural areas.

Although millions of rural people have escaped poverty as a result of rural development in many Asian countries, a large majority of rural people continue to suffer from persistent poverty. The socio-economic disparities between rural and urban areas are widening and creating tremendous pressure on the social and economic fabric of many developing Asian economies. These factors, among many others, tend to highlight the importance of rural development. The policy makers in most of the developing economies recognize this importance and have been implementing a host of programs and measures to achieve rural development objectives. While some of these countries have achieved impressive results, others have failed to make a significant dent in the problem of persistent rural underdevelopment.

The definition of “rural” differs by country, though it is usually used in contrast to “urban”. For instance, this word is defined based on population density in Japan, indicating an area other than “an area with over 5,000 people, which consists of each district with a population density of over 4,000 per square kilometer”. However, we cannot simply apply this definition to other countries. Moreover, due to the fact that the concept of “rural” varies from Asia to Africa, it is difficult to define it uniformly. Therefore, the use of “rural” (including fishing and mountain villages) as a relative concept to “urban”, based on social, economic, and natural conditions in each country may be most adequate. The term could also be used to describe areas where a majority

of the residents are engaged in agriculture in a broad sense (including livestock farming, forestry, and fisheries).

United States Census (2000 census) defines rural areas as comprising open country and settlements with fewer than 2,500 residents (population/administrative-based); areas designated as rural can have population densities as high as 999 per square mile or as low as 1 person per square mile (population/land use-based).

United States Department of Agriculture (2002 farm bill) defines rural areas as any area other than (1) a city or town that has a population of greater than 50,000 inhabitants, and (2) the urbanized areas contiguous and adjacent to such a city or town.

## **2.5 Small Scale Industries**

Typically, Smaller Enterprises (industries) face higher costs than larger enterprises in obtaining credit. Insufficient funding has been made available to finance working capital. Poor management and accounting practices to raise finance, information asymmetries associated with lending to small scale borrowers have restricted the flow of finance to smaller enterprises. An approach to learning how small enterprises (SSEs) perceive the impact of financial, regulatory, technical, marketing, and other input constraints, and to evaluating the results in relation to other empirical indicators. Lack of access to finance emerges as the binding constraint for smaller, less established firms in Ghana and for all the SSEs—not only is informal financing limited for Ghanaian firms, even firms of adequate size and experience have difficulty borrowing from banks, and, if they do borrow, have difficult relations with their lenders. In Ghana regulatory and tax constraints appear largest for the smallest firms, declining somewhat as firms grow: because enforcement is comprehensive, the bureaucratic burden of negotiating with government officials is greatest for small firms.

In Storey, (1994) opinion there is no single, uniformly acceptable, definition of small firm. Firms differ in their levels of capitalization, sale and employment. Hence, definitions which employ measures of size (number of employees, turnover, profitability, net worth, etc.) when applied to one sector could lead to all industry being classified as small, which the same size definition when applied to a different sector could lead to a result. The first attempt to overcome this definition problem was formulated an 'economic' and 'statistical' definition.

Under the economic definition, an industry is regarded as a small if it meets the following criteria: It has a relatively small share of the market place; It is managed by owners or part owners in a personalized way, and not through medium of a formalized management structure; It is independent, in the sense of not forming part of large enterprise.

The Committee also devised a "statistical" definition to be used in three main areas; Quantifying the size of the small firm sector and its contribution to GDP, employment, export etc; Comparing the extent to which the small firm sector's economic contribution has changed over time; Applying the statistical definition in a cross-country comparison of the small firms' economic contribution.

Small scale enterprises have been variously defined, but the most commonly used criterion is the number of employees of the enterprise. In applying this definition, confusion often arises in respect of the arbitrariness and cut off points used by the various official sources. In Boapeah et al, (1993) opinion, the number of employees in Ghana is the common criterion used in official circles to classify firms by size. As contained in its industrial Statistics, the Ghana Statistical Service (GSS) considers firms with less than 10 employees as Small Scale Enterprises and their counterparts with more than 10 employees as Medium and Large-Sized Enterprises. Ironically, the



GSS in its national accounts considered companies with up to 9 employees as small and medium enterprises. An alternative criterion used in defining small and medium enterprises is the value of fixed assets in the organization. However, the National Board of Small Scale Industries (NBSSI) in Ghana applies both the fixed asset and number of employees' criteria. It defines a Small Scale Enterprise as one with not more than 9 workers, has plant and machinery (excluding land, buildings and vehicles) not exceeding 10million cedis (US \$9506, using 1994 exchange rate). The Ghana Enterprise Development commission (GEDC) on the other hand uses a 10 million cedis upper limit definition for plant and machinery. A point of caution is that the process of valuing fixed asset in it poses a problem. Secondly, the continuous depreciation in the exchange rate often makes such definition out-dated.

Small Scale Enterprises in Ghana, used the employment cut off point of 30 employees to indicate Small Scale Enterprises.

The later however, dis-aggregated small scale enterprises into 3 categories: Micro – employing less than 6 people; Very small, those employing 6-9 people; Small- between 10-29 employees.

From the various definitions above, it can be said that there is no unique definition for a small scale enterprise thus, operational definition is required.

## **2.6 The Welding Processes and Their Sub-divisions**

The official listing of welding processes and their grouping is listed, courtesy of the American Welding Society (AWS) Master Chart of Welding and Allied Processes. The AWS definition for a welding process is "a materials joining process which produces coalescence of materials by heating them to suitable temperatures with or without the application of pressure or by the application of pressure alone and with or without the

use of filler material. AWS has grouped the processes together according to the "mode of energy transfer" as the primary consideration.

### **2.6.1 The Arc-Welding Processes: Consumable Electrode**

In arc welding, the heat required is obtained through electrical energy. Through the use of a consumable or non-consumable electrode (rod or wire), an arc is produced between the tip of the electrode and the parts to be welded, using AC or DC power supplies.

### **2.6.2 Shielded Metal Arc-Welding;**

Shielded metal arc welding (SMAW) or manual metal arc (MMA) welding is a process that uses covered electrode. The electrodes are in the shape of thin, long sticks; hence, this process is also known as **stick welding**. An electric arc is formed when an electric current pass between two electrodes separated by a short distance from each other. In arc welding, using direct-current, one electrode is the welding rod or wire, while the other is the plate to be welded. The electrode and plate are connected to the supply, one to the positive pole and one to the negative pole. The arc is started by momentarily touching the electrode on to the plate and then withdrawing it to about 3 to 4mm from the plate. When the electrode touches the plate, current flows, and as it is withdrawn from the plate the current continues to flow in the form of a 'spark' across the very small gap first formed. This causes the air gap to become ionized or made conducting, and as a result the current is able to flow across the gap, even when it is quite wide, in the form of an arc. The electrode must always be touched on to the plate before the arc can be started, since the smallest air gap will not conduct a current (at the voltages used in welding) unless the air gap is first ionized or made conducting. The thicker the electrode used, the more heat is required to melt it, and thus the more current is required: The welding current may vary from 20 to 600A in manual metal arc welding (Davies A. C., 2004).

When alternating current is used, heat is developed equally at plate and rod, since the electrode and plate are changing polarity at the frequency of the supply. If a bare wire is used as the electrode it is found that the arc is difficult to control, the arc stream wandering hither and thither over the molten pool. The globules are being exposed to the atmosphere in their travel from the rod to the pool and absorption of oxygen and nitrogen takes place even when a short arc is held. The result is that the weld tends to be porous and brittle. The arc can be rendered easy to control and the absorption of atmospheric gases reduced to a minimum by 'shielding' the arc. This is done by the flux covering the electrode, and as a result gases such as hydrogen and carbon dioxide are released from the covering as it melts and form an envelope around the arc and molten pool, excluding the atmosphere with its harmful effects on the weld metal.

Under the heat of the arc chemical compounds in the electrode covering also react to form a slag which is liquid and lighter than the molten metal. It rises to the surface, cools and solidifies, forming a protective covering over the hot metal while cooling and protecting it from atmospheric effects, and also slows down the cooling rate of the weld. Some slags are self-removing while others have to be lightly chipped. The shielded arc weld on steel base plate with a covered electrode (Davies A. C., 2004).

The SMAW circuit (Pritchard, 2001) Arc energy is usually expressed in kilojoules per millimeter length of the weld (kJ/mm) and Arc energy  $\text{kJ/mm} = \text{voltage} \times \text{welding current} \times \text{welding speed (mm/s)} \times 1000$  The welding set must be capable of supplying a continuous current, which can be adjusted to suit various sizes of electrode, at an open circuit voltage of between 50V and 100V. There are a number of types available, which vary in their energy requirement, type and amount of current delivered, open circuit voltage, duty cycle, and cooling mechanism (Pritchard, 2001).

### 2.6.3 Submerged Arc Welding

Characteristics of submerged arc welding (SAW); Type of operation: Mechanized; Heat source: Arc; Shielding: Granular flux; Current range: 350 to 2000 A; Heat input: 9 to 80 kJ/s; Mode of operation: An arc is maintained between the end of a bare wire electrode and the parent metal. The current is controlled by the power-supply unit. As the electrode is melted, it is fed into the arc by a servo-controlled motor. This matches the electrode feed rate to the speed at which the electrode is melting, thus keeping the arc length constant. The electrode and drive assembly is moved along the joint line by a mechanized traverse system. The arc operates under a layer of granular flux (hence 'submerged' arc). Some of the flux melts to provide a protective blanket over the weld pool. Unbelted flux is recovered and re-used. (Gourd L. M. 1995) *Typical* applications: Joints in thick plate in pressure vessels, bridges, ships, structural work, welded pipes.

### 2.6.4 Gas Metal-Arc Welding

In gas metal-arc welding (GMAW), also called MIG welding (for metal inert gas), the weld area is shielded by an external source, such as argon, helium, carbon dioxide, or various other gas mixtures. In addition, deoxidizers are usually present in the electrode metal itself, in order to prevent oxidation of the molten weld puddle. The consumable bare wire is fed automatically through a nozzle into the weld arc and multiple weld layers can be deposited at the joint. This process, developed in the 1950s, is suitable for a variety of ferrous and nonferrous metals and is used extensively in the metal-fabrication industry. The process is rapid, versatile, and economical; its welding productivity is double that of the SMAW process and it can easily be automated and lends itself readily to robotics and flexible manufacturing systems. (Kalpakjian and Schmid, 2008). Gas metal welding process Basic equipment used in gas metal-arc-welding operations. (Kalpakjian and Schmid, 2008).

### **2.6.5 Flux Core Welding**

According to Wikipedia, flux core welding is a semi-automatic or automatic welding process. This means that the welder needs a way to continuously feed a tubular electrode (consumable) that has flux with a constant voltage. Sometimes the welder may use a shielding gas but it is not necessary; the flux will protect the process from contamination. Because this is a process that is quick, it is used in construction. It is also a portable process.

There are basically two types of flux core welding overview that are used: one type uses a shielding gas and the other one does not. With the first type a shielding gas is not used because the flux already has characteristics to resolve a contamination problem so it acts as its own shield. Most welders prefer this type because it penetrates well with the base metal and because it is portable. The second type uses an outside source for its shielding gas and generally is used to weld different steels together. This type of welding process is used when you have very thick metals to join together or when you have metals that are out of position for some reason. One has to be wary of outside air conditions when using this one because too much wind could make slag on your metal. (Ivan Irons, Welding Basics 1997).

### **2.6.7 The Arc-Welding Processes: Non-consumable Electrode**

Unlike the arc-welding processes that use consumable electrodes, described in the previous section, no consumable-electrode arc-welding processes typically use a **tungsten electrode**. As one pole of the arc, the electrode generates the heat required for welding; a shielding gas is supplied from an external source.

### **2.6.8 Gas Tungsten Arc Welding**

Characteristics of gas tungsten arc welding (GTAW); Alternative name: Tungsten inert-gas (TIG) welding; Type of operation: Manual; Heat source: Arc; Shielding: Inert gas; Current range: 10 to 300 A; Heat input: 0.2 to 8kJ/s. Mode of operation: An arc is established between the end of a tungsten electrode and the parent metal at the joint line. The electrode is not melted and the welder keeps the arc gap constant. The current is controlled by the power-supply unit. Filler metal, usually available in 1 m lengths of wire, is added to the leading edge of the pool as required. The molten pool is shielded by an inert gas which replaces the air in the arc area. Argon is the most commonly used shielding gas. Typical applications: High-quality welds in metals such as aluminum, stainless steels, Nimonic alloys, and copper in chemical plant; sheet work in aircraft engines and structures. (Gourd L. M. 1995).

Tarnq, et al (1999) in their study —Modeling, optimization and classification of weld quality in tungsten inert gas welding of thin aluminum plates observed that, the quality of TIG welds ranks higher than that of any of the arc-welding processes, due to the reliability, clearance and strength of the weld. The quality of TIG welds is greatly dependent on the selection of process parameters such as arc gap, inert gas flow rate, welding current, welding speed and cleaning percentage. The cost of the inert gas makes this process more expensive than SMAW, but it provides welds with very high quality and surface finish. (Kalpakjian and Schmid, 2008).

### **2.6.9 Resistance Welding**

Resistance welding depends on the heating effect of a current flowing through an interface between two overlapping sheets. The interface offers a resistance to the flow of the current, and the energy expended is converted to heat. Applying Ohm's law, the voltage (V) required for a current flow (I) is given by  $V = IR$ , where R is the resistance

of the interface. The total energy for a current flow lasting  $t$  seconds is expressed as  $H = IVt = I(IR)t = I^2Rt$  joules Principles of resistance welding. (Gourd L. M. 1995). The time to make a single resistance weld is usually less than one second. (Connor L. P., 1989).

#### **2.6.10 Resistance Spot Welding (RSW)**

Resistance spot welding (RSW) emerged in the 1950s, and is nowadays the predominant assembly technique in the automotive industry. The vehicle components (body in white (BIW), cradle, doors, etc.) are made of thin metal sheets that are connected through spot-welded joints (or simply spot welds). To create a spot weld, two or more metal sheets are pressed together by electrodes, and an electric current is passed through. The resistance of the metal generates heat, and the sheets are welded together by means of local metal fusion: a spot weld has been created. No welding material is added in this process. Three regions are identified in a spot weld. They are: a weld nugget with cylindrical shape, a heat-affected zone (HAZ) and the base material sheets (Donders et al, 2006). These regions have different material properties. For example, the yield stress in the nugget is up to three times higher than in the base material (Chao Y., 2003).

Donders et al, (2006) say due to the applied pressure by the electrodes during the welding, the thickness of the nugget is often less than the thickness of the two metal sheets. This so-called nugget indentation is typically not significant for plate thickness up to 1 mm, but is more pronounced when thick plates are assembled. Stress concentration may occur at the indentation edges where a change of thickness takes place or at the notch root; this may result in crack initiation (Chao Y., 2003).

The machines used for spot welding can be either stationary or portable. These machines include a rocker-arm and larger spot welders with hydraulic or pneumatic

cylinders, and portable spot welding guns; widely used in the car industry, (Gourd L. M. 1995).

- *Various kinds of small scale industries*

The available Small Scale Industries of manufacturing sector or the service sector in Ghana are mainly divided into five types:

- *Manufacturing Industries*

The industries that are liable for producing articles for processing and direct consumption industries are called as manufacturing industries. Some popular examples of this category are Power looms, khadi industries, engineering industries, processing industries, coin industries etc.

- *Ancillary Industries*

This industry is liable for producing small to bigger parts of every component that are used to render services in big industries.

- *Service Industries*

The well-known service sector is known for covering all light repair shops that are essential to maintain all types of mechanical equipment. This industry is also known for the complete dependency on machines.

- *Feeder Industries*

The all-time popular feeder industries are a specialized industry for some particular types of services and products and some of them are Welding, Casting and electroplating, etc.

- *Mining or Quarries*

The demand of minerals, different types of stones is increasing in the global market and so many mining projects are running just to meet the requirement of the masses. Today we can see many findings are in the process just in hunt of finding the right location for



mining. Just because of increasing awareness on the issue of the environmental impact of these mining they have reduced its effect and trying to improve safety. Searching location for mining is not very simple thing you must beware about the respected location, quarry, other infrastructure and related facilities. After selection of sites they need to establish better management just to ensure that things will be handled properly. The end step of mining is quite complex and so it must be handled carefully as it reflects some impact on the environment. Therefore, stoppage of existing mines must be done with full attention.

According to Owusu,(2011) Abugre (1994) small-scale industries are those industries employing 29 or fewer workers. Micro industries are those that employ between 1 to 5 people with fixed assets not exceeding 10,000 US dollars excluding vehicles, land and buildings. Small industries employ between 6 and 29 or have fixed assets not exceeding 100,000 US Dollars excluding land and building. It must be emphasized that lack of finance remains the major constraint to small-scale industries in the country.

## **2.7 Challenges Facing Welding Industries**

Small and medium enterprises (SMEs) are considered the backbone of economic growth in all countries. They play an important role in Ghanaian's economic growth, as they constitute 67% of the companies in Ghana. They also contribute to national development by positively influencing the distribution of income in both functional and nominal terms.

In emphasizing the importance of SSWIs, Rogers stated that: they enhance capacity building as they serve as entrepreneurial training avenues; they create more employment opportunities per unit of investment because of their labour intensive operations; they achieve a much more relative value added operations because they are propelled by basic economic activities that depend mostly on locally sourced raw

materials; they provide feeder industry services as they serve as major suppliers of intermediate goods and components to large-scale industries as well as major agents for the distribution of final products of such industries; they provide opportunities for the development of local skills and technology acquisition through adaptation. Despite the catalytic role of SSWIs in the economic emancipation of countries, some of their major operational challenges in Ghana and hence the Nadowli Kaleo Include:

**Financial Problems:** About 80% of Small and medium enterprises are stifled because of poor financing and other associated problems. The problem of financing SSWIs is not so much the sources of funds but its accessibility. Factors identified inhibiting funds accessibility are the stringent conditions set by financial institutions, lack of adequate collateral and credit information and cost of accessing funds. Harper (1994) believes that the capital shortage problem in the small firm sector is partly one, which stems for the uneconomic deployment of available resources by the owner-managers. This view was shared by Ihyembe (2000) who claimed to have seen businessmen take loan for expansion projects only to turnaround to marry new wives, acquire chieftaincy titles or buy houses abroad. Bruch and Hiemenz (1984) in a study of SSWIs in Asia observed that financing working capital needs was the most frequently mentioned problem.

Binks and Ennew (1996) expressed the view that the funding problem of SSWIs is primarily due to the behavior of banks and imperfection of the capital markets.

**Management Problems:** Lack of trained manpower and management skills also constitute a major challenge to the survival of SSWIs in Ghana. According to West and Wood (1972), “90% of all these business failures result from lack of experience and competence.” Rogers (2002), also added that inefficiency in overall business management and poor record keeping is also a major feature of most SSWIs; technical problems/competence and lack of essential and required expertise in production,

procurement, maintenance, marketing and finances have always led to funds misapplication, wrong and costly decision making.

**Inadequate Basic Infrastructure:** Government has not done enough to create the best conducive environment for the striving of SSWIs, the problem of infrastructures ranges from shortage of water supply, inadequate transport systems, lack of electricity to improper solid waste management. Ghana's underdeveloped physical and social infrastructures create a binding constraint to SSWIs growth, since; they heavily rely on the inefficiently provided state infrastructures and cannot afford the cost of developing alternatives.

**Socio-Cultural Problems:** Most Ghanaian industries do not have the investment culture of ploughing back profits. Bala (2002) stressed that the attitude of a typical Ghana entrepreneur is to invest today and reap tomorrow. Also, the socio-political ambitions of some entrepreneurs may lead to the diversion of valuable funds and energy from business to social waste. The problem of bias against made in Ghana goods is significant. Most Ghanaians have developed a high propensity for the consumption of foreign goods as against their locally made substitutes.

**Strategic Planning Problems:** SSWIs often do not carry out proper strategic planning in their operations. Ojiako (2000) stated that one problem of SSWIs is lack of strategic planning. Sound planning is a necessary input to a sound decision-making.

**Location/Economic Problems:** Market stores are dominated by absentee landlords who charge exorbitant rates. The ownership of market stores by politicians is crowding real small-scale operators out of the market. The high rents charged by store owners on good locations have forced real small-scale operators into the streets or at best into accessible places. Also, domestic economic problems of deregulation and removal of protection as well as the global financial crisis have been detrimental to SSWIs.

**Poor Accounting System:** The accounting system of most SSWIs lack standards hence, no proper assessment of their performances. This creates opportunity for mismanagement and eventually leads to the downfall of the establishment.

**Multiple taxation:** This has become a major problem especially given the role of tax consultants and agents hired by local governments. They are often crude in their operation, excessive in their assessment and destructive in their relationship with the production process. They tax everything in their bid to generate revenue without considering the net effect to household incomes and employment.

**Unstable policy environment:** Instability in government policies have caused some SSWIs to collapse. One of such policies is that of the 1980s when government specified that cocoa should not be exported in raw or unprocessed form after a specified deadline. Nwoye (1988), argued that strategic changes might take place in a firm without initial formulations, such decision could be informed by expansion strategy, preference to cash sales policy, innovation strategy, change in production techniques, local sourcing or use of alternative materials, backward integration and merger. Thus, any entrepreneur who wants to succeed must identify business opportunities, be creative, visionary, daring, risk taking, courageous and sensitive to changes in the business environment.

## **2.8 Prospects of Welding Industries**

Small and medium scale enterprises (SMEs) are generally regarded as the engine of economic growth and equitable development in developing economies. They are labour intensive, capital saving and capable of helping create most of the one billion new jobs the world will need by the end of the century. They are also perceived as the key to Ghana's economic growth, poverty alleviation and employment generation. But their unimpressive performance in employment generation in recent years has generated a

lot of research interests on their challenges and prospects. For instance after Nigeria's independence in 1960, much emphasis has been laid on the growth of small and medium scale industries as a means of reducing the incidence of poverty and unemployment in the country. Since the adoption of the economic reform programme in 1986, there has been a decisive shift from grandiose, capital intensive and large scale industrial projects based on import substitution to small scale industries with immense potentials for developing domestic linkages for sustainable industrial development.

Apart from SMEs potential for self-reliant industrialization using local raw materials, they are in a better position to boost employment, guarantee even distribution of industrial development and facilitate the growth of non-oil exports. Fissaeha (1991), states that SMEs employ 22% of the adult population in developing countries while Fabayo (1989) observed that small firms are major source of employment opportunities for a wide cross-section of the workforce: the young, old part-time workers and the cyclically unemployed. Kombo, et al (2011), submitted that "SMEs have contributed greatly to the growth of Kenyan economy, accounting for 12-14% of GDP, through creating employment opportunities, training entrepreneurs, generating income and providing a source of livelihood for the majority of low income households in the country".

Hence, promotion of such enterprises in developing economies like Ghana will bring about great distribution of income and wealth, economic self-dependence, entrepreneurial development and a host of other positive economic uplifting factors.

SSWIs are veritable engines for attainment of national objective in terms of employment generation at low investment cost, development of entrepreneurial capabilities and indigenous technology. They reduce the flow of people from rural to urban areas and can easily be established with minimal skill. They also contribute

substantially to the country's gross domestic product, export earnings and development of employment opportunities.

## **2.9 Impacts of Small Scale Welding Industries**

Since the 1960s to date, small and medium sized industries (SSIs) have been given due recognitions especially in the developed nations for playing very important roles towards fostering accelerated economic growth, development and stability within several economies (Yitzhaki, 2006). They make-up the largest proportion of businesses all over the world and play tremendous roles in employment generation, provision of goods and services, creating a better standard of living, as well as immensely contributing to the gross domestic products (GDPs) of many countries (OECD,2000). Over the last few decades, the contributions of the SSI sector, the development of the largest economies in the world have beamed the search light on the uniqueness of the SSIs; and this has succeeded in over ruling previously held views that SSIs were only—miniature versions of larger companies (Al-Shaikh 1998; Gaskill etal.1993). And although Small and Medium Industries have been at the center of the policy debate for quite some time in both developed and developing countries, little analytical work has been undertaken in this area. The dearth information that exists among researchers on Small and Medium Industries however provides a sense of how important this sector is for sustainable development in emerging economies (Medina, 2001). For instance, recent studies conducted by United Nations Industrial Development Organization (UNIDO) concert with emphasis on Owusu at SSIs are: labor-intensive ,providing more opportunities for low-skilled workers, correlated with lower income distribution inequality, necessary for agriculture-dependent nations transitioning to an industrial and service-oriented economy, excellent sites for

innovation and sustainable initiatives due to their inherent flexibility and risk-taking ability (Patricoff & Sunderland, 2005).

In both the UK and Nigeria, the SSIs sector constitutes the largest proportion of the entire businesses.

In the UK for instance, SSIs represent over 95 percent of all businesses and contribute over 65 percent of the labor force as well as over 30 percent of the GDP (Day 2000; Dewhurst and Burns 1993) .Likewise, In Nigeria, data from the Federal Office of Statistic service shows that about 97 percent of the entire industries in the country are SSIs and they employ an average of 50 percent of the working population as well as contributing up to 50 percent to the countries industrial output (Ariyo,1999;Ihua,2005).

Globally, the growth of any economy is dependent on vibrant SSIs and when the reverse seems the case, the entire economy suffers. The stunted growth of the economy has often been blamed on many factors, top of which is the challenge of uncoordinated tax administration that has crippled production capacity of the SSIs (Yitzhaki, 2006). One of the major impediments to the growth of SSIs is the issue of taxation. The taxes on SSIs ranked second among the factors stunting the growth of the economy in USA (Thuronyi, 2009). Thuronyi says that taxes are heavy yokes that frustrate existing investors, and scares away prospective ones.

A study conducted by Shome (2004), in collaboration with the Washington, United States-based Center for International Private Enterprise exposed the actual extent of the burden of multiple tax on SSIs in South America. According to Shome, the Jamaican business environment is being suffocated by too many taxes from the national, federal and local governments. Indeed, an indigenous restaurant operator, barber or a hairdresser who has to pay taxes to the various tiers of government in

addition to the cost of powering his business via generators, and paying staff salaries will find it difficult making profit to keep his business running because of high taxes incurred (Terkper, 2003).

In Africa, the same attention about the growth and ensuing challenges of SSIs has continued to top discussions among researchers. According to Terkper (2007) and estimates from the Manufacturers Association of Nigeria (MAN) about 1,000 SSIs firms in Nigeria that set out to do business in the country annually end up shutting down due to the unfriendly business environment. Taxes confront the manufacturing sector in different shapes and shades import duties, export & excise duties, sales and VAT, with holdings and income taxes, mobile advertising & billboard levies, education, levies, social responsibility charges (Terkper, 2007).

In Gambia, companies pay taxes on more than 100 items imposed by both the state and its various Local Governments. According to Cordes, Hertzfeld & Vonortas (1999) in Survey of High Technology Firms, they identified several effects of successful taxation as economically: counterproductive, destroys investor confidence, raises cost of doing business and it is one of the major threats to the growth of manufacturing sector in Gambia.

Ghana is said to have a relatively long history of government initiatives to promote and finance, small-scale industries (SSI). The contributions these SSIs make to the economic development and growth of Ghana are substantial because many people are employed by these industries. This is so because it is accepted worldwide that the development and growth of SSIs can play an important role in turning the growing unemployment situation around. In the light of fore going, policies and programmes that would support the development of SSI are formulated and implemented to better the lives of the citizenry. According to Mbuta and Nkandela (1998), the importance of SSIs



in contributing to job creation and output growth is now widely accepted in both developed and developing countries. Of particular interest is the process of expansion of the industries from micro or small in to medium size, as it is when they become medium-sized that growth-oriented SSIs make their most tangible contribution to economic growth and job creation. Dynamic medium-sized industries provide a competitive edge in two ways—as leading subcontractors and as venture firms in their own right (Owusu,2011). Still to create room for development of small-scale industries in Ghana, government established national board for small scale industries (NBSSI) in 1985 under act 434 of 1981 as an apex body for the development of small scale industries. However, in order to create a single dynamic and integrated organization adequately capitalized and capable of responding to the needs of small enterprise sector, the government merged the Ghanaian enterprise commission (GEDC) and cottage industries division of the department of rural housing and cottage industries (DRHCI) with the board in 1994 the board provide financial and non-financial services to potential entrepreneurs in the manufacturing and service sector.

Welding dates back to the earliest days of metalworking and continues to be widely applied today due to its cost-effectiveness, reliability, and safety. When compared with other joining methods, such as riveting and bolting, welded structures tend to be stronger, lighter-weight, and cheaper to produce. More than 100 processes and process variants comprise the family of welding technologies, and include methods for welding metals, polymers, and ceramics, as well as emerging composite and engineered materials. These various technologies allow a great deal of flexibility in the design of components to be welded.

They also encourage designing for optimal cost-effectiveness in productivity and product performance.

Welding and joining technologies pervade commercial and defense manufacturing, and are a significant source of value-added in the manufacturing process. Occurring late in the manufacturing stream, the joining process is typically the final step in assembly and plays the major role in ensuring structural performance. Additionally, the emergence of near-net-shape processes to produce sub-components has raised the importance of assembly processes as the next area for increased production efficiency. The role of welding and joining in the repair and life extension of manufactured products is even more critical since these processes are frequently used to repair structures and components that were not originally welded. The welding industry incorporates the workforce that uses welding technologies to perform welding operations; the welding supply industry that provides the equipment, products, consumables, and services needed by the workforce; and the end-users in the larger national and international industrial sector who rely on welding and joining processes to manufacture their products.

### **2.9.1 The Welding Workforce**

Assembly operations account for a significant percentage of the labor content of manufactured products. Given the dominance of welding and joining as an assembly process, a significant percentage of the U.S. manufacturing workforce is involved in the application of welding in the course of their manufacturing duties.

The 1996 Occupational Outlook Handbook published by the U.S. Bureau of Labor Statistics indicates that over 450,000 Americans were employed as welders, cutters, and welding machine operators. Additionally, the Handbook lists 25 other trades (e.g., ironworkers, boilermakers, pipefitters) or occupations (e.g., precision assembly, ship fitting) where welding is either a specialized skill or an integral part of the operation. By including the workers from these professions that are directly involved in welding,

the size of the welding community swells to over 2 million workers, or over 10 percent of the manufacturing workforce. These employment figures, significant both in terms of raw numbers and the impact of welding on the manufactured-goods component of the gross national product, still do not reflect welding's total influence. Other individuals work with welded products in the areas of product design, industrial and systems engineering, production engineering, and management.

These individuals are not counted in the employment figures cited above. Clearly, welding is a vital element of U.S. manufacturing and critical to future U.S. competitiveness.

Changes in the manufacturing sector's workforce are likely to cause the percentage of workers involved in welding to fluctuate. According to the U.S. Bureau of Labor Statistics, manufacturing's share of total employment is expected to drop from 14 percent to 12 percent by the year 2006, with a loss of 350,000 jobs. Since manufacturing is expected to maintain its share of total output, overall manufacturing productivity must increase by a minimum of 15 percent, just to break even. From welding's perspective, this implies a greater reliance on mechanized, automated, and robotic welding.

### **2.9.2 The Welding Supply Industry**

The bulk of welding products are purchased from "welding distributors," virtually all of whom are primarily industrial gas distributors. Most of these businesses are owned by industrial gas producers (e.g., Praxair, AGA, Air Products), or by rapidly growing distribution conglomerates (e.g., Airgas). Their primary focus is merchandising, and few have technical staff trained to help customers select the best processes for their needs or to solve their technical problems quickly. Thus, small- and medium-sized manufacturers have little or no direct access to experts and many of their welding

applications are sub-optimal, with penalties to the cost and quality of their products. (Recently, some suppliers have realized that lack of technical expertise makes them look like commodity suppliers to their customers, and they are moving to improve their service.)

Machinery, filler materials, and accessories for the various welding processes are manufactured and supplied by fewer than 10 large companies whose sales exceed \$100 million. Several hundred much smaller companies specialize in items like welding torches, welders' helmets, hammers, marking equipment, welding screens, special fluxes, and so forth. The value of shipments at the manufacturing level fluctuates with the volume of metals consumed in U.S. industry, and there have been pronounced upward and downward movements in these figures over the years.

### **2.9.3 The End-Users**

Virtually every manufacturing industry uses a welding process at some stage of manufacturing or in the repair and maintenance of process equipment. From the soldering of PC boards to the heavy-duty welding of steel plates for shipbuilding to the repair of industrial boilers, industry relies on welding for reliable joining of materials.

Among the manufacturing industries that rely on welding are the following: Heavy Equipment Aerospace, Electronics, Medical Products, and Precision Instruments, Electric Power, Petrochemical. Although end-user manufacturers would not typically consider themselves as part of the welding industry, advanced joining technologies allow manufacturers to use the latest materials and designs to enhance their products' performance, reduce manufacturing costs, and decrease life-cycle costs. Because the established distribution system sometimes places a barrier or “filter” between the manufacturers of welding products and the end users, it is sometimes difficult for these manufacturers to learn what the users think of their products, and what their long-term

needs (and opportunities) really are. The joining needs of each industry vary, of course, depending on the demands placed upon its products, and the pressures for more cost-effective productivity.

U.S. manufacturers have requirements in at least three areas: meeting the changing demands of their customers, competing with foreign manufacturers, and complying with government regulations. This means they continually concentrate on developing a new generation of improved, high-value-added products. Joining technologies that have evolved to meet new industrial needs include specific arc welding techniques for the shipbuilding, aerospace, and oil and gas industries, and advanced resistance welding that has been driven by the automotive and appliance industries.

Even as manufacturers expand their development of new products, they must continually strengthen their production economies and achieve the bottom-line performance required by shareholders. The result is a movement towards “mass customization,” where the manufacturing base is both highly flexible and highly efficient.

To achieve this flexibility and efficiency, responsibility for manufacturing components and subassemblies is being pushed to suppliers, leaving the prime manufacturers free to concentrate on marketing, sales, and final assembly. As a result, prime manufacturers and the companies in their supply chains are more closely integrated now than at any time in the history of U.S. manufacturing. The ultimate example of this may be in the automotive industry, where a single facility has been proposed to incorporate the prime’s assembly plant and several suppliers' component-manufacturing operations.

While suppliers have increasing responsibility for design, production, and “just-in-time” logistics, these smaller companies find it difficult to secure the financial and technical resources to respond to the challenge. The resources they have may be fully

consumed in meeting daily production commitments and in struggling to meet the needs of their customers.

#### **2.9.4 Situation Analysis of Today's Industry**

As market pressures require industry to regularly introduce new product lines and enhancements, the prime-supplier team is driven by a short product-development cycle. Each new product cycle brings increased performance requirements and enhancements in product quality. At the same time, there is pressure for new products to be more affordable, both in their initial production costs and in overall life-cycle costs.



## CHAPTER THREE

### STUDY AREA AND METHODOLOGY

#### 3.0 Introduction

This chapter comprises the profile of the study area, techniques and procedures engaged in carrying out the study. It also gives an in-depth description of the research design, data requirements for the study as well as sampling procedures for data collection and mode of analysis of the data collected for better presentation, interpretation and discussion in subsequent chapters.

#### 3.1 Research Methodology in Brief

The study embraced a case study approach using both explanatory and descriptive methods in achieving its objectives. This combination is to provide context-dependent; that is practical knowledge as opposed to context-independent; theoretical knowledge (Yin, 2003). As it is of more empirical research, the study focus is on the use of primary sources of data. However, it made good use of secondary sources of data as well.

Key Informant Interview guide is yet another instrument used to collect primary data. Key relevant persons in the community are identified and interviewed with the help of the interview guide. The study also employed Focus Group Discussions with the help of a discussing guide: As a matter of principle, the study employed Personal observations. The researcher personally visited some communities to see for himself the functioning of welding activities in in the Nadowli Kaleo District.

#### *Primary Sources*

These are the various sources through which the study gathered primary information from community members. Primary data in this regard refers to the data that has been

collected from the field for the first time. Various tools and techniques are employed which included the following;

**Questionnaires:** The questionnaires were developed based on certain indicators that could measure the impact of small scale welding to rural development. It possessed both close and open-ended questions. The questionnaires captured the demographic characteristics of the respondents, the various kinds of welding industries, challenges facing welding industries and the prospects of the welding industry in the Nadowli Kaleo.

**Personal observations:** small scale welding facilities and community members have been observed by the researcher. This is done in order to help the researcher assess the quality and functioning capacity of facilities and how community members used the available facilities for their social and economic activities within the district.

**Sampling Size and Techniques:** sampling as a method of selection was employed to select the unit of analysis.

Both probability and non-probability sampling techniques are used. In addition, stratified and accidental samplings are also engaged. These methods gave every member of the population the chance to be selected. Relevant contact persons are also selected using purposive sampling.

### ***Secondary Data***

Secondary data refers to published data which is always readily available, some of the sources are archives, technical publications (manuals, handbooks, data sheets, census reports, welding study Surveys), internet data basis, computer-based data, government departmental reports etc. Works from scholars would also be made use of. That is to say; data would be collected from the Works of scholars who have delved into the subject area. These are obtained from books, reports, Journals, newspapers and research



works relating to the subject matter. Relevant information and data would also be gathered from various documentary sources in the country including websites. The data provided from these sources provided the framework to guide the study.

### **3.2 Profile of the Study Area**

#### **3.2.1 Location**

The Nadowli Kaleo District, which lies on latitudes 9°49'35'' N and longitudes 2°40'51'' W is one of the eleven districts that make up the Upper West Region of Ghana. The Nadowli Kaleo District was carved out of the Daffiama BUSSIE Issh (DBI) district and made an autonomous district by L.I 1751 in 2004 with Nadowli as its capital. The total area of the district is approximately 1,856 square km which constitutes about 10 % of the region's total land area, which is estimated at 18,478 square km. The district shares boundary with Wa municipal and Jirapa municipality to the north, Wa municipal to the East, Nadowli to the North and to the West Ivory Coast.

The 2010 National Population and Housing census results put the Wa West District population at 81,348. This constitutes about 11.57% of the Upper West Region's total population of 702,110. (Source: GSS). This comprises 40,227 males and 41,121 females. Using a growth rate of 1.7% per annum, the projected population for 2013 is 85,497 comprising of 41,467 males and 44,030 females representing 48.50% and 51.50% respectively.

#### **3.3 Sample Size**

The dissertation targeted a sample size of about 381 people covering ten (10) communities with electricity. The study population comprised members with electricity in their homes in some selected communities in the Nadowli Kaleo district; namely Loho, Kaleo, Kpanko, Sombo, Goli, Sankana, Nyimbali, Takpo, Gyili etc. The sample size is obtainable via the formula  $n = \frac{N}{1 + Ne^2}$  where "N" is the Sample frame and "e"

the significance level or sampling error. Thus, with  $N=8,000$  households, at 5 percent significance level which corresponds to 95 percent confidence level; and  $e=0.05$ , then  $n= 8000/ \{1+ 8000(0.5)^2\}$  which is 380.9.

The estimated sample size of 380.9 rounded up to the nearest 100 amounted to 381 households. Convenient sampling was used to select members of the sample frame.

### **3.4 Sampling Techniques**

Two sampling techniques were adopted because of the differences in the characteristics of the target population, thus probability and non-probability sampling.

**Purposive Sampling:** This technique was used to select particular sample participants from about 20 communities who are involve in welding activities. About thirty (30) people were considered in this case notably among them were chiefs, leaders of various women and youth groups, the district planning officers and the district community development officer since they play direct role in the economic development of the district.

**Accidental Random Sampling:** The remaining unit of analysis was selected using the accidental random sampling technique. The technique gave every member of the population the chance to be selected and become part of the sampling units.

### **3.5 Economy of the Nadowli Kaleo District**

The main sources of funding for the Assembly is the District Assembly's common Fund, the District Development Fund, support from Government of Ghana and other donors. However, the District Assembly generates her internal revenue from taxes on properties, land and royalties, sale of goods and services, fees, fines, penalties and forfeits. It also generates income from tourism through the hippopotamus sanctuary. However, it is important to indicate that the District is developing more strategies to meet its revenue target in subsequent years.

The District is divided into nine (9) circuits for effective school supervision and service delivery. Each circuit is supervised by an officer while the District Education Directorate oversees the activities of all schools. Total number of kindergartens counts eighty-three (83) whilst primary schools are ninety-three (93). There are seventy-five (75) Junior High Schools. The District also has three (3) Senior High School with one teacher training college named after a Rev father called Macoy

The tourism potential of the Nadowli Kaleo District is found in its rich natural, cultural, historical and man-made attractions. These, however, have not received the needed support and development to attract tourists to the district. The most significant of them is the dungyagu under sombo called the porcupine Sanctuary which is 5km from Sombo. The Dungyagu porcupine Sanctuary is a community-based conservation initiative aimed at providing the dungyagu catchment area inhabitants with a source of revenue and offering protection to the flora and fauna found within the designated areas. Other unique attractions are the sankana slave hive and rocks. These attractions are a potential for making the Nadowli Kaleo District a unique tourist destination. However, investment in tourist infrastructure is required. The administrative set-up of the district consist of the District Assembly and its secretariat, department of the Assembly, 5 sub-districts namely Daffiama Bussie Issa kaleo. The District Assembly responsible for the overall development of the district is made up of forty (40) Assembly Members consisting of thirty-four (34) males and six (6) females. Out of this number, twenty-eight (28) are elected and twelve (12) appointed. Out of the six (6) female Assembly Members, two (2) are elected and the rest are appointed.

The political wing of the Nadowli Kaleo District Assembly is made up of one Member of Parliament, forty (40) Assembly members comprising twelve (12) government appointees and twenty-eight (28) elected including the presiding member of the

Assembly. This composition sometimes excludes the District Chief Executive who is the political Head of the District from the main composition of the Assembly. In the Assembly, seven (7) out of the forty Assembly members are females with two elected and five appointed. The Government employees of the Assembly are responsible for implementing policies and taking decision for the Assembly which are on behalf of the central government.

The Assembly has five statutory sub committees and an Executive Committee chaired by the District Chief Executive. The various Sub committees submit their reports to the Executive Committee for consideration. Consideration, approval or ratification is given to reports by the General Assembly for implementation by the General Administration, headed by the District Coordinating director who is also the secretary to the General Assembly.

The Nadowli Kaleo District has one Constituency, twenty-eight electoral areas, five traditional areas and five (5) area councils which includes, Charikpong, Daffiama, Bussie, Kaleo and Nadowli. About 70% of the inhabitants of the Nadowli Kaleo District are in agriculture sector. Agriculture as the dominant livelihood activity is followed by commerce which constitutes about 9% whilst the industrial sector consists of about 3%. Some other key sectors of the economy are energy, communication, tourism and transport. Residents of the Nadowli Kaleo District have their livelihoods in the agriculture, commerce and industrial sectors. Less than 5% of the inhabitants of the District are engaged in communication, tourism and transport sectors (NAKDA, 2012). Nevertheless, the fact that the District is commercial by all standard, trading along the Burkina Faso border, agriculture is the main economic practice. Crop cultivation and animal rearing remains the largest single contributor to the local economy and employs about 70% of the active population. The main staple crops grown include millet,

sorghum, maize, rice, cowpea, leafy vegetables, pepper and livestock such as cattle, sheep, goat, pigs and poultry are reared subsistence basis. Goat especially is quite significant followed by cattle, sheep and poultry in that order. Hoes, cutlasses and mechanized tools like tractors are used for preparing land for cultivation (Field survey, 2015).

On the other hand, soya beans, groundnuts, bambara beans are produced as cash crops. Yams and sweet potatoes are also cultivated extensively for both consumption and economic purposes. Economic trees within the District include teak, mango, shea, baobab and dawadawa among others.

However, the inhabitants of the District have most of their livelihood activities within the informal sector because majority of them have low levels of education and are not able to find jobs within the formal sector (MOFA, 2012).

About eight thousand (8000) households are in the district. With most of them built with mud and roofed with iron sheets. Only few houses are built with block and roofed with iron sheets. Most houses have kitchen, bathroom but without toilet facilities, energy and water supply (Nadowli Kaleo District, 2015).

Few of the houses in the district use solar powered energy, the major towns like Loho, Kaleo, Kpanko, Sombo, Bussie, Daffiams, Kyerekpong and Issa are connected to the grid while the few villages use flash lights. The women use firewood for their cooking. There is a gradual depletion of individual farms lands (Nadowli Kaleo District Assembly 2015).

### **3.6 Design and Methodology**

A survey methodology is chosen because it recognizes the importance of the context to both understand and explain the impact of rural electrification. The study includes both qualitative and quantitative materials gathered from interviews. Triangulation of

different related research techniques are employed in this study. This consists of a combination of mainly qualitative and quantitative methods of data collection and analysis. The two styles have different complementary strengths and a study that employs both is comprehensive. The shortcomings of one method are complimented by the positives of the other method (Neuman 2000).

### **3.6.1 Research Design**

The selection of the right research design is crucial in the research process and for arriving at valid findings is dependent on how right the research design is. To this end, the Non-experimental Descriptive cross-sectional Survey Research Design is employed to adequately investigate the research problem. This study is primarily empirical in nature, thus in quest of identifying, describing and making coherence of observations found in the field rather than the development of exhaustive discussions or theoretical models of rural electrification.

The research strategy that the study utilized is the descriptive technique/method. This descriptive research method intends to provide facts concerning the nature and status of a situation, as it exists at the time of the study (Creswell, 1994). It is also concerned with practices and relationships that exist, values, processes and viewpoints that are in progress, special effects that are felt, or activities that are just beginning and growing. Furthermore, such methods attempt to identify and explain current circumstances, actions or systems based on the reactions and impressions of the respondents of the research (Creswell, 1994).

This research is also cross-sectional because of limited time. It is a study of a particular phenomenon (or phenomena) at a particular time (Saunders et al., 2003). Therefore, cross sectional studies often employ the survey strategy, and seek to bring out the impact of rural electrification on the people of Nadowli Kaleo District. The study

involved analysing and evaluating the impact of small scale welding industries on the various sectors of the economy in Nadowli Kaleo District.

As a result, the research was designed to achieve the objectives set out in order to provide a systematic guide to direct the research actions and to prevent eventual distortions, errors and biases. This study has combined primary and secondary sources of data. The rationale for this is to facilitate the study by delivering acceptable discussions for the readers that will help them understand more about the issues. The primary data for the study is represented by the survey results that are acquired from the respondents on the field. On the other hand, the literature review presented in the second chapter of the study represents the secondary data of the study. The secondary sources of data came from published articles, books, journals and thesis of related studies.

The findings of this study are based on data and information obtained from a mix of instruments. The objective for this mixed approach is to collect qualitative data as much as possible with quantitative data from key stakeholders such as the community members. The survey for this research used questionnaires and direct interviews with the community.

### **3.6.2 Sampling Techniques.**

It is obvious from the definition of the population above that a census is not feasible in this study because the complete target population may not be covered for practical reasons, and above all it makes it possible to observe the sample into detail. In accordance, the study adopted the survey type of research in which a sample from the target population is used for the study.

Both probability and non-probability sampling techniques were employed because of the differences in the characteristics of the target population. The study adopted a non-

probability sampling technique (purposive sampling) in order to approach the problem with a specific plan of selecting predefined groups of people in the District. The Nadowli Kaleo is purposively selected since it is an old District but still undergoing rural electrification and more installing of welding industries as a way of alleviating rural poverty. With a purposive sample, opinions of the target groups were obtained but sub groups were over weighted in the population that are more readily accessible hence the research employed the accidental sampling technique where each respondent is chosen entirely by chance and on the relative ease of their access at any stage during the sampling process. This enabled the research to draw externally valid conclusions about the entire population based on the sample.

The study also made use of probability sampling procedure (Accidental sampling) which is quick in data collection and requires minimum advance knowledge of the population different from the frame. Its straight forwardness also makes it comparatively easy to interpret data collected in this manner. It is for this reason that the District was purposively selected through the use of accidental sampling which best suits the situation. It is also suitable for this study because there is not much information available about the population and data collection was efficiently conducted on easiness of access and the availability of respondents hence the cost of sampling was small enough to make efficiency important.

The sample area was selected purposively on the basis of knowledge of the inhabitants, its essentials and the rationale of the study which is more suitable for in-depth qualitative research in which the focus is often to understand complex social phenomena by drawing the most appropriate sample based on the purpose of the research (Marshall, 1996; Small, 2009).



### 3.6.3 Sample Units and Size

Sample size determination aims at selecting part of the population from which information will be drawn to form conclusions about the entire population. For a survey design based on accidental sampling, the sample size required is calculated using the formula for sample size determination stated below. This formula allows for a geographically dispersed sample to be used, with participants simultaneously responding to the study from the study area, hence taking advantage of existing social groups to achieve the study objectives.

The dissertation targeted a sample size of about 100 people covering 10 communities which are undergoing rural electrification hence the establishment of small scale welding activities. The study population comprised members with electricity in their homes in some selected communities in the Nadowli Kaleo district; namely Loho, Kaleo, kpanko, serekpere, kyerekponh Nadowli, daffiama issa etc. which are electrified. Under the condition that only individuals with electricity in their homes were interviewed, the sample size is obtainable via the formula;  $n=N/[1+Ne^2]$  where “N” is the Sample frame and “e” the significance level or sampling error. Thus, with N=8,000 households, at 10 percent significance level which corresponds to 90 percent confidence level; and  $e=0.1$ , then  $n= 8000/ \{1+ 8000(0.1)^2\}$  which is 98.8.

The estimated sample size of 98.8 rounded up to the nearest 100 amounted to 100 households. Convenient sampling was used to select members of the sample frame.

### 3.7 Data Collection Methods

The study utilized primary sources of data collection methods. These are the various sources through which the study gathered primary information from community members. Primary data in this regard refers to data that is collected from the field for the first time. Various tools and techniques were employed.

Questionnaires were utilized as a framework of questions that are designed and administered to respondents. These Questionnaires are developed based on certain indicators that help assess the impact of small scale welding industries on rural development of the Nadowli Kaleo District. It contained both close and open-ended questions. The questionnaires captured the demographic characteristics of the respondents, various ways through which rural communities are electrified. These questionnaires were administered to the sampled population which involves the general community members, Assembly members, staff of the district assembly, and other political heads in the district.

Key Informant Interviews were used in the identification and interviewing of key relevant persons in the community. Individuals considered to be key informants appeared to be vested with issues concerning the area and the topic under study. The key informants will be contacted on individual basis. Key persons believed to have relevant information concerning small scale industries and rural development.

Focus group Discussions were also utilized which Twumasi (2003) describes as a method of data collection and information gathering in which a group of 6 to 10 people who are knowledgeable about a topic are brought together to engage them in a guided discussion. The focus group discussion usually has a moderator or a facilitator who will guide, lead and direct the tempo and pace of the discussion.

As a relevant tool, it was employed by this study. The study organized some participants with relevant knowledge within the district to form groups in the communities under study.

### **3.8 Data Analysis and Presentation**

Combinations of qualitative and quantitative methods are used to analyze the data collected from the field. As the study deals with numbers in terms of the sample size, quantitative analysis is relevant. The analysis of data entailed a process of summarizing and aggregating information according to relevant themes in view of the research objectives. Micro-soft Excel as a statistical tool is used to carry out the quant.



## CHAPTER FOUR

### ANALYSIS AND DISCUSSION OF FINDINGS

#### 4.0 Introduction

This chapter focuses mainly on field data analysis and the discussion of findings. The chapter is divided into four sections namely demographic characteristics of respondents, the kinds of small scale welding industries in Nadowli Kaleo, challenges facing welding industries and the prospects of welding industries in the Nadowli Kaleo District.

#### 4.1 Socio-Demographic Characteristics of Respondents

The following respondent's characteristics are discussed: sex, age, occupation, marriage as well as educational status of respondents. The aim is to determine how these characteristics influence the views of respondents on the impacts of small scale welding industries on rural development on the socio-economic development of the Nadowli Kaleo District.

The demographic characteristics of respondents are central to the concept of assets. People may be poor because of their sex, age, education status, marital status among others. This limits their capital assets, material or non-material assets and access to some rights which can be used to support their livelihoods. Age, sex, marital status, educational levels, and many others influence their levels of vulnerability in pursuing various livelihood activities especially farming, business activities and access to electricity and gadgets.

**Table 4.1 Demographic Characteristics of Respondents**

<b>Characteristic</b>	<b>Group</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Age</b>	20-25	20	20.0%
	26-30	34	34.0%
	31-35	18	18.0%
	36-40	20	20.0%
	Above 41	8	8.0%
<b>Total</b>		<b>100</b>	<b>100%</b>
<b>Sex</b>	Male	44	44.0%
	Female	56	56.0%
<b>Total</b>		<b>100</b>	<b>100%</b>
<b>Marital Status</b>	Single	26	26.0%
	Married	48	48.0%
	Divorced	16	16.0%
	Widowed	10	10.0%
<b>Total</b>		<b>100</b>	<b>100%</b>
<b>Level of Education</b>	No Formal Education	54	54.0%
	Primary	21	21.0%
	Middle School/JHS	16	16.0%
	Secondary/Technical/Vocational	5	5.0%
	Tertiary	4	4.0%
<b>Total</b>		<b>100</b>	<b>100%</b>
<b>Occupational Status</b>	Farming	42	42.0%
	Business	35	35.0%
	Formal Employment	23	23.0%
<b>Total</b>		<b>100</b>	<b>100%</b>

**Source: Field Survey, November, 2020**

Table 4.1 indicates the demographic characteristics of respondents interviewed. Majority of the respondents constituting about 56.0% are females whereas the remaining 44.0% constitute males in the Nadowli Kaleo District. In terms of age,

majority of the respondents (34%) were between the age group of 26-30 whilst the age group of 41+ recorded the least respondents (8.0%).

Out of a total of one hundred (100) respondents, 54.0% had no formal education, 21.0% obtained primary education, and about 16.0% of the respondents had middle or Junior High School education whilst only 5.0% and 4.0% of the respondent in the three (3) communities attained secondary / technical or vocational and tertiary status respectively. With regards to marital status of respondents, about forty-eight (48) representing 48.0% were married; twenty six (26) respondents were single recording 26.0%, 16.0% and 10.0% representing 16 and 10 respondents are divorced and widowed respectively.

The occupational status of the respondents of the study indicates that farming, trading (business), and formal employment (Civil Servants) were the major occupations found in the Nadowli Kaleo District. From the study about 42 respondents representing 42.0% are farmers, 35 respondents representing 35.0% are engaged in business activities whereas 23 people representing 23.0% of the respondents were in formal employment.

#### **4.2 The Kinds of Welding Industries in Nadowli Kaleo**

The official listing of welding processes and their grouping is listed, courtesy of the American Welding Society (AWS) Master Chart of Welding and Allied Processes.

The AWS definition for a welding process is "a materials joining process which produces coalescence of materials by heating them to suitable temperatures with or without the application of pressure or by the application of pressure alone and with or without the use of filler material. AWS has grouped the processes together according to the "mode of energy transfer" as the primary consideration.

**Table 4.2: Kinds of Welding Industries in Nadowli Kaleo**

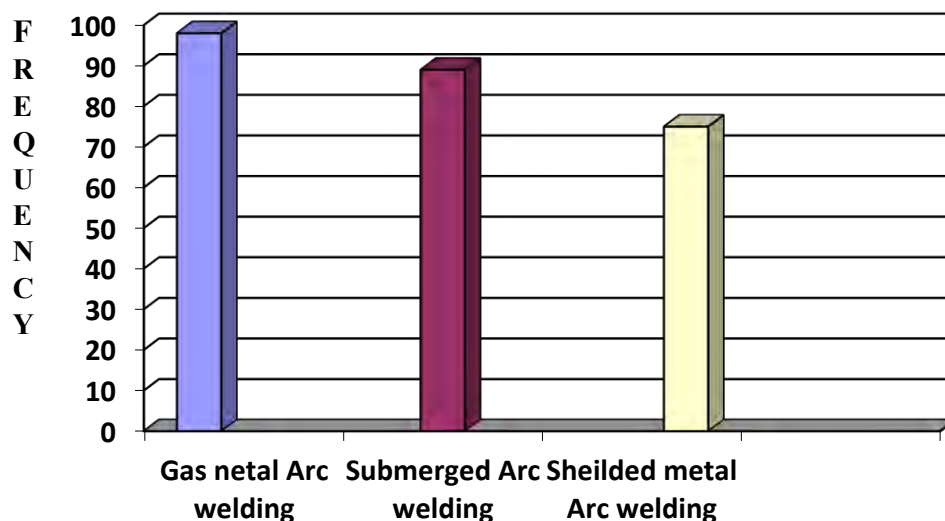
<b>Kinds of welding</b>	<b>Frequency</b>	<b>Ranks</b>
Gas metal Arc welding	98	1
Submerged Arc welding	89	2
Shielded metal Arc welding	75	3

**Source: Field Survey, February, 2017**

As indicated in table 4.2, the types of welding available and used by the residents of the Wa West District are Gas metal Arc welding, Submerged Arc welding and Shielded Arc welding is the most popular welding types in the District. About 98 respondents from the ten (10) communities interviewed ranked the use of Gas metal arc welding as the major source of welding used before the extension of grid services in the Wa West District. Again about 89 respondents ranked the use of submerged welding as the second most used source of welding type in most of the visited communities under the study area whereas 75 of those interviewed also ranked the engagement of shielded metal arc welding as the third most used source of welding type in the Nadowli kaleo District.

During the Focus Group Discussions some respondents reported that before the extension of grid services to the Nadowli kaleo District the residents relied basically on the use of Gas metal arc welding, submerged arc welding and the use of shielded metal arc welding as confirmed by a respondent of Nadowli who indicated that;

*“.....before and after the extension of grid electricity services to our area, my community used Gas metal-arc welding and shielded metal arc welding as our source of welding to enable us undertake developmental activities...”*



**Figure 4.1: A Bar Chart Showing Kinds of Welding Industries in Wa West District**

### 4.3 Challenges Facing Welding Industries

Small and medium enterprises (SMEs) are considered the backbone of economic growth in all countries. They play an important role in Ghanaian’s economic growth, as they constitute 67% of the companies in Ghana. They also contribute to national development by positively influencing the distribution of income in both functional and nominal terms.

**Table 4.3: Challenges Facing Welding Industries**

Challenges facing Welding industries	Frequency	Ranks
Financial problems	40	1
Management issues	30	2
Socio-cultural problems	12	3
Inadequate basic infrastructure	12	4
Multiple taxation	6	5

**Source: Field Survey, February, 2017**



Table 4.3 reveals the major challenges facing small scale welding industries in the Nadowli Kaleo District. A total of about 40 respondents ranked financial problems as the major problem facing the welding industry in most communities leading to their inability to purchase welding machines in the study area whereas 30 respondents ranked management issues as challenge confronting the welding industry. 12 respondents attested to the fact that socio-cultural problems is their most nagging issue on them whereas 12 and 6 respondents confirmed that inadequate basic infrastructure, for instance power supply and multiple taxation are the challenges militating against the activities of the welding industry in the Nadowli Kaleo District.

From the Focus Group Discussion held in Nadowli the district capital, one respondent in discussing the challenges facing welding industries argued that:

*“...Following limited access to finance, militates against the survival and flourishing of their businesses with the outcome being lower incomes etc...”*

The study falls in line with the findings that by Harper (1994) believe that the capital shortage problem in the small firm sector is partly one, which stems from the uneconomic deployment of available resources by the owner-managers. This view was shared by Ihyembe (2000) who claimed to have seen businessmen take loan for expansion projects only to turnaround to marry new wives, acquire chieftaincy titles or buy houses abroad. Bruch and Hiemenz (1984) in a study of SSWIs in Asia observed that financing working capital needs was the most frequently mentioned problem.

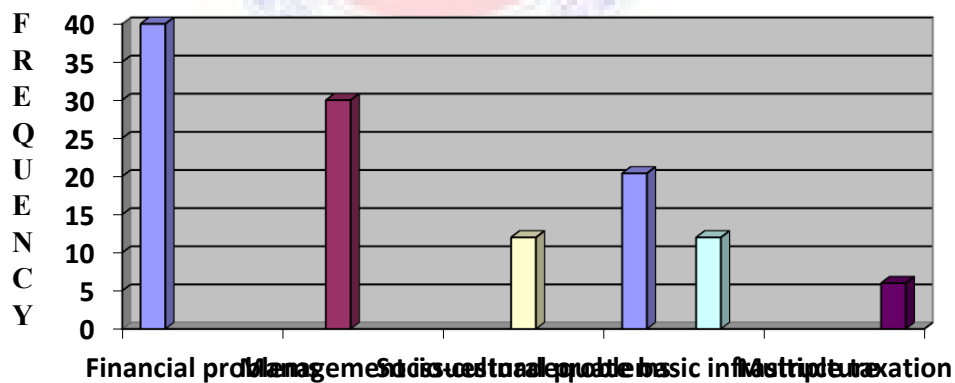
Binks and Ennew (1996) expressed the view that the funding problem of SSWIs is primarily due to the behavior of banks and imperfection of the capital markets.

Another respondent through the Focus Group Discussion held at Loho regarding the seeming setbacks facing small scale welding industries claimed that:

*“...Socio-cultural forces are great hindrance in his effort to establish and expand existing businesses in the district...”*

The study falls in line with the findings of Bala (2002) asserting that the attitude of a typical Ghanaian entrepreneur is to invest today and reap tomorrow. Also, the socio-political ambitions of some entrepreneurs may lead to the diversion of valuable funds and energy from business to social waste. The problem of bias against made in Ghana goods is significant. Most Ghanaians have developed a high propensity for the consumption of foreign goods as against their locally made substitutes.

The study reveals that the Nadowli Kaleo District has followed the small scale welding industry path after realizing the implications it has on the development. The challenges of welding activities in the District is felt across various sectors; health, education, communication, economy or business and agriculture in rural communities.



**Figure 4.2: A bar chart showing the Challenges facing welding industries**

#### **4.4 Prospects of the Welding Industry**

Small and medium scale enterprises (SMEs) are generally regarded as the engine of economic growth and equitable development in developing economies. They are labour intensive, capital saving and capable of helping create most of the one billion new jobs the world will need by the end of the century. They are also perceived as the key to Ghana's economic growth, poverty alleviation and employment generation. But their unimpressive performance in employment generation in recent years has generated a lot of research interests on their challenges and prospects. For instance, after Nigeria's independence in 1960, much emphasis has been laid on the growth of small and medium scale industries as a means of reducing the incidence of poverty and unemployment in the country. Since the adoption of the economic reform programme in 1986, there has been a decisive shift from grandiose, capital intensive and large scale industrial projects based on import substitution to small scale industries with immense potentials for developing domestic linkages for sustainable industrial development.

Apart from SMEs potential for self-reliant industrialization using local raw materials, they are in a better position to boost employment, guarantee even distribution of industrial development and facilitate the growth of non-oil exports. Fissaaha (1991), states that SMEs employ 22% of the adult population in developing countries while Fabayo (1989) observed that small firms are major source of employment opportunities for a wide cross-section of the workforce: the young, old part-time workers and the cyclically unemployed. Kombo, etal (2011), submitted that "SMEs have contributed greatly to the growth of Kenyan economy, accounting for 12-14% of GDP, through creating employment opportunities, training entrepreneurs, generating income and providing a source of livelihood for the majority of low income households in the country".

Hence, promotion of such enterprises in developing economies like Ghana will bring about great distribution of income and wealth, economic self-dependence, entrepreneurial development and a host of other positive economic uplifting factors.

Small scale welding industries are veritable engines for attainment of national objective in terms of employment generation at low investment cost, development of entrepreneurial capabilities and indigenous technology. They reduce the flow of people from rural to urban areas and can easily be established with minimal skill. They also contribute substantially to the country's gross domestic product, export earnings and development of employment opportunities.

**Table 4.4: Prospects of the welding industry**

Prospects of welding industry	Frequency	Ranks
Employment generation	98	1
Economic growth	92	2
Entrepreneurial development	82	3
Poverty alleviation	75	4

**Source: Field Survey, February, 2017**

Table 4.4 reveals that a total of about 98 respondent agreed that welding activities serve as the bane of employment creation in the district whereas about 92 respondents also argued that small scale welding activities enables the economic growth of an area and thereby contributing significantly to GDP growth. About 82 respondents ranked entrepreneurial capabilities development as the third impact of the welding activity on economic activities whereas the final 75 respondents were of the view that welding industries enables some people to earn a living from the proceeds they get from operating, this therefore alleviated their poverty levels significantly. During a Focus Group Discussion held at Daffiamma, one respondent in discussion claimed that;

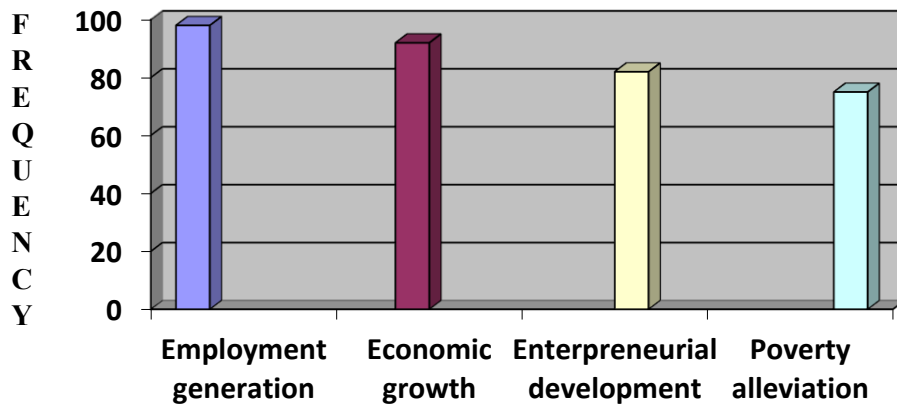
*“His family income was meager and the household used to sleep sometimes without a night meal but since he entered into the welding industry, the family can now have the three square meal and even save some amount from the business”*

The extension of electricity to the Nadowli Kaleo District is seen as an effective catalyst to economic activities of the rural communities. The findings therefore confirm studies conducted by Yitzhaki, (2006) that welding industries make-up the largest proportion of businesses all over the world and play tremendous roles in employment generation, provision of goods and services, creating a better standard of living, as well as immensely contributing to the gross domestic products (GDPs) of many countries (OECD,2000). Over the last few decades, the contributions of the SSI sector, the development of the largest economies in the world have beamed the search light on the uniqueness of the SSIs; and this has succeeded in over ruling previously held views that SSIs were only—miniature versions of larger companies (Al-Shaikh 1998; Gaskill etal.1993).

Globally, the growth of any economy is dependent on vibrant SSIs and when the reverse seems the case, the entire economy suffers. The stunted growth of the economy has often been blamed on many factors, top of which is the challenge of uncoordinated tax administration that has crippled production capacity of some welding industries.

Ghana is said to have a relatively long history of government initiatives to promote and finance small-scale industries. The contributions these welding industries make to the economic development and growth of Ghana are substantial because many people are employed by these industries. This is so because it is accepted worldwide that the development and growth of welding industries can play an important role in turning the growing unemployment situation around. In the light of fore going, policies and

programmes that would support the development of welding industries are formulated and implemented to better the lives of the citizenry.



**Figure 4.3: A Bar Chart Showing the Prospects of Welding Industry**



## CHAPTER FIVE

### SUMMARY, CONCLUSION AND RECOMMENDATIONS

#### 5.0 Introduction

This chapter is the final section of the study. It presents a summary of the key findings of the study as well as the conclusions drawn and recommendations made to enhance the socio-economic impact of small scale welding industries in the Nadowli Kaleo District of the Upper West Region.

#### 5.1 Summary of Key Findings

The findings of the study are based on the objectives of the study. As a result, this section summarizes the key issues of the socio-economic characteristics of respondents, kinds of welding industries, challenges facing the small scale welding industries and the prospects of the welding industries in the Nadowli Kaleo District.

##### 5.1.1 Socio-Demographic Characteristics of Respondents

Majority of the respondents constituting about 56.0% are females whereas the remaining 44.0% constitute males in the Nadowli Kaleo District. In terms of age, majority of the respondents (34%) were between the age group of 26-30 whilst the age group of 41+ recorded the least respondents (8.0%).

Out of a total of one hundred (100) respondents, 54.0% had no formal education, 21.0% obtained primary education, and about 16.0% of the respondents had middle or Junior High School education whilst only 5.0% and 4.0% of the respondent in the three (3) communities attained secondary / technical or vocational and tertiary status respectively. With regards to marital status of respondents, about forty-eight (48) representing 48.0% were married; twenty six (26) respondents were single recording

26.0%, 16.0% and 10.0% representing 16 and 10 respondents are divorced and widowed respectively.

The occupational status of the respondents of the study indicates that farming, trading (business), and formal employment (Civil Servants) were the major occupations found in the Nadowli Kaleo District. From the study about 42 respondents representing 42.0% are farmers, 35 respondents representing 35.0% are engaged in business activities whereas 23 people representing 23.0% of the respondents were in formal employment.

### **5.1.2 The Kinds of Welding Industries in Nadowli Kaleo**

The findings of the study reveals that, the types of small scale welding available and used by the residents of the Nadowli Kaleo District are Gas metal Arc welding, Submerged Arc welding and Shielded Arc welding is the most popular welding types in the District. About 98 respondents from the ten (10) communities interviewed ranked the use of Gas metal arc welding as the major source of welding used before the extension of grid services in the Nadowli Kaleo District. Again about 89 respondents ranked the use of submerged welding as the second most used source of welding type in most of the visited communities under the study area whereas 75 of those interviewed also ranked the engagement of shielded metal arc welding as the third most used source of welding type in the Nadowli Kaleo District. This therefore suggest that Gas metal Arc welding is the predominantly used form of welding engaged by most of the citizens of the District for their survival and livelihood.

### **5.1.3 Challenges Facing Welding Industries**

A total of about 40 respondents ranked financial problems as the major problem facing the small scale welding industry in most communities leading to their inability to purchase welding machines in the study area whereas 30 respondents ranked management issues as challenge confronting the welding industry. Also 12 respondents



attested to the fact that socio-cultural problems is their most nagging issue on them whereas 12 and 6 respondents confirmed that inadequate basic infrastructure, for instance power supply and multiple taxation are the challenges confronting the activities of the small scale welding industry in the Nadowli Kaleo District.

The study reveals that the Nadowli Kaleo District has followed the welding industry path after realizing the implications it has on the development. The challenges of welding activities in the District is felt across various sectors; health, education, communication, economy or business and agriculture in rural communities.

#### **5.1.4 Prospects of the welding industry**

The study established that a total of about 98 respondents agreed that welding activities constitute the bane of employment creation in the district whereas about 92 respondents also are of the view that welding activities enables the economic growth of an area and thereby contributing significantly to GDP growth. About 82 respondents ranked entrepreneurial capabilities development as the third impact of the welding activity on economic activities whereas the final 75 respondents were of the view that small scale welding industries enables some people to earn a living from the proceeds they get from operating, this therefore alleviated their poverty levels significantly.

#### **5.2 Conclusion**

Welding industries are generally regarded as the engine of economic growth and equitable development in most developing economies for which Ghana is not exceptional. They are labour intensive, capital saving and capable of helping create most of the one billion new jobs the world will need by the end of the century. They are also perceived as the key to economic growth, poverty alleviation and employment generation. But their unimpressive performance in employment generation in recent years has generated a lot of research interests on their challenges and prospects.

The advent of small scale welding industries has contributed greatly to the growth of several economies, accounting for 12-14% of GDP, through leading employment opportunities, training entrepreneurs, generating income and providing a source of livelihood for the majority of low income households in the country.

Hence, promotion of such enterprises in developing economies like Ghana will bring about great distribution of income and wealth, economic self-dependence, entrepreneurial development and a host of other positive economic uplifting factors. Small scale enterprises are veritable engines for attainment of national objective in terms of employment generation at low investment cost, development of entrepreneurial capabilities and indigenous technology. They reduce the flow of people from rural to urban areas and can easily be established with minimal skill. They also contribute substantially to the country's gross domestic product, export earnings and development of employment opportunities

Most small scale welding industries in rural Ghana fold up within their first five years of existence, a smaller percentage goes into extinction between the sixth and tenth year while only about five to ten percent survive, thrive and grow to maturity.

Many factors have been identified contributing to this premature death of welding industries. The most influencing among them include insufficient capital, irregular power supply, infrastructural inadequacies (water, roads etc.), lack of focus, inadequate market research, over-concentration on one or two markets for finished products, lack of succession plan, inexperience, lack of proper book keeping, lack of proper records or lack of any records at all, inability to separate business and family or personal finances, lack of business strategy, inability to distinguish between revenue and profit, inability to procure the right plant and machinery, inability to engage or employ the right caliber of staff, cut-throat competition.

### **5.3 Recommendations**

It is observed that most of the problems of small scale welding industries are external to it, among them are those related to capital shortage, taxation and regulations, product liability patent and franchising abuses. The internal problems of welding industries in Ghana include: inadequate working capital, stiff competition from larger companies, difficulties in sourcing raw materials, low capacity utilization, lack of management strategies, poor educational background of operators, and huge financial problems while the external problems include: policy inconsistencies, multiple taxation, harsh regulatory requirements and trade groups.

The study recommends that, since welding plants serve as the backbone for economic growth and subsequent economic development both internal and external factors need to be put in check for sustained economic development.

The research also recommends that multiple taxation and other militating factors should be relaxed if not completely removed by the tax imposing authorities for a smooth running of such businesses.

Again, the study recommends that government should institute policies and programmes aimed at motivating the youth who are unemployed to go into the small scale welding industry such that the unemployment rate will be reduced significantly.

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## APPENDIX

**UNIVERSITY OF EDUCATION, WINNEBA  
COLLEGE OF TECHNOLOGY EDUCATION, KUMASI  
SCHOOL OF GRADUATE STUDIES AND RESEARCH  
QUESTIONNAIRE FOR WELDERS**

My name is Ing AMETUS GAMBA ZENEDEME, a student of University of Education, Winneba, Kumasi. Pursuing a Masters programme in Mechanical Technology. I am undertaking an academic research on: **“the impact of small scale welding industries on rural development; prospects and challenges in Nadowli kaleo district”**.

I would be very grateful if you could respond to these questionnaires.

Accuracy of your response and cooperation is very important to collecting relevant data.

The responses provided will be strictly confidential, and purely for this academic purpose and nothing else.

Thank you for your kind cooperation.

**SECTION A: SOCIO-DEMOGRAPHIC CHARACTERISTICS.** *(Tick (✓)for the right option or answer in the spaces provided)*

1. Sex: Male [ ] Female [ ]

2. Age

20-25yrs [ ] 26-30yrs [ ] 31 -35yrs [ ] 36-40yrs [ ] Above 41yr

3. Marital Status: Married [ ] Divorce [ ] Single [ ].

4. Level of Education

O' Level [ ] Secondary school graduate [ ] College/Undergraduate [ ]

Masters/PhD [ ] No formal Education [ ]

5. Occupational status farming [ ] teaching [ ] trading [ ]  
Nursing [ ] none [ ]

**SECTION B: THE KINDS OF WELDING INDUSTRIES IN WA WEST**

5. Do you engage in welding activities? Yes [ ] No [ ]

6. How many types of welding activities do you know? .....

7. Name them?

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

8. Explain some of the welding activities in your community.

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



**SECTION C: CHALLENGES FACING WELDING INDUSTRIES**

9. Do you receive any recognition as a welder for your academic qualification?

Yes [ ] No [ ]

10. What is the ladder of progression as a welder? .....

11. Do you have any difficulty in interpreting drawings and blueprints?

12. In your opinion, do you think acquiring welding certification in Ghana is difficult?

13. As a welder, do you have proper welding machines and materials?

Yes[ ] No[ ]

If yes, state some

.....  
.....

14. Is power supply a problem to your business? Yes[ ] No[ ]

15. Have you been receiving refresher courses to update your welding technology? Yes [ ] No [ ]

16. Is capital available to expand your business? Yes[ ] No[ ]

17. Does government support your operations to grow the business?

Yes[ ] No[ ]

**SECTION D; PROSPECTS OF WELDING INDUSTRIES**

18. Does welding industries enable you to increase output in production?

Yes[ ] No[ ]

How do you use welding activities in production? .....

.....

.....

Does welding activities increase your level of income from production?

Yes [ ] No [ ]

19. Before you enter this business, how much were you earning as income in a year?

.....

.....

20. After you engaged in this business, how much do you earn as income in a year? .....

21. Does that increase or decrease your living standard?

Increase [ ] decrease [ ]

22. Do you think with the coming of welding industries, teachers and nurses now stay in their posted communities? Yes [ ] No [ ]

23. Is the welding industry having any potential development in the district?

Yes [ ] No [ ].If yes explain your answer?

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