ENGINEERING IRON AND STEEL ASSOCIATION OF ZIMBABWE

DIAGNOSTIC STUDY 2021

ENGINEERING, IRON & STEEL INDUSTRY OF ZIMBABWE

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Executive Summary

The Ministry of Industry and Commerce mandated the Engineering Iron and Steel Sector of Zimbabwe to develop the road map for the revival of the engineering iron and steel industry of Zimbabwe. The first phase was an evaluation phase to gather key facts about the status of the sector and hence establish the baseline. A diagnostic study was carried out based on 7 key diagnostic dimensions namely; sources of inputs and supplies; production capacity and technology use; end markets and trade; sustainable production and technology use; value chain governance; value chain finance; and business and socio-economic context. Sector evaluation studies were commissioned for products and markets; macroeconomic and infrastructural environmental analysis; human and technical capacity needs analysis; and firm level diagnostic analysis. The diagnostic studies were meant to establish the precursor upon which the engineering iron and steel sector strategy would be developed. A number of approaches for data collection was used including desktop studies; field surveys; questionnaire administration; and key informant interviews and focused discussions with key stakeholders. The diagnostic study has managed to establish the status of the sector in terms of structure and main subsectors; size and spatial distribution; employment levels; size of sector by gross annual value; main products; import substitution potential; export potential; existing value chain map; identification of main constraints and opportunities based on the UNIDO 7 diagnostic dimension approach as well as insights into value chain selection. In concluding the diagnostic study, the sector general overview; the major constraints; weaknesses; opportunities and strengths of the sector are summarized.
This diagnostic work, therefore becomes an important precursor to the development of the Engineering Iron and Steel Sector Strategy, which must involve all the key stakeholders for the sector, which include; the firms and their representative associations; government support institutions; business networks and industry associations; professional bodies; academia and research and development institutions; and regulatory bodies amongst others. A provocative guideline of sector strategy development aspects that may be considered was also presented.

Some key insights into the diagnostic study and its findings were as follows;

General:

- Between 500 and 600firms exist in the engineering iron and steel sector of Zimbabwe, with the majority of the firms (77%) based in Harare (51%) and Bulawayo (26%).
- The majority of firms are predominantly shareholding companies with non-traded shares or shares traded privately; with a notable number being limited partnership and sole proprietorship.
- The majority of the firms are into engineering services, repairs and maintenance; assembling of general, special purpose and industrial parts and the machining thereof; and fabrication of metal and structural steel products.
- The majority of firms have high space requirement, typically over 5000 square metres. Most firms did not own operating premises (about 78%) and hence mainly relying on rentals averaging about USD32,380 per annum (about 2% of average annual revenues)
- The majority of the firms (67%) were micro-scale, with the remaining share almost equally shared amongst small scale, medium and large scale.
- Over 13,000 are formally employed by the sector, with about 12% being female employees. Harare and the Eastern region employed about 61% of total employment with 39% employed by the Bulawayo and Western region.
- The major employers by subsector are; the electrical engineered goods; assembled goods – general & special purpose machinery and goods; fabricated metal and structural steel products; agricultural equipment and foundry and engineering; engineering services and primary steel production
- The majority of firms were formed during the GNU Era (2009 – 2013).
- About 22% of firms in the sector closed shop, with Bulawayo (51%) and Harare (24%) dominating the closures. The major subsectors affected by closures included; engineering services, repairs and maintenance; assemble goods – general & special purpose machinery and goods; fabricated metal and structural steel products; agricultural equipment and foundry and engineering; automotive industry and electrical engineered goods, transformers, motors, etc.

Production, imports, exports and balance of trade:

- The estimated annual value of the engineering iron and steel sector is between USD3Billion and 4Billion (Precision is hampered by a lot of informal activity in the sector)
- Local production constitutes about 55% (USD2.2Billion per annum) of gross value, with imports at about 45% (USD1.8Billion per annum). About 7% (USD284Million per annum) is exported.
- Imports were dominated by; automotive industry (motor vehicles –USD542Million); electronic components, boards and computers; fabricated metal and structural products; electrical motors, generators and transformers, transmission and distribution equipment; flat rolled, sections and bars and rods; machinery for mining, quarrying and construction; assembled goods – general & special purpose machinery and goods and water and pumping machinery.
- Raw materials and spares were the major constituents of imports at every level of the value chain
- The major sources of imports are; South Africa; China; Zambia; Europe (UK, German and Sweden); and India
- Export competitiveness was very low with an export to imports ratio of 16%. The products with high export potential are; basic iron and steel products; jewellery; air and space craft machinery; motor vehicles; machinery for mining, quarrying and construction; household appliances; electrical motors, generators and transformers, transmission and distribution equipment; and agricultural and forestry products


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LOAD
agropower
WARAPP
Engineering (Pvt) Ltd
CIRCLEPAK
(PVT) LTD
Epiroc
Longden Steel
Steel For All Structures
METALFLEX
CUSTOMIZED ELASTOMER PRODUCTS
- EST. 1988 -
CLAUDE NEON SIGNS
BSi STEEL
automation JVS
projects JVS
National Spring Steel
THERMOTEC
AMES
ELECTRICAL
AMES
ENGINEERING
Parrogate

Table of Contents

List of Figures

List of Tables

Chapter 1 - Bacground

The engineering, iron and steel sector is a strategic and critical sector that used to contribute significantly to the Zimbabwean economy. A variety of products which included steel bars, metal sheets, boilers, bearings, pulleys, wire ropes, rail stock, electrical as well as agriculture and mining equipment was produced by the sector. As the heart-beat of the sector was ZISCO-Steel which had a production capacity of one million tonnes per annum at full capacity, employing over 5,000 employees and supplying various types of steel feed stock to the downstream players of the value chain. At peak operation (1975 – 1992), up to seventy percent (70%) of the steel was exported, contributing significantly to foreign currency generation. The decline of production at ZISCO Steel from 2000 till its closure in January 2008 was accompanied by a myriad of challenges for the engineering iron and steel sector. The sector vibrancy was also significantly affected by the economic crisis of the 2000 – 2008 hyperinflation era, resulting in the closure of many companies, low capacity utilization, dwindling export competitiveness, low local demand, antiquated machinery due to lack of foreign currency for retooling, amongst many others. The closure of Zisco-Steel also negatively affected other ancillary industries such as rail transport, coal mining, power generation and chemical industries that heavily depended on it.

The Government of Zimbabwe has responded through several policy initiatives as a spring board for the development of effective sector revival strategies to enhance the performance of the Zimbabwean economy and having direct implications on the revival of the engineering iron and steel sector. Notable policies include; i) The Zimbabwe National Trade Policy [NTP 2019 – 2023]: *(which spells out the vision, objectives and initiatives for enhancement of Zimbabwe's local and international trade)*; ii) National Export Strategy [NES 2019-2023]: *(which spells out the strategies for trade facilitation and export development and promotion)*; iii) Unfinished work of the Transitional Stabilisation Programme [TSP 2018 – 2020]: *(carried forward to the National Development Strategy:2021-2025)*; iv) National Development Strategy [NDS 2021 – 2025] *(which provides a policy framework for the support of local manufacturing companies to enhance their production capacities)*; v) Comprehensive Agriculture Policy Framework [APF 2012 – 2032] and the Draft Agriculture Policy [DAP 2018 – 2023] *(which seek to promote appropriate irrigation and mechanisation as key drivers of productivity growth in the agriculture sector)*; vi) Mining sector policies envisaging a USD12Billion Mining Sector Road Map; and vii) Energy Policies *(which seek to increase renewable energy generation to 1800MW by 2030)*.

NTP and NES [2019 – 2023]:

Major emphasis is on import-substitution and transformation of local industry to export-orientation, with government support to enhance export development and promotion; diversification of export products and export markets; and market access through negotiations at bilateral, regional and multilateral levels. The policy also sought to transform Zimbabwe from an exporter of raw and semi-processed products to an exporter of internationally competitive high value products. A general shift from inward-looking policy interventions of protecting domestic industry to approaches which balance the need for protection with regional, international and bilateral trade commitments is envisaged in the policy document. The iron and steel sector was prioritized for export development and promotion. Strategies outlined for the sector include technical intervention strategies, export marketing training, export packaging training, SME cluster development, standards and certification, building and adoption of export culture, export incentives and trade fairs and exhibitions.

NDS 1 [2021 – 2025]

Unfinished Work of the TSP [2018 – 2020]: It prioritizes the resuscitation of the engineering iron and steel industry through the implementation of the following; i) securing investors in the iron and steel industry; ii) resuscitation of steel foundries and use of modern technologies in the sector; iii) processing of scrap metals into new steel products; iv) strict control of scrap metal exports to ensure adequate throughput to domestic foundries; v) promotion of manufacturing of steel billets from scrap metal; vi) facilitation of increased supply of coal and electricity to the iron and steel industry; v) enhanced coke production for local foundries; vi) resuscitation of the machine tools and accessories manufacturing subsector; vii) industrial support to increase the supply of domestically manufactured buses and delivery trucks, thereby potentially benefiting the upstream industries that manufacture bolts, batteries, steel sheets, tyres, upholstery, paint, carpet manufacturers; and reducing the import bill; viii) development of strategy to enhance the local assembly of private vehicles to increase job creation and reduce import bill on new and recycled vehicles and accessories; ix) effecting of measures that promote consumption of locally manufactured goods like the termination of customs duty deduction on imported buses, compelling of line ministries to purchase vehicles from local assemblers amongst others; x) inclusive participation of the engineering iron and steel sector in the provision of intermediate goods and services to support the USD12Billion Mining Sector Growth Strategy/Road Map; and xi) rehabilitation and expansion of water treatment plants and range boosters, sewerage network and pump stations amongst others (Examples are water sources such as Kunzvi and Musami Dams, Caledonia, Hatcliffe and Warren Control amongst others).

APF [2012 – 2032] and DAP [2018 – 2023]:

These policies were aimed at decentralization of service and repair of farm mechanization equipment; farm structures and post-harvest facilities and technologies; provision of spares, technical back-up and capacity building; as well as rehabilitation, modernization and development of irrigation schemes (over 2.5 million of developed irrigation; 200Ha irrigated per administrative district by 2030). Engineering iron and steel products envisaged include agricultural tractors (including pedestrian controlled - two-axle tractors, single axle tractors), balers (straw and fodder balers including pick-up balers), combine harvesters (threshers), harvester and threshers, manure spreaders and fertiliser distributors, milking machines, ploughs (e.g. reversible and non-reversible ploughs), root or tuber harvesting machines, seeders, planters and transplanters, soil working equipment, threshing machines and track-laying tractors (crawlers), irrigation pumps, and centre pivots amongst others.

Energy policies:

The Renewable Energy Policy of Zimbabwe seeks to increase grid-solar energy generation capacity to 1800MW by 2030, giving massive opportunities for the engineering, iron and steel sector in terms of manufacturing and assembling of local solar panels, batteries for solar energy storage, transmission lines, other accessories for solar energy projects and research and development.

It was against this background that the Government of Zimbabwe, through the Ministry of Industry and Commerce, mandated the Engineering Iron and Steel Association of Zimbabwe (EISAZ) to lead the development of a roadmap and resuscitation strategy for the engineering iron and steel sector of Zimbabwe in line with government policy and vision. The revival is expected to culminate in the production of one million tonnes of long products, bars and wire rods per annum in the first phase and three million tonnes of flat products, section steel and belts per annum in the second phase (Government of Zimbabwe, 2018). In addition, it is expected that imports of steel products would be reduced by at least US$350 million per annum, while US$1 million worth of exports will be generated together with 3,000 direct jobs and 20,000 indirect jobs in the value chain.

Key inputs to the development of the national engineering iron and steel sector resuscitation strategy was; i) a macroeconomic environment and infrastructure analysis; ii) end markets and trade analysis; iii) value chain finance analysis; iv) human and technical capacity analysis; and v) the firm/enterprise level value chain diagnostic analysis.

1.2 Aims, Objectives and Scope

The broad objective of the diagnostic study was to establish a baseline for the Engineering Iron and Steel Sector of Zimbabwe as a precursor to the development of the engineering iron and steel sector revival strategy. Ultimately, the Sector Revival Strategy Document shall be produced and implementation road map prepared for execution. The ultimate goal was met through meeting the following objectives;

- End markets and trade analysis of the engineering iron and steel sector
- Macroeconomic environment and infrastructure analysis of the engineering iron and steel sector
- Human capital and technical capacity analysis of the engineering iron and steel sector
- Value chain finance analysis of the engineering iron and steel sector; and the
- Enterprise Level Diagnostic Study using the UNIDO 7 Diagnostic Dimension Approach

The Enterprise/Firm Level Study formed the core of the baseline study and its objectives were as follows;

- Identify the key products, value chains and subsectors of the engineering iron and steel sector and define the major sector structures and features (e.g. gender, spatial distribution, size, etc)
- Establish the value chain map for the current engineering iron and steel sector
- Establish the key features/characteristics of the seven (7) diagnostic dimensions namely; i) sources of inputs and supplies; ii) production capacity and technology use; iii) end markets and trade; iv) sustainable production and energy use; v) value chain governance; vi) value chain finance; vii) business and socio-economic context
- Identify major constraints and opportunities
- Provide recommendations and proposals to enhance sector viability at every level of the value chain

The results of the diagnostic study will enhance the development of the Sector Strategy Development Template that will be used by the key stakeholders (Ministry of Industry and Commerce and the Engineering Iron and Steel Sector of Zimbabwe) to produce the Engineering Iron and Steel Sector Revival Strategy Document.

Chapter 2 - Methodology

A variety of approaches was implored in carrying out the diagnostics study to ensure that the study reflected the true picture of the sector. The study had to cover the majority of the subsectors spatially distributed across the country as well as the diverse scales of operation. The key arms of the methodology were as follows; i) Consultation with the major sector representative body (EISAZ and NEC Engineering) and government ministries and departments; ii) Engagement of Consultants to conduct key studies that feed into the diagnostic study (macroeconomic analysis, market analysis, value chain finance and human and technical capacity development); iii) Establishment of population of firms for diagnostic study guided by NEC Engineering database and other sources; iv) Sampling of companies for data collection; v) Instruments development for collection of data and testing; iii) Establishment of Survey Population and Sampling for the different subsectors guided by NEC database and desktop survey; iv) Instruments administration (led by NEC Designated Agents for regions) (electronic and physical questionnaires were disseminated; v) Field visits to major players in the value chain; vi) Key informant interviews, focused discussions, structured, semi-structured and informal discussions and interviews with various stakeholders; vii) Data Collation; viii) Data Analysis; ix) Reports writing, presentations and validation through stakeholder consultations; and x) Report and presentations submission.

2.1 Population and sampling

The engineering iron and steel sector of Zimbabwe has a long history dating back to the 1930s. It has thus developed representative institution that has generally kept a reliable database of the main firms in its value chain. Vital information about the population and sampling was obtained from the Engineering Iron and Steel Association of Zimbabwe's (EISAZ) NEC Engineering, Iron and Steel division. The Engineering, Iron & Steel Association of Zimbabwe (EISAZ) is a legally constituted employers association, registered to exercise functions and powers of an industrial association. The organisation was formed by a group of industrialists in 1937. It derives its mandate from companies which are involved in mechanical engineering, agricultural engineering, structural engineering, foundries, building and assembly of bodies for vehicle chassis of passenger goods and/ or bulk carriers, commercial refrigeration, mining engineering and electrical engineering.

With a membership of about 500 firms in the engineering iron and steel sector, covering the whole of Zimbabwe, its population was found to be representative of the engineering iron and steel sector of Zimbabwe. The firms were classified into various categories according to main business line, scale of operation as well as geographical location. After the classification, about 15% sampling was done across the main subsectors and categories of the engineering iron and steel sector to ensure fair coverage.

2.2 Instruments development, dissemination and administration

A questionnaire was developed based on the UNIDO Seven Diagnostic Dimensions Approach to extract information from the firms. The instruments were reviewed and validated by key experts in the engineering iron and steel sector, tested and administered by the NEC Designated Agents. Over 100 questionnaires were disseminated to firms through the trained NEC designated Agents using the following three methods; i) online application; ii) physical copies; and iii) electronic copies via email. The completed questionnaires were returned mainly using email or online completion, as well as physical copies to a lesser extend due to COVID 19 restrictions. The different versions were consolidated into the same format in excel for ease of collation, cleaning and analysis. A total sample of 66 firms responded across the various subsectors as presented in Table 2.1 below;

Table 2.1: Responding firms in the engineering iron and steel sector

Category of Firm	#No of Firms
Primary Steel Production, Supply and Distribution	6
Foundry & Engineering	6
Wire and Fencing fabrication, Installations, Services & Repairs	4
Steel Fabrication & Manufacture, Installations, Repairs & Maintenance, including light steel works, tubes, pressure vessels, etc.	11
Structural Steel Fabrication & Manufacture, Installations, Repairs & Maintenance, etc.	3
Machinery parts & metal fabrication, assembly & engineering, including Agricultural Equipment, Household & Medical & Water Engineering Equipment	10
Mining & Mineral Processing Machinery Engineering, Fabrication, Assembly, Services, Repairs & Installations	4
Automotive & Industrial equipment manufacturing & services	4
Electrical Engineered Goods, Transformers, Motors, etc.	2
Electrical Engineering Services, Repairs& Installations	3
Engineering Services & General Contracting, Repairs and Maintenance	13
Total	**66**

2.3 Field surveys and key informant interviews

Some field surveys were done to key upstream players in the engineering iron and steel sector. Dedicated field assessments were conducted at ZISCO Steel, Lancashire Steel and Coal Suppliers in Hwange (Hwange Colliery Company HCCL] and Zambezi Gas and Coal Mine [ZGCM]). Focused discussions, semi structured interviews, plant tours were conducted with key personnels (managers, senior engineers, marketing and operations executives, etc.) at key stakeholders who include ZISCO, Coal Miners (HCCL and ZGCM), the National Railways of Zimbabwe (NRZ), Zimbabwe National Water Authority (ZINWA), Zimbabwe Electricity Transmission and Distribution Company (ZETDC) and Lancashire Steel amongst others. The information was captured and incorporated into the diagnostic study.

2.4 Desktop studies

Some relevant studies have been done, e.g. the Needs Assessment Study for the MSMEs in the Engineering Iron and Steel Sector of Zimbabwe (EISAZ, 2015) and the Engineering and Metals Value Chain Diagnostics Study (ZEPARU, 2014) and the Engineering, Iron and Steel Sector Strategy (2015 – 2020) which was not implemented. Work done by engaged consultants has also been reviewed, giving vital input to the diagnostic study as well and company reports, reports from organizations like Confederation of Zimbabwe Industries (CZI), Zimstat, Chamber of Mines, etc. industrial bulletins, government policy documents and budgets, amongst others.

2.4 Limitations

The methodology enabled the collection of adequate data for the diagnostic data. The major population for diagnostics was the NEC Database, which approximately constitutes 85% of all the registered/ formal engineering iron and steel companies. However, no data was collected for the informal sector. It is also worth noting that despite 66 firms (respondents) participating in the survey, not all of them responded to all the questions given per diagnostic dimension. A significant number did not respond to questions related to highly confidential information like financial income and annual sales revenue. Field surveys were limited due to the COVID restrictions and hence much of the data collection was done electronically. The information collected was up to 2019 since most firms had not yet prepared complete reports for 2020, therefore any significant shifts in 2020 was not accounted for. Generally the data used was typically from 2009 to 2019.



Chapter 3 - Structure of the engineering iron and steel sector of Zimbabwe

This section looks at the current structure, actors in the engineering iron and steel sector and their classification and categories, size and spatial distribution, scale of operation and employment levels amongst others. The sector structure is shaped by various factors including product demand, incumbency and historical factors, as well as the dynamics of production and supply influenced by the economic environment and the business and socio-economic context. Ultimately, the value chain map of the sector was established to give a clear picture of the current sector structure in Chapter 4. The generic value chain structure of the engineering iron and steel sector of Zimbabwe is presented in Table 3.1 on page 7.

Table 3.1 - Value chain structure of the engineering, iron and steel sector in Zimbabwe

INPUTS		TRANSFORMATIONAL PROCESSES		FINISHED PRODUCTS
Iron Ore	Available locally as course and fine ores with grades ranging from 40%Fe (Mwanesi) to about 55%Fe (Ripple Creek). Over 30Billion tonnes of resource from Mwanesi. Investment into exploration and exploitation is required to extract and supply adequate ore for downstream processes	**Mining & Mineral Processing**	Drilling, Blasting, Haulage, Crushing, Screening, Concentration, Separation, Agglomeration, Pelletisation, Sintering, etc. The typical low grade ores in Zimbabwe require upgrading via some of the processes mentioned above. Contract mining may enhance efficiency and cost competitiveness. Iron ore mines include - Nyuni in Masvingo (>100Mt: 45-67%Fe resource); Ripple Creek in Kwekwe (54Mt: 54%Fe resource); Mwanesi (33Bt:40-60%Fe resource)	**Automotive:** Modern vehicles contain over 50% advanced high strength steels. Zimbabwe has 3 major vehicle assemblers - WMM1 (Deven), Quest, AVM Africa. Capacity is over 18,000 vehicles per annum. Current utilisation is less than 10%. Demand for new vehicles is over 5,000 per annum; Used imported ones over 60,000 vehicles per year. About USD400Million per year vehicle imports vs USD4.2Million exports per year. At peak USD1.3Billion spent on vehicle imports
Coal	Metallurgical Coal: used for iron making via the BF - BOF Route; also used in smelting processes and foundries. Locally produced, mainly from Hwange. Over 3Billion tonnes of resource. Investment required to increase production capacity to meet projected demand	**Coke Making and Reducing Agent Preparation**	Production of Coke for the BF - BOF Route via Coke Oven Batteries (By Product Recovery or Non Recovery Types). Useful by-products like Coke Oven Gas, Coal Tar, Benzol, etc for petrochemical refineries and road construction, power production, etc. Alternative use of non-coking coal for DRI/Smelt Reduction Process of iron and steel making. 4 x Coke Ovens at ZISCO (0.87Mtpa) requiring rehabilitation; 0.18Mtpa Coke Ovens at HCCL requiring major overhaul; and 0.9Mtpa from about 4 Chinese Coke Oven Batteries located in Hwange:- Total Cap: 1.95Mtpa	**Buildings and Infrastructure:** About 50% of steel produced is used in buildings and infrastructure, and buildings and infrastructure from steel can last 40 - 100yrs. Lots of opportunities in construction activities in Power Infrastructure, Railway rehabilitation, road construction, Dam Constrcution, Water and Irrigation, etc. High consumption of channels, angles, bars, rods, wires, plates,etc. About USD1.7Billion required annually to rehabilitate infrastructure. Africa Steel, BSI, Steel Warehouse, Houmin, Steel World, Steel Brands, Steel Centre, Steel Warehouse, etc are some of the major players
	Non-coking coal: used for the DRI route for iron and steel making. Locally produced mainly from Hwange. Over 7Billion tonnes of resource. Investment required to increase production capacity to meet projected demand	**Iron Making**	Blast Furnace Route using coke to produce pig iron or Alternative Direct Reduced Iron Technology or Smelt Reduction Technologies using non coking coal or natural gas as reducing agent. Security of supply of reducing agent, suitability of technology, investment cost and environmental laws critical in determining the technology route. ZISCO with installed capacity of 1Mtpa (BF No. 4 & BF No. 3) is not operational since 2008. Local DR1 Capacity to produce Sponge Iron at about 36000tonnes per annum	**Mechanical Equipment:** Agricultural, industrial machinery, mining machinery and parts, medical equipment, etc. About USD500Million spent per year on mechanical equipment imports vs USD18Million exports. 2.5Million Ha irrigation targeted by 2030. Also opportunities in Farm Mechanisation (shortage of 30,000 tractors) and USD12Billion Mining Road Map, etc. Zimplow, Baines, Warrap are some of the key producing firms
Scrap	Used mainly in the Electric Arc Furnace; a significant portion also used in the Basic Oxygen Furnace Route of Steel Making. More environment friendly. Local resource has to be quantified	**Steel Making**	Basic Oxygen Furnace Route (BOF), Electric Arc Furnace Route or Induction Furnace Route. ZISCO BOF not operational due to closure of upstream processes. A handful Chinese Induction Furnaces operational (about 20000tpa) and a few EAF processes (about 20000tpa). Thus local production currently under 0.1Mtpa	**Metal products:** Packaging materials, pressure vessels, reservoirs, tanks, structural metal products, containers,etc. sheet metal works, etc. Also includes wires, nails, bolts, etc. An average of USD138Million imported vs USD13Million exports per annum
Aggregates	Lime, Limestone, Calcium Carbide and Magnesite, used mainly as fluxes. Resources are available locally. About 54Mt of limestone ore resource is found at Ripple Creek	**Steel Casting**	Mainly via Ingot, Pig casting and Continuous Casting. Current local installed capacity of about 1Mtpa. Ingot casting now obsolete. Continuous casting the most used method. ZISCO's continuous casters not operational due to closure of upstream processes. Steel Makers CCM - operational	**Domestic Appliances:** About 75% of domestic appliances are comprised of steel, e.g. kitchen ware, household furniture, etc. Tregers is one of the major producers of domestic appliances as well as Electrosales
Alloys	Important in manufacture of steel to required grades (over 3500). They determine properties like hardness, tesnile strength, ductility and corrosion resistance amongst others. Major alloys include aluminium, manganese, nickel, silicon, titanum, zinc, vanadium, etc. Majority found locally	**Rolling Mills**	Rolling Mills installed in about 10 Plants, with ZISCO having the biggest rolling capacity of over 0.8Mtpa. Common Mills are Bar and Rod Mills, Wire, and Billet Mills. ZISCO and Lancashire Mills are down, requiring major overhauls. Other small mills operational, supported by scrap and sponge iron fed steel making processes, producing bars, rods, angles and sections (about 0.1Mtpa). No capacity for plates, sheets and pipes	**Other Transport:** These include shipping containers, spacecraft, motor cycles, railway and locomotives, military vehicles, boats and ships, etc. An average of USD28Million imported annually vs exports of about USD11Million. The National Railways of Zimbabwe, Morewear Industries, ZECO, ZISCO, Professional Engineers, etc. used to be the major manufacturers.
Energy	Huge consumption of electrical and thermal energy in the iron and steel making and transformational processes to drive machines, coking, blowing, rolling,casting and other transformational processes. Zimbabwe needs to increase power production to meet the needs of the sector. Current production is below 50% of installed capacity of about 2200MW	**Moulding and Casting**	Use of Cupola, Induction and Electric furnaces for smelting of different types of moulded products in Foundries, from light duty to heavy duty parts. Over 20 Foundries are scattered around Zimbabwe's towns. Metallurgical coke, water and electricity are key inputs	**Electrical Equipment:** Special steel tailor made to produce specific magnetic properties. Electrical steels used extensively through out the energy value chain - power generation (transformers, motors, cables), transmission and distribution (cables, accessories, protective devices, etc) and consumption (electric motors, transformers, lighting, elements, etc). I also covers manufacture of batteries and accummulators, manufacture of wiring and wiring devices, optic fibres, electronic devices, etc.An average of USD147Million imported annually vs USD16Million exports. Key players include CAFCA and Powerspeed
Water	Required mainly for cooling, processing and domestic use. Although usage is generally high, actual consumption is low	**Metal fabrication and finishing**	All machining processes in a Machine & Fabrication Shop (Machining, Milling, Drilling, Boring, Cutting, etc.); Welding, Boiler Making, Bending, etc., Heat Treatment, Coating, Plating, Galvanising, etc., Forging, Drawing, etc. Several workshops are dotted around the country	**Electronic Equipment:** This includes computers, electronic and optical products, communication equipment, consumer electronics, control and instrumentation equipment, optical and photographic equipment, etc.
Transport	Iron ore, Steel and its intermediate and final products are heavy and rely on rail as well as good transport infrastructure for its transportation. Road and rail is currently in bad state in Zim and require recapitalisation	**Assembly Processes, Equipment Installations and Commissioning**	All setting up, joining, alignment, assembly technologies including automation and robotics, production control systems, electrical components, control and instrumentation, electronics and programming	**Solar and Semiconductor Devices:** A relatively new subsector that is growing significantly and worthy distinguishing. Includes the solar photovoltaics modules, the inverters, the batteries, the charge controllers, the controls, etc.

3.2 Classification of companies in the engineering iron and steel sector of Zimbabwe

There are different classification approaches, local, regional and international used by economists, governments, statistical bodies, and industrial and professional associations amongst others in-order to standardize analysis, trade and reporting for various stakeholders. Some of the common ones are; i) the Central Product Classification (CPC) used by the United Nations; ii) the Harmonised Commodity Description and Coding System (HS) used by the World Customs Organisation (WCO); iii) the International Standards Industrial Classification (ISIC) used by the Industrial Labour Organisation; and iv) the Standard International Trade Classification (SITC) of the United Nations.

The Central Product Classification (CPC) consists of a coherent and consistent classification structure for products based on a set of internationally agreed concepts, definitions, principles and classification rules. It provides a comprehensive framework within which data on products can be collected and presented in a format that allows for economic analysis supporting decision-taking and policy-making. The Harmonized Commodity Description and Coding System (HS) is an exhaustive nomenclature of internationally traded commodities (goods) classified according to the following criteria: (a) raw or basic material; (b) degree of processing; (c) use or function; and (d) economic activities. ISIC is a standard classification of economic activities arranged so that entities can be classified according to the activity they carry out. The groups and divisions, the successively broader levels of classification, combine the activities of producing units according to: similarities in the character of the goods and services produced, the uses to which the goods and services are put, and the inputs, process and technology of production. ISIC is a basic tool for studying economic phenomena, fostering international comparability of data, providing guidance for the development of national classifications and for promoting the development of sound national statistical systems. The SITC is a product classification of the United Nations (UN) used for external trade statistics (export and import values and volumes of goods), allowing for international comparisons of commodities and manufactured goods. The commodity groupings of the SITC reflect (a) the materials used in production; (b) the processing stage; (c) market practices and uses of the products; (d) the importance of the commodities in terms of world trade; and (e) technological changes.

In Zimbabwe, the ISIC is commonly used by ZIMRA and ZimStats. The classification of products belonging to the engineering iron and steel sector are presented in Table 3.2 .

Table 3.2: Classification of engineering iron and steel products

Product Category	ZIMRA/Zimstat/ ISIC Coding	CPC	HS
Mining and Quarrying	**Section B**		
Mining of hard coal	5: 51 - 510	11	Chapter 25 - 27
Mining of iron ores	7: 71 - 710	14	Chapter 72 - 73
Mining of non-ferrous ores	7:72		Chapter 74 - 81
Manufacturing	**Section C**		
Manufacturing of coke and refined petroleum products	*19*		Chapter 25 - 27
Manufacture of coke oven products	1910		
Manufacture of basic metals	*24*	41	
Manufacture of basic iron and steel	2410		Chapter 72 - 73
Manufacture of basic precious and other non-ferrous metals	2420		Chapter 74- 81
Casting of iron and steel	2431	42	Chapter 72 - 73
Casting of non-ferrous metals	2432		Chapter 74- 81
Manufacture of fabricated metal products except machinery and equipment	*25*		
Manufacture of structural metal products, tanks, reservoirs and steam generators	251		Chapter 72 - 73
Manufacture of weapons and ammunition	2520	44	Chapter 93
Manufacture of other fabricated metal products, metal working service activities - forging, pressing, stamping, roll forming, powder metallurgy, treatment and coating, cutlery and hand tools, hardware, etc	259: 2591 - 2599	42	Chapter 82 - 83
Manufacture of computers, electronic equipment, optical products, consumer electronics, electromedical, instrumentation, communication equipment, etc	26: 261 - 268	45	Chapter 84 - 85
Manufacture of electrical equipment; electric motors, generators, transformers, aircon and ventilation, batteries and accumulators; wiring and wiring devices; fibre optic cables; electric lighting; domestic appliances, etc	27: 271 - 275	46	
Manufacture of machinery and equipment; general purpose machinery; engines and turbines except air craft; pumps, ovens, furnaces;	28: 2811 to 2829	43	
Manufacture of motor vehicles; trailers; body works, parts and accessories	29: 291 - 293	44	Chapter 86 - 89
Manufacture of other transport equipment; boats and ships, railway locomotives and rolling stock; aircraft and related; military fighting vehicles; motor cycles, bicycles, etc	30: 301 - 309	49	
Manufacture of furniture:	31	43	
Other manufacture - jewellery, musical instruments, sporting goods, medical and dental	32: 321 - 329	48	Chapter 90 - 92
Repair and installation of machinery	33: 331 - 332		

As shown in the Table, the ISIC classification adopted by ZIMRA/ZimStats is the most appropriate for Zimbabwe, making it easy to classify the different products produced by the sector.

3.2.1 Classification of companies

The classification of companies was guided by the classification of engineering iron and steel products derived from the ISIC/ZIMRA classification. Nevertheless, there is a lot of interfacing of products making it difficult to classify certain companies which produce a mix of products that cut across several classes, e.g. agricultural, mining, automotive and general engineering. The main database used in classification of companies was derived from NEC, a division of EISAZ with over 85% of the countries engineering iron and steel firms. There are several engineering iron and steel subsectors as presented in Figure 3.1 below.

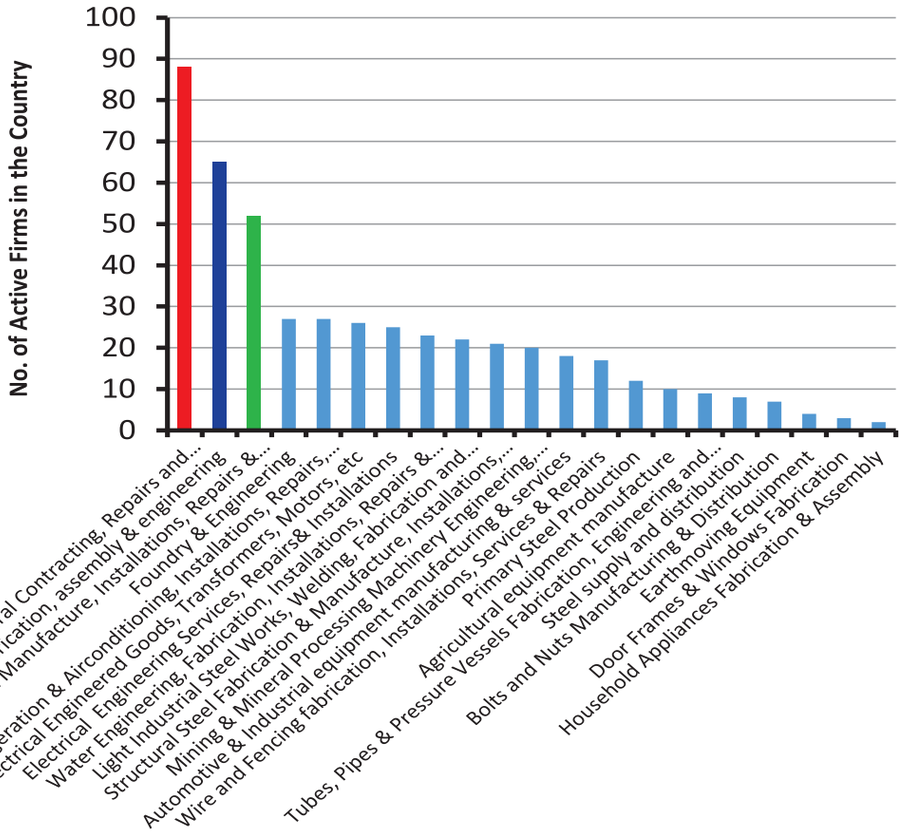


Figure 3.1 Classification and size of sub-sectors in the engineering iron and steel sector of Zimbabwe

The engineering iron and steel sector has over 486 active firms (about 500firms) operating in the various sub-sectors. Based on the number of active firms, the sector was dominated by Engineering services and general contracting, repairs and maintenance sub-sector with about 88 formally registered companies, followed by Machinery parts and metal fabrication, assembly and engineering and Steel fabrication and manufacture with 65 and 52 firms respectively. The Foundry and Related Engineering, Refrigeration and Air-conditioning, Electrical Engineered Goods and Services were also notable subsectors with significant number of active firms.

3.2.1.1 Spatial distribution of firms in the engineering iron and steel sector

The spatial distribution of firms in the engineering iron and steel sector are presented in Figure 3.1 below.

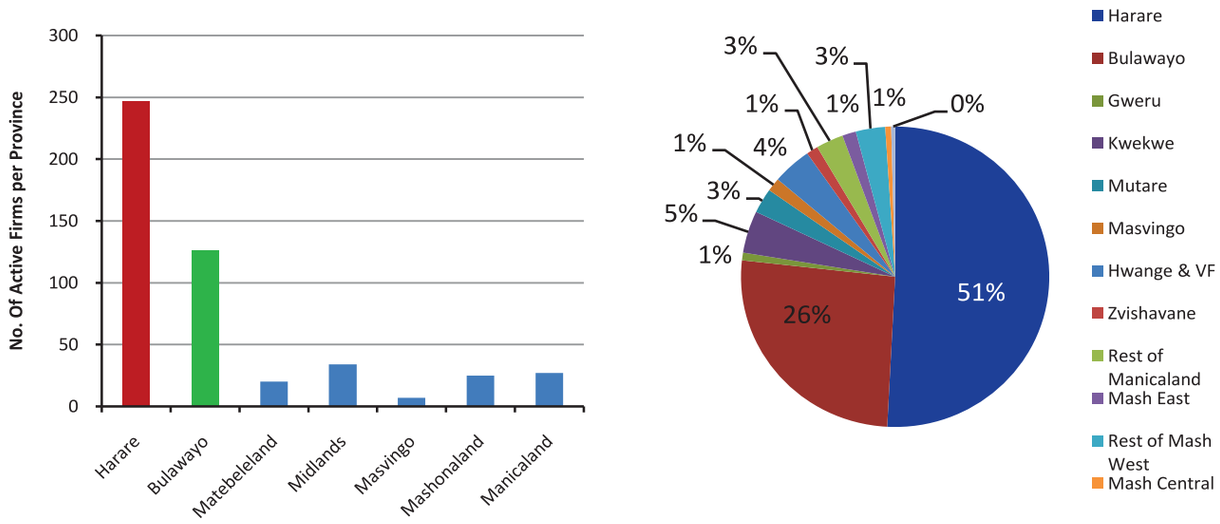


Figure 3.2 Spatial distribution of firms in the engineering iron and steel sector of Zimbabwe

As presented in Figure 3.2 above, the majority of active firms were in Harare (51%) and Bulawayo (26%), followed by Kwekwe (5%). Thus in general, the two biggest cities, Harare and Bulawayo constitute about 77% of the engineering iron and steel sector active firms, with the remaining 23% distributed almost evenly across Midlands, Mashonaland, Manicaland and Matabeleland. The skewed distribution will definitely continue to pile pressure on the big cities as people seeking employment will converge in the two cities and hence causing congestion and overloading services. It will be crucial to consider opportunities provided by resources in the different regions as well as devolution in order to minimize the skewed distribution. The spatial distribution of engineering iron and steel sub-sectors was also analysed and presented in Figure 3.3 below.

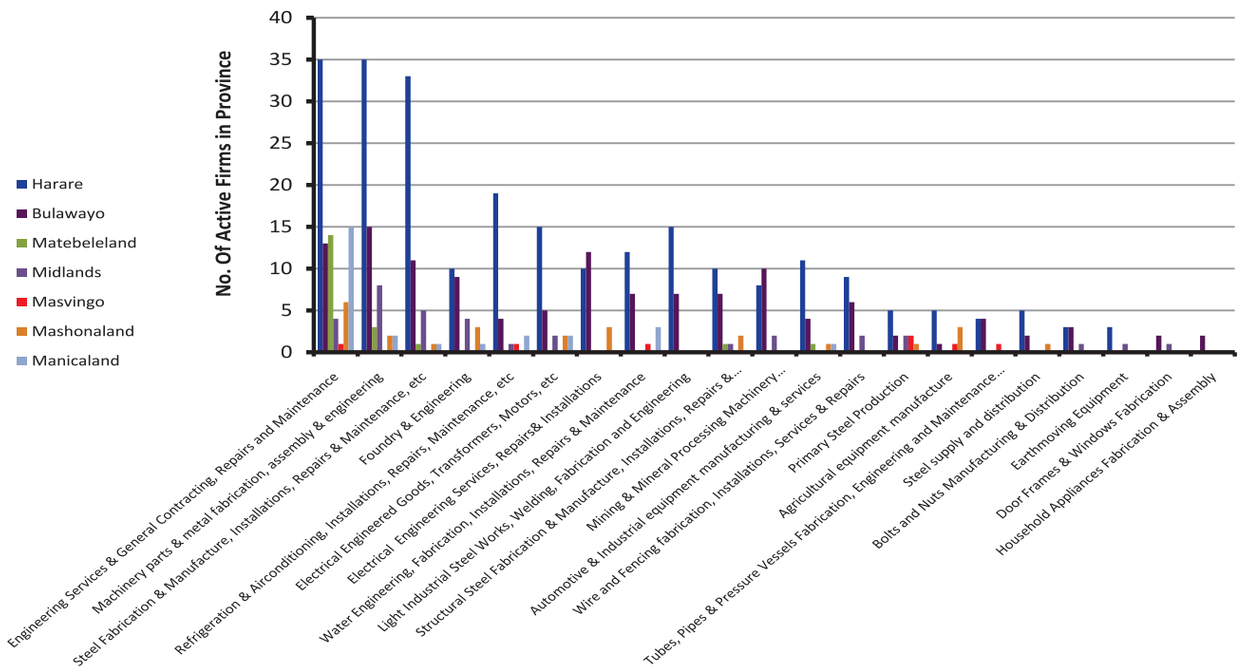


Figure 3.3: Spatial distribution of engineering iron and steel subsectors of Zimbabwe

Despite the fact that Harare generally dominated for the majority of sub-sectors, there are some subsectors which are more active in other regions than Harare. Bulawayo is equally dominant in foundry and related engineering firms; electrical engineering services, repairs and Installations; Mining and Mineral processing equipment engineering, fabrication and assembly; tubes, pipes and pressure vessels and bolts and nuts manufacturing. Manicaland had significantly active firms in engineering services and general contracting (about 15 firms); Midlands had active firms in engineering services, machinery equipment and parts, metal fabrication and foundry (buoyed by primary steel fabrication in the vicinity). Matabeleland had some active firms in engineering services and machinery parts and metal fabrication, anchored mainly by the coal value chain in Hwange. Mashonaland had also some notable firms active in engineering services and general contracting, foundry and engineering, electrical engineering services, structural steel fabrication and agricultural equipment engineering and manufacture anchored mainly by agricultural activity. Masvingo was active in primary steel production.

In the spirit of devolution, it is worth noting that each region had some key drivers for certain sub-sectors, implying that every region has the potential to leverage on these key drivers to uniquely contribute towards the development of the engineering iron and steel sector. The opportunities presented for the different regions are summarized in Table 3.3 below.

Region	Key Drivers	Subsectors with great potential
Harare	High population and residential constructions	Doors and window frames, wires and related products
	High commercial activity	Engineering services, repairs and maintenance
	Road Construction	Structural engineering goods and services
	Construction of commercial buildings	
	High energy consumption	Electrical goods and services
	Existing engineering iron and steel production infrastructure	Vehicle Assembly Plants, Foundries, Agricultural Equipment Assemblers,Machine Assembly, parts fabrication, Agric Equipment Assembly,etc
Bulawayo	Existing engineering iron and steel production infrastructure	Foundries and engineering, Metal Fabrication, Machinery and Parts Fabrication and Assembly; Household Appliance Manufacture
	High population and residential constructions	Doors and window frames, wires and related products
	High commercial activity	Engineering services, repairs and maintenance
	Closeness to gold and coal mines	Mining and mineral processing equipment fabrication
	Closeness to primary steel production centres	
Midlands (Kwekwe, Gweru, Zvishavane)	Existing iron and steel production infrastructure	Primary iron and steel production
	Abundant iron ore and limestone	
	Existing heavy mining and mineral processing industry	Structural Steel production, Foundries and Engineering
	Growing residential population	Engineering services, repairs and maintenance
	Abundancy of other minerals (chrome, PGMs, asbestos, diamonds, etc)	Heavy machinery Assembly and Parts Fabrication
	Abundance of coal in Gokwe	
	Abundant Solar radiation	Manufacture of Solar PV Mounting Equipment
	Centrality of location	
Matebeleland (Hwange, Vic Falls, Lupane)	Abundance of coal and coal bed methane gas in Hwange	Engineering services, repairs and maintenance
	Tourism in Victoria Falls & Hwange National Park	
	Potential power generation from Batoka Hydropower	Structural steel production, services and goods; Heavy machinery parts fabrication and servicing
	Power generation from thermal power stations	
	Abundant Solar Radiation	
	Closeness to the Border	

Region	Key Drivers	Subsectors with great potential
Mashonaland East (Marondera, Mutoko, Murehwa, Hwedza)	Abundant iron ore resource in Mwanesi (> 33Billion tonnes)	Primary iron and steel production
	High agricultural activity (tobacco, maize, etc)	Agriculture equipment assembly, fabrication of parts and servicing
	Existing engineering iron and steel infrastructure	Foundry and related engineering services
Mashonaland West (Chinhoyi, Kadoma, Norton, Chegutu, Kariba, Selous)	High agricultural activity (tobacco, maize, etc)	Foundry and related engineering services, Irrigation and water engineering
	PGMs mining - Zimplats	Engineering services, repairs and maintenance
	Power generation from Hydropower	
	Tourism from Kariba Dam	
	Existing engineering iron and steel infrastructure	
Mashonaland Central (Mazoe, Bindura, Mt Darwin)	Gold Mining	Agriculture equipment assembly, fabrication of parts and servicing, Irrigation and Water Engineering
	High agricultural activity	
Manicaland (Mutare, Rusape, Nyanga, Dorowa, Chipinge, Chimanimani)	Diamond Mining	Foundry and related engineering services, Agricultural equipment assembly, Irrigation and Water Engineering
	High agricultural activity	
	Mining activities in Dorowa, Penhalonga, etc	Engineering services, repairs and maintenance
	Tourism in the eastern highlands	
	Closeness to the port	
	Existing engineering iron and steel infrastructure	
Masvingo (Masvingo, Chiredzi)	Abundant Iron Ore in Nyuni	Primary iron and steel production
	Existing iron production facility	
	Abundant solar radiation	Engineering services, repairs and maintenance
	Agricultural activity in Triangle	
	Closeness to South Africa	

As presented in Table 3.3; it can be deduced that the national hubs for primary iron and steel production will be Redcliff, Masvingo and Chivhu. Considering the heaviness of steel, heavy industrial steel manufacturing works like foundries and heavy machinery and equipment assembly plants shall be located close to these hubs. Space in these areas is also relatively cheap and available to meet the requirements of these subsector activities. The agricultural rich Mashonaland Province can become the hub for agricultural equipment manufacturing and assembly, light foundries and irrigation and water engineering. Bulawayo and Harare will remain the main hubs for Machinery and Metal Fabrication Engineering and Steel Fabrication taking advantage of the economies of scale and the existing infrastructure. Harare and Mutare shall remain the major Vehicle Assemblers considering the already existing infrastructure. Nevertheless, major components could be supplied from the iron and steel production hubs in Masvingo, Kwekwe and Chivhu, with fabricated machine parts and sheets coming from Bulawayo and Harare.

3.2.1.2 Classification of firms by size

The firms that operate in the engineering iron and steel sector vary in size and can be classified according to the number of people they employ. The distribution of firms by size is presented in Figure 3.4 below.

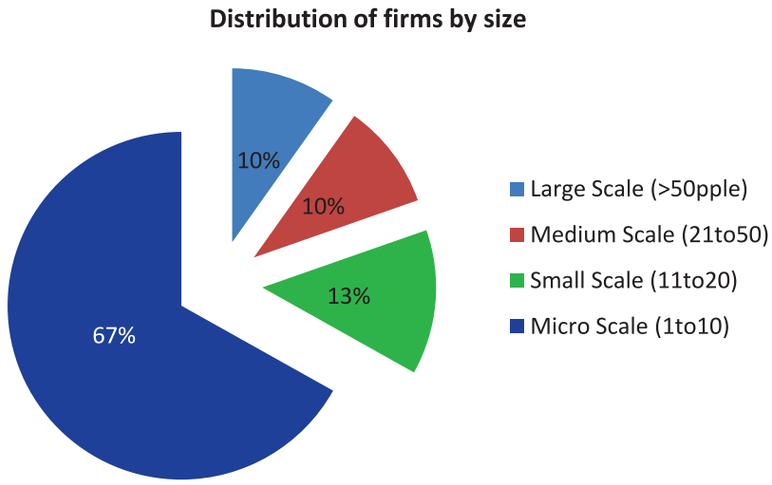


Figure 3.4: Distribution of firms by size in the engineering iron and sector of Zimbabwe

As presented in the pie chart above, the majority of the companies (67%) were micro-scale, with small scale constituting 13% and large and medium scale enterprise having 10% apiece of the share. This scenario is a major cause for concern, since the impact to employment creation and contribution to the fiscal is typically significant when medium and large scale firms have a significant share. The distribution of firm categories by region is presented in Figure 3.5 below.

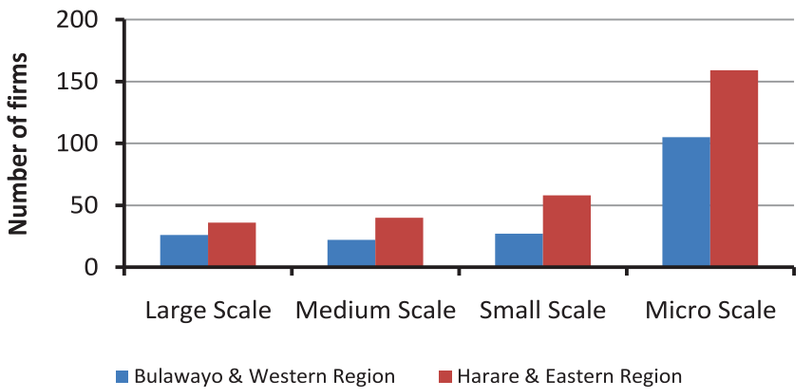


Figure 3.5: Regional distribution of firms by size in the engineering iron and sector of Zimbabwe

As presented above, Harare and the Western region has a greater share of firms for all categories. Nevertheless, the gap for large scale firms was narrow implying that Bulawayo and the Western region had a relatively notable number of large scale firms. The distribution of classes of firms by sub-sector is presented in Figure 3.6 below.

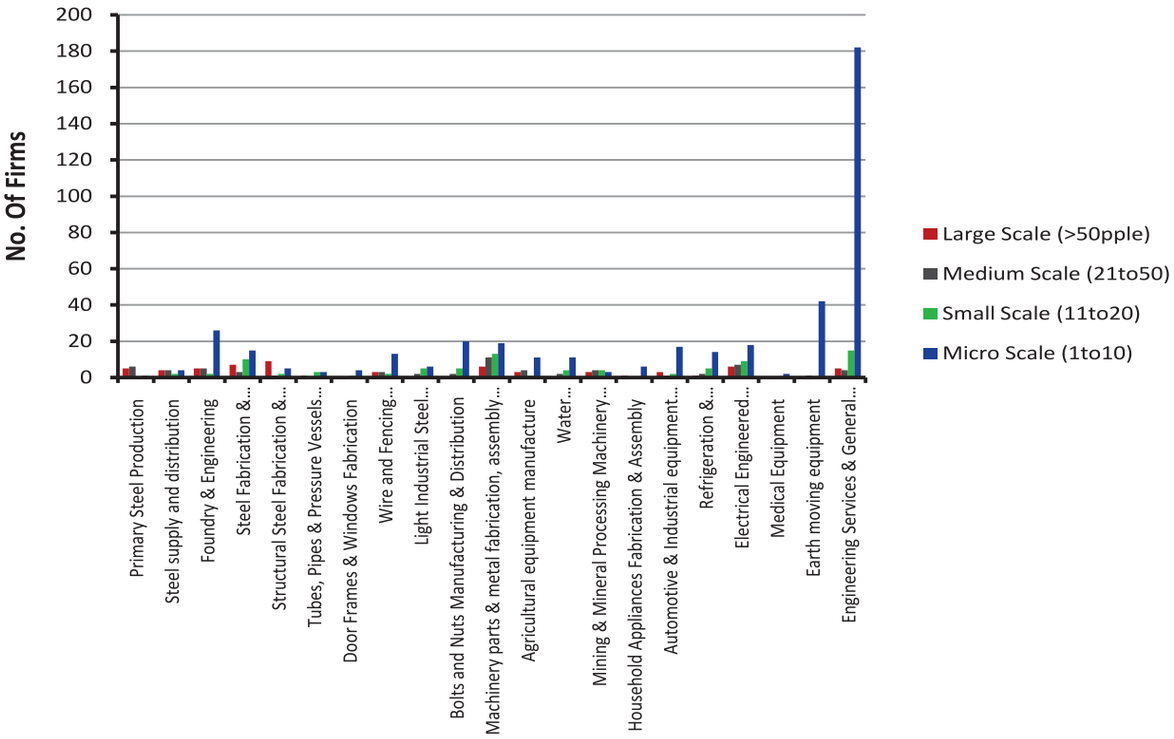


Figure 3.6: Distribution of firm categories by subsector in the engineering iron and sector of Zimbabwe

As presented in Figure 3.6 above, it was only the Primary Steel Production, Steel Supply and Distribution, steel fabrication and manufacture; Electrical Engineered Goods and Services and Machinery Parts and Equipment Assembly; and Mining and Mineral Processing Equipment with notable share of large and medium scale firms. This was attributable to the capital intensive nature of the subsectors which inhibits the participation of micro-enterprises.

3.2.1.3 Employment levels in the engineering iron and steel sector of Zimbabwe

According to the population studied (excluding the informal sector); the engineering iron and steel sector employed about 13,000 people. The detailed breakdown of number of employees is presented in Annex 3. The employment levels by region are presented in Figure 3.7 below.

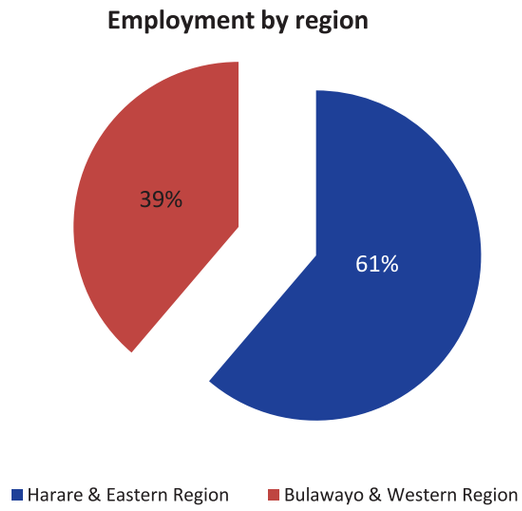


Figure 3.7: Employment levels by region in the engineering iron and sector of Zimbabwe

As shown in the pie chart above, Harare and the Eastern region constituted 61% of the total employed personnel. This was consistent with the higher number of active firms in Harare and the Eastern region as compared to Bulawayo and the Western Region. The employment levels by subsector are shown in Figure 3.8 below.

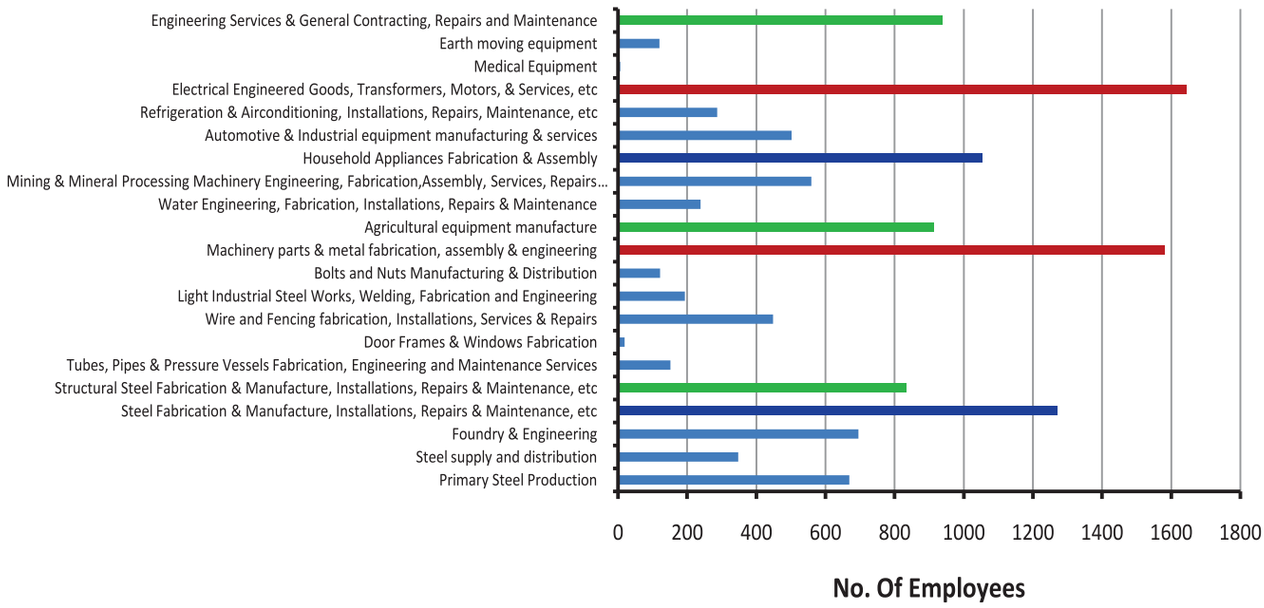
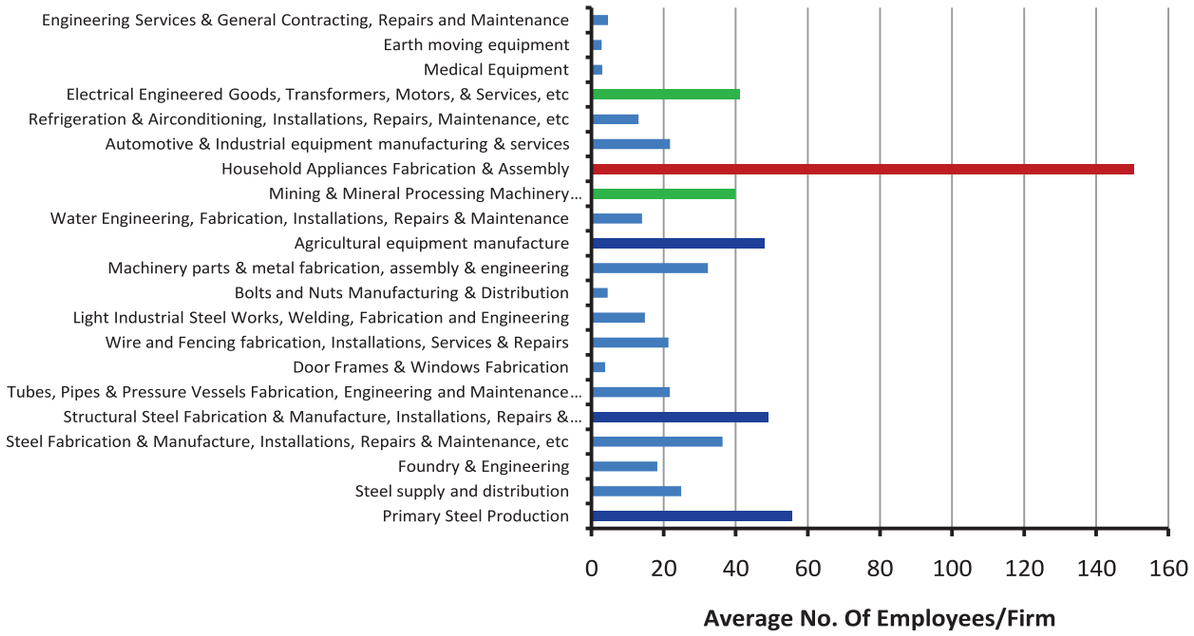


Figure 3.8: Employment levels by subsector in the engineering iron and sector of Zimbabwe

The subsectors with highest employment levels were Electrical Engineered Goods and Services and Machinery Parts and Metal Fabrication, Assembly and Engineering; followed by Steel Fabrication and Manufacture and Household Appliances fabrication and Assembly as shown in Figure 3.8 above. It is worth noting that despite having many firms in the Engineering Services subsectors; the high number of firms did not translate to high employment levels. Ironically, Electrical Engineered Goods and Machinery, Parts and Equipment subsectors without significant number of firms had highest levels of employment. Thus the employment potential of each subsector is presented in Figure 3.9 below.

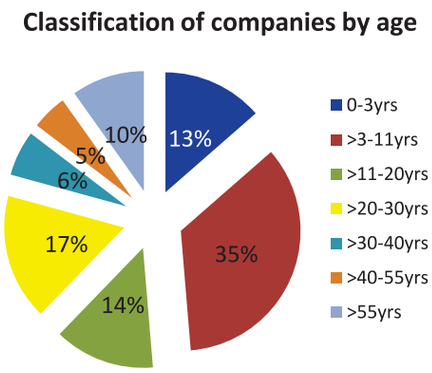


3.9: Employment potential of subsectors in the engineering iron and sector of Zimbabwe

As presented in the bar chart above, the subsectors with high employment potential were; i) Household appliances, followed by; ii) Primary Steel production; iii) Structural Steel Fabrication and Manufacture; iv) Agricultural Equipment; v) Electrical Engineered Goods and; vi) Mining and Mineral Processing Machinery. These subsectors have a notable number of large scale firms and growth and expansion of these companies have a significant and positive impact to employment creation and fiscal income.

3.2.1.4 Age of companies

In the Zimbabwean context, where the economy has gone through different eras, most of which were very tough in the business and socio-economic and political context, the age of a company has significant meaning. Firms that have survived through various economic eras may mean high resilience and robustness. The number of companies formed in a certain era may imply effectiveness of certain policy measures, interventions or be correlated with the environment prevailing in that era. The classification of companies by age is presented in Figure 3.10



Age	Year Range	Economic Era
0-3yrs	2018 to 2021	New Dispensation
>3-11yrs	2009 to 2017	Post Hyperinflation
>11-20yrs	2000 to 2008	Hyperinflation
>20-30yrs	1990 to 1999	ESAP
>30-40yrs	1980 to 1989	PreESAP (Post Independence)
>40-55yrs	1965 to 1979	UDI (Preindependence)
>55yrs	Before 1965	Pre-UDI (Preindependence)

Figure 3.10: Classification of firms by age in the engineering iron and sector of Zimbabwe

As shown in the pie chart above, about 35% of the firms were formed in the post hyperinflation era of 2009 to 2017, notably benefitting from the stable business, socio-economic and political environment of the Government of National Unit (GNU) Era. About 17% were formed in the 1990 to 1999 era, when the economy was still fairly stable. About 48% of companies were formed post-hyperinflation. This implies that the sector has great potential for revival and rapid growth in a stable economic environment. Overally, about 15% of the companies were formed pre-independence, whilst 85% were formed post-independence. This 15% class of companies is special to the sector because of its robustness and resilience, having gone through at least through 7 economic eras. The regional distribution of firms by age is presented in Figure 3.11 below.

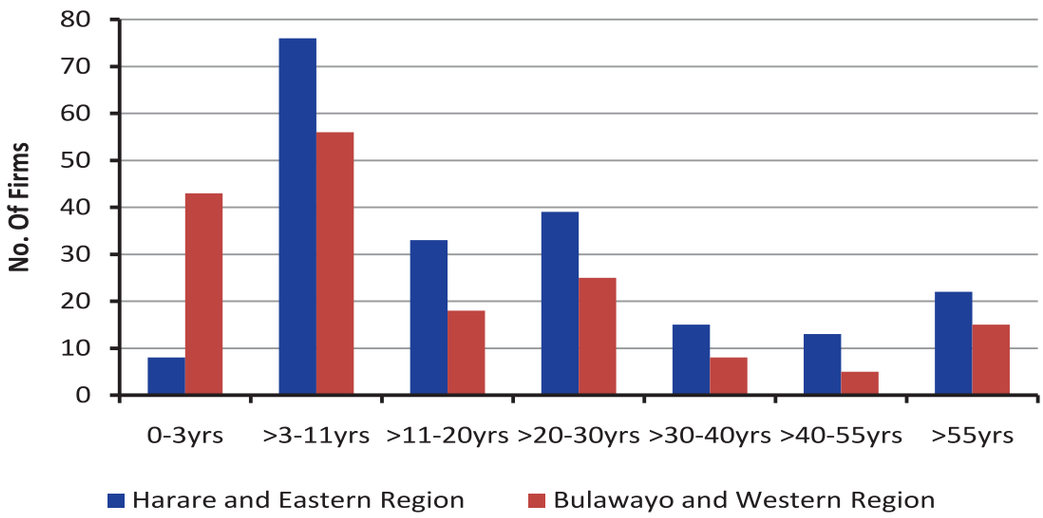


Figure 3.11: Regional distribution of firms by age in the engineering iron and sector of Zimbabwe

Generally the pattern was the same for Harare and the Eastern Region and Bulawayo and the Western Region, with Harare and the Eastern Region having more firms in each age category except the 0-3years category. Bulawayo and the Western Region has significantly more companies formed over the last 3 years, implying that there could be region focused interventions that promoted the growth of the engineering iron and steel sector in that region. The comparison for the Eastern and the Western Regions are further presented in Figure 3.12 below.

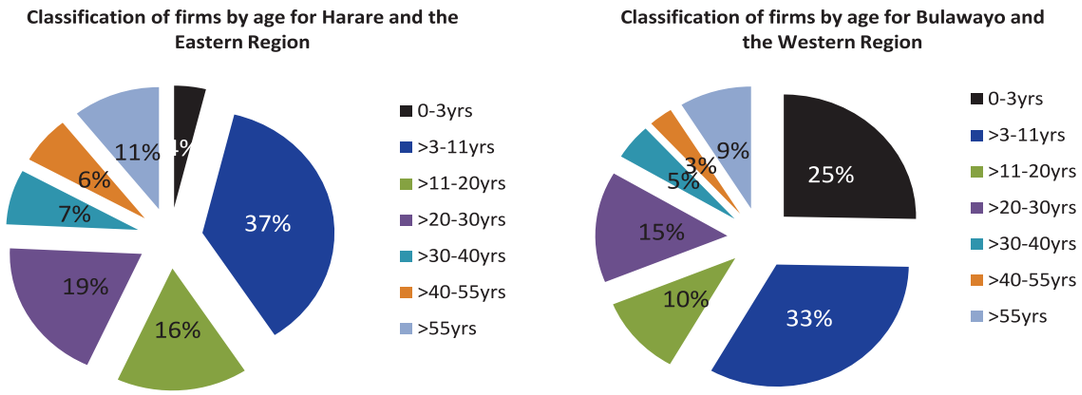


Figure 3.12: Comparison of firms by age for the Eastern and Western regions of the engineering iron and sector of Zimbabwe

The age distribution by subsector is presented in Figure 3.13 below.

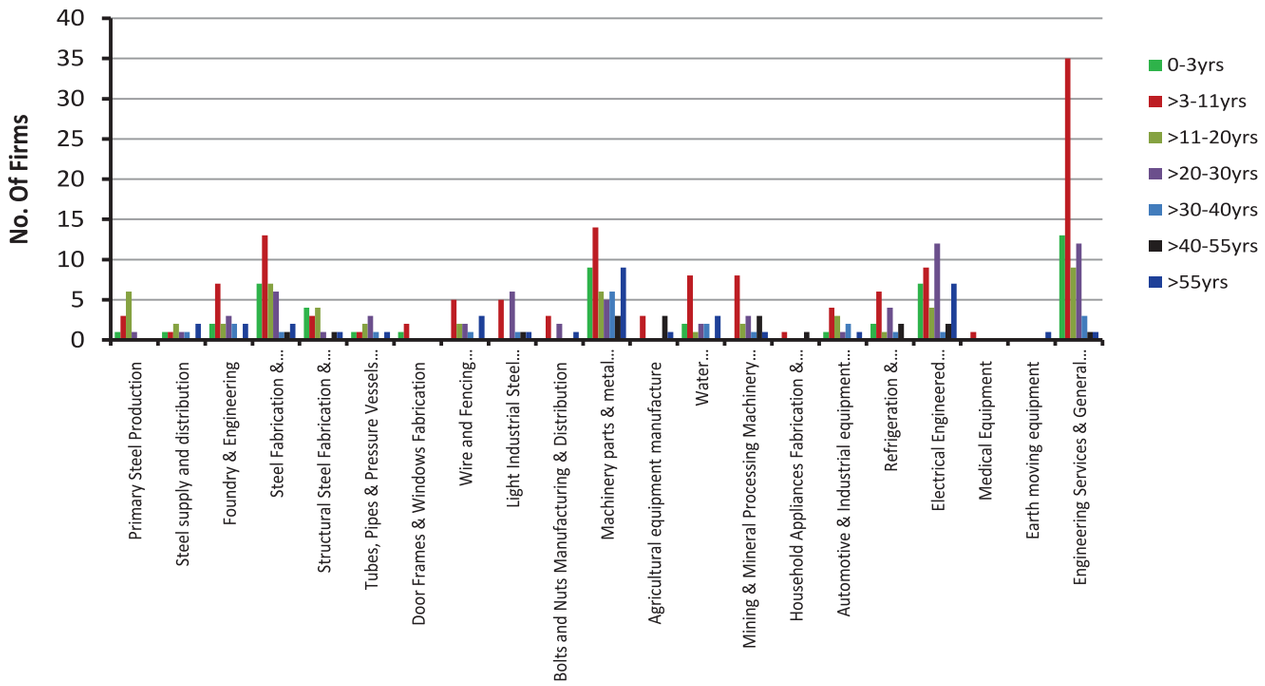


Figure 3.13: Age distribution by sub-sector in the engineering iron and sector of Zimbabwe

As shown in the graph above, the older firms were found in the steel supply and distribution; machinery parts and fabrication; electrical engineered goods and services; wire and fencing and foundry and related engineering subsectors. On the other hand, the younger firms were found in engineering services, contracting, repairs and maintenance; electrical engineered goods and services; machinery parts and services; and steel fabrication.

3.2.1.5 Companies that have closed shop

About 110 firms (22% of active firms) in the engineering iron and steel sector closed operations due to a variety of factors. The number of firms that closed shop by region is presented in Figure 3.14 below.

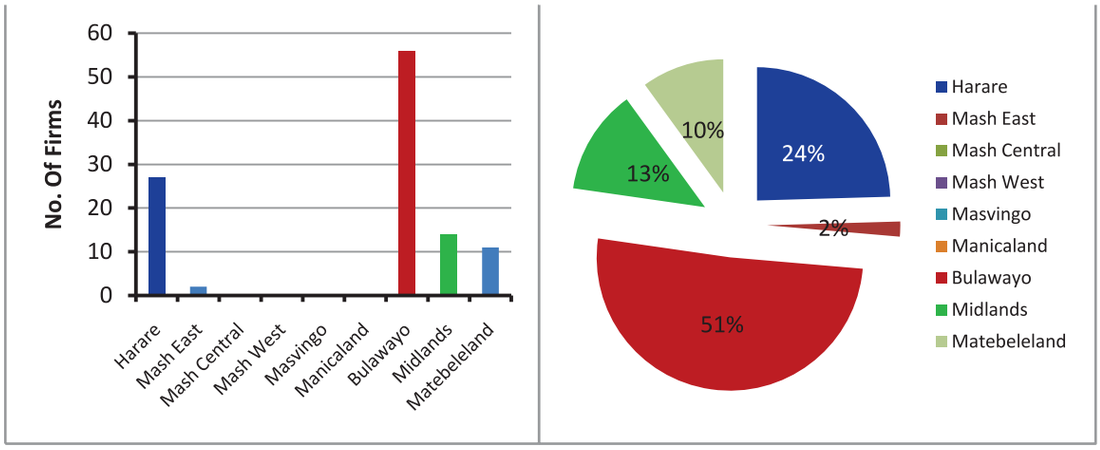


Figure 3.14: Regional analysis of firms that have closed operations in the engineering iron and sector of Zimbabwe

As shown in Figure 3.14 above, about 51% of the firms that have closed were based in Bulawayo, followed by Harare firms at 24%. It may imply that the general business environment in Harare could be less sensitive to environmental risk than Bulawayo and hence greater mitigation plans for environmental risks in Bulawayo should be developed and established to improve resilience. The number of firms that closed by subsector are presented in Figure 3.15 below.

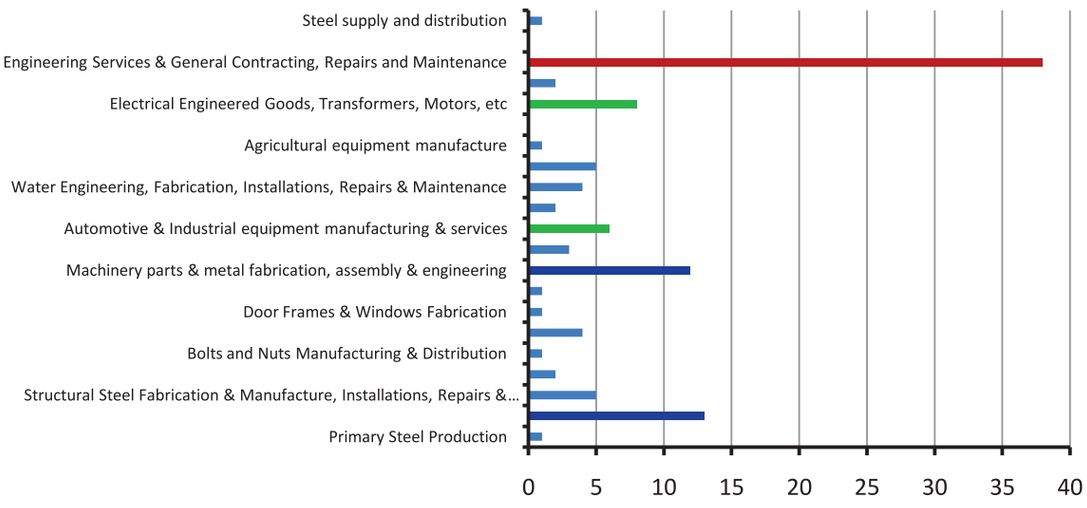


Figure 3.15: Firms that have closed operations by subsector in the engineering iron and sector of Zimbabwe

The subsectors mainly affected by the harsh economic environment were the engineering services and general contracting, repairs and maintenance; steel fabrication and manufacture; machinery parts and metal fabrication, automotive industry; and electrical engineered goods. It is worth noting that although primary steel production, wire and fencing and mining and mineral processing equipment seem small, these subsectors involved large scale players with huge impact on the downstream industries, e.g. ZISCO, Lancashire Steel, Morewear, etc.

3.2.2 Main support services to the engineering iron and steel sector

The main support services are presented in the Table 3.4

Table 3.4: Major stakeholders in provision of support services to the engineering iron and steel sector of Zimbabwe

Main support service	Key resources and features	Key Stakeholders	General Status
Land	Funding for purchase, rentals or lease; Title deeds; Land permits, concessions, etc	Ministry of Lands, Local Municipalities, Private Land Owners	Mostly owned by municipalities and state, and several idle factory warehouses of closed companies.Land is generally adequate and price can be negotiated
	Large Space generally required for primary steel production, foundry, Assembly Plants,etc		
Energy and Power	Electricity (Coal thermal, Hydropower, Solar, Standby Diesel Generators)	ZESA (ZPC, ZETDC, ZENT, Powertel); IPPs, Private Owners Owning Plants for Self Consumption and exporting excess to the Grid via Net Metering	ZESA still dominant supplier through hydro and coal thermal, not much was yet coming from IPPs. Uptake of solar by industry still marginally low; Current power production of about 1000MW (50% utilisation) still low as compared to projected demand. Major challenges were climatic for hydropower and antiquated machinery for thermal power plants and transmission and distribution
			New capacity of power generation being built, e.g. 600MW Hwange Thermal Expansion. Important to note that primary steel production is energy intensive and require support of big power plants and transmission infrastructure, e.g. ZISCO requires at least 60MW. Solar power uptake still minimal in the EIS Sector
	Heating fuels (Coal, Coke, Gas, Biogas, Solar thermal, Heavy Oils, Coal Tar, Oxygen)	HCCL; Zambezi Gas & Coal Mine; Makomo Resources; Contago Mine; BOC Gases; Petrotrade, ZUVA; PUMA, Coke Producers in Hwange (e.g South Mining, Dinson, etc)	All primary steel production, foundries and smelters require coke or coal for furnaces, or some instances as reducing agent. Coking coal current production capacity is about 2Mtpa; Thermal Coal production at about 5Mt; Capacity must be increased to meet new demand in sync with growing EIS Sector. Projected demand within 15years for coking and thermal coal at 5Mtpa and 20Mtpa respectively. In case coking coal is in scarcity, technologies that use non-coking coal may be adopted. Gas despite having great potential is marginally used. Huge Coal Bed Methane Gas resource in Lupane can revolutionalise the energy supply mix if investment is found
			Investment in New Oxygen Plants required for new and large scale iron and steel production. Heavy Oils use not significant in heating due to high cost of importing and scarcity of forex
	Fuel Oils for Automobils (Diesel, Petrol, Kerosene, Biofuels)	ZUVA; PUMA; ENGEN; TOTAL; GREEN FUELS; etc	Fuels mainly used in transportation of goods, by road and by air. Steel products are very heavy and hence require heavy engines that consume a lot of fuel for transportation. Rail transport is more ideal and air freight not appropriate due to the high cost associated with the weight of steel and volumes. Rail is currently in bad state, and road is currently the major mode of transport which is more expensive
Water	Dams, Lakes, Weirs, Reservoirs, Water Reticulation Infrastructure, Water Treatment Plants, Waste Water Treatment Plants and Sewerage Works; Pumping Systems	ZINWA, Local Municipalities, Ministry of Water, Private Suppliers, Owners Boreholes, EMA	Water is generally required for cooling process and treatment processes. Although high volume of water is used in primary steel production, little is consumed. Most water treatment plants and waste water plants; pumping and reticulation systems need overhaul and upgrading for reliable supply of water.

Main support service	Key resources and features	Key Stakeholders	General Status
Transportation	Logistics companies; fuels; roads; railway network and signalling and controls; trucks, locomotives, wagons; repairs, maintenance & servicing	ZINARA; NRZ; Logistical/Freight Companies	Peak transportation was in 1998 (18Mtpa) vs 2Mtpa (2014). Railway line requires overhaul with over 16% of railway line under speed restrictions. Over 25% of locomotives require replacement; available ones require major overhauls; several wagons also require overhaul and replacement; Signalling, controls and communication equipment require replacement. Roads are in bad shape requiring overhaul. Over USD70Million required for rail rehabilitation. Road currently being used for transportation and generally 60% more expensive. Speed restrictions on rail causing long lead times
Information and Communication Technology	Optical fibres, Base Stations, Communication gadgets, Hardware and Software, etc	PTC,Tel One, Econet, Liquid Telecoms, POTRAZ, Net One, Telecel	Main players are PTC, Tel One, Econet. Major cities were generally adequately covered. Minor cities coverage is generally poor. The cost was considered on the higher side compared to regional averages
Academic & Training Institutions	Laboratories, Testing Facilities, Lecturers, Students	Universities (UZ; NUST; HIT; CUT; BUSE; MSU); Polytechnics (Mutare; Gweru; Masvingo; Bulawayo; Harare; Kushinga; Kwekwe); Vocational Training Colleges; Industrial Training Institutes (ZESA; Delta, AAMTI, etc); Apprenticeship Programmes (ZISCO; ZESA; etc); Ministry of Education; MoHTESTD	Generally good coverage of academic and training institutes across the country. Laboratories require overhaul and upgrading in line with new technologies. Limited caoacity for R & D
Research and Development Institutions	Laboratories, Testing Facilities, Researchers, Technologies, etc	SIRDC, Universities, Company R&D Divisions	Limited technological capacity to do R&D. Lack of specialised laboratories for strategic EIS products and value chains
Standards and Quality Management Organisations	Laboratories, Testing Facilities, Standards, Technologies, Scientists, Engineers	Standards Association of Zimbabwe	Limited coverage country wide
Banking and Financial Institutions	Banking platforms, Internet Banking; Concessionary Loans, Bank and Government Guarantees, Subsidies, etc	Bankers Association of Zimbabwe, IDBZ, CBZ, Stanbic, Ecobank, Stewart Bank, Stanchart, Cabs, NBS, Pension Funds (OM, FML, NSSA, etc)	Currently charaterised by high interest rates and short term loans
Intellectual Property Organisations	ICT Applications and Online Platforms, Researchers, Scientists, Engineers, Evaluators	ZIPO, ARIPO, WIPO, MITS	First National Intellectual Property and Policy Implementation Strategy (2018 - 2022) was launched. Generally Zimbabwe has high IP Potential but very low utilisation, mainly due to lack of awareness of how to apply intellectual property protection

The detailed analysis of the support services stakeholders and status was presented in the Macro-economic environment and infrastructural analysis report (Dube, 2021).

3.2.3 Engineering iron and steel sector governance

The main institutions governing the engineering iron and steel sector include professional bodies; industrial associations; environmental and health and safety regulatory bodies; trade and regulatory bodies; local governance and municipal regulation; energy regulation as well as water governance. The summarized but not exhaustive list of regulatory institutions governing the engineering iron and steel sector is presented in Table 3.5 below.

Table 3.5: Regulatory institutions and stakeholders governing the engineering iron and steel sector of Zimbabwe

Governance Body	Major Stakeholders	Key Features
Professional Bodies	Engineering Council of Zimbabwe (ECZ); Zimbabwe Institution of Engineers (ZIE); Zimbabwe Association of Consulting Engineers (ZACE)	Registration of professionals and work in the various field of engineering work and practice. Certification; Permits and Licenses
Industry Associations	Engineering Iron and Steel Association of Zimbabwe (EISAZ); Chamber Of Mines (CoM); Zimbabwe Institute of Foundrymen (ZIF); Confederation of Zimbabwe Industries (CZI); Motor Industries Employers Association of Zimbabwe (MIEAZ); Coal Producers and Processors Association of Zimbabwe (CPPAZ)	Representation of subsectors; advocacy, etc
Energy Regulatory Bodies	Ministry of Energy;Zimbabwe Energy Regulatory Authority (ZERA)	Regulation of energy and power supply, distribution, consumption, tariffs and safety
Water and Environmental Bodies; Health and Safety	Ministry of Environment, Water and Climate; Environmental Management Agency; NSSA	Regulation of the environment and water; permits and licenses governing emission limits, EIAs, etc; Industrial and Occupational Health and Safety
Financial Bodies	Reserve Bank fo Zimbabwe, Ministry of Finance	Regulation of financial institutions; forex allocations; monetary policy, etc
Trade Regulation; Taxes, etc	MoIC, Zimtrade, ZIMRA	Regulation of imports and exports; Permits and Licenses; Tax Administeration; etc
Local Governance	Municipalities and City Councils	Land Permits and Licenses, Rates and Water Tariffs
Quality and Standards	Standard Association of Zimbabwe	Product registration and standardisation

The detailed regulatory environment; institutions and instruments were presented in the Macro-economic environment and infrastructural analysis report (Dube, 2021).

3.3 Conclusion

In this Chapter, the structure of the current engineering iron and steel sector has been established and described; as follows;

- The generic value chain structure of the engineering iron and steel sector was defined with key inputs, transformational processes and finished products categories established
- Firms have been classified according to their main business activities (over 450firms), where about 21 subsectors have been determined.
- Key structural features/attributes of the engineering iron and steel sector of Zimbabwe were established, such as spatial distribution, firm sizes, employment levels, age, etc.
- Active and closed firms were also established
- Main support services and sector government structure were also established.

Having looked at the structure of the engineering iron and steel sector that was responsible for producing various products and services, Chapter 4 looked at the value chain mapping centred on the different products produced by the firms.

Chapter 4: Main products of the engineering, Iron and Steel sector of Zimbabwe and value chain mapping

The main products of the sector were established mainly from data from Zimstat and Trade map (International Trade Centre), as well as the export/import information provided by Zimstat. The products and end markets report (Matsika, 2020) was also vital in the mapping process. The data used spanned from 2009 – 2019; with annual averages computed for the period analysed. Ultimately, the value chain mapping was aimed at establishing the current main subsectors of the engineering iron and steel sector; the main product levels; the total value at each level of the value chain; the local production levels; the exports value; and the imports at every level; and the estimated number of active players at each level amongst others.

4.2 Local production, imports and exports at various levels of the engineering iron and steel sector

The average annual local production, imports and export levels of the engineering iron and steel sector for the period 2009 to 2019 is presented in Table 4.1 below.

Table 4.1: Average annual production, export and import levels in the engineering iron and steel sector of Zimbabwe: 2009 – 2019 (Sources: Zimstat and ITC Trade Map)

Subsector	Av Annual Imports (2009 - 2019) (USD)	Av. Annual Exports (2009 - 2019) (USD)	Est. Local Production Av. 2017 - 2019 (USD)	Total Subsector Annual Gross Value (USD)
Iron Ore	**1,899**	**478,981**	**1,116,085.00**	**1,117,983.73**
Scrap Metal*	-	-	***10,000,000.00***	***10,000,000.00***
Subtotal - Iron Ore and Scrap Metal	**1,899**	**478,981**	**11,116,085**	**11,117,984**
Primary Steel Production	**134,086,890**	**183,477,039**	**292,140,821.00**	**426,227,711.48**
Fabricated metal products	**146,945,305**	**21,850,289**	**375,842,344.00**	**522,787,648.82**
Water Engineering, Pumps and Hydraulic Equipment	71,392,269	2,666,912	14,856,558.11	86,248,827.22
Agric and Forestry equipment	45,686,508	4,195,771	113,901,743.00	159,588,251.29
Industrial, General and Special Purpose Machinery	147,193,996	3,628,890	30,630,713.77	177,824,710.16
Mining, Mineral processing and Heavy Machinery	193,004,672	6,412,812	40,163,804.26	233,168,476.14
Household appliances	43,484,043	5,803,311	9,048,923.86	52,532,966.61
Other manufactured goods	83,160,160	25,321,032	321,295,025.00	404,455,185.07
Automotive Equipment	542,647,025	6,596,226	4,900,000.00	547,547,025.28
Other Transport Equipment	24,935,732	10,399,961	220,046,141.00	244,981,873.45
Electrical Engineered Goods	143,775,741	10,523,721	372,770,000.00	516,545,741.41
Electronic and Related goods	247,229,569	3,087,449	402,544,511.00	649,774,080.40
Assembled goods subtotal	**1,542,509,717**	**78,636,086**	**1,530,157,420**	**3,072,667,137**
Engineering Iron and Steel	**1,823,543,811**	**284,442,395**	**2,198,140,585**	**4,021,684,396**

**Assumption as follows: Local Scrap metal supply at about 100000tpa; No scrap exported or imported. Nevertheless, Zimbabwe Institute of Foundrymen says export of scrap metal is ongoing despite local demand higher than supply.*

As presented in Table 4.1 above, the estimated Gross Annual Value of the engineering iron and steel sector was about USD3Billion. Local Gross Annual Production was estimated at about USD1.5Billion, whilst the Gross Annual Imports were estimated at about USD1.8Billion. The Gross Annual exports were estimated at USD284Million.

4.2.1 Comparison of imports with local production

The comparison of imports with local production is presented in Figure 4.1 below. The deep blue bars indicate the significantly higher imports as compared to local production.

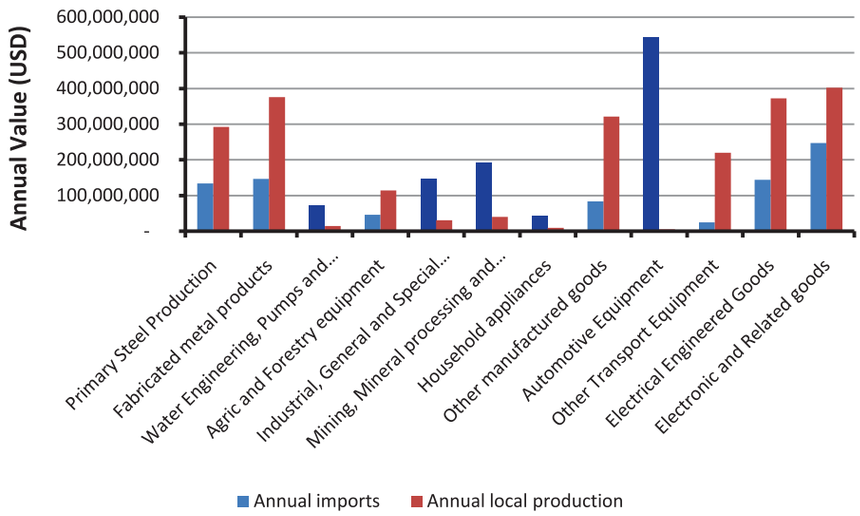


Figure 4.1: Comparisons of imports with local production in the engineering iron and sector of Zimbabwe

As presented in Figure 4.1 above, automotive subsector was predominantly imports (>USD500Million/year) with insignificant local production. Other notable subsectors with predominantly larger imports as compared to local production were Mining and Heavy Machinery; Industrial, general and special purpose machinery; Water Engineering and Hydraulic equipment as well as Household Appliances. Generally, there were more imports than local production for assembled and finished goods subsectors. Local production was predominant for; i) Electronic and related goods; ii) Fabricated metal products; iii) Electrical Engineered Goods; iii) Primary Steel production; iv) Other manufactured goods; v) Other Transport equipment; and vi) Agriculture and Forestry equipment. It is therefore important to leverage on the subsectors which are strong at local production and strengthen their capacities for growth, whilst at the same time looking at ways of substituting imports for those subsectors that heavily rely on imports. Of major concern is the automotive industry with huge imports despite the country having vehicle assembly plants. The overall comparison of annual imports to local production is presented in Figure 4.2 .

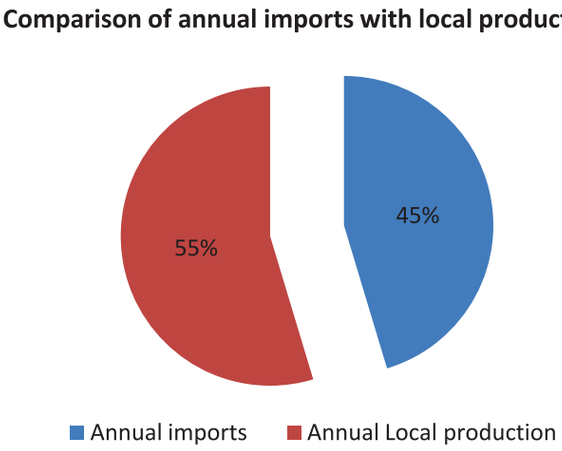


Figure 4.2: Overall comparisons of imports to local production in the engineering iron and sector of Zimbabwe

As shown in the pie chart above; imports were a significant component of gross consumption in the engineering iron and steel sector, constituting about 45% of consumption.

4.2.2 Comparison of annual imports with exports

The comparison of annual imports with exports for the period 2009 to 2019 is presented in Figure 4.3 below.

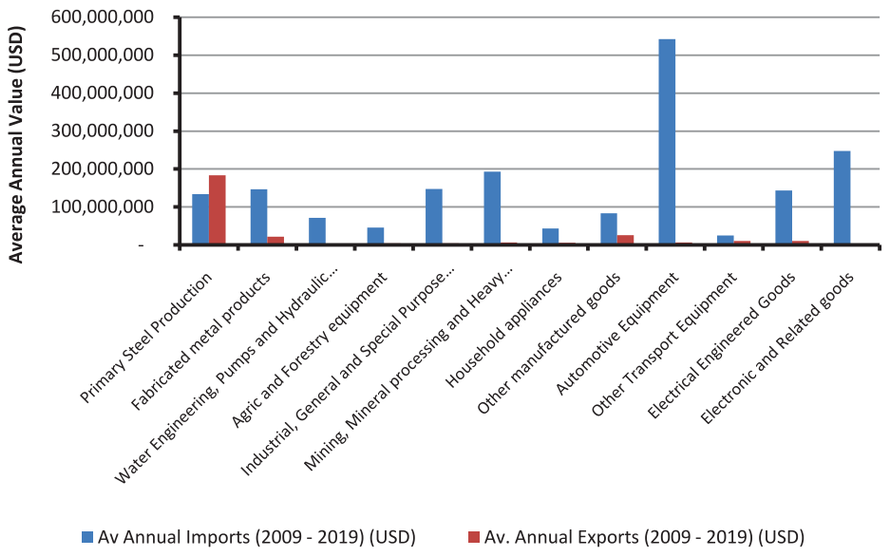


Figure 4.3: Comparison of imports to exports in the engineering iron and sector of Zimbabwe

As presented in Figure 4.3 above, exports were generally insignificant as compared to imports except for primary steel production. Strategies have to be sought in-order to increase the export of value added goods which could earn the sector foreign currency required to import only critical resources. Import substitution is also important to serve the hard earned foreign currency as well as increasing employment levels triggered by local production.

4.2.3 Gross value by subsector

The gross value by subsector is presented in Figure 4.4 below.

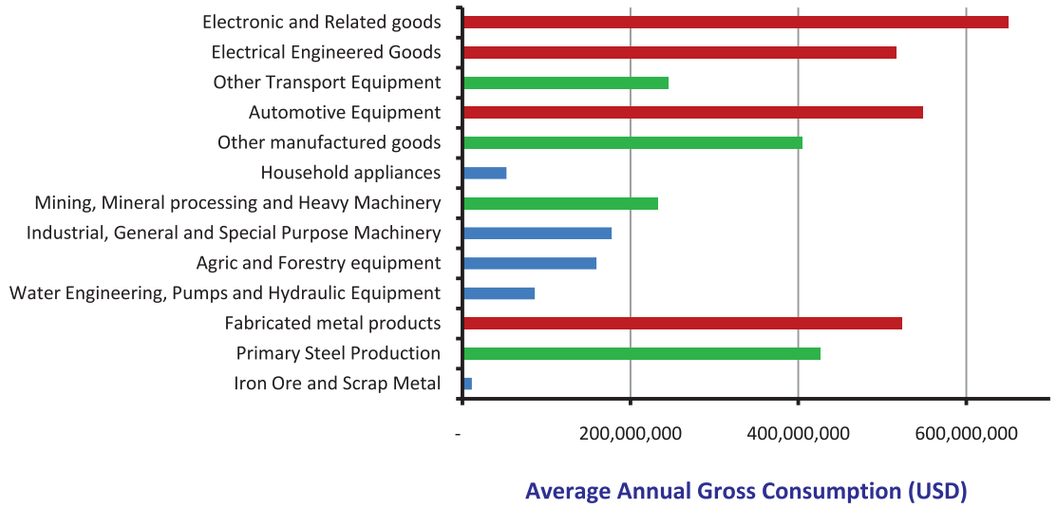


Figure 4.4: Average annual gross value by subsector in the engineering iron and sector of Zimbabwe

The top 4 dominant subsectors by gross value according to rank were; i) Electronic and related goods; ii) Automotive industry; iii) Fabricated metal products; and iv) Electrical Engineered Goods. It is worth noting though that automotive industry was dominated by imports despite the huge consumption. Opportunities for local beneficiation have to be identified and implemented. The other notable subsectors following behind the top 4 were; i) Primary steel production; ii) Other manufactured goods; iii) Other transport equipment; and iv) Mining, mineral processing & heavy machinery and parts. It was interesting to note that primary steel production was notable despite the fact that the major local supplier (ZISCO) was closed for the whole period of the assessment. It shows that new players were settling in to augment imports to feed the downstream players. A more detailed breakdown and illustration of the significant subsectors in the engineering iron and steel sector is presented by the average annual imports (2014 – 2019) as shown in Figure 4.5 below.

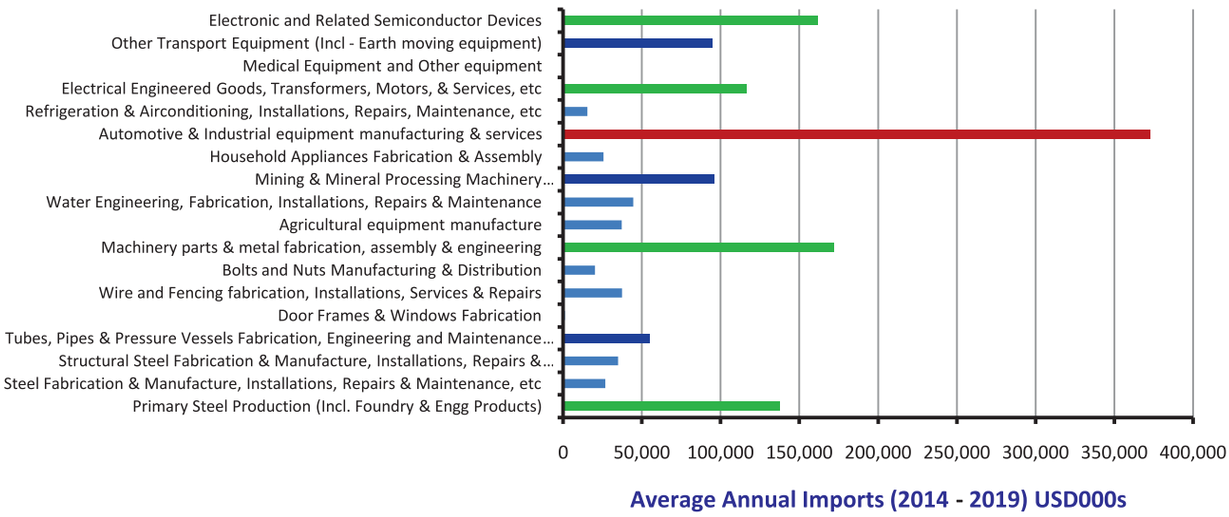


Figure 4.5: Significant subsectors by average annual imports in the engineering iron and sector of Zimbabwe

The automotive subsector (red bar in Figure 4.5 above) was the most significant (over USD350Million per annum); followed by industrial, general and special purpose machinery and parts; electronic and related products; primary steel products; and electrical engineered goods (over USD100Million per annum) [See green bar in Figure 4.5 above]. Also notable subsectors were those showed by deep blue bars in Figure 4.5 above (Mining, mineral processing and heavy machinery and parts; tubes, pipes and vessels; and other transport equipment- particularly earth moving equipment).

4.2.4 Import substitution potential in the engineering iron and steel sector of Zimbabwe

The previous section has assessed the value chains at subsector level and hence noting the following dominant subsectors; i) Automotive industry; ii) Electronic and related goods; iii) Fabricated metal products; iv) Electrical engineered goods; v) Primary steel production; vi) Other manufactured goods; vii) Mining, mineral processing and heavy machinery and equipment; and viii) Other transport equipment. In this section, the dominant products in the subsectors by value were established. It is worth noting that there were some dominant products not necessarily found in the dominant subsectors, but in the so called not-so-dominant subsectors. Since exports were generally insignificant in the engineering iron and steel sector except for primary steel production and local production was not conveniently categorized; indicative dominance of products were determined from the well classified imports (45% of Gross consumption).

4.2.4.1 Product categories with potential for import substitution in the automotive subsector

The imported products in the automotive subsector are presented in Figure 4.6 below.

Product category	Average Annual Import (USD) [2009 - 2019]
C2910:Manufacture of motor vehicles	484,800,331
C2920:Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers	15,577,097
C2930:Manufacture of parts and accessories for motor vehicles	42,269,598
Total - Automotive Subsector	**542,647,025**

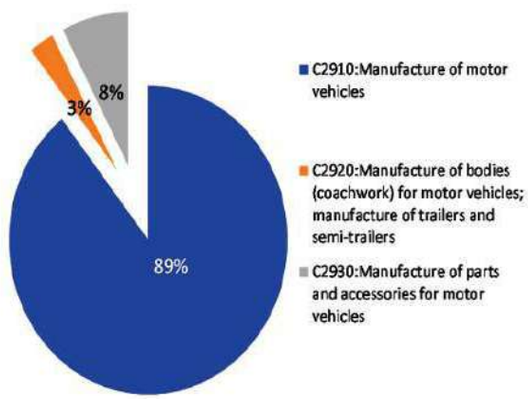


Figure 4.6: Products with high impact on import substitution in the automotive subsector of Zimbabwe

As shown in Figure 4.6 above, the manufacture of motor vehicles and related parts and accessories had high impact potential on import substitution.

4.2.4.2 Product categories with high impact on import substitution in the electronics and related products

The imported products in the electronics and related products category are presented in Figure 4.7 below.

Product Category	Average Annual Import (USD) [2009 - 2019]
C2610:Manufacture of electronic components and boards	101,428,151
C2620:Manufacture of computers and peripheral equipment	61,624,497
C2630:Manufacture of communication equipment	30,460,705
C2640:Manufacture of consumer electronics	9,944,060
C2651:Manufacture of measuring, testing, navigating and control equipment	29,599,474
C2652:Manufacture of watches and clocks	437,155
C2660:Manufacture of irradiation, electromedical and electrotherapeutic equipment	9,835,834
C2670:Manufacture of optical instruments and photographic equipment	3,160,601
C2680:Manufacture of magnetic and optical media	739,093
Electronic and Related goods	**247,229,569**

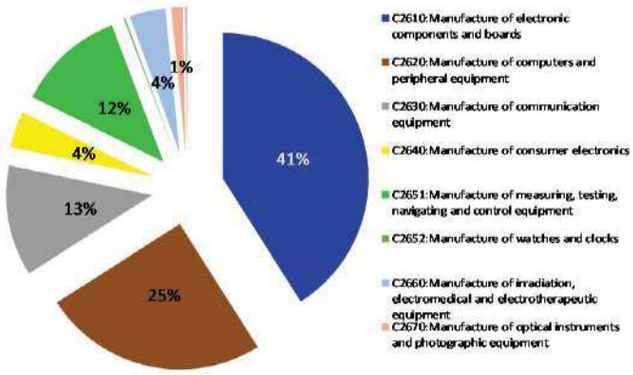


Figure 4.7: Products with high impact on import substitution in the electronics and related products subsector of Zimbabwe

As presented in Figure 4.7 above, the high impact products for import substitution consideration were the manufacture of electronic components and boards; manufacture of computers and peripheral equipment; manufacture of communication equipment; and manufacture of measuring, testing, navigating and control equipment.

4.2.4.3 Product categories with high impact on import substitution in the fabricated metal products subsector

The imported products in the fabricated metal products category are presented in Figure 4.8 below.

Product Category	Average Annual Import (USD) [2009 - 2019]
C2511:Manufacture of structural metal products	27,391,206
C2599:Manufacture of other fabricated metal products n.e.c.	71,733,293
C3100:Manufacture of furniture	14,630,065
C2512:Manufacture of tanks, reservoirs and containers of metal	6,989,716
C2814:Manufacture of bearings, gears, gearing and driving elements	23,608,607
C2513:Manufacture of steam generators, except central heating hot water boilers	2,592,416
Fabricated metal products	**146,945,305**

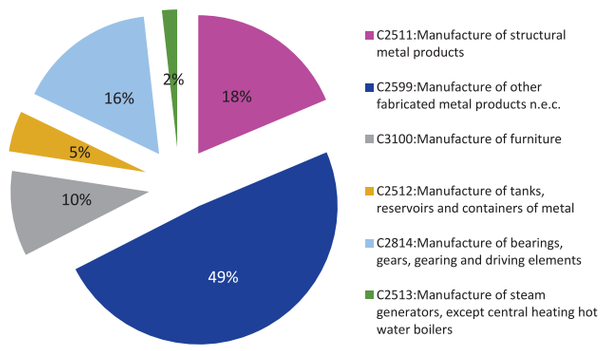


Figure 4.8: Products with high impact on import substitution in the fabricated metal products subsector of Zimbabwe

The high impact products on import substitution were manufacture of other fabricated metal products; manufacture of structural metal products and manufacture of bearings, gears, gearing and driving elements.

4.2.4.4 Product categories with high impact on import substitution in the electrical engineered goods subsector

The imported products in the electrical engineered goods subsector are presented in Figure 4.9 below.

Product Category	Average Annual Import (USD)
C2710:Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus	79,072,387
C2720:Manufacture of batteries and accumulators	12,964,961
C2731:Manufacture of fibre optic cables	5,723,592
C2732:Manufacture of other electronic and electric wires and cables	17,437,645
C2740:Manufacture of electric lighting equipment	11,849,604
C2790:Manufacture of other electrical equipment	16,727,552
Electrical Engineered Goods	**143,775,741**

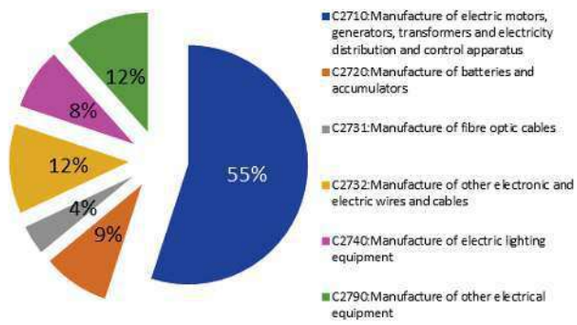


Figure 4.9: Products with high impact on import substitution in the electrical engineered goods subsector of Zimbabwe

The manufacture of electric motors, generators, transformers and electricity distribution and control apparatus; and manufacture of other electronic and electric wires and cables had high impact on import substitution as shown in Figure 4.9 above.

4.2.4.5 Product categories with high impact on import substitution in the primary iron and steel products subsector

Figure 4.10 below shows product categories with high impact on potential substitutions in primary steel production.

Product Category	Average Annual Import (USD)
Flat-rolled products of iron or non-alloy steel, of a width of >= 600 mm, hot-rolled or cold-rolled ...	71,100,381.63
Section Steels	18,924,411.20
Bars and rods, of iron or non-alloy steel, of various types	22,300,620.92
Wire of iron or non-alloy steel, in coils, plated or coated with zinc (excl. bars and rods)	15,988,918.83
Casting of iron and steel	5,772,557.90
Primary Iron and Steel Production	**134,086,890.47**

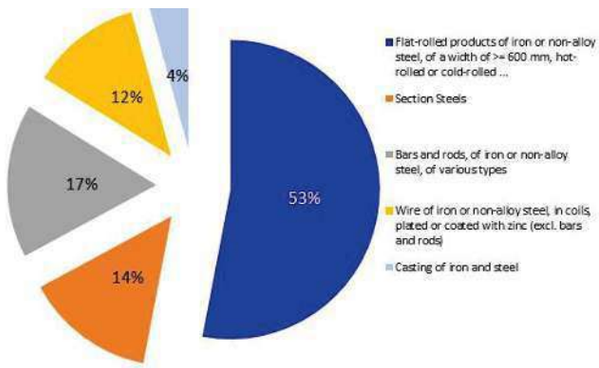


Figure 4.10: Products with high impact on import substitution in the primary iron and steel products subsector of Zimbabwe

As shown in Figure 4.10 above, the flat rolled products and bars and rods have highest impact on import substitution.

4.2.4.6 Product categories with high impact on import substitution in the mining and heavy machinery products subsector

Figure 4.11 below shows product categories with high impact on potential substitutions in the mining and heavy machinery product category.

Product Category	Average Annual Import (USD) [2009 - 2019]
C2815:Manufacture of ovens, furnaces and furnace burners	4,011,131
C2816:Manufacture of lifting and handling equipment	22,905,907
C2822:Manufacture of metal-forming machinery and machine tools	9,173,600
C2823:Manufacture of machinery for metallurgy	2,169,750
C2824:Manufacture of machinery for mining, quarrying and construction	154,744,285
Mining Mineral processing and Heavy Machinery	**193,004,672**

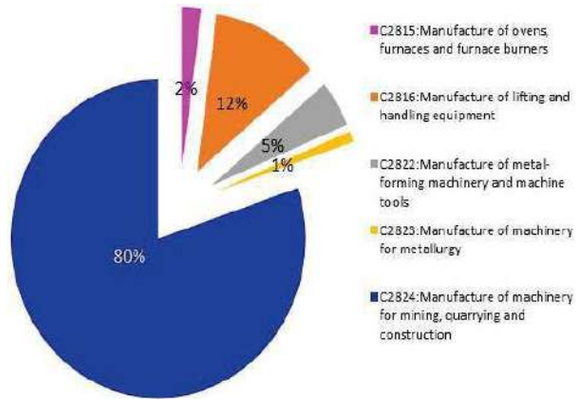


Figure 4.11: Products with high impact on import substitution in the mining and heavy machinery products subsector of Zimbabwe

As shown in Figure 4.11 above, the manufacture of machinery for mining, quarrying and construction has very high potential impact on import substitution, followed by manufacture of lifting and handling equipment

4.2.4.7 Top 21 product categories with high impact on import substitution

From about 60 product categories in the engineering iron and steel sector, the top 21 by average annual import value were identified. These constitute about 83% of imported engineering iron and steel products by value. The product categories with the highest impact on import substitution are presented in Table 4.2 below.

Table4.2: Top 21 product categories with high impact on import substitution.

Rank		Product Category	Average Annual Import (USD) [2009 - 2019]	Segmented (USD)	ABC
Top 5 Products	1	C2910:Manufacture of motor vehicles	484,800,331	**893,700,692**	59%
	2	C2824:Manufacture of machinery for mining, quarrying and construction	154,744,285		
	3	C2610:Manufacture of electronic components and boards	101,428,151		
	4	C2710:Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus	79,072,387		
	5	C2819:Manufacture of other general-purpose machinery	73,655,539		
Top 10 Products	6	C2599:Manufacture of other fabricated metal products n.e.c.	71,733,293	**311,387,221**	21%
	7	Flat-rolled products of iron or non-alloy steel, of a width of >= 600 mm, hot-rolled or	71,100,382		
	8	C2620:Manufacture of computers and peripheral equipment	61,624,497		
	9	C2813:Manufacture of other pumps, compressors, taps and valves	54,403,082		
	10	C3250:Manufacture of medical and dental instruments and supplies	52,525,968		
Top 21 Products	11	C2930:Manufacture of parts and accessories for motor vehicles	42,269,598	**305,495,815**	20%
	12	C2593:Manufacture of cutlery, hand tools and general hardware	30,607,709		
	13	C2630:Manufacture of communication equipment	30,460,705		
	14	C2829:Manufacture of other special-purpose machinery	29,780,658		
	15	C2651:Manufacture of measuring, testing, navigating and control equipment	29,599,474		
	16	C2511:Manufacture of structural metal products	27,391,206		
	17	C2825:Manufacture of machinery for food, beverage and tobacco processing	24,559,506		
	18	C2814:Manufacture of bearings, gears, gearing and driving elements	23,608,607		
	19	C2816:Manufacture of lifting and handling equipment	22,905,907		
	20	Bars and rods, of iron or non-alloy steel, with indentations, ribs, groves or other defo	22,300,621		
	21	Agricultural or horticultural mechanical appliances, whether or not hand-operated, for projecting, ...	22,011,824		
		Totals	**1,510,583,728**	**1,510,583,728**	**100%**

The top 5 product categories with highest impact on import substitution include manufacture of motor vehicles, manufacture of machinery for mining, quarrying and construction; manufacture of electronic components and boards; manufacture of electric motors, generators, transformers, electricity distribution and control apparatus; and manufacture of general purpose machinery.

4.2.5 Products with high potential for exports in the engineering iron and steel sector of Zimbabwe

From about 60 product categories in the engineering iron and steel sector of Zimbabwe, the top 20 exports were identified and ranked. These constituted about 97% of average annual exports by value. The top 20 export product categories are presented in Table 4.3 below.

Table4.3: Top 20 exported products in the engineering iron and steel sector of Zimbabwe

Rank		Product categories	Average Annual Exports - USD (2009 - 2019)	Segmented (USD)	ABC
Top 5 Products	1	C2410:Manufacture of basic iron and steel	183,395,247	**229,230,928**	**83%**
	2	C3211:Manufacture of jewellery and related articles	21,905,196		
	3	C3030:Manufacture of air and spacecraft and related machinery	9,246,434		
	4	C3100:Manufacture of furniture	8,094,511		
	5	C2599:Manufacture of other fabricated metal products n.e.c.	6,589,541		
Top 10 Products	6	C2910:Manufacture of motor vehicles	5,640,141	**24,487,405**	**9%**
	7	C2824:Manufacture of machinery for mining, quarrying and construction	5,617,504		
	8	C2750:Manufacture of domestic appliances	4,642,683		
	9	C2710:Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus	4,391,306		
	10	C2821:Manufacture of agricultural and forestry machinery	4,195,771		
Top 20 Products	11	C2511:Manufacture of structural metal products	3,588,696	**21,313,624**	**8%**
	12	C2720:Manufacture of batteries and accumulators	3,166,445		
	13	C2512:Manufacture of tanks, reservoirs and containers of metal	2,682,173		
	14	C2732:Manufacture of other electronic and electric wires and cables	2,677,579		
	15	C3290:Other manufacturing n.e.c.	2,469,632		
	16	C2825:Manufacture of machinery for food, beverage and tobacco processing	1,938,509		
	17	C2811:Manufacture of engines and turbines, except aircraft, vehicle and cycle engines	1,521,657		
	18	C2593:Manufacture of cutlery, hand tools and general hardware	1,160,628		
	19	C2813:Manufacture of other pumps, compressors, taps and valves	1,054,213		
	20	C2819:Manufacture of other general-purpose machinery	1,054,092		
		Totals	**275,031,957**	**275,031,957**	

As shown in Table 4.3 above the top engineering iron and steel exports include basic iron and steel products; manufacture of jewellery and related articles; manufacture of air and spacecraft and related machinery; manufacture of other fabricated parts; manufacture of motor vehicles; and manufacture for machinery for mining, quarrying and construction. However, it is worth noting that exports were very subdued over the 10year period assessed, and constituted about 19% of average local annual production by value. Thus there is great potential to explore ways of enhancing the export competitiveness of the product categories with high potential.

4.3 Value chain map of the engineering iron and steel sector of Zimbabwe

A value chain is a set of businesses, activities and relationships engaged in creating a final product (or service). It comes from the fact that a product which is seldom consumed in its original form must be transformed, combined with other products, transported, packaged and marketed until it reaches the final consumer. Thus the engineering iron and steel value chain describes how input suppliers, producers, processors, buyers, sellers, and consumers, separated by time and space gradually add value to products as they pass from one link to the next. Based on the analysis done, an attempt was made to define the current value chain map of the engineering iron and steel sector. Support services like transport, logistics and freight, consulting services, standards bodies, industry representatives, research and academia, government ministries, regulators, banking, etc., were not included on the value chain map to minimize clutter. The value chain map is presented in Figure 4.12 in the next page...

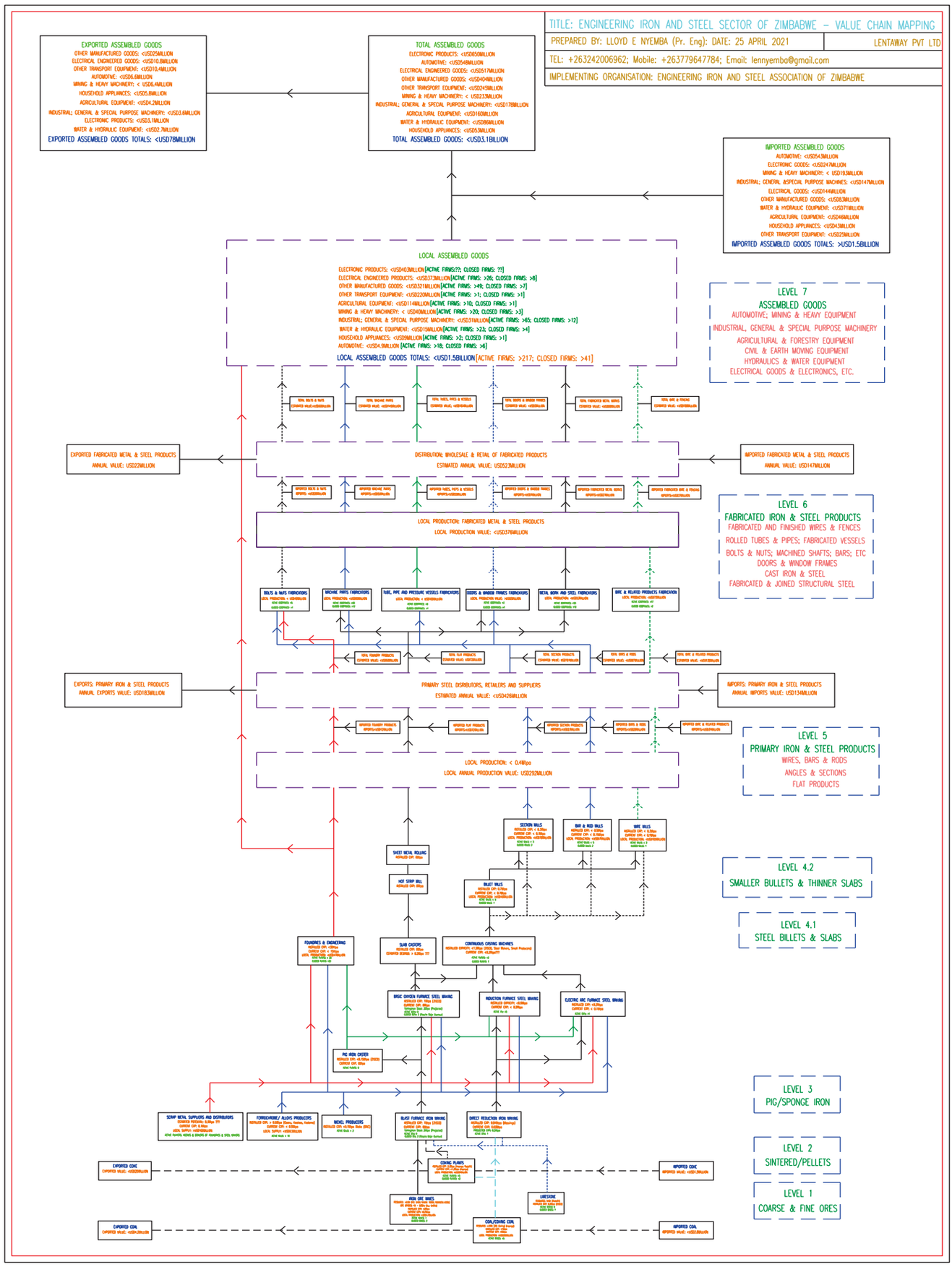


Figure 4.12: Value chain map of the current engineering iron and steel sector of Zimbabwe

4.4 Conclusion

- In this Chapter, the main products and value chain map were established as follows;
-
- Over 15 subsectors and 60 product categories were established for the engineering iron and steel sector
- The most attractive subsectors and product categories based on import substitution potential, local

production capacity and export potential were identified and ranked

- The value of the engineering iron and steel sector according in terms of Gross Production, Consumption, Exports and Imports was estimated
- A baseline Value Chain Map of the current engineering iron and steel sector was developed

Having fully defined the structure of the engineering iron and steel sector; the main products and key market characteristics; and the value chain map; a systematic assessment of current sector constraints and opportunities as well as key dimensions across subsectors was carried out.

Chapter 5: Diagnostic analysis of the engineering iron and steel sector firms

Having fully defined the structure of the engineering iron and steel sector; the main products and key market characteristics; and the value chain map; a systematic assessment of current sector constraints and opportunities as well as key dimensions across subsectors was carried out.

5.1 Introduction and general approach

The UNIDO Seven diagnostic dimension approach was used to assess the current status of firms in the engineering iron and steel sector of Zimbabwe. The assessment was based on 7 diagnostic dimensions for industrial assessment namely; i) sources of inputs and supplies; ii) production capacity and technology use; iii) end markets and trade; iv) sustainable production and energy use; v) value chain governance; vi) value chain finance; and vi) business and socio-economic context. A questionnaire was developed based on these dimensions, tested and administered to 66 out of a population of about 486 (about 13.6% sample) engineering firms spatially distributed around Zimbabwe. Key informant interviews were conducted, and field visits to notable firms in the value chain like ZISCO and the coal producers were done.

5.1.1 Sector representation

Care was taken to ensure that the assessment covers all the sectors of the engineering iron and steel sector of Zimbabwe (except the informal sector due to COVID related limitations). The subsector coverage is represented in Figure 5.1 below

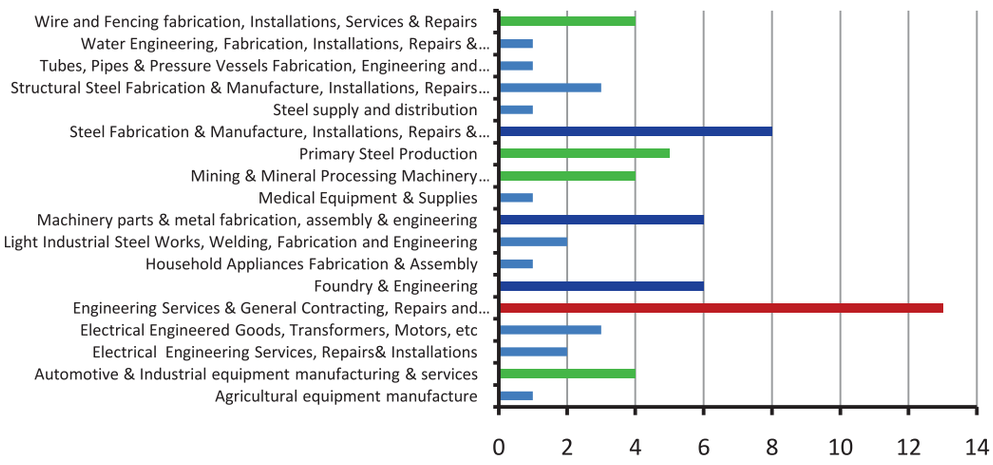


Figure 5.1: Number of firms surveyed by subsector

As shown in Figure 5.1, a total of 18 subsectors in the engineering iron and steel sector were assessed to ensure fair subsector representation. It is worth noting that sampling was done proportionately, therefore subsectors with a higher number of active members would accordingly have higher numbers assessed, but the % sampling per subsector remained fairly the same.

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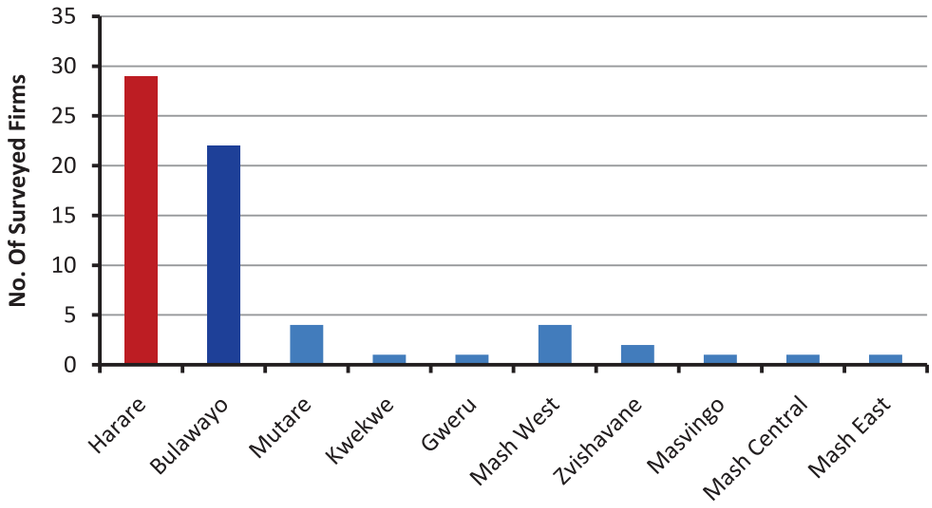

Figure 5.2: Number of firms surveyed by region

As presented above, the firms from different regions of the country were assessed. However, the majority of the firms were from Harare and Bulawayo, where most of the engineering iron and steel firms were concentrated.

5.2 General engineering iron and steel sector overview

In this section, the survey looked at the general features of the engineering iron and steel sector like legal status of firms, employment levels, firm sizes and scope of operations, land requirements, property ownership and rentals.

5.2.1 Legal status, size of companies and employment characteristics

The legal status of the companies is presented in Figure 5.3 below.

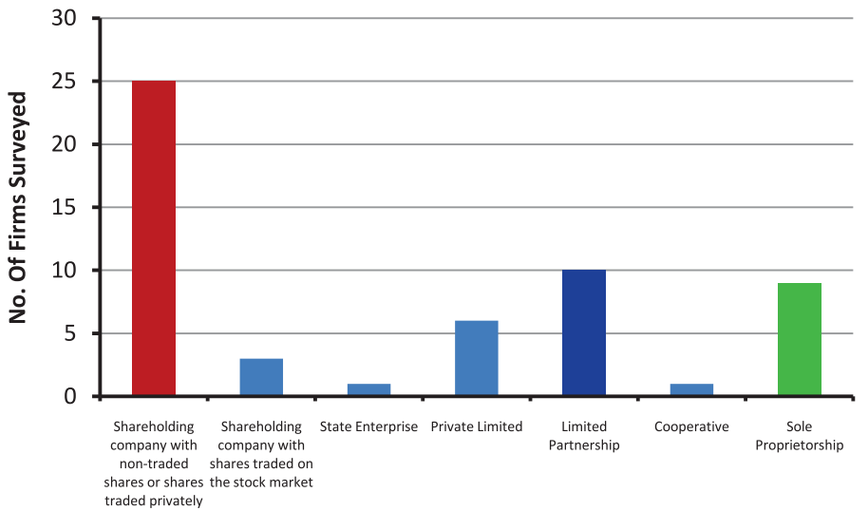

Figure 5.3: Legal status of firms

As shown in figure 5:3, the majority of firms surveyed were shareholding companies with non-traded shares or shares traded privately; with a notable number being limited partnership and sole proprietorship. The significant number of companies with shareholding indicates high level of stability, better corporate governance and easier implementation when it comes to financial stimulus packages amongst other structured interventions for the sector. The average number of employees per firm for different subsectors is presented in Figure 5.4 below.

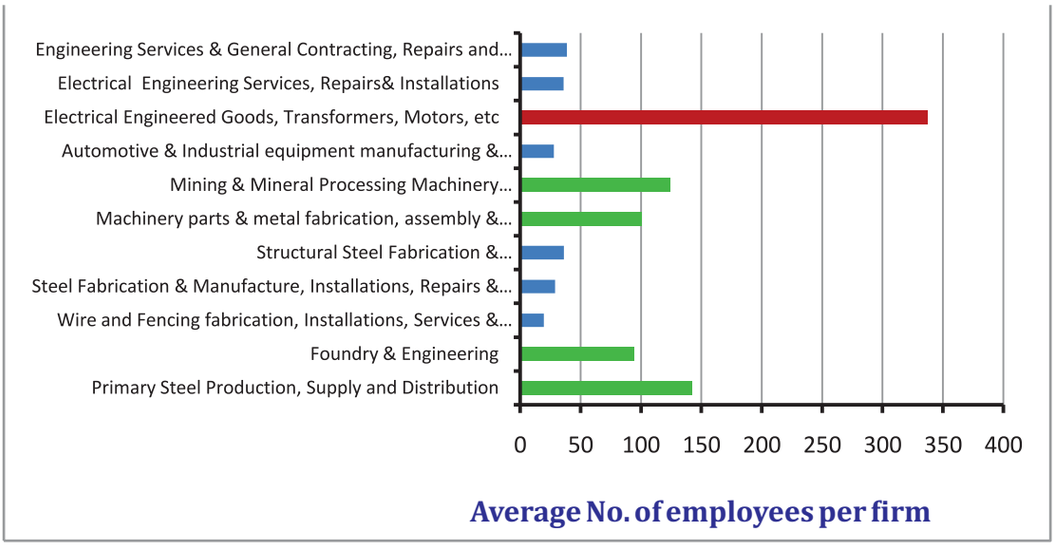

Figure 5.4: Average employment levels per firm

The average employment per firm was about 77employees. The subsectors with high average employment by rank are; i) electrical engineered goods (332); ii) primary steel production (142); iii) mining and heavy machinery (124); iv) industrial, general and special purpose machinery and parts (101); and v) foundry and engineering (94). The employment capacity of subsector may contribute to subsector attractiveness by addressing issues of high unemployment rate. The level of employment of women in the engineering iron and steel sector is presented in Figure 5.5 below.

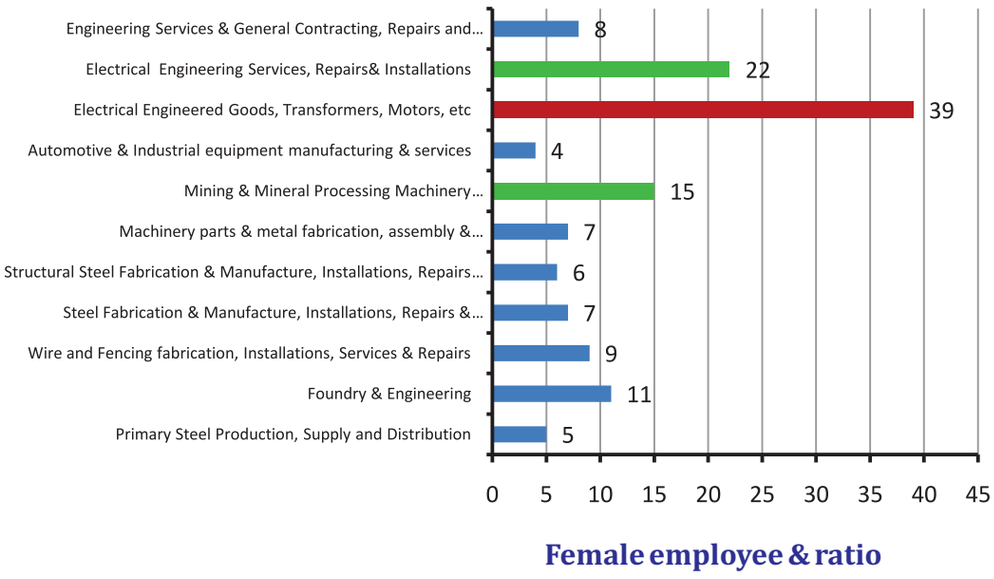

Figure 5.5: Level of employment of females

The average of level of employment of females in the engineering iron and steel sector was about 12%, showing a huge gender imbalance. The only subsectors with notable employment of females were; i) electrical engineered goods (39%); ii) electrical engineering services (22%); and iii) mining and heavy machinery (15%). It is important therefore to establish the major hindrances to women entering the engineering iron and steel sector and identify possible ways of increasing the employment levels of women in the sector.

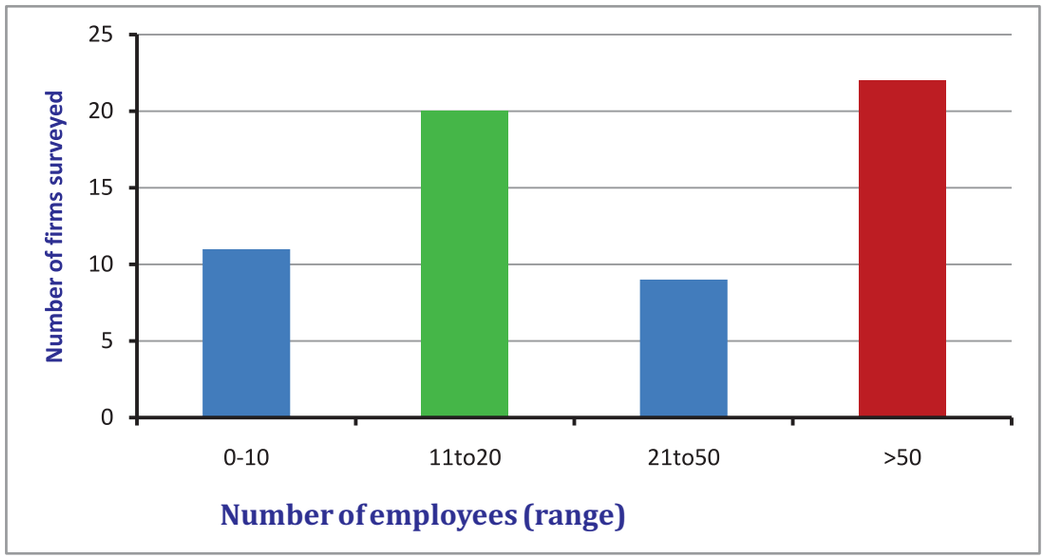

Figure 5.6: Firm size by number of employees

As shown in Figure 5.6 above, a significant number of firms (35%) employ over 50 people and may be classified as large scale; followed by small scale (11-20 employees) at 32%; then micro-enterprises (0-10) at 18%; and lastly medium scale (21 to 50 employees) at 15%. The microscale to small scale combined constituted 50% of the firms, implying that there is significant participation of small scale players in the value chain. Harmonization of operations of both small and large scale operations using approaches like industrial clusters may be considered to ensure viability of the different types of actors in the sector.

5.2.3 Age and firm growth and expansion

The firm growth and expansion over the years is presented in Figure 5.7 below.

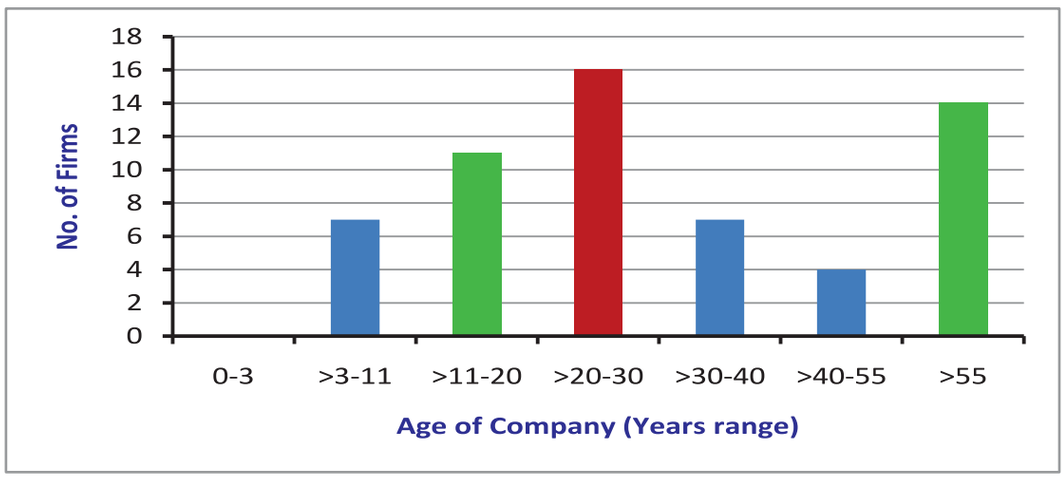

Figure 5.7: Age of firms

The highest number of firms (27%) were in the >20-30yrs range [ESAP]; followed by >55yrs range [Pre-UDI] (24%); then 19% in the >11 to 20yrs range [Hyper-inflation]; 12% in the >30-40yrs age range [Pre-ESAP]; and 7% for the >40-55yrs range [UDI].

About 31% of the firms were formed before independence (69% formed after independence). This special class of firms represents the most resilient and robust firms which have gone through different economic eras including the worst ones but still survived. These firms may be studied to understand the key features of their resilience and robustness for the benefit of the whole sector. All in all, about 70% of the firms were formed before hyper-inflation era, implying that the engineering iron and steel sector is generally a robust and resilient sector, which had the potential to do well in a stable economic environment. The other resilient class of firms is those that were formed in the hyperinflation era (about 12%) which also survived the harsh environment. Significant expansion occurred during the GNU era which saw 19% of the firms being formed. This was attributable to the stable economic and political environment ushered in by the Government of National Unit (GNU).

Despite the assumed resilience and robustness of the older firms, it is equally important to ensure that these firms were not too conservative and using old technologies that compromised growth and improved competitiveness.

5.2.4 Space requirements and property ownership

The space requirements analysis is presented in Figure 5.8 below.

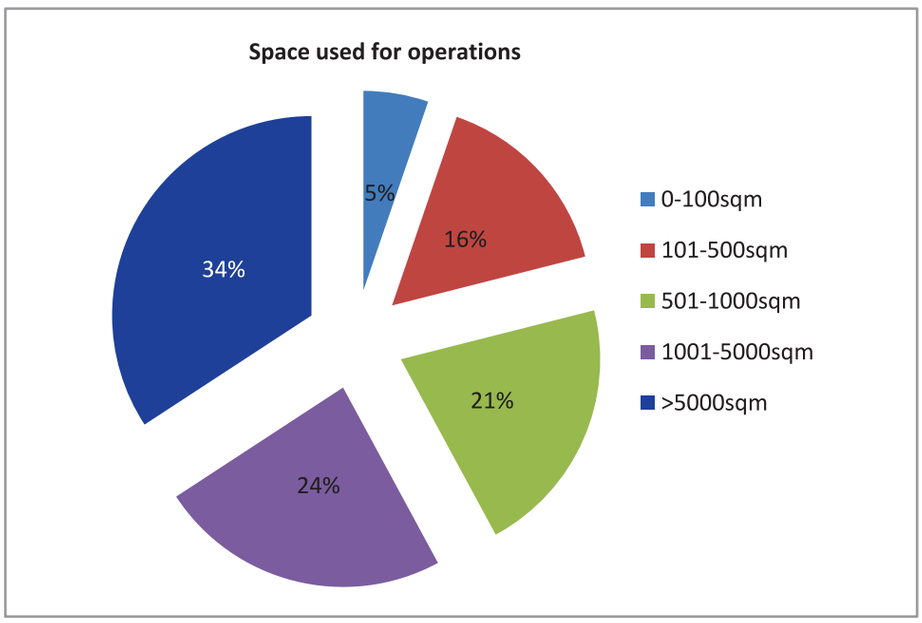

Figure 5.8: Space requirements in the engineering iron and steel sector

As shown in Figure 5.8 above, the highest proportion of firms (34%) require over 5000 square metres of operating space; followed by 24% requiring land size ranging from 1000 to 5000 square metres. Thus over 58% of firms required land greater than 1000 square metres, implying that the engineering iron and steel sector requires considerable sizes of land for operations. The space requirements by subsector are presented in Figure 5.9.

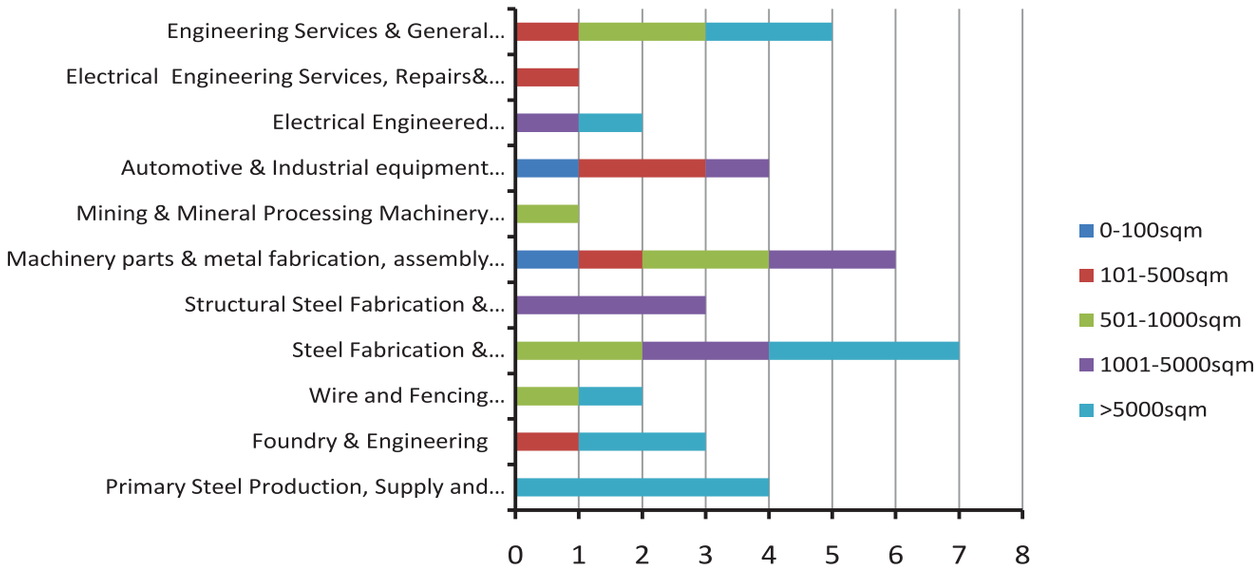

Figure 5.9: Space requirements by subsector

The subsectors with the majority of firms requiring over 1000 square metres of land include primary steel production; foundry and engineering; structural steel fabricators; and fabricated metal and steel products manufacturers. Support is therefore required for these subsectors to get adequate land or premises at viable prices or lease terms to ensure sustainability. The stability of firms was also analysed based on the level of ownership of premises. Premise ownership and rentals are presented in Figure 5.10 below.

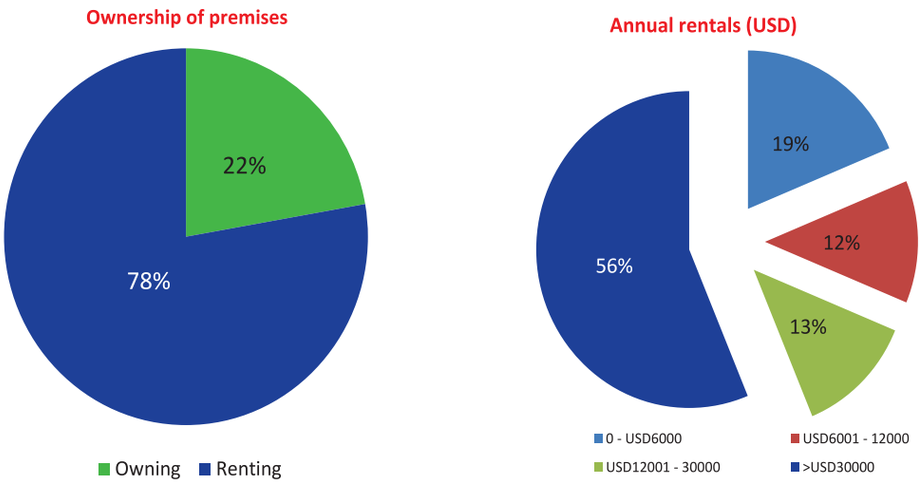

Figure 5.10: Ownership of premises and rentals

About 78% of the firms are renting whilst 22% own their operating premises. Majority of the firms that rented (56%) paid annual rentals of over USD30, 000 per annum; (25% paid less than USD12, 000 per annum); whilst 19% paid annual rentals in the range of USD12, 000 to 30,000. Generally average annual rental was USD32, 830 per annum. Thus rental cash-flow might be a challenge for the micro to small scale players. Clustered factory shells where various firms operating in the same value chain may be sheltered could help reduce the rental burden through shared cost and hence increasing the stability of small scale players. The level of ownership of property by subsector is presented in Figure 5.11

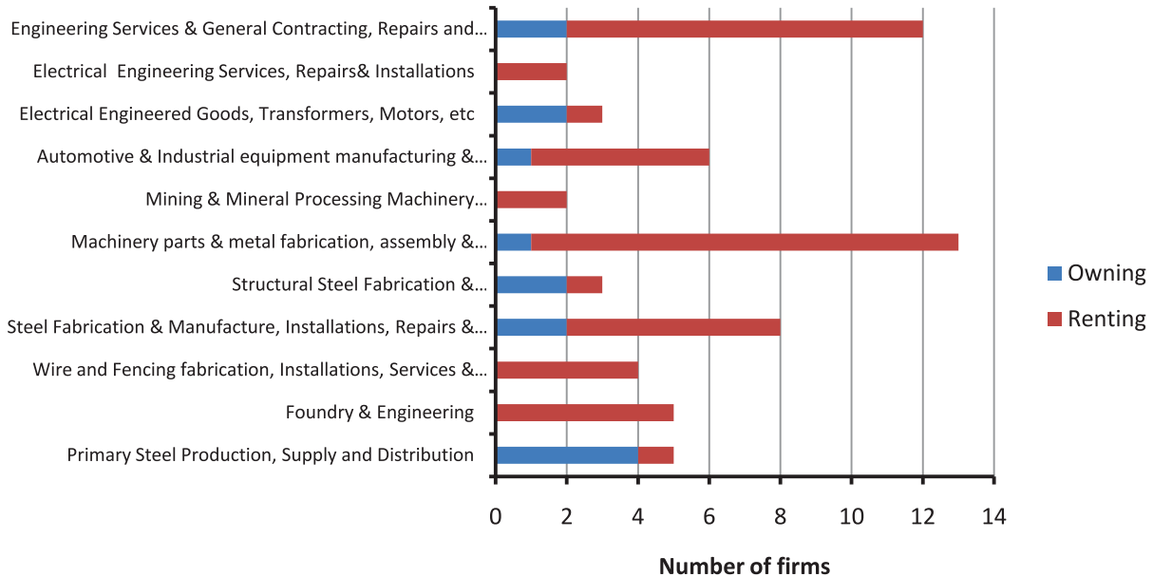

Figure 5.11: Ownership of premises by subsector

Whilst the majority of firms in the various subsectors did not own the premises from which they operated, the majority of primary steel producers; structural steel fabricators and manufacturers; and electrical engineered goods manufacturers owned their operating premises.

5.2 Sources of inputs and supplies

This section looked at the major inputs according to the surveyed firms; the sources of inputs (whether local or imports); annual imports share; inputs origin share; major sources/origin of imports; and major reasons for sourcing inputs locally or importing amongst others.

5.2.1 Major inputs and their sources

The major inputs according to respondents are presented in Table 5.1 below.

Subsector	Major raw materials	Important additives	Other important inputs
Primary steel production; Foundry and engineering	Iron ore; Scrap metal; metallurgical coal; coke; limestone; cast iron; bentonite; chrome sand	Ferromanganese; silicone; manganese; sylic blacking	Electricity and labour
Fabricated metal products	Scrap metal; steel; angles & sections; tubes and pipes; wire and coils; metal sheets; aluminum & welding rods; coke and coal	Chrome; ferrosilicon; manganese; boric acids; vanishes	Gas, electricity and labour
Assembled goods	Steel; bearings; metal sheets; aluminum; bentox sheets; brass scrap	Welding rods; chemical urethane; glass; rubber; wood	

Table 5.1: Major inputs in the engineering iron and steel sector

Scrap metal, steel, coal and coke appeared as the major inputs for the engineering iron and steel sector. Metal sheets (flat products); wire and coils; angles, tube and sections were also important inputs to the sector. Scrap metal use was very dominant; indicating high demand for it. It is therefore important to reinforce policies that ensure availability of scrap to the sector, including banning of scrap exports. Considering the importance of scrap to the sector and the world over; it was important to recognize scrap steel as a subsector. A detailed assessment of the scrap subsector was proposed to; i) establish the main types of scrap in the sector, their major sources and predicted annual volumes; ii) major actors and their capacities; iii) current production capacities; iv) current consumption and demand patterns; and v)constraints and opportunities amongst others. It was noted that the current production or collection rate could only meet less than 40% of demand. The situation was worsened by the absence of primary iron and steel production since the closure of ZISCO. Electricity, labour and gas were also notable inputs to the engineering iron and steel sector.

5.2.1.1 Sources of inputs

The major sources of inputs are presented in Figure 5.12 below.

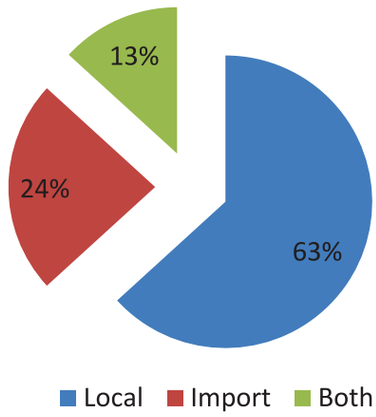

Figure 5.12: Sources of inputs

As shown in Figure 5.12 above, about 63% sourced all their inputs locally; 24% entirely imported their inputs; whilst 13% used both local and foreign inputs. Thus about 37% imported their inputs. The sources of inputs were further assessed to determine the origin share of inputs (Figure 5.13 below).

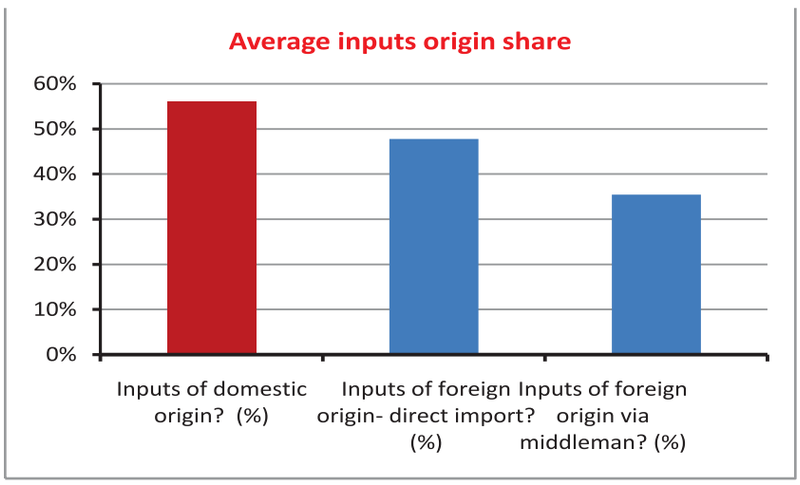

Figure 5.13: Inputs origin share - overall

As presented in Figure 5.13; about 56% of respondents had their inputs being of domestic origin; whilst 48% had inputs of foreign origin – direct imports; with 35% saying that their inputs were of foreign origin via middleman. It implies that about 44% of inputs by origin were foreign. The significant number of participants who imported their inputs via middlemen (35%) was significant; the consequences being the increased cost of raw materials threatening the competitiveness of end products. Although the majority of firms sourced their inputs locally (56%) [attributed to the local availability of the raw materials]; about 44% imports are worrying ironically considering the vast resources that the country has to feed into the sector. The vast iron ore and related alloy mineral resources as well as the resuscitation of primary iron and steel production at ZISCO and new plants had the potential of flooding the local market with inputs to the engineering iron and steel sector. In this way the importation of the major inputs could be substituted with local feed. The inputs origin share by subsector is presented in Figure 5.14 below.

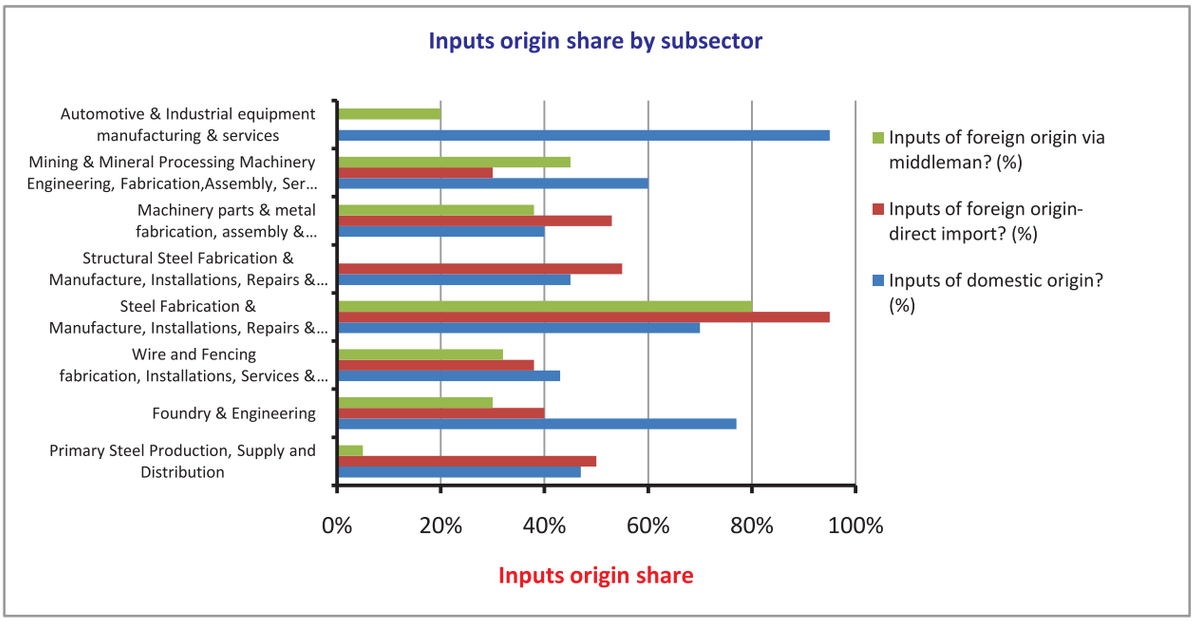

Figure 5.14: Inputs origin share by subsector

The inputs origin share for inputs tilted in favour of imports (red and green bars in Figure 5.14) for primary steel production; fabricated metal products and structural steel; assembled industrial machinery; and mining and heavy machinery. This trend shows that there is major need to invest in downstream processes in engineering iron and steel sector to increase the local supply of feedstock and save on foreign currency usage. The foundries depended more on local supply considering that scrap and all the other raw materials were available locally.

5.2.1.2 Analysis of imports

Figure 5.15 presents the annual import share of various components of inputs.

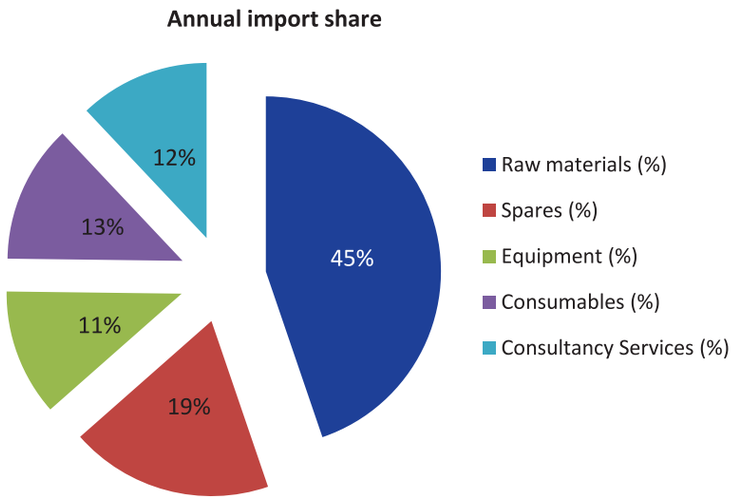

Figure 5.15: Overall annual imports share

As shown in the pie chart above, the raw materials (45%) and spares (19%) constituted the large share of annual imports. This was a major cause for concern considering the critical nature of raw materials to operations and spares to maintenance. With such a scenario, competitiveness of the sector for exports, as well as against imported finished products becomes inferior. The annual import share by subsector is presented in Figure 5.16 below.

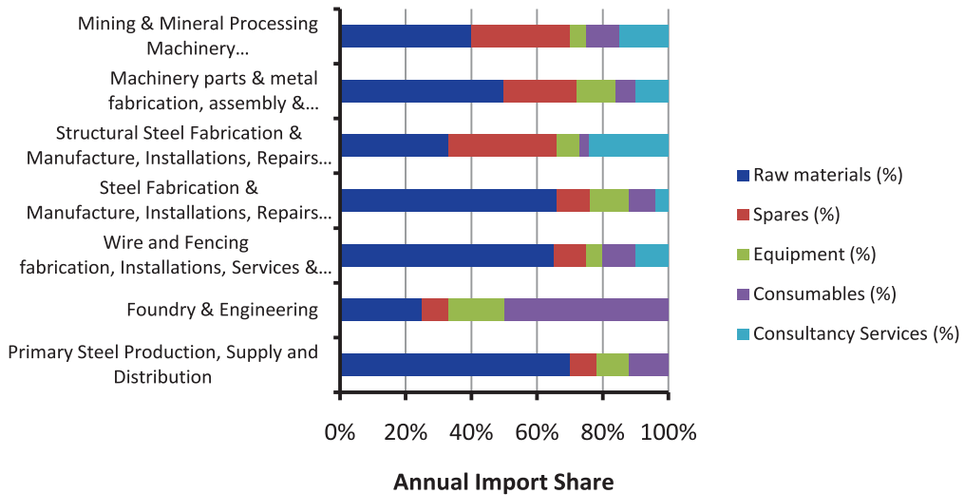

Figure 5.16: Annual import share of inputs by subsector

As presented in Figure 5.16 above, raw materials and spares constituted the major annual imports for the various sectors. This situation threatened the competitiveness of the sector. Import substitution was therefore vital to enhance the competitiveness of the sector. The major sources of imports are presented in Figure 5.17

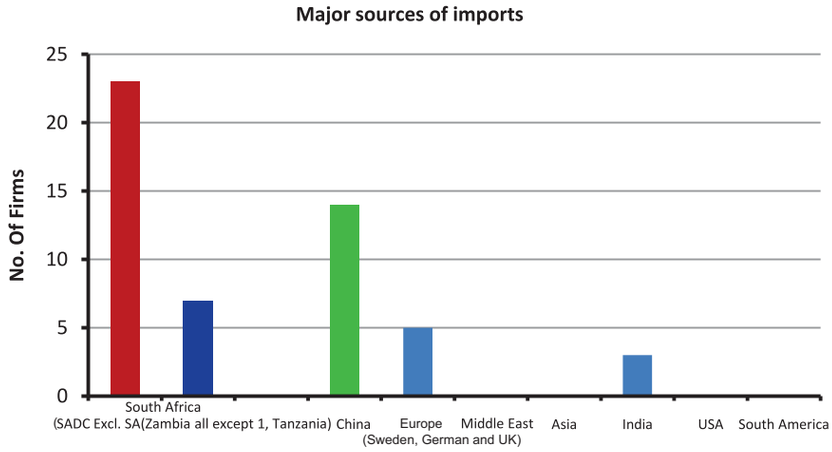

Figure 5.17: Main sources of imports for the engineering iron and steel sector

As shown, the main sources of imports were South Africa (dominant); followed by China; then SADC (mainly Zambia and Tanzania); then Europe (Sweden, German and UK); and India. South Africa and Zambia as choices for imports was due to their proximity considering the cost of transportation of heavy steel products. China and India's imports are mainly due to existing investment linkages as well as technology supply to the local iron and steel industry. Europe's supply of imports could be attributable to supply of technology. Without developing local capacity for production as well as technology, it will be very difficult to substitute imports considering that the developed countries will always seek to increase their exports of value added products as well as technology to the developing world and maintain that status quo forever. Every SADC country also seeks to improve their export competitiveness, and in the process provide competitive products to our local market. This has already been shown by South Africa's dominance and Zambia and Tanzania showing up on the local market. It is also scaring to note that even the semi-finished/less value added products which the sector used to export were being imported to feed the sector. Therefore investment in production of all kinds of steel to feed the sector was inevitable.

5.2.2 Constraints and opportunities

The main constraints and opportunities were captured through the capture of the major reasons why firms imported or sourced their inputs locally. The main reasons why firms imported inputs are presented in Figure 5.18 below and gave an indication of the constraints associated with sources of inputs.

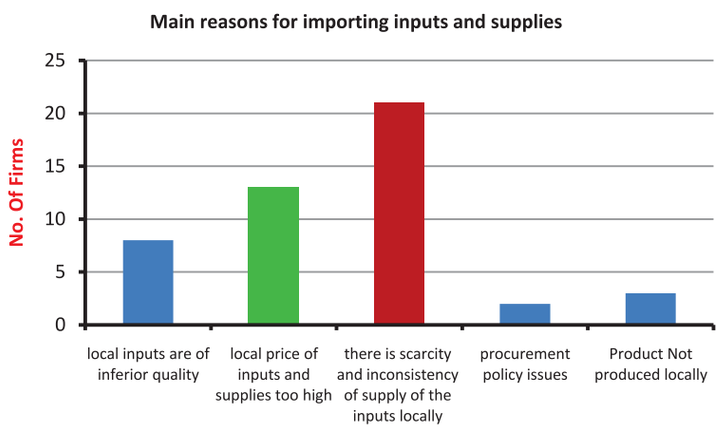

Figure 5.18: Main reasons for importing inputs

The main reasons for importing inputs according to rank were; i) scarcity and inconsistency of supply of the inputs locally (45%); ii) local price of inputs and supplies too high (28%); iii) inferior quality of local inputs (17%); iv) inputs not produced locally; and v) procurement policy issues. The scarcity and non-availability of inputs locally as well as inferior quality are major cause for concern. Investment in new iron and steel production plants and the upgrading and resuscitation of existing ones like ZISCO Steel was expected to address the issues of availability, quality and cost.
The major reasons for sources locally are presented in Figure 5.19 below.

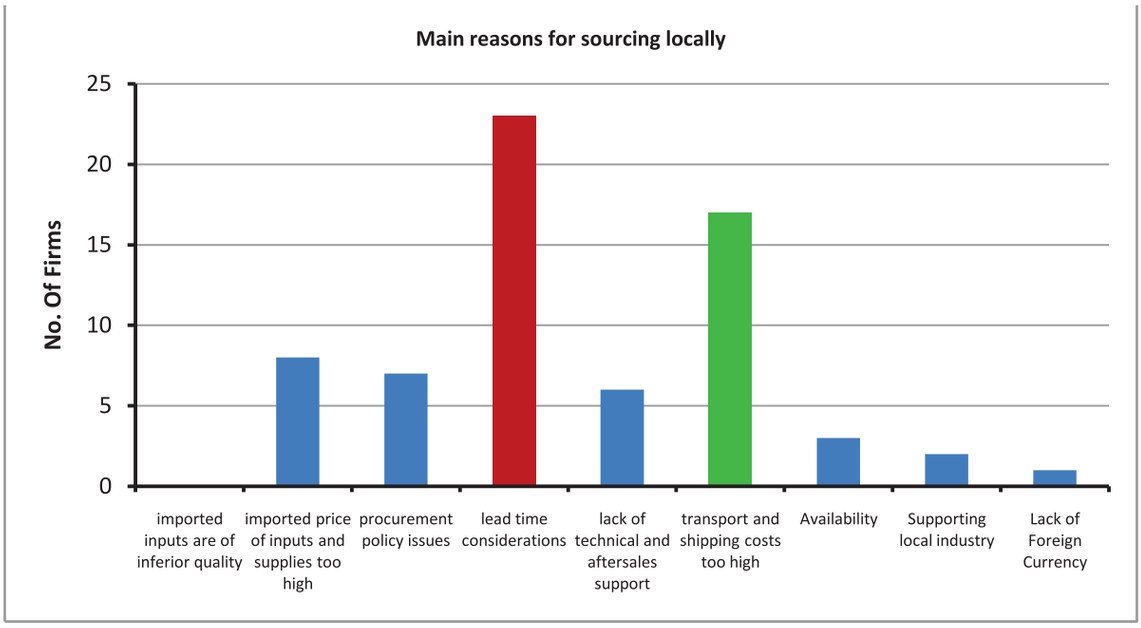

Figure 5.19: Main reasons for local sourcing of inputs

As presented in Figure 5.19 above; the major reasons for sourcing locally according to rank were as follows; i) lead time considerations (34%); ii) transport and shipping costs for importing were too high (25%); iii) imported price of inputs and supplies were too high (12%); iv) procurement policy issues (10%); and lack of technical and aftersales support (9%). The other reasons included availability, supporting of local industry and lack of foreign currency. Therefore the opportunities and potential for import substitution are presented to the sector taking advantage of the high cost of transport and shipping for imports; long lead times associated with importing steel; lack of foreign currency; and lack of technical and aftersales support associated with imports amongst others.

5.3 Production capacity and technology use

In this section, the working pattern; the capacity utilization; major constraints and opportunities for increased capacity utilization; the level of subcontracting and interdependency; technology competitiveness; and the use of ICT in the sector were assessed.

5.3.1 Working pattern and capacity utilization

The working pattern for the firms is presented in Figure 5.20 below.

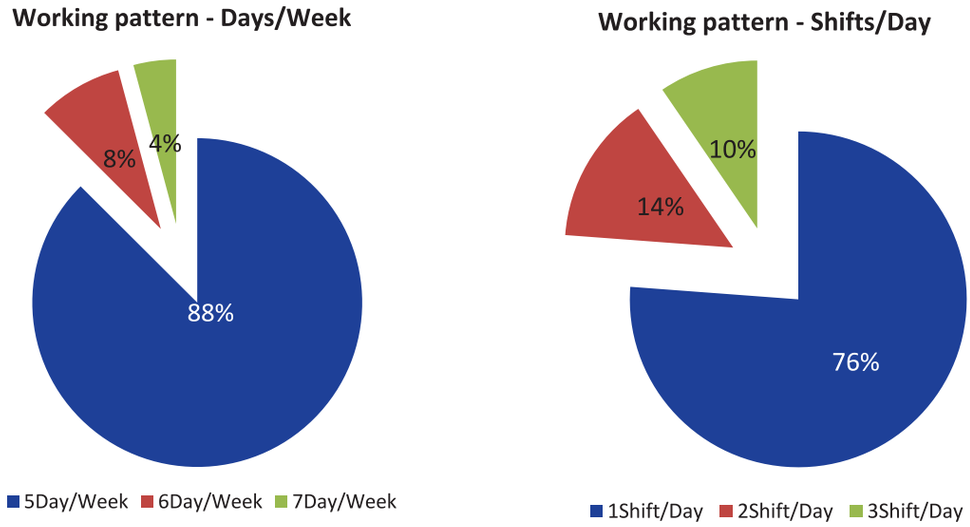

Figure 5.20: Working patterns in the engineering iron and steel sector of Zimbabwe

As presented above, the majority of companies (88%) operated on a 5day working shift, with 76% of the surveyed firms doing 1 shift per day. Before calculating the capacity utilization of the sector, one may already deduce from the working pattern that capacity utilization was low, considering that already only 1 shift per day (out of a potential 3shift day – about 33% utilization of a productive day) was mostly utilized for a 5day week. Only 10% of the firms were utilizing the 3 day shift.

The capacity utilization ranges by volume are presented in Figure 5.21 below.

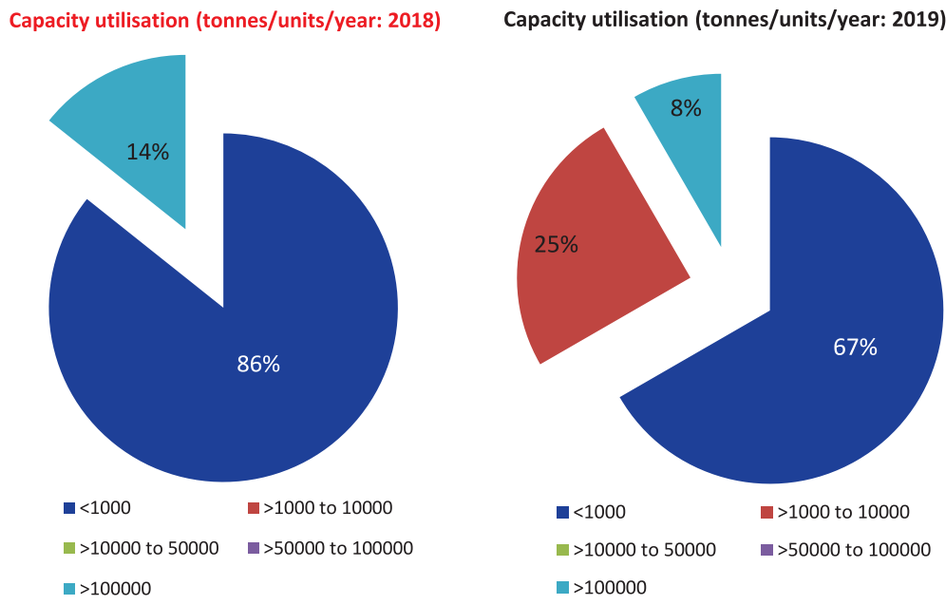

Figure 5.21: Annual capacity utilization by volume in the engineering iron and steel sector of Zimbabwe

The majority of firms produced under 1000tonnes/units per year in 2018 (88%) and 2019 (67%). In 2019 there was improved in production volumes from less than 1000 units to the >1000 to 10000 units bracket. Nevertheless less produced over 100,000tonnes/units in 2019 as compared to 2018. The production volumes point to a subdued capacity utilization. This could be attributable to the fact that the majority of firms were now small scale due to challenges in the economic environment. The capacity utilization for 2017, 2018 and 2019 is presented in Figure 5.22 below.

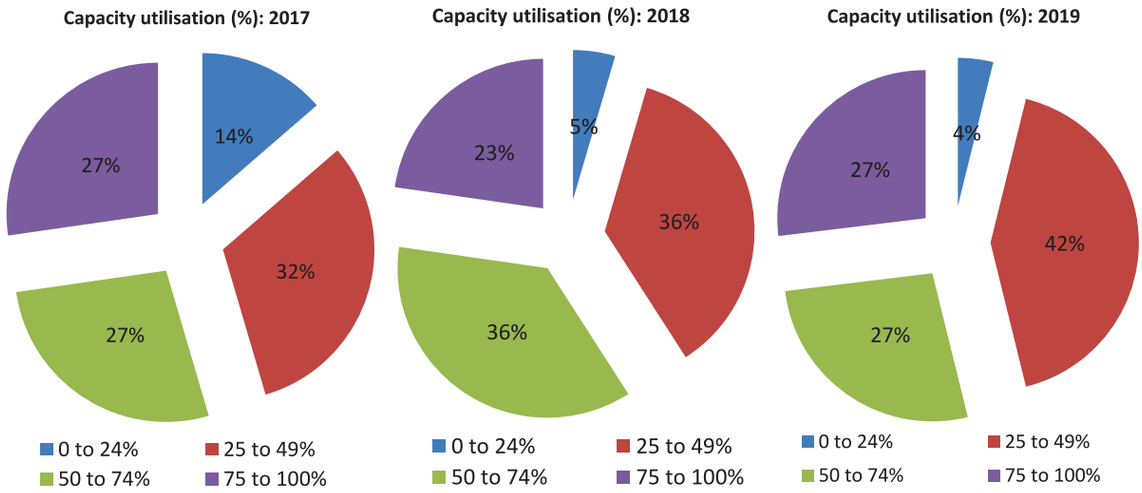

Figure 5.22: Percentage capacity utilization ranges for companies in the engineering iron and steel sector

About 54%; 59%; and 54% of firms operated at over above 50% capacity utilization for 2017, 2018 and 2019 respectively. About 23 to 27% of the firms operated above 75% capacity utilization 2017 to 2019. Between 4 and 14% of the companies operated below 25% capacity utilization. The average annual capacity utilization for the sector for 2017, 2018 and 2019 was 54%, 56% and 56% respectively implying that overall, there was no major shift in capacity utilization. Nevertheless, it is worth noting that the majority of companies were operating at only 1 shift per day, implying that the real capacity utilization assuming a potential 3 day shift could be a third of what was computed {33% of (54%; 56%; 56%)}; which is about 20%. The main reasons for high capacity utilization for some firms are presented in Figure 5.23.

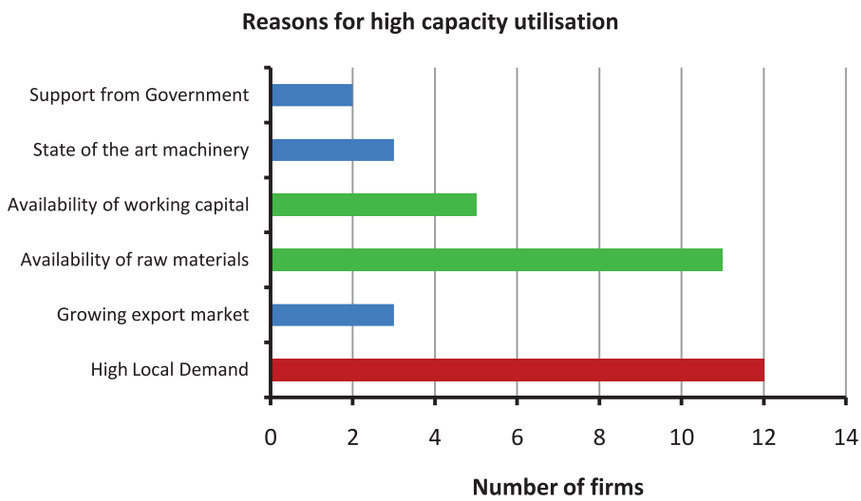

Figure 5.23: Reasons for high capacity utilisation

The ranked major reasons for high capacity utilization as shown in Figure 5.23 above were; i) high local demand; ii) availability of raw materials; iii) availability of working capital; iv) state of the art machinery; v) growing export market; and vi) support from government. It is encouraging to note that the availability of raw materials, availability of working capital, improved technology and government support can indeed lead to high capacity utilization given the fact that the market is readily available. For the firms that operated below 50% capacity utilization, the major reasons are presented in Figure 5.24 below.

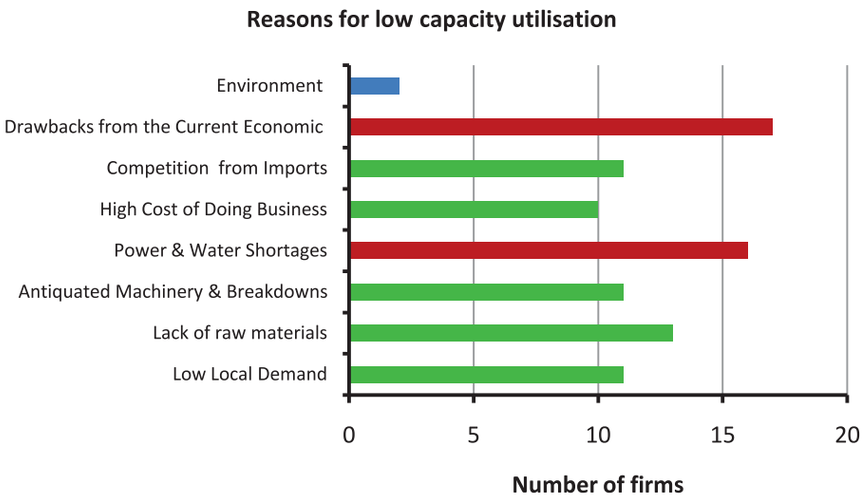

Figure 5.24: Reasons for low capacity utilisation

The main reasons for low capacity utilization according to rank were as follows; i) drawbacks from the current economic context; ii) power and water shortages; iii) lack of raw materials; iv) competition from imports; iv) antiquated machinery and breakdowns; v) low local demand; vi) and high cost of doing business.

5.3.2 Subcontracting and business linkages

According to responding firms, the main operations subcontracted were as follows (Table 5.2 below);

Table 5.2: Subcontracted operations in the engineering iron and steel sector of Zimbabwe

Subsector	Subcontracted operation
Foundry and engineering	Smelting
Fabricated metal products and structural	Bending, cutting, Foundry casting, Forklifts, Scaffolding
Assembled Goods –Industrial, General Purpose, Special purpose, mining and heavy machinery	Chrome plating, electroplating, epoxy coating galvanizing, sand blasting, construction
Automotive industry	Foundry casting, refrigeration, cutting and bending, Fitting and Turning

The extent of subcontracting is presented in Figure 5.25 below.

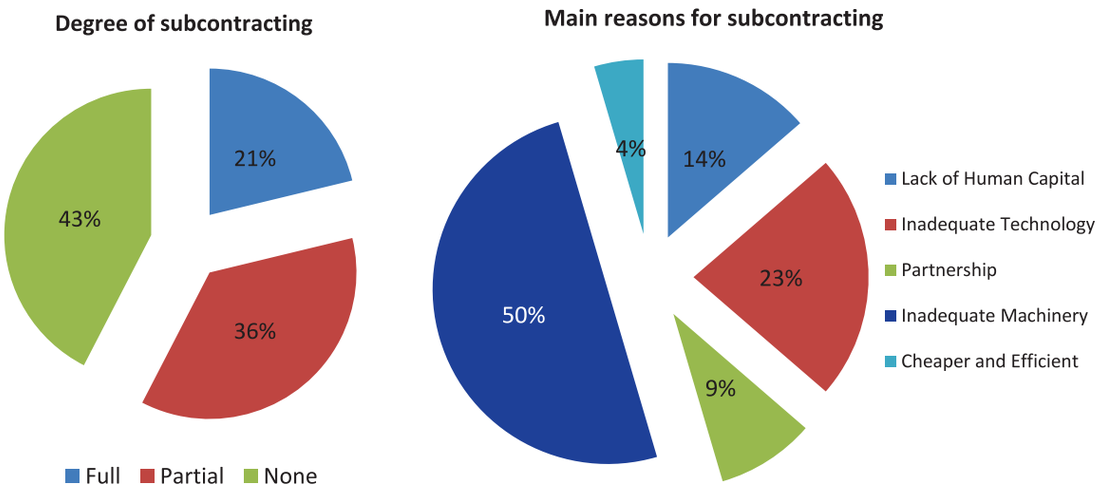

Figure 5.25: Level of subcontracting and the major reasons for doing so

About 57% of firms did subcontract operations, with 43% not subcontracting. About 21% of the firms fully depended on subcontracting. This showed that there was a lot of interdependence on the operating firms and hence the closure of one firm severely affected the operations of the other firms. On the other hand, the opening, growth and expansion of one firm had high probability of triggering business activity for other operators. The main reasons for subcontracting were; i) inadequate machinery; ii) inadequate technology; iii) lack of human capital; iv) partnerships and v) cheaper and more efficient operations/technologies from subcontracted firm.

5.3.3 Technology competitiveness

The major technologies used in the engineering iron and steel sector according to responding firms are presented in Table 5.3 below.

Table 5.3: Major technologies used in the engineering iron and steel sector of Zimbabwe

Subsector	Major technologies	Remark
Primary iron and steel production	Old By- Product Recovery Coke Plant; Non Recovery Coke Plant; Old Blast Furnace; Direct Reduction Iron Rotary Kilns; Basic Oxygen Furnace; Old Induction Furnace; Electric Arc Furnace; Basic Oxygen Furnace; Continuous Casting; Old cogging mills; Old Billet Mills; Old Bar Rod Mills; Old Section Mills	Current technology generally old, heavily manual, low productivity; low energy efficiency and high levels of emissions
Foundry and engineering	Moulding; Pattern Making; Cupola Furnaces; EAF; Induction Furnace; Rotary Furnace; Reverberatory Furnace; Crucibles; Gravity Die Casting; Sand Casting; Centrifugal; Tilt pouring; high and low pressure casting; Heat Treatment; Machining; etc.	Current technology generally old, heavily manual, low productivity; low energy efficiency and high levels of emissions
Fabricated metal products	Automated and semi-automated assembly lines; Sub arc welding; Laser cutting; Machine shop and fabrication shop machines like Drills, Lathe; Milling; Rolling; Bending; Cutting; Winding; etc.	Automation; CNC; CAM,etc are new trends focusing on high productivity; precision engineering; flexible manufacturing; rapid prototyping; energy efficiency; low emissions; etc.
Assembled goods		

The competitiveness of the technologies is presented in Figures 5.26 and 5.27 below.

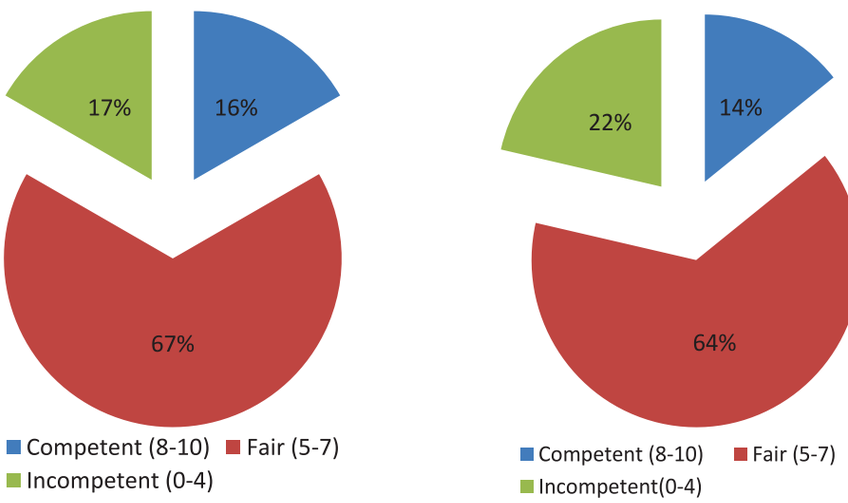

Figure 5.26: Technology competitiveness vs local competitors and medium income Africa

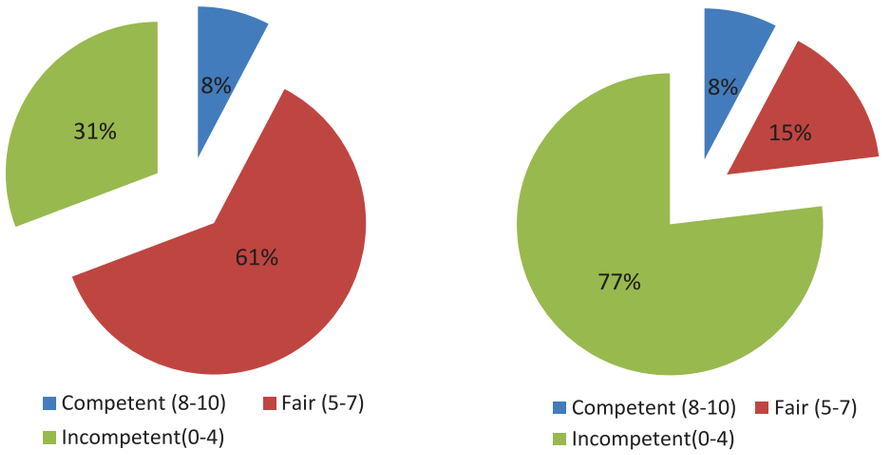

Figure 5.27: Technology competitiveness vs high income Africa and Global firms

Generally the majority of the firms (61 – 67%) perceived their technologies to be fairly competent as compared to low, medium and high income Africa. A paltry 8 to 14% felt that they were competent, whilst 17 to 31% felt that they were incompetent as compared to low, medium and high income Africa. Compared to global firms, a huge 77% of the firms felt incompetent. The technology competitiveness of the sector was therefore a major cause for concern since the majority of the firms were not confident of their technologies even against low income Africa. To edge out competition from manufacturers in SADC and Africa, the technologies have to be more competitive and hence ensure that the local market share for products is not usurped by competitors like Zambia and South Africa in the region. Furthermore technologies have to be upgraded to compete with global firms if export competitiveness is to be enhanced.

The upgrading of technology at every level of the value chain is crucial to ensure competitiveness at local, regional and international markets. To ensure competitiveness of the sector as a whole; any new investment in technology must be approved after meeting set minimum competitiveness thresholds to safeguard the viability of the sector and protect it from technology dumping.

5.3.3.1 New product development potential

A majority of the firms (57%) felt that they could develop new products using the existing technologies as portrayed in the pie chart below.

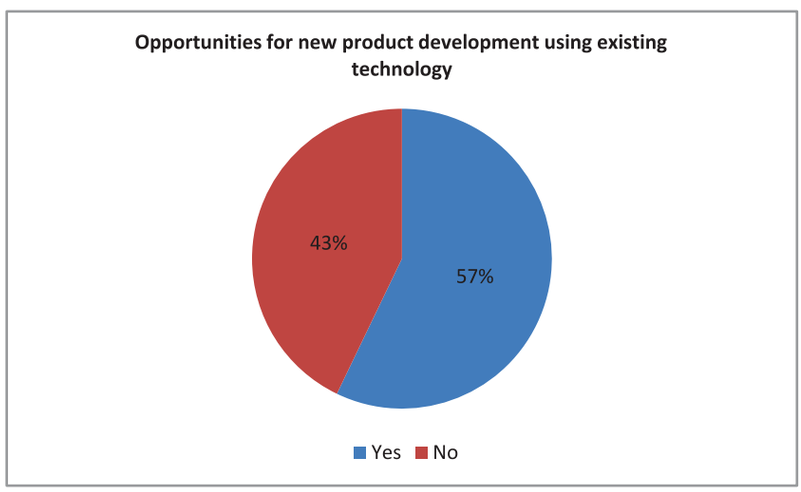

Figure 5.28: Opportunities for new product development using existing technology

The major obstacles to new product development are summarized in Figure 5.29 below.

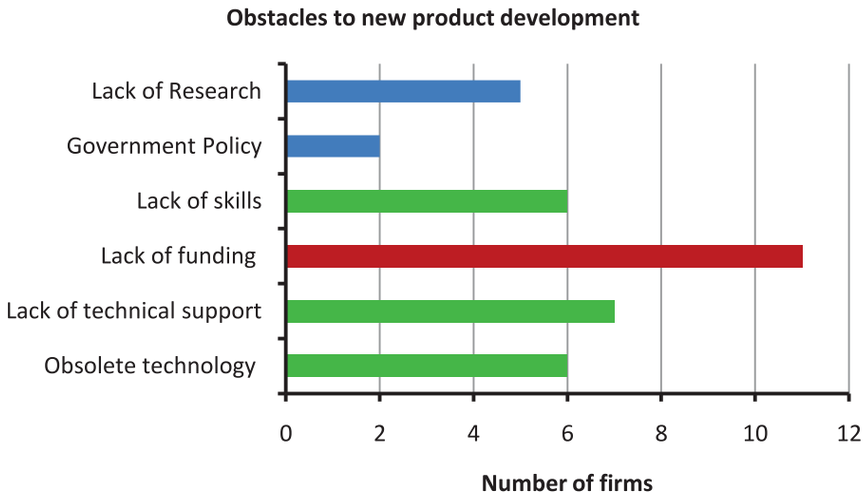

Figure 5.29: Obstacles to new product development

As shown in Figure 5.29 above, the major hindrances to new product development were; i) lack of funding; ii) lack of technical support; iii) lack of skills; iv) obsolete technology; v) lack of research; and v) government policy. New product development could be enhanced through strong collaborations with research and development, training and academic institutions.

5.3.4 Use of ICT in the engineering iron and steel sector

The level of use of ICT in the engineering iron and steel sector is presented in Figure 5.30 below.

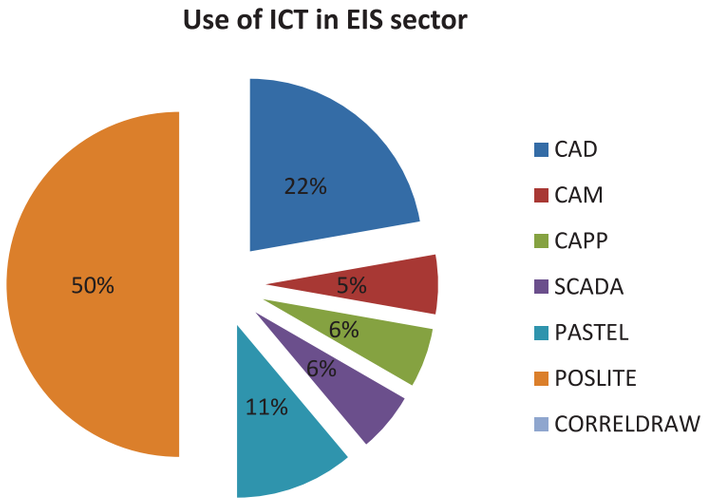

Figure 5.30: Use of ICT in the engineering iron and steel sector

Whilst a significant number of firms used POSLITE (for inventory management and administrative purposes), a low percentage used technical and process related applications like CAD (22%), CAM (5%) and CAPP (6%). Computer Aided Manufacturing will enhance productivity improvement; precision engineering; quality control and improvement; rapid prototyping and new product development.

5.4 Human capital development

Although human capital is a sub-dimension of production capacity and technology use, it was given its own special attention considering its impact to the sector. In this section, the following aspects were investigated and analysed; i) major technical and professional skills, staffing levels and recruitment process; ii) main sources of certified professionals; iii) capacity of local academic and training institutions; iv) Suitability of academic and training institutions to meet technical requirements; v) existence of research and development and vi) intellectual property protection.

5.4.1 Technical and professional skills requirements in the engineering iron and steel sector of Zimbabwe

The major skills required by the engineering iron and steel sector are presented in Table 5.4 as follows;

Subsector	Technicians/Artisans	Engineers	Others
Primary iron and steel production	Metallurgist, electricians, mechanical artisans; welders; boiler makers; instruments technicians; brick layers and builders; pattern makers; riggers; draftspersons; laboratory, chemical and process	Metallurgist; Chemical and Process; Mechanical & Mechatronics; Civil and Water; Electrical; Electronics; Environmental; Energy	OHS technicians and health professionals, Lawyers, Finance and Accounting, Business & Marketing Experts
Foundry and engineering	Metallurgist, electricians, mechanical artisans; welders; moulders; pattern makers; draftspersons; laboratory, chemical and process	Metallurgist; Chemical and Process; Mechanical & Mechatronics; Electrical; Environmental;	OHS technicians and health professionals; instruments technicians; Energy; Civil; Finance, Business & Marketing
Fabricated metal products and structural	electricians, mechanical artisans; welders; boiler makers; instruments technicians; riggers; draftspersons	Mechanical & Mechatronics; Civil; Structural; Architectural; Electrical; Electronics; Environmental; Energy	Metallurgist; OHS technicians and health professionals; Electrical; Electronics; Environmental; Finance, Business & Marketing
Assembled goods	Metallurgist, electricians, mechanical artisans; welders; boiler makers; instruments technicians; draftspersons;	Mechanical & Mechatronics; Electrical; Electronics; Environmental; Energy	OHS technicians and health professionals; Environmental; Civil and Water; Process; metallurgist; laboratory; Finance, Business & Marketing; Legal
Electrical Engineered goods and Electronics	Metallurgist, electricians, mechanical artisans; welders; instruments technicians; moulders; pattern makers; riggers; draftspersons;	Electrical; Electronics; metallurgist; mechatronics	Mechanical; OHS technicians and health professionals; environmental; energy; civil; chemical and process; Finance, Business & marketing
Engineering services and consultancy	Metallurgist, electricians, mechanical artisans; welders; boiler makers; instruments technicians; brick layers and builders; pattern makers; riggers; draftspersons; laboratory, chemical and process	Metallurgist; Chemical and Process; Mechanical & Mechatronics; Civil and Water; Electrical; Electronics; Environmental; Energy; Architectural; Automation	OHS technicians and health professionals; Human Resources; Finance; Business & Marketing; Economists; Legal

Table 5.4: Major skills required in the engineering iron and steel sector of Zimbabwe

The level of skills and staffing levels are presented in Figure 5.31 below.

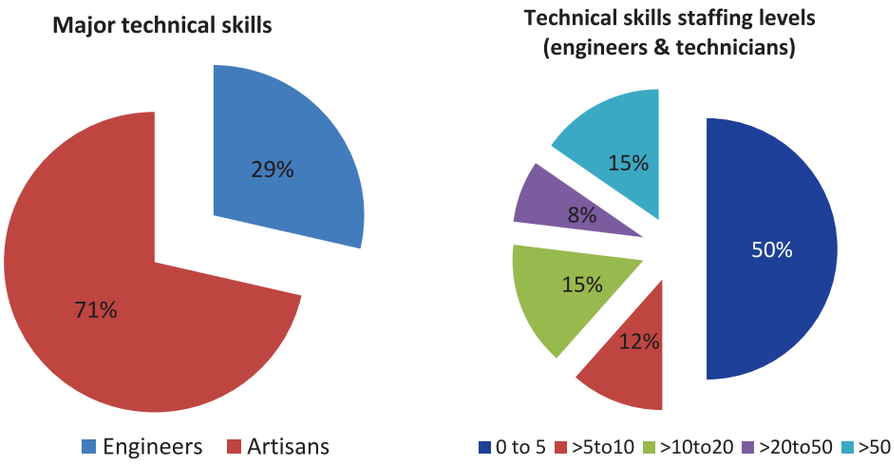

Figure 5.31: Level of skills required and staffing levels in the engineering iron and steel sector

As shown in Figure 5.31 above; the engineering iron and steel sector was a heavy consumer of artisans and technicians (71%) as compared to engineers (29%). The majority of firms (50%) employed up to a total of 5 engineers and artisans/technicians (combined). About 23% of firms apiece employed over 20 engineers and technicians combined, whilst 15% employed over 50 engineers and technicians combined. Indicatively; the sector employed on average about 20 engineers and technicians (combined) per firm [6engineers and 14technicians]. These statistics show that the engineering iron and steel sector has the potential to employee a significant number of engineers and technicians if it grew. The major recruitment process was internal and local with about 12% done by a consultant as shown in Figure 5.32 below.

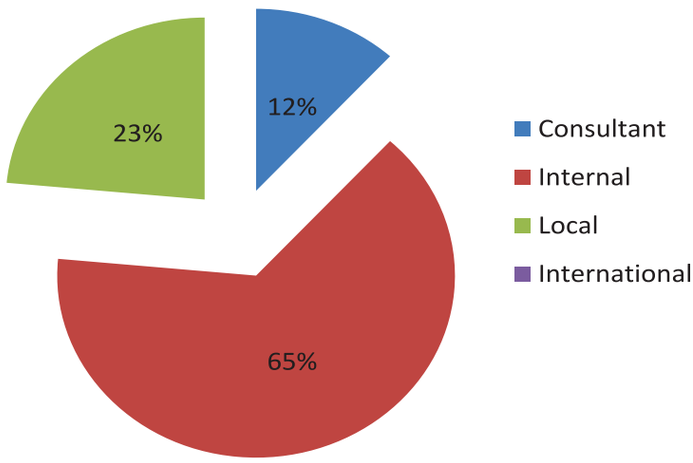

Figure 5.32: Recruitment process in the engineering iron and steel sector

Professional skills requirements are presented in Figure 5.33 below.

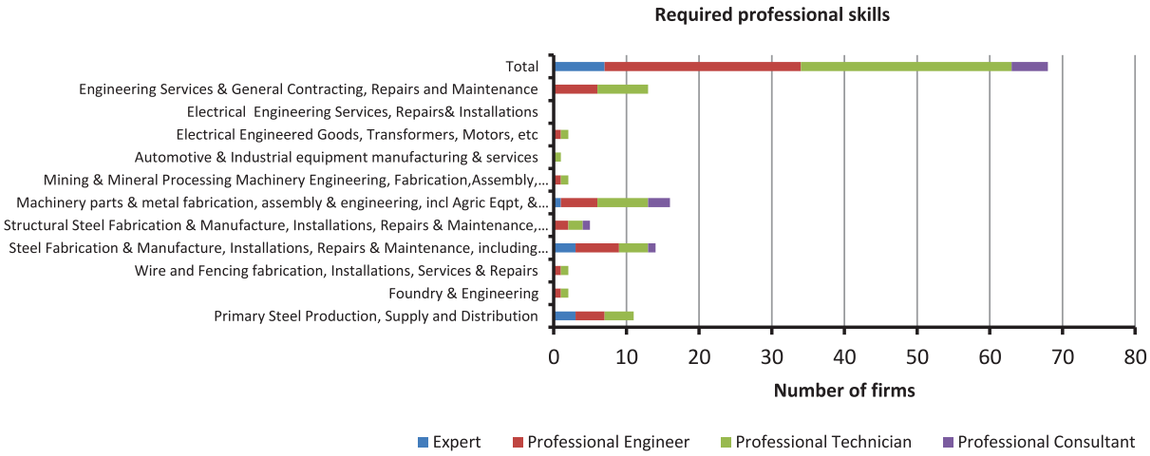

Figure 5.33: Professional skills requirements in the engineering iron and steel sector of Zimbabwe

As shown in Figure 5.33 above, generally all subsectors required the services of professional engineers and technicians. Experts were significantly required for the primary steel production and fabricated metal products and notable for the assembled goods subsector. Professional consultants were used significantly in the assembled goods subsector and to some notable extent in fabricated metal products and structural steel subsectors. The demand for professional skills showed that advanced training and continuous professional development was crucial to the development, growth and competitiveness of the sector. The improved use of appropriate expertise and professional consultants could also enhance the competitiveness of the sector. Capacity building strategies for experts, ("neuro-surgeons of the sector") in strategic value chains of the engineering iron and steel sector of Zimbabwe could be vital to enhance competitiveness of the sector.

5.4.2 Major sources of critical skills for the engineering iron and steel sector of Zimbabwe

The main local institutions that supply professional and technical skills to the engineering iron and steel sector of Zimbabwe are presented in Figure 5.34 below.

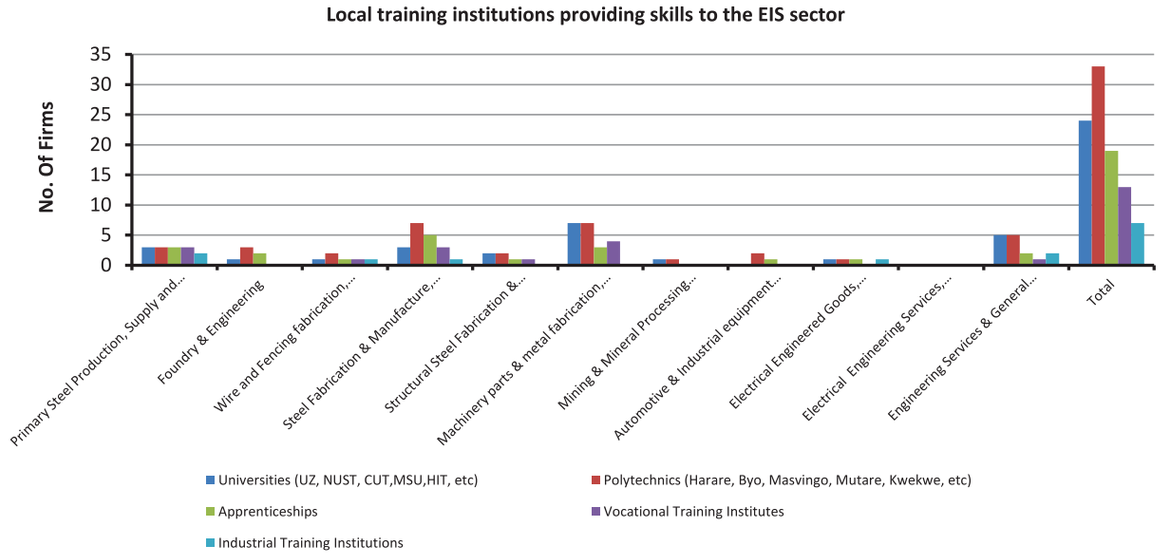

Figure 5.34: Local training institutions for the engineering iron and steel sector of Zimbabwe

Polytechnics like Harare, Bulawayo, Kwekwe, Mutare and Masvingo dominate as the major sources of technicians and were generally considered as the heart of the technical skills. Also significant were the Universities (University of Zimbabwe, National University of Science and Technology, Harare Institute of Technology, Chinhoyi University of Technology and to some extent Bindura University of Science Education and Midlands State University). Apprenticeship programmes; vocational training and industrial training institutions also contributed significantly to the provision of skills for the industry. A more detailed needs analysis for these vital institutions with the aim of strengthening their capacities to produce the required skills as well as fostering strong linkages with the sector could enhance the competitiveness of the sector. Synergies amongst the various training institutions (vertical and horizontal) are also important for competitiveness of the sector as a whole.

The main sources of certified personnel are presented in Figure 5.35 below.

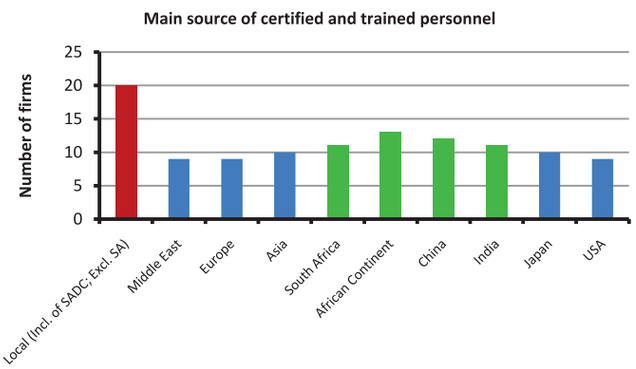

Figure 5.35: Main sources of certified and trained personnel for the engineering iron and steel sector of Zimbabwe

The major source of certified and trained personnel was local as shown in Figure 5.35. Significant training and certification also came from the general African continent, South Africa, China and India. Generally certification and training for the sector has come from all over the world. This could be attributable to the presence and influence of Zimbabwean diaspora community all over the world. Thus strong collaborations with various institutions across the world can enhance the competitiveness of the sector through strong and holistic global value chain linkages incorporating human capital development and technology transfer and pollination.

5.4.3 Capacity of training institutions in the engineering iron and steel sector of Zimbabwe

The capacities of various training institutes are presented in this section. The capacities of universities and polytechnics are presented in Figure 5.36 below.

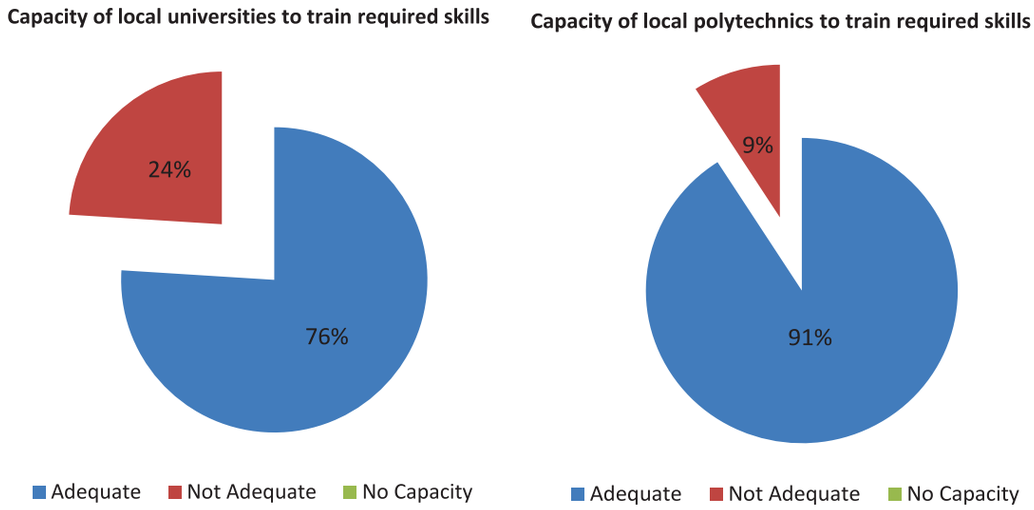

Figure 5.36: Capacity of local universities and polytechnics for the engineering iron and steel sector of Zimbabwe

As shown in Figure 5.36 above, the sector was generally happy with the capacity of polytechnics (91%) to train the skills they wanted. The majority of firms (76%) were also satisfied with the capacity of the universities to train the skills they wanted. However, a significant number of firms (24%) felt that the capacity of universities to train their skills was not adequate. It was therefore vital for the universities to have strong links with the sector to fully understand the needs and hence align their curricular accordingly.
The capacities of professional and industrial training bodies are presented in Figure 5.37 below.

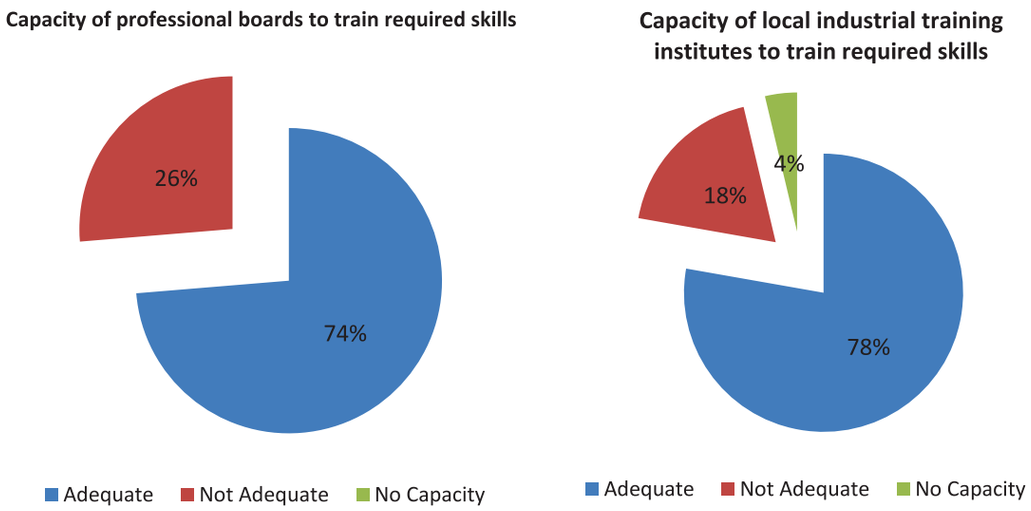

Figure 5.37: Capacity of professional bodies and industrial training institutes for the engineering iron and steel sector of Zimbabwe

A majority of the firms (74 and 78%) felt that the above mentioned institutions had adequate capacity to train the skills they needed. However, a significant number of firms felt that the capacity was not adequate. Strong collaborations and aligning or restructuring of some of the professional and industrial bodies to suit the needs of the industry may improve the capacities and suitability of the training institutions to meet industry requirements.

5.4.4 Research and development, innovation and new product development in the engineering iron and steel sector of Zimbabwe

In this subsection the existence of research and development; the extent of innovation and new product development; relevance of local research and development and level of collaboration between sector and local research and development institutions was assessed. Figure 5.38 below presents the existence of research and development in the engineering iron and steel sector.

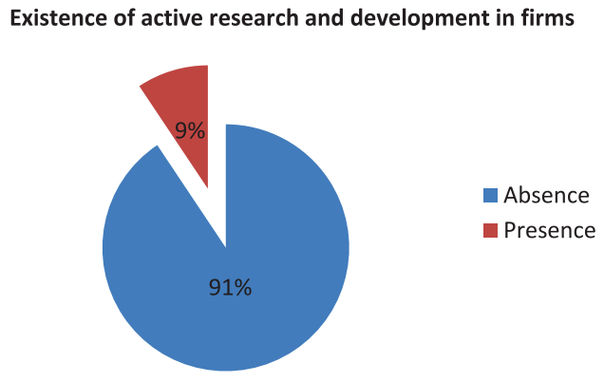

Figure 5.38: Existence of research and development in the engineering iron and steel sector of Zimbabwe

Research and development was just as good as non-existent as shown in Figure 5.38 above. It therefore becomes difficult for the sector to become continuously competitive without active and dynamic research and development. As a result a few new products were developed in the sector. Some noted new products included wires and sleeves; chicken heaters; maize dryers; maize shellers; wheel chairs; mining equipment; and marine engine strainers amongst others. The level of protection of new products is presented in Figure 5.39 below.

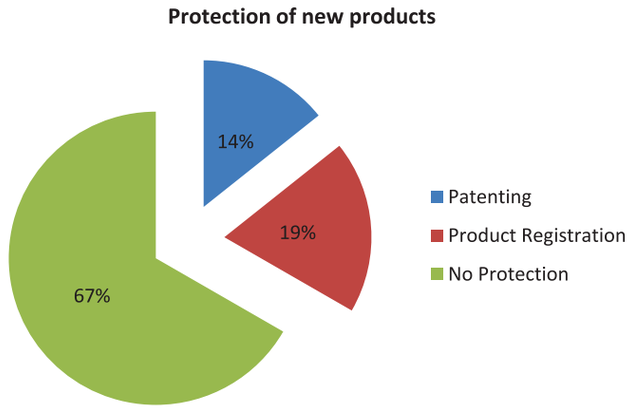

Figure 5.39: Protection of new products and intellectual property in the engineering iron and steel sector of Zimbabwe

A shown in Figure 5.39 above, the level of protection of new products and intellectual property was low with 67% of the firms saying they did not protect their new products. A notable number (19%) did protect their products through product registration whilst 14% protected through patenting. A lot of support was required to ensure that the sector's innovations and new products were protected.

5.4.4.1 Relevance of local research and development institutions

The relevance of local research and development organizations is analysed in Figure 5.40 below.

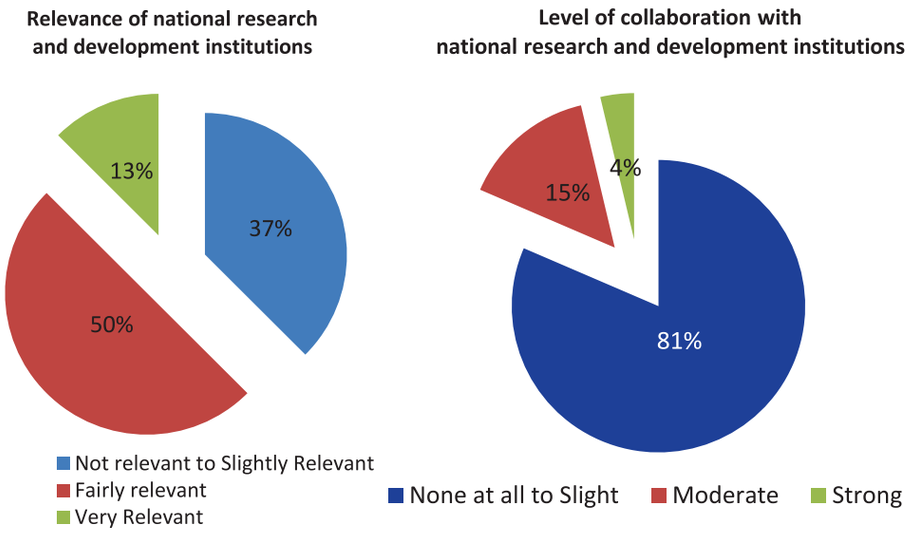

Figure 5.40: Relevance and level of collaboration between R&D institutions and the engineering iron and steel sector of Zimbabwe

About 63% said the Research and Development Institutions were fair to very relevant to the needs of the sector. Nevertheless, collaboration between research and development institutions and the sector was very weak as shown in Figure 5.40 above. Ways to foster strong collaboration have to be identified and implemented to enhance the competitiveness of the sector.

5.5 End markets and trade analysis

This section looked at the following key aspects of end markets and trade analysis namely; i) main products produced by subsectors; ii) level of demand and reasons for demand scenarios; iii) factors affecting price of product; iv) main competitors; v) suitability of business location; vi) annual sales; vii) export competitiveness; viii) main customer groups; ix) growth of products and markets; x) product market methods.

5.5.1 Main products in the engineering iron and steel sector

The main products in the engineering iron and steel sector of Zimbabwe are presented in Table 5.5 below.

Category of Firm	Cited products
Primary Steel Production, Supply and Distribution	Wires; Bars and Rods; Angles and Shapes; Sponge Iron; Tubes and Vessels
Foundry & Engineering	Mining Equipment &Machinery; Steel castings; Agro-processing equipment; machined and fabricated parts
Wire and Fencing	Wire products; bars and rods; barbed wire; brick force; wire meshes
Fabricated metal products and structural steel products	Tubes, pipes and fittings; pressure vessels; machined and fabricated parts; long steel products; mining machinery; escalators and elevators; welded and seamless vessels and tanks; light industrial engineering parts and general; rig construction
Assembled goods and machinery	Agricultural and agro-processing machinery; mining and heavy industry equipment and parts; industrial & food processing machinery; automotive components; steel house boats and pontoons
Electrical Engineered Goods	Household appliances; electrical transformers and motors; Generators; Data centres; CCTVs; Weighing equipment – digital and electronic; compressors; solar pv and components

Major products that are conspicuous include billets; pig cast; and flat products which are key inputs to down-stream operations. Their absence could be attributable to the limited number of basic iron and steel producing plants after the closure of ZISCO.

5.5.2 Level of demand in the engineering iron and steel sector of Zimbabwe

The level of demand is presented in Figure 5.41 below.

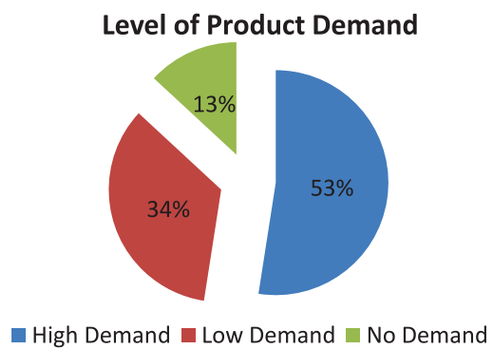

Figure 5.41: Level of demand in the engineering iron and steel sector of Zimbabwe

As shown in Figure 5.41 above, a slight majority of firms said that the demand for their products was high on the market. Contrastingly, about 13% said that there was no demand for their products on the market. In such a scenario, new product development is inevitable; or development of new markets. The reasons for high product demand are presented in Figure 5.42.

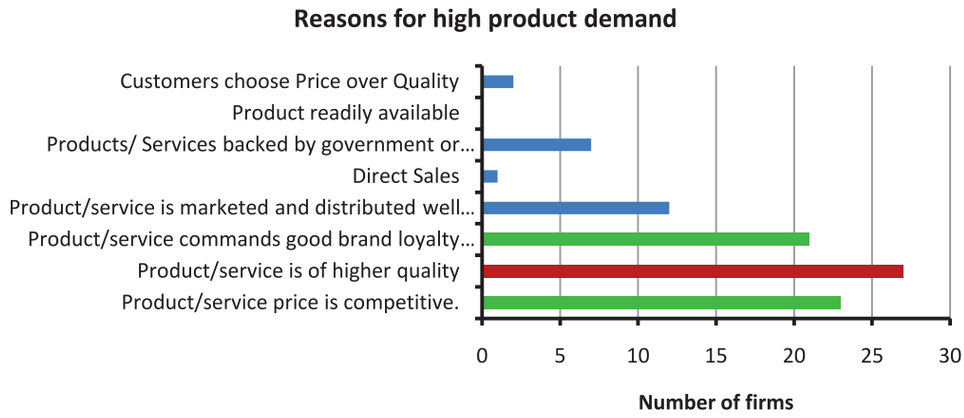

Figure 5.42: Reasons for high product demand in the engineering iron and steel sector of Zimbabwe

The major reasons for high product demand as cited by responding firms according to rank were; i) high quality product/service; ii) product/service price was competitive; iii) brand loyalty; iv) product and service was distributed well; and product was backed by government.
The main reasons for low product demand are presented in Figure 5.43 below.

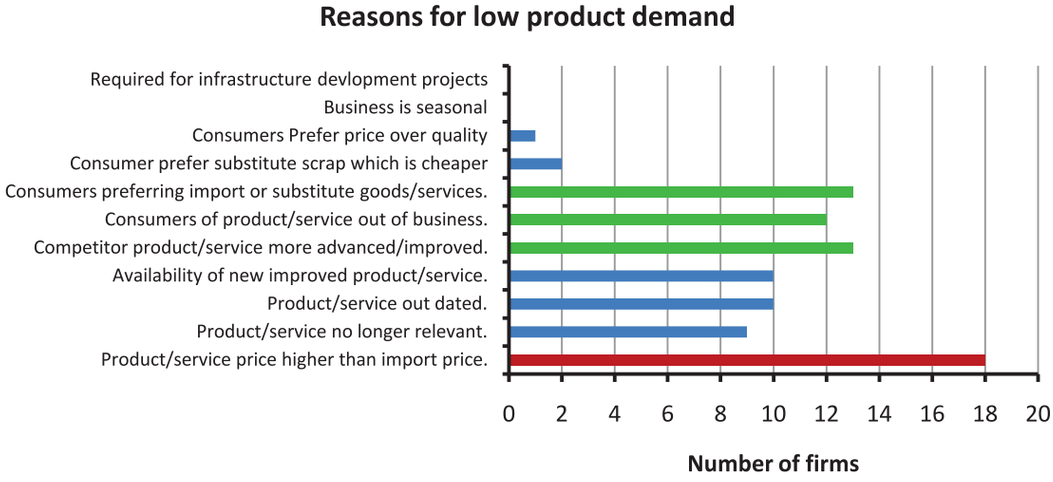

Figure 5.43: Reasons for low product demand in the engineering iron and steel sector of Zimbabwe

The main reasons for low product demand were ranked as follows; i) product/service price was higher than import price; ii) consumers preferring import or substitute goods; iii) competitor product/ service more advanced; iv) consumers of product/service out of business; vii) product/ service was outdated and no longer relevant; and availability of new and improved products. With the above mentioned reasons, it is clear that firms have to invest in new product development, explore new markets and improve cost competitiveness and quality of products to remain in the game and outwit competitors.

5.5.3 Main competitors in the engineering iron and steel sector

The main competitors are shown in Figure 5.44 below.

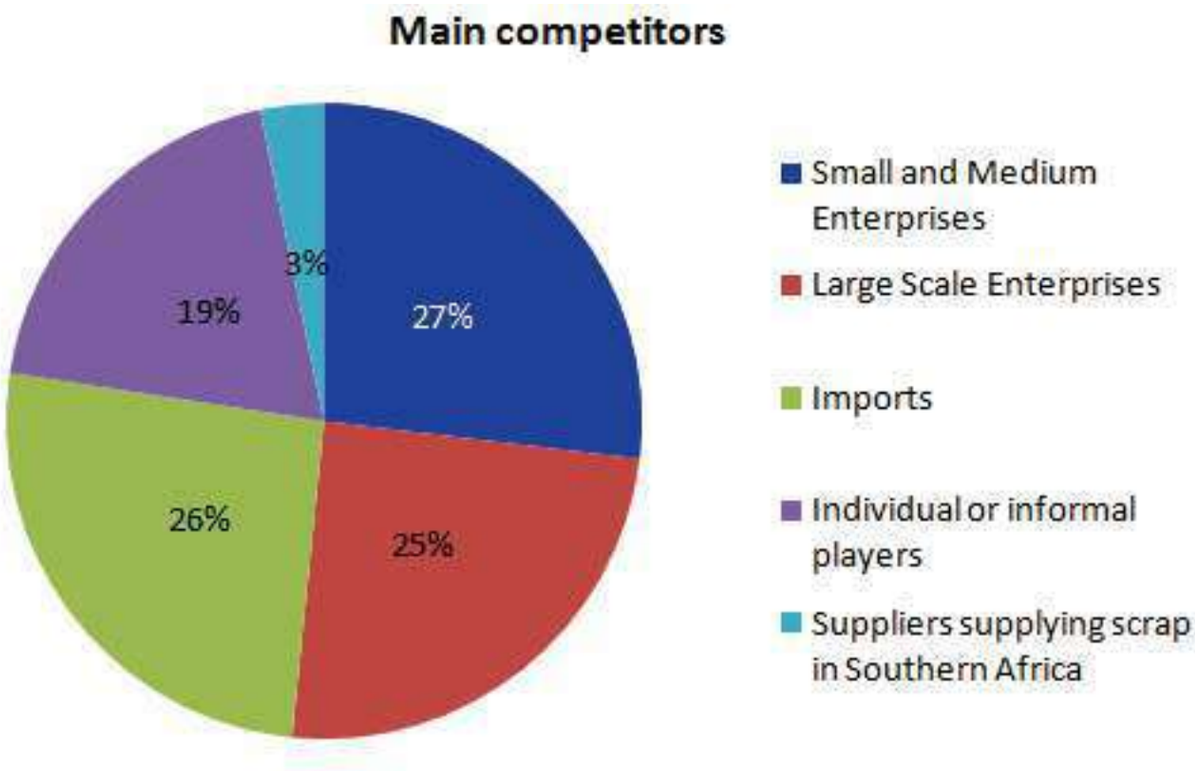

Figure 5.44: Main competitors in the engineering iron and steel sector of Zimbabwe

Small and medium scale enterprises; imports and large scale enterprises seemed to compete evenly on the market. Individual or informal players were also significant players on the market. Synergies and win - win models amongst these key players on the market may ensure sustainability of the sector. Cluster development around attractive value chains may ensure good health for both the sector and individual firms of different sizes when they operate together to achieve common value chain goals.

5.5.4 Factors affecting price of product

The factors that affected the price of product are presented in Figure 5.45 below.

Figure 5.45: Main competitors in the engineering iron and steel sector of Zimbabwe

5.5.3 Main competitors in the engineering iron and steel sector

The main competitors are shown in Figure 5.44 below.

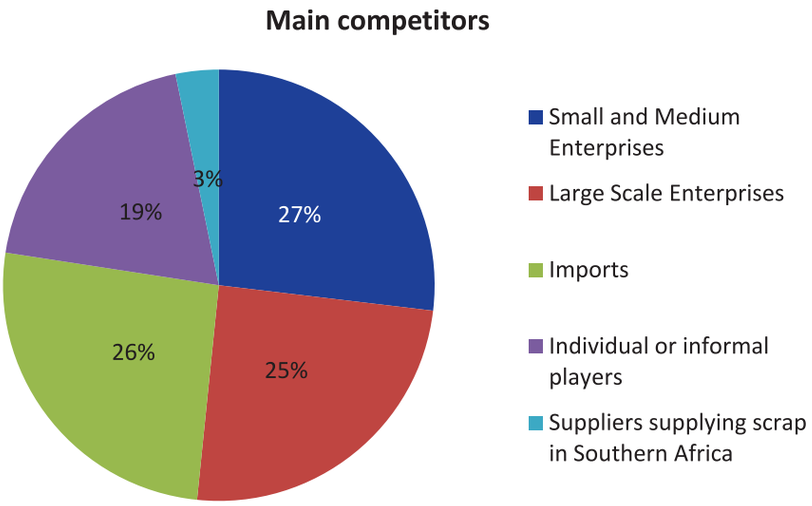

Figure 5.44: Main competitors in the engineering iron and steel sector of Zimbabwe

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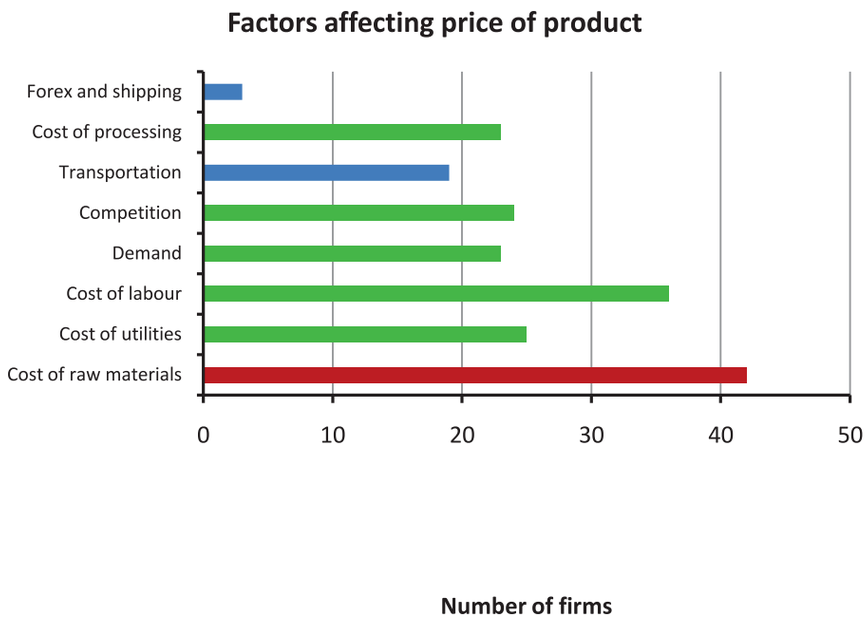

Figure 5.45: Main competitors in the engineering iron and steel sector of Zimbabwe

The major factors affecting product price as presented in Figure 5.45 above were as follows; i) cost of raw materials; ii) cost of labour; iii) cost of utilities; iv) competition; v) cost of processing; and transportation. Therefore cost of competitiveness in production processes as well as sourcing of inputs was vital to ensure viability. It is worth noting that the introduction of new iron and steel plant is expected to have a huge positive impact of the cost of product and competitiveness. Firms have to invest in technologies that are energy efficient, highly mechanized and highly productive to improve cost competitiveness of product and high quality.

5.5.5 Suitability of business location

The suitability of business location is best illustrated in Figures 5.46 and 5.47.

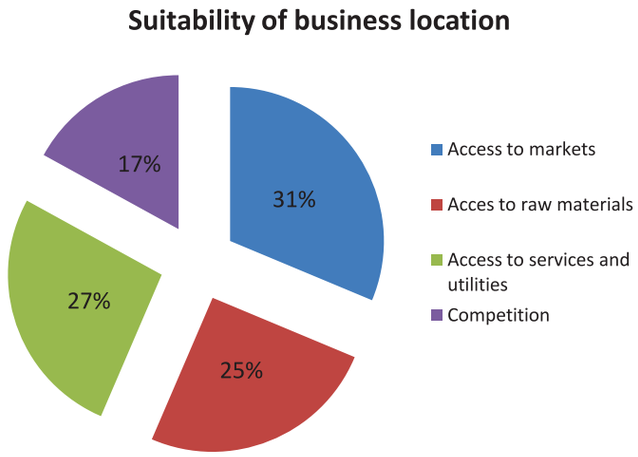

Figure 5.46: Main competitors in the engineering iron and steel sector of Zimbabwe

A major number of firms felt their business location was suitable due to good; i) access to markets; ii) access to services and utilities; iii) access to raw materials; and iv) for competition. A notable number of firms benefited from other businesses in their vicinity through i) favourable pricing; ii) payment terms; iii) resource sharing; iv) supplier agreements; and v) a few through cost sharing (Figure 5.47).

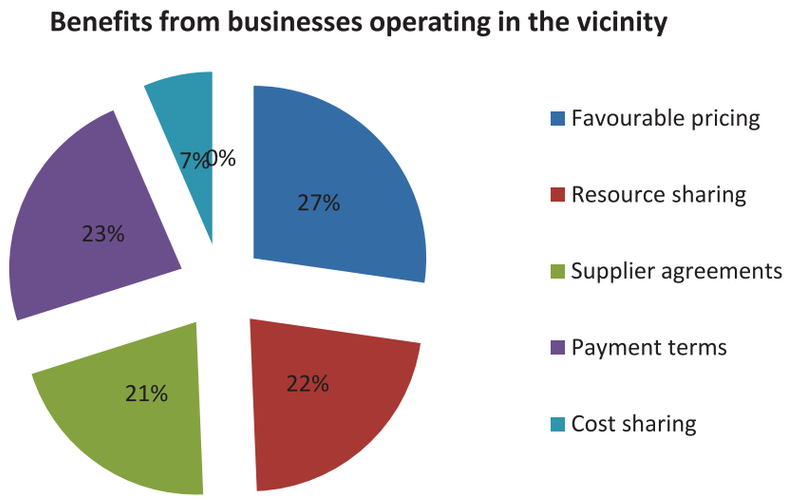

Figure 5.47: Main competitors in the engineering iron and steel sector of Zimbabwe

Such existing arrangements will enhance the formation of market oriented clusters around attractive local, regional and global value chains.

5.5.6 Average annual sales

It was difficult to get information on the annual sales of most companies as they deemed it highly confidential. However a couple of firms did divulge their average annual sales for the period 2017 to 2019. The indicative average annual sales per firm are presented in Figures 5.48 below.

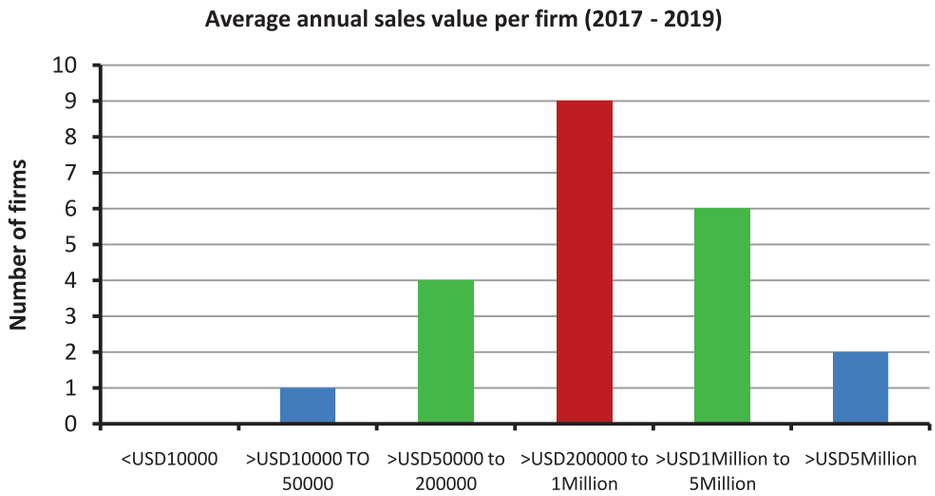

Figure 5.48: Average annual sales (per firm) in the engineering iron and steel sector of Zimbabwe

As presented above, the majority of firms earned revenues in the range of USD 200,000 to 1Million dollars; followed by those in the range of USD1Million to USD5Million. A considerable number of firms were in the USD 50,000 to 200,000, with a few over USD5Million, representing the large scale companies. The average annual revenue per firm was USD1.89Million. Thus at current production levels and an estimated 500 active firms, the estimated annual revenues would around USD945Million. However, it is worth noting that the sample on annual sales was not totally representative of the whole sector with most small and micro-scale firms not forthcoming with their revenue figures.

5.5.7 Export competitiveness

This subsection analyses the extent to which companies export and the export destinations. The level of exports within the engineering iron and steel sector is presented in Figure 5.49 below.

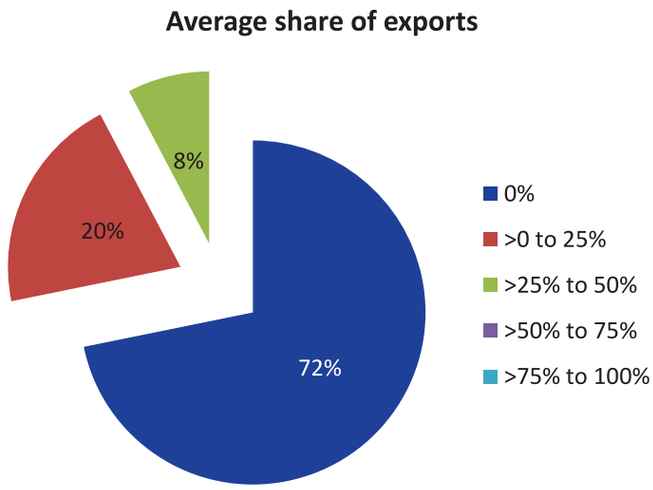

Figure 5.49: Share of exports in the engineering iron and steel sector of Zimbabwe

As a major cause for concern, about 72% of the firms surveyed exported no product. Only 20% of the firms exported less than 25% of what they produced with a paltry 8% exporting between25 and 50% of what they produced. Thus the export competitiveness of the sector is very low. Incentives and policies that promote exports must be established and put in place to increase the share of the exports and hence volumes of production and capacity utilization. The major destinations of the limited exports are presented in Figure 5.50 below.

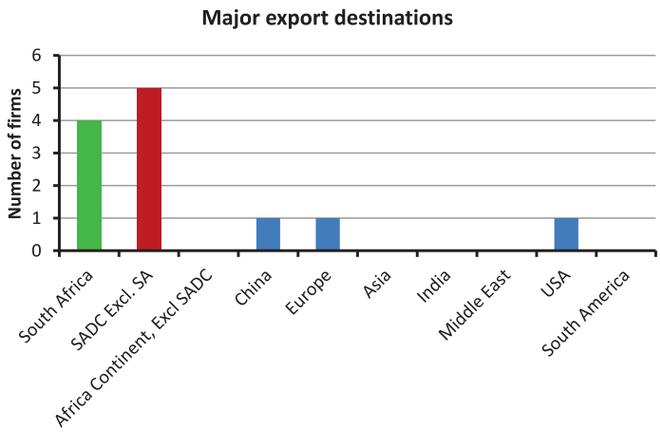

Figure 5.50: Major export destinations for products in the engineering iron and steel sector of Zimbabwe

The major export destinations were; i) SADC excluding SA (mainly Zambia); ii) South Africa; iii) China; iv) Europe (UK) and v) USA. The fact that the sector was exporting to Europe, China and USA shows that it has great export potential.

5.5.8 Main customer groups, growth of products and markets and marketing methods

The main customer groups are presented in Figure 5.51 below.

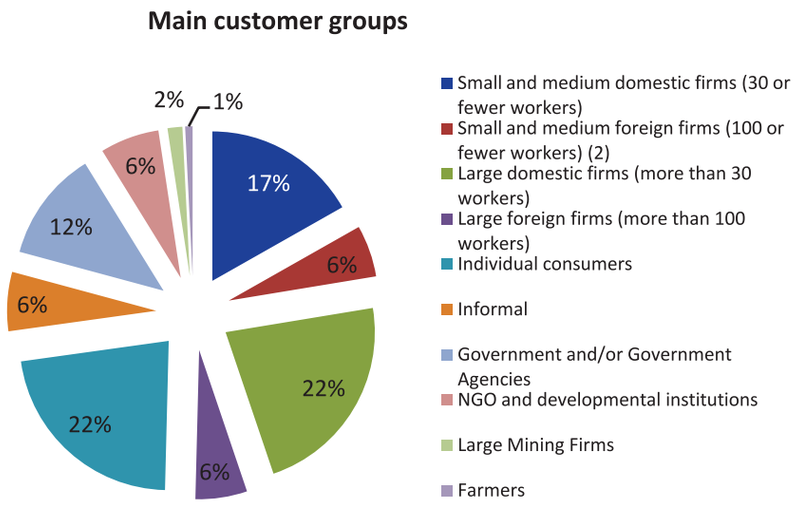

Figure 5.51: Main customer groups in the engineering iron and steel sector of Zimbabwe

The major customer groups included the large domestic firms, individual consumers, small and medium domestic firms and government institutions. The major obstacles to growth of products and markets are presented in Figure 5.52

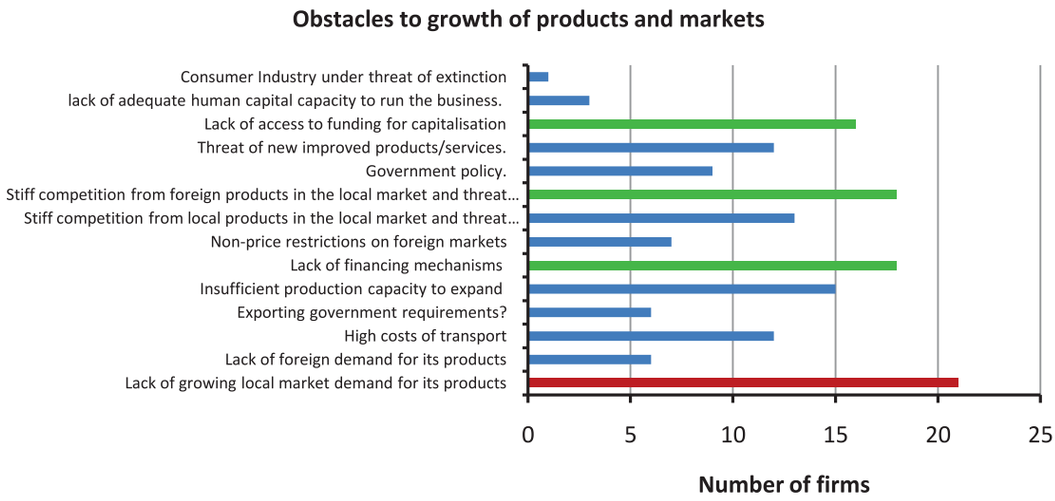

Figure 5.52: Obstacles to growth of products and markets in the engineering iron and steel sector of Zimbabwe

As presented in Figure 5.52 above, the major obstacles were; i) lack of growing local demand for its product; ii) stiff competition from foreign products on the local market and threat of substitutes; iii) lack of financing mechanisms; iv) lack of access to funding for mechanization; v) insufficient production capacity to expand; vi) stiff competition from local products on the local market; and vii) high cost of transport.
The main methods used in marketing products and services are presented in Figure 5.53 below.

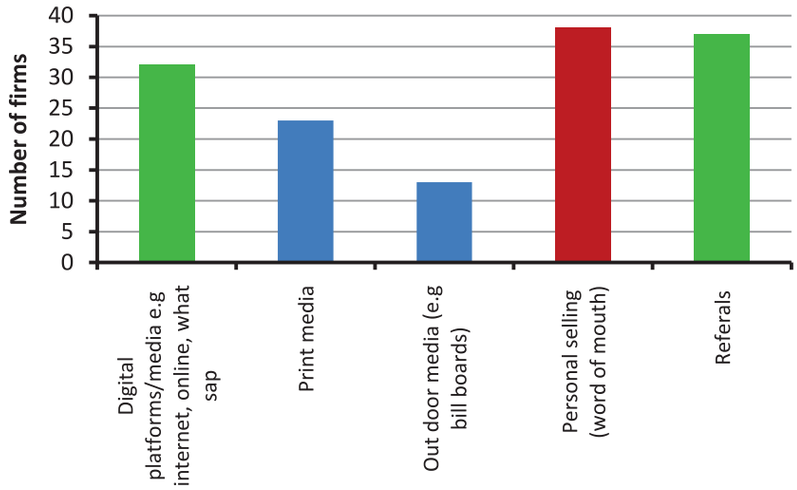

Figure 5.53: Major product marketing methods in the engineering iron and steel sector of Zimbabwe

As shown in Figure 5.53 above, the major marketing methods were; i) personal selling (word of mouth); ii) referals; and iii) digital platforms. New product marketing methods have to be devised to reach out to the export market as well as to increase digital and online marketing in sync with the modern trends.

5.6 Sustainable production and energy use

In this section, the usage of main resources (energy, water, electricity, gas, etc.) is analysed, as well as environmental considerations and permit and licensing. The main uses of energy in the sector are presented in Table 5.6 below.

Table 5.6: Major uses of energy in the engineering iron and steel sector of Zimbabwe

Subsector	Electricity	Coal	Gas	Diesel	Solar
Primary Steel production	Driving all electric powered machinery; Lighting; controls, etc.	Reducing agent; Heating of furnaces; mills; etc.	Reducing agent; Heating of furnaces; mills; etc.	Stand-by Generators; Heavy Mobile Plant	Grid Tie and Hybrid Power Generation Systems
Foundry and Engineering	Driving all electric powered machinery; Welding; lighting; controls; etc.	Heating of melting furnaces	Gas Welding & Cutting	Stand-By Generators	Grid Tie and Hybrid Power Generation Systems
Fabricated metal products	Driving all electric powered machinery; Welding; lighting; controls; etc.	Insignificant	Gas Welding & Cutting	Stand-By Generators	Grid Tie and Hybrid Power Generation Systems
Assembled goods	Driving all electric powered machinery; lighting; Welding; controls; etc.	Insignificant	Gas Welding & Cutting	Stand-By Generators	Grid Tie and Hybrid Power Generation Systems
Engineering services & consultancy	Powering machines; lighting; etc.	Insignificant	Gas Welding & Cutting	Stand-By Generators	Hybrid and Back Up Power Generation Systems
Distribution	Powering machines; lighting; etc.	Insignificant	Insignificant	Stand-By Generators	Grid Tie, Hybrid and Back Up Power Generation Systems

It is worth noting that the lower levels of the engineering iron and steel value chain are energy intensive and heavy consumers of electricity (e.g. ZISCO alone could have a peak demand of 60MVA or greater; Smelting furnace can consumes far greater than 1MVA each). The nature of the operations are such that power outages have disastrous effects not only to operations but even to equipment, damaging features like refractories and linings and costly processes to repair or remove solidified material in ladles, mixers or furnaces. For example the solidification of molten metal in hot metal mixers (> 1500tonnes) at one operation due to prolonged power outage cost over USD1Million in restoring the hot metal mixers to normal operation. Therefore uninterrupted power was critical for the engineering iron and steel sector.

The main uses of water in the engineering iron and steel sector are presented in Table 5.7 below.

Table 5.7: Major uses of water in the engineering iron and steel sector of Zimbabwe

Subsector	Cooling	Process	Washing, Cleaning and Environmental	Other
Primary Steel production	Cooling of Blast Furnaces; Coke By Product Plants; Furnaces; etc.	Heat treatment	Dust Suppression Systems; Environmental cleaning	Domestic consumption; lawns, etc.
Foundry and Engineering	Cooling of furnaces	Heat treatment	Dust Suppression Systems; Environmental cleaning	Domestic consumption; lawns, etc.
Fabricated metal products	Cooling of heavy machinery	Heat treatment	Environmental cleaning	Domestic consumption; lawns, etc.
Assembled goods	Cooling of heavy machinery	Heat treatment	Environmental Cleaning	Domestic consumption; lawns, etc.
Engineering services & consultancy	Insignificant	Insignificant	Insignificant	Domestic consumption
Distribution	Insignificant	Insignificant	Insignificant	Domestic consumption

Generally, the use of water decreases from upstream processes which are heavy users of water to downstream operations which use significantly less in comparison. In lower levels of the value chain, water is mainly used for cooling processes, heat treatment systems and dust suppression systems. The quality of the water must also be checked considering the devastating effects of hard and corrosive water to main processes like cooling plants and reticulation systems. Although water usage was high, water consumption was not very significant since most of the water was used in closed loop cycles with consumption mainly limited to blow downs and evaporative losses. There is a modern drive towards more water resource efficient technologies like dry quenching in coke making as well as recycling. In one major operation, water shortage led to catastrophic shutdown the entire operation causing millions of dollars. Uninterrupted water supplies were therefore a prerequisite for the viability of the sector.

5.6.1 Sources of key resources

The main sources of energy are presented in Figure 5.54 below.

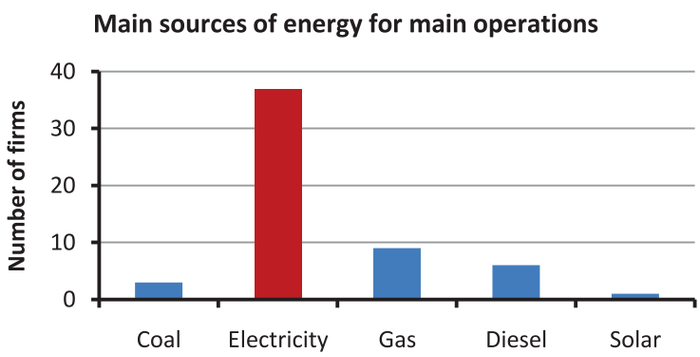

Figure 5.54: Main sources of energy for main operations in the engineering iron and steel sector of Zimbabwe

As presented in Figure 5.54 above, electricity is the major source of energy for operations used by almost all operations. Gas usage, diesel and coal were also notable. Nevertheless, solar uptake was still very low in the sector. Incentives may have to be availed to promote the use of the abundant solar energy in the sector. Although coal usage was not high in terms of the number of firms, the few firms who used it in the lower levels of the value chain consumed it in large volumes (e.g. ZISCO at peak consumes about 1Million tonnes per annum of coking coal) and hence it became very critical to the sector. Alternative sources of energy like coal bed methane must also be explored since they have potential to increase choice of energy mix for the sector and enhance the drive towards cleaner production in line with global trends and increasingly stringent environmental laws. Diesel usage was mainly as a result of electrical power outages.The main sources of water are presented in Figure 5.55 below.

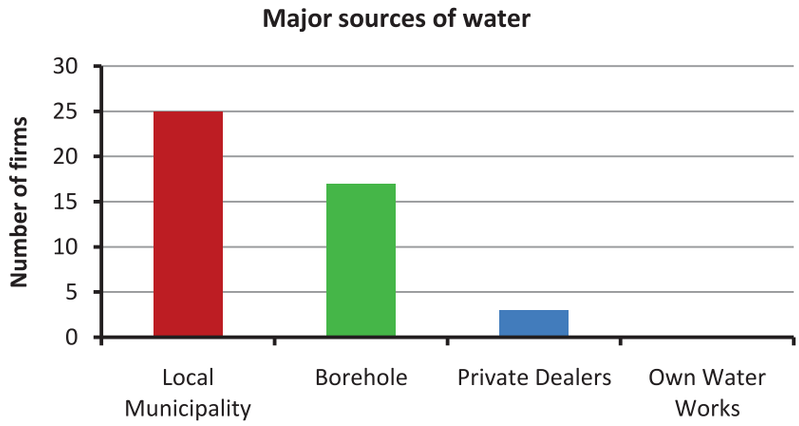

Figure 5.55: Main sources of water for main operations in the engineering iron and steel sector of Zimbabwe

The local municipality and company own boreholes were the major sources of water. The contribution of Private dealers was also notable to a small extent. Considering the importance of water to the sector, key stakeholders like local municipalities must be engaged to jointly develop a reliable and uninterruptible water supply system of water for critical operations in the most attractive value chains and the sector as a whole. Borehole water optimization must also be considered for firms that operate in certain physical clusters or in the vicinity of each other. This could be done with the involvement of water engineering and borehole services providers.

5.6.2 Main constraints with key resources

The challenges and constraints with major resources are presented in Figure 5.56 below.

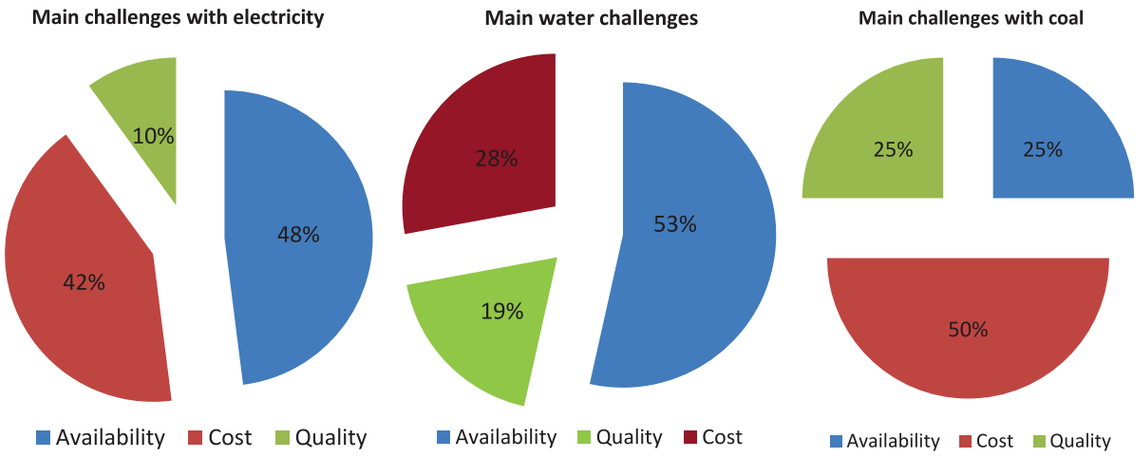

Figure 5.56: Main sources of water for main operations in the engineering iron and steel sector of Zimbabwe

5.6.2.1 Main challenges with electricity

As shown in Figure 5.56 above, the major challenges with electricity was availability and cost. This was a major threat both to competitiveness and viability of the sector, since the major operations could not tolerate interruptions of electricity supply. The high cost of electricity push up the prices of products, and hence threatening price competitiveness both on the domestic and export markets. Dedicated power was required for major players in the value chain to ensure uninterrupted electricity supply. Renewable energy could be considered in the energy supply mix to ensure reduction of green-house gas emissions as well as improving the reliability of supply. The capacity of the main supplier of electricity, could also be strengthened to ensure improved power supply. Collaborations between Independent Power Producers, ZETDC and the major players in the engineering iron and steel sector could be encouraged and incentivized to ensure reliable and cost competitive electrical energy supply to the sector. Also considering the energy intensive nature of the low level actors in the sector as well as the high cost of electricity; demand side management and energy efficiency becomes vital to ensure viability of the sector. This could be achieved through; i) promoting energy efficiency by vetting of new technologies in the sector which should pass a certain minimum threshold of energy efficiency; ii) heavy penalties for inefficiency; iii) incentivizing energy efficiency and energy management programs in the sector.

5.6.2.2 Main challenges with water

As presented in Figure 5.56 above, the major challenge with water was mainly availability. This was mainly attributable to the limited capacity of local municipalities to deliver water to the main actors of the sector due to several reasons that include; i) antiquated pumping equipment; ii) old and heavily corroded reticulation systems; iii) malfunctioning and old water treatment facilities. On the other hand water availability from boreholes was limited to lower yields due to climatic and other factors, whilst deliveries from private dealers was prohibitively costly. A significant number also noted the cost and quality of water to threaten the viability of their operations. The water availability, cost and quality could be addressed through; i) Collaborative approach between sector players, ZINWA and local municipalities in developing dedicated reliable water supply systems for attractive value chain clusters in the sector backed by sustainable funding packages and tariff models; ii) regulation of new water use and consumption technologies to ensure that the facilities pass a specified minimum efficiency threshold; iii) incentivisation programs for efficient water use in the sector and penalization of inefficiency amongst others.

5.6.2.3 Main challenges with coal

As shown in Figure 5.56, the majority of firms (50%) had challenges with the quality of coal, with a significant number having challenges with availability as well as cost. Coal is mainly used in primary iron and steel production as both a reducing agent and a heating fuel for the furnaces. Metallurgical/coking coal was required for the production of coke for use in the Blast Furnace route of steel making as well as for melting in foundries. Poor quality coal and coke significantly reduces production efficiencies and productivity of operations like the blast furnaces and the melting furnaces in foundries; as well as producing high levels of emissions and waste against environmental limits. Thus quality significantly threatens the viability of the sector together with availability and cost challenges. The challenges could be solved through; i) Strong collaboration and backward integration initiatives through relevant value chain clusters backed by funding models and sustainable offtaker agreements to ensure that the coal miners have adequate capacity to produce high quality coal in right quantities at optimal cost; ii) consideration of non-coal technologies and technologies that use less coal than conventional ones, amongst others.

5.6.3 Monitoring of major resources in the engineering iron and steel sector

The monitoring of electricity, water and the environment was investigated for the sector and the results are presented in Figure 5.57 below.

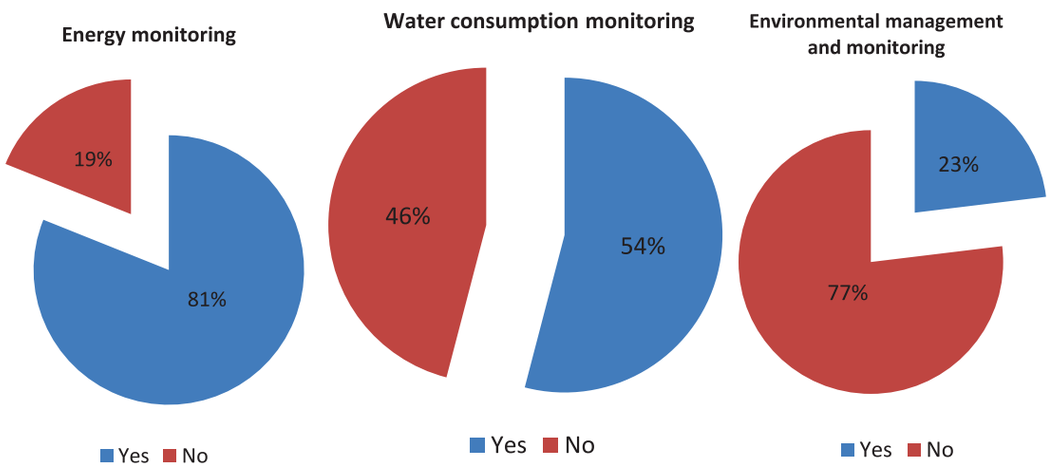

Figure 5.57: Resource usage monitoring in the engineering iron and steel sector of Zimbabwe

As presented in Figure 5.57 i) significant majority of players monitored their energy usage; ii) slight majority monitored their water consumption; whilst iii) significant majority did not practice environment monitoring and management. Considering the resource constraints in terms of availability and costs; the sector must be incentivized to increase energy management and monitoring; iii) water consumption monitoring and efficient usage; iii) environmental management, monitoring and implementation of programs to minimize and eliminate waste. About 55% of the firms surveyed had programs to eliminate waste. The main permits and licenses required for operation of firms are presented in Figure 5.58 below.

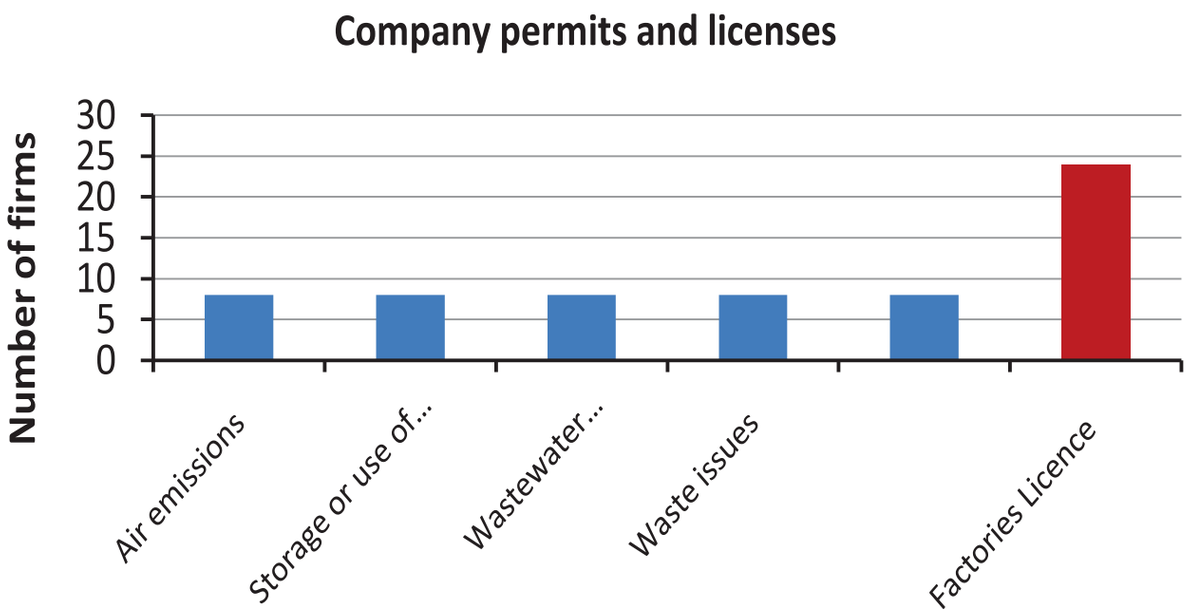

Figure 5.58: Major permits and licenses required in the engineering iron and steel sector of Zimbabwe

5.7 Value chain governance

In this section the interaction of firms with business/industrial associations, professional organisations, clusters and government support institutions was assessed.

5.7.1 Major industry related associations and bodies

The main industry related associations and bodies mentioned by firms are presented in Table 5.8 below.

Table 5.8: Main industry related associations and bodies mentioned by firms in the engineering iron and steel sector in Zimbabwe

Business network/ associations	Professional Bodies	Industrial Clusters	Government Support Institutions
Engineering Iron and Steel Association of Zimbabwe (EISAZ)	Zimbabwe Institution of Engineers (ZIE)	Marine Operations	National Manpower Advisory Council (NAMACO)
Construction Industry Federation of Zimbabwe (CIFOZ)	Zimbabwe Institute of Management (ZIM)	Western Region	National Social Security Authority (NSSA)
Small to Medium Enterprises Association of Zimbabwe (SMEAZ)	Institute of Personnel Management of Zimbabwe (IPMZ)		Apprenticeship Board
Zimbabwe National Chamber of Commerce (ZNCC)	Manicaland Association of Engineers (MAE)		Zimbabwe Manpower Development Fund (Zimdef)
Chamber of Mines (CoM)			Ministry of Industry and Commerce
			Environmental Management Agency (EMA)

The interaction is indicated by the level of membership to the various organisations as shown in Figure 5.59 below.

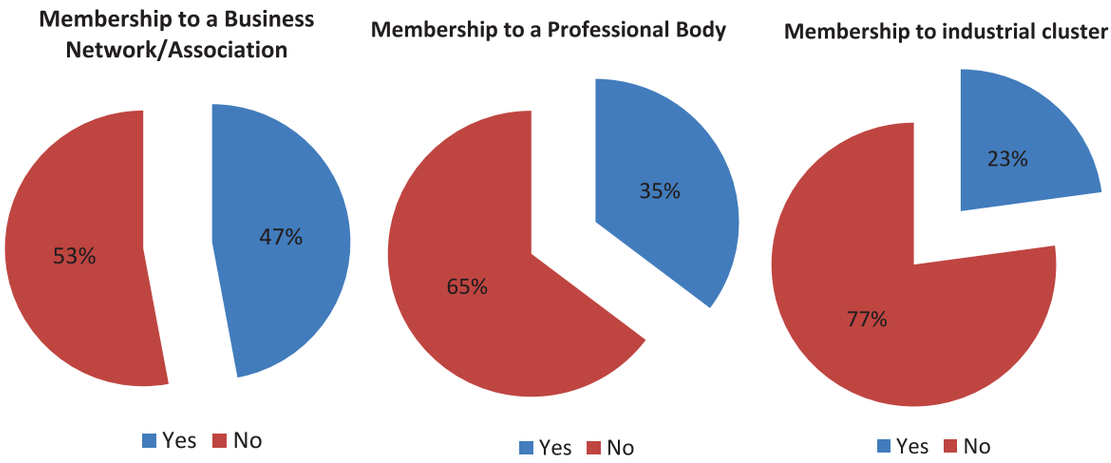

Figure 5.59: Membership to professional, business and clusters in the engineering iron and steel sector of Zimbabwe

As shown in Figure 5.59 above, the majority of firms did not belong to the above mentioned industry related bodies.

The main reasons for not joining were as follows;

- Failure to meet the requirements
- Lack of information and awareness
- Absence of body locally
- Not interested because of poor quality of service
- Financial limitation for subscription

For those who were members, the main reasons for joining were;

- Networking and exchanging of ideas
- Lobbying
- Support for human resources and labour related issues

The ease of registration with bodies is presented in Figure 5.60 below

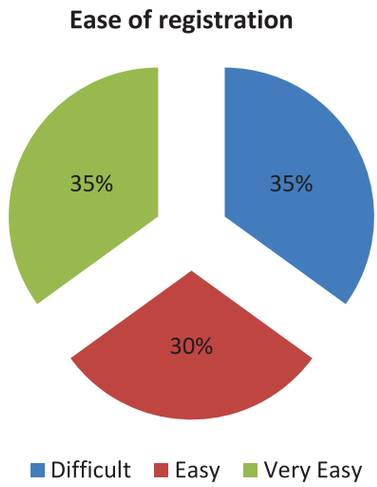

Figure 5.60: Ease of registration with bodies/associations in the engineering iron and steel sector of Zimbabwe

As shown in Figure 5.60 above, registration with bodies was generally not difficult for firms (65%). However, a notable number of firms found it difficult (35%).

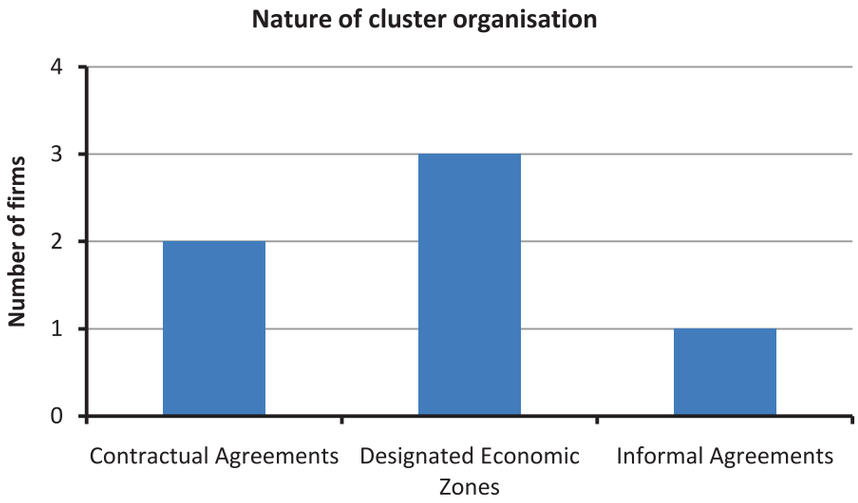

Figure 5.61: Nature of clusters in the engineering iron and steel sector of Zimbabwe

Of the few clusters that existed in the engineering iron and steel association of Zimbabwe, the majority ones were Designated Economic Zones, then contractual agreements and informal agreements as shown in Figure 5.61 above. Figure 5.62 shows the level of government support according to firms.

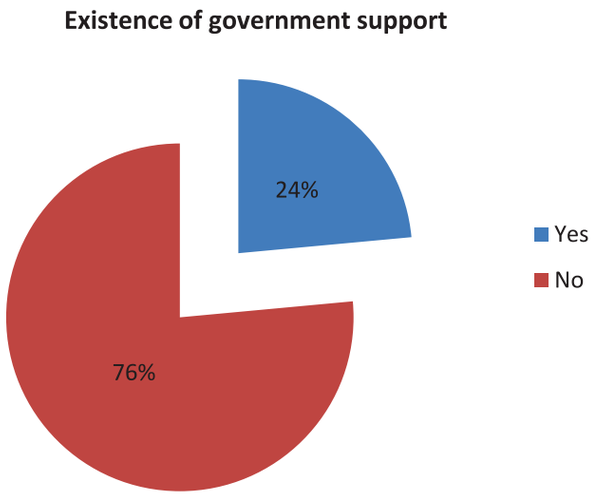

Figure 5.62: Level of government support in the engineering iron and steel sector of Zimbabwe

As shown above, government support is minimal (24%). Generally it was shown that the governance of the sector was weak, disjoint with limited number of synergies. A more synergistic approach to production and doing business, supported by government, professional bodies and business associations could be improve the competitiveness of the sector. Professional bodies and business associations have to be relevant and value adding to firms and there has to be strong collaboration for sector development. Thus professional bodies and industry/business associations have to be strengthened to enhance their capacities and relevance to the sector. Market/business oriented clusters, which are private sector led and supported by government, have to be established to drive sector growth and development.

5.8 Value chain finance

This section looked at the extent to which finance enhanced the engineering iron and steel sector of Zimbabwe. Although not all firms were eager to share much on finance due to confidentiality matters, about half of the respondents did share valuable information. Key value chain finance aspects analysed were; i) annual financial requirements; ii) sources of funding; iii) interest rates; iv) repayment period; v) ease of access to funding and major constraints; amongst others.

5.8.1 Financial requirements and sources of funding

The annual financial requirements are presented in Figure 5.63 below.

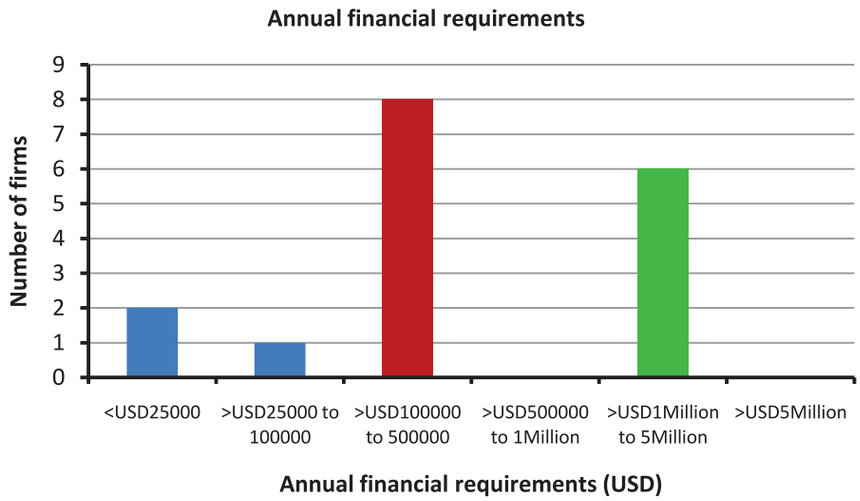

Figure 5.63: Annual financial requirements in the engineering iron and steel sector of Zimbabwe

As expected, financial requirements varied with scale of operations. The majority of firms required between USD100, 000 and 500,000 annually. The larger scale firms required between USD1Million and USD5Million per annum, whilst the micro-scale and small scale required (less than USD25, 000) and (between USD25,000 and USD100,000) per annum respectively. This information could help funding institutions in designing appropriate packages for different firms by size.

The major uses for funding for the period 2016 to 2019 are presented in Figure 5.64 below.

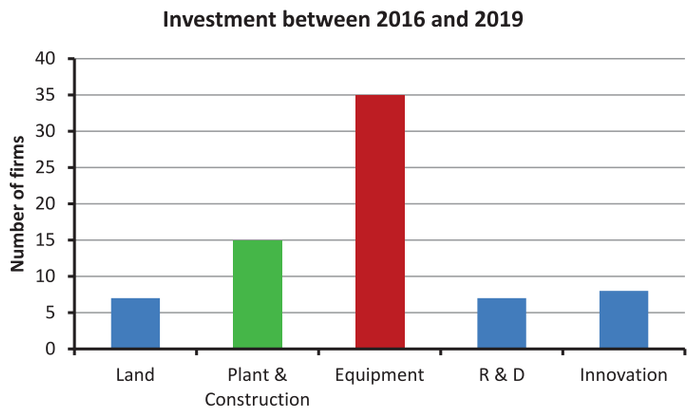

Figure 5.64: Funds invested in the engineering iron and steel sector of Zimbabwe between 2016 and 2019

The majority of funds went to equipment, followed by plant and construction, then innovation, research and development and land. It shows that the firms were keen on retooling to enhance capacity and competitiveness. Furthermore, the investment in land and plant and construction signifies sector growth and expansion.
A significant number of firms (42%) had projects that they felt were bankable and hence requiring funding to take off (Figure 5.65 below).

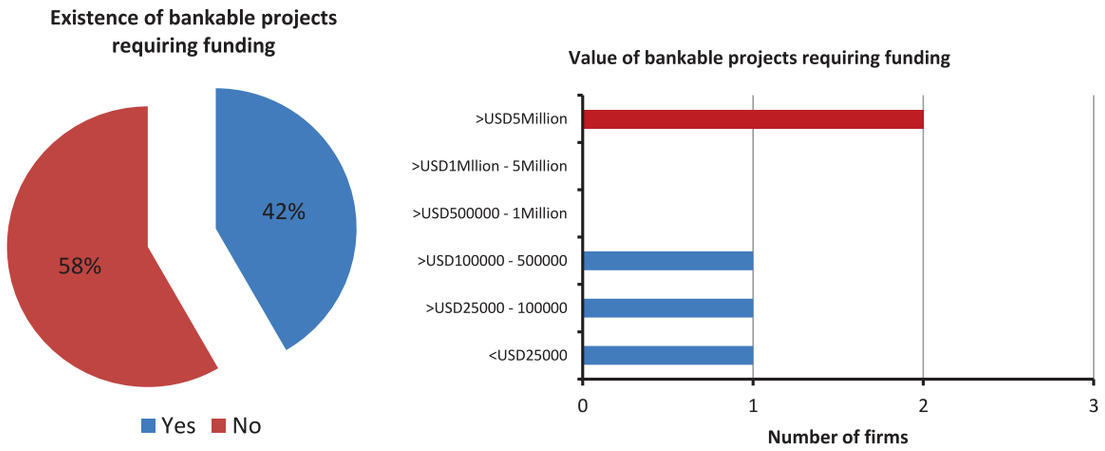

Figure 5.65 Bankable projects in th uiring

The sources of funding are presented in Figure 5.66 below.

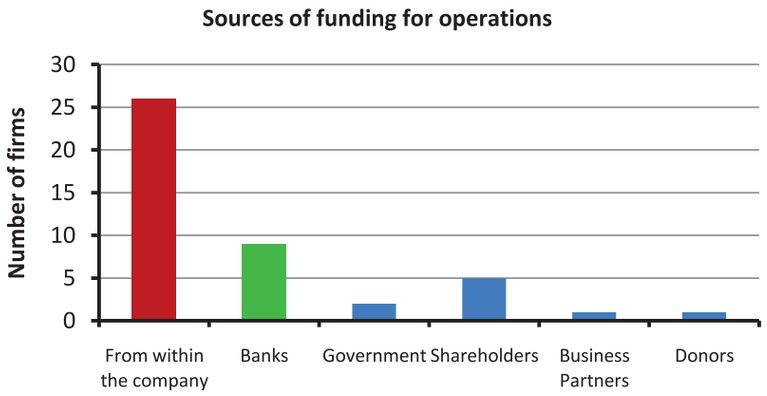

Figure 5.66: Sources of funding for operations in the engineering iron and steel sector of Zimbabwe

The majority of firms were funded from within the companies. A notable funding also came from banks and shareholders, with little coming from government financial support. Banks could be incentivized to fund the sector through the presentation of bankable value chains with minimal risks.

5.8.2 Access to bank funding

The level of access to funding is presented in Figure 5.67 below.

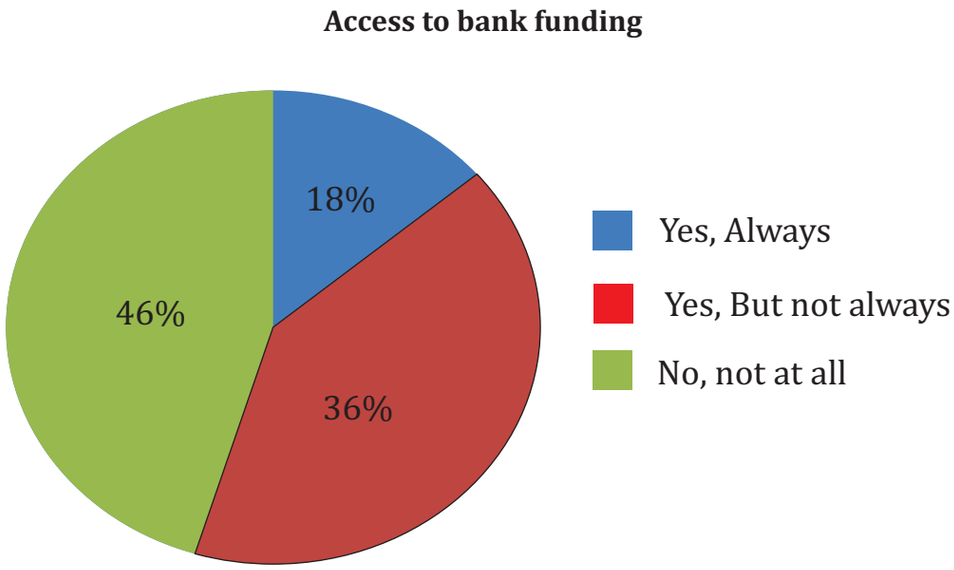

Figure 5.67: Access to bank funding in the engineering iron and steel sector of Zimbabwe

As shown in Figure 5.67 above, only 18% of firms surveyed had regular access to bank funding. About 36% had access but not regular basis. Of major concern was the large number of firms with no access to bank funding (46%). The major hindrances in accessing funding according to firms are presented in Figure 5.68 below.

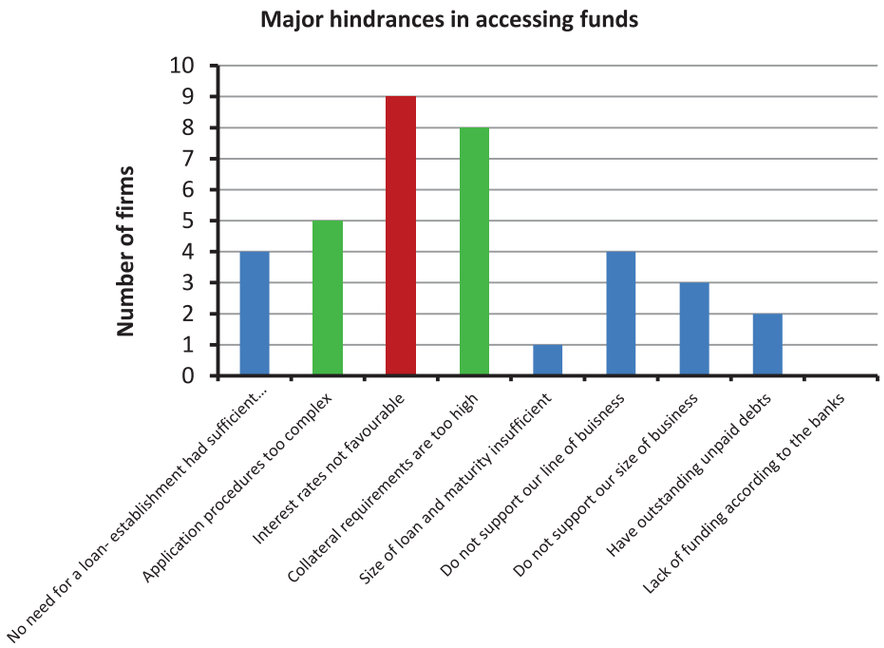

Figure 5.68: Major hindrances in accessing funding in the engineering iron and steel sector of Zimbabwe

The main hindrances in accessing funding by rank were; i) unfavorable interest rates; ii) collateral requirements were too high; iii) application procedures too complex; iv) line of business not supported; v) no need for a loan as the firm had sufficient financial resources for self-financing; and vi) size of business not supported; amongst others. The extent to which funding is an obstacle to business operation is presented in Figure 5.69 below.

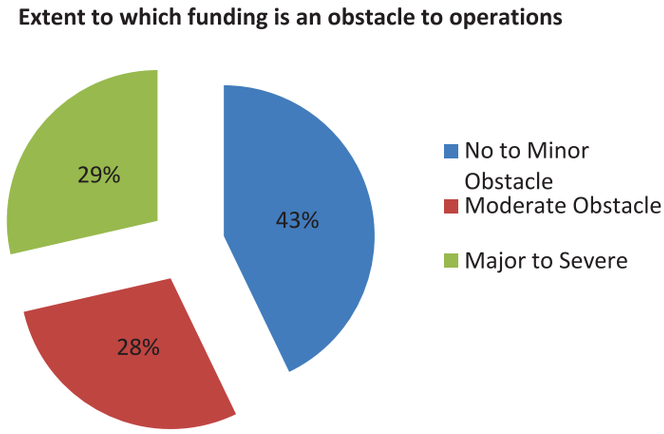

Figure 5.69: Extent to which funding is an obstacle to operations in the engineering iron and steel sector of Zimbabwe

A significant majority of about 57% cited funding as an obstacle to operations. A significant 43% though did not see funding as an obstacle to their operations.

5.8.2.1 Facilities funded by banks and terms

The terms of bank funding are presented in Figures 5.70 and 5.71 below.

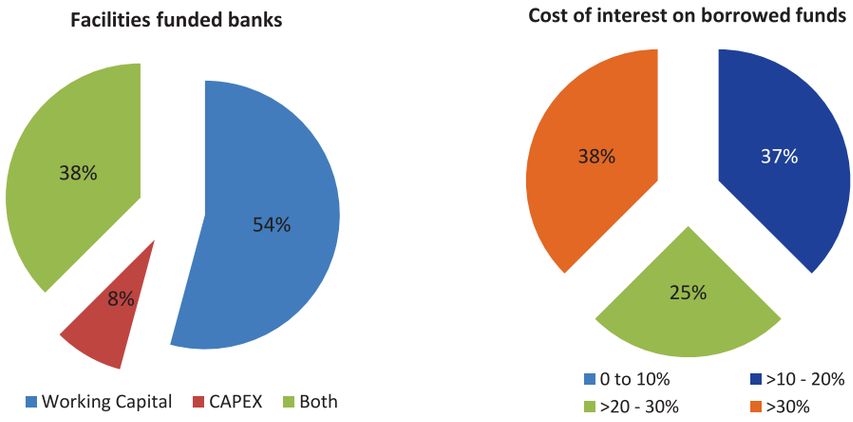

Figure 5.70: Facilities funded by banks and interest rates in the engineering iron and steel sector of Zimbabwe

The majority of bank funding was used for working capital (92%). The bank interest rates were over 10%, with a significant majority (63% of firms) with interest rates over 20% interest rates. The high interest rates were a major threat to the viability of the sector as 38% of the firms cited interest rates of over 30%. The repayment period is presented in Figure 5.71 below.

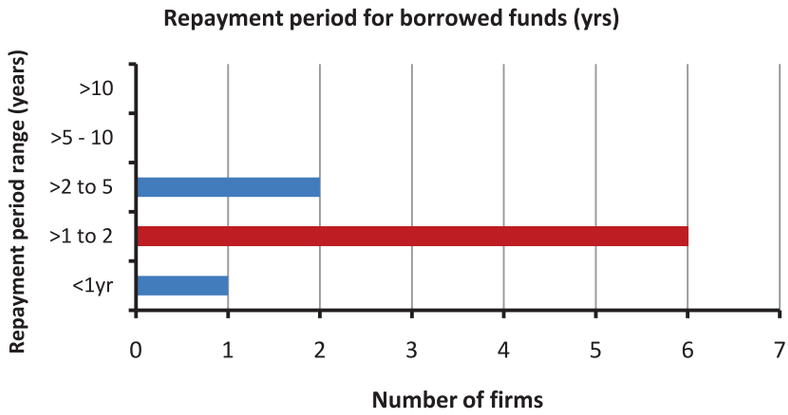

Figure 5.71: Repayment period for borrowed funds in the engineering iron and steel sector of Zimbabwe

The repayment period of most funding was between 1 and 2years and a few between 2 and 5years. Nevertheless, there was no firm with long term loans. Thus bank funding was generally short to medium medium term and not long term. This could have limited funding into retooling and upgrading of technology which typically requires longer term funding.

5.8.3 Conclusion

The following conclusions were made from the value chain finance analysis

- The annual requirements of most of the firms were in the USD500, 000 to USD1Million and USD1Million to USD5Million bracket.
- The major investments done in the last five years were in equipment and plant and construction
- A significant number of firms had bankable projects requiring funding, sum with up to USD5Million requirement.
- The major source of funding for the sector was from within the companies with limited funding coming from the bank
- Access to bank funding is difficult for a significant number of firms. The major hindrances were high interest rates, and collateral requirements and complex application procedures.
- Funding was a significant obstacle to operations of firms in the sector

5.9 Business and socio-economic context

In this section, the effect of the general business operating context was assessed. The firms view and perception of aspects like tax rates and administration; permits and licensing; political landscape; corruption; legal system; customs and trade regulations and labour regulations were investigated.

5.9.1 Tax rates and administration

The firms' views on tax rates and administration are presented in Figures 5.72 below.

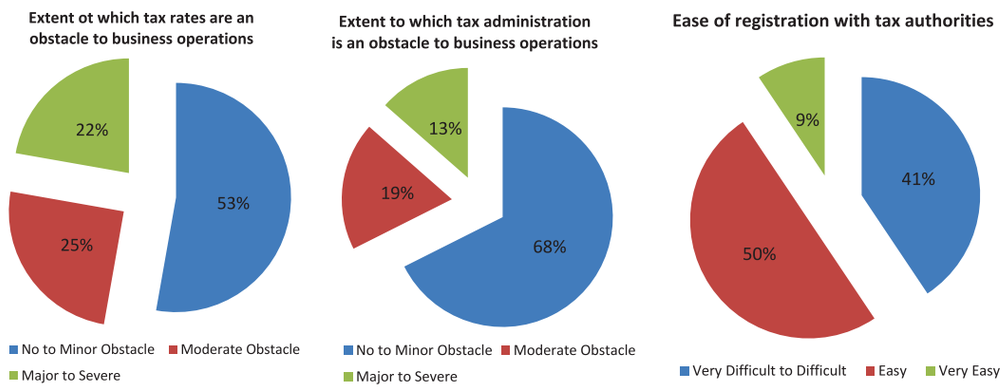

Figure 5.72: Tax rates and administration in the engineering iron and steel sector of Zimbabwe

As presented in Figure 5.72 above, a slight majority of firms saw tax rates as no or minor obstacle to their business operations. Tax administration was also seen by the majority of firms as being no or minor obstacle to their business operations. Although a significant majority (59%) saw registration with tax authorities being easy, about 41% felt that it was difficult to register with the tax administration. It is therefore worthwhile to find ways of easing tax registration and administration to reduce the number of informal players and incentivize formalization.

5.9.2 Permits, licenses and legal system

Some of the permits and licenses mentioned by firms were; NSSA Factories; EMA's hazardous chemicals and emissions; and municipal licenses for health and shops. The companies' perceptions on permitting, licensing and legal system are presented in Figure 5.73 below.

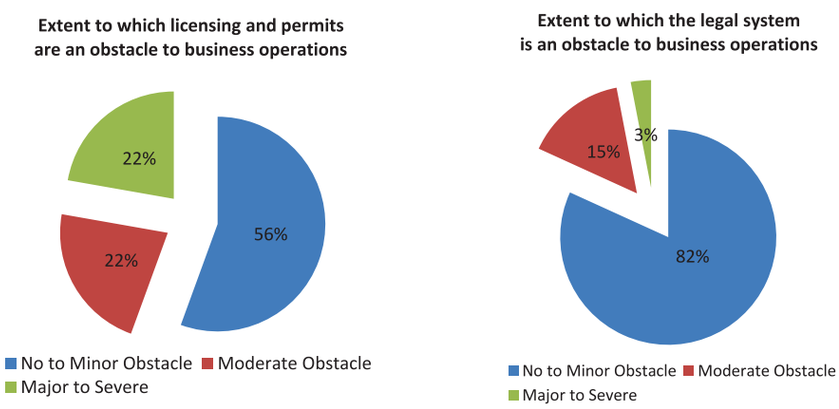

Figure 5.73: Extent to which permitting and licensing are an obstacle to business operations in the engineering iron and steel sector of Zimbabwe

As presented above, above 56% saw permits and licenses as no or minor obstacles to business operations; whilst a notable 22% saw the permits and licenses as major or severe. It may be worthwhile to further investigate the aspects of permitting and licensing that may be inhibitive and identify opportunities for easing the process without necessarily compromising the permitting and licensing fundamentals. The legal system was perceived by a majority of the firms as being no obstacle to business operations.

5.9.3 Customs and trade regulations

The views on customs and trade regulations, export and import licenses are presented in Figure 5.74 below.

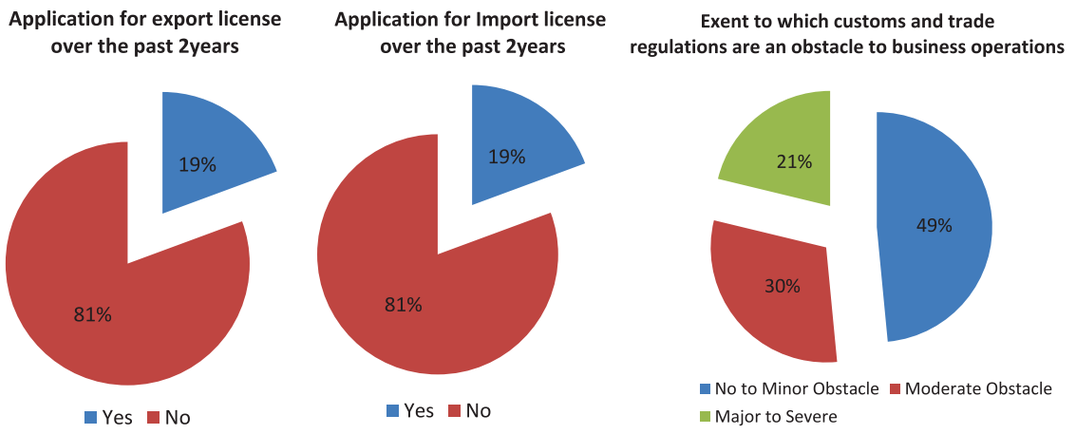

Figure 5.74: Customs and trade regulations in the engineering iron and steel sector of Zimbabwe

As shown in Figure 5.74 above, not many firms sought licenses and permits for importing and exporting of goods. A slight majority of firms (51%) viewed customs and trade regulations as an obstacle to business operations. Of major concern was the notable 21% of firms which saw customs and trade regulations as a major or severe obstacle to business operations. This could be attributable to the fact that there are significant imports required by firms for their production activities, and any challenges with customs have great impact to their smooth operations. Import substitution is expected to positively reduce the negative impact of customs and trade regulations. It was also import to consider the key barriers within the customs and trade regulations that negatively affected the smooth operation of the sector. The ease with which import and export licenses were obtained is presented in Figure 5.75 below

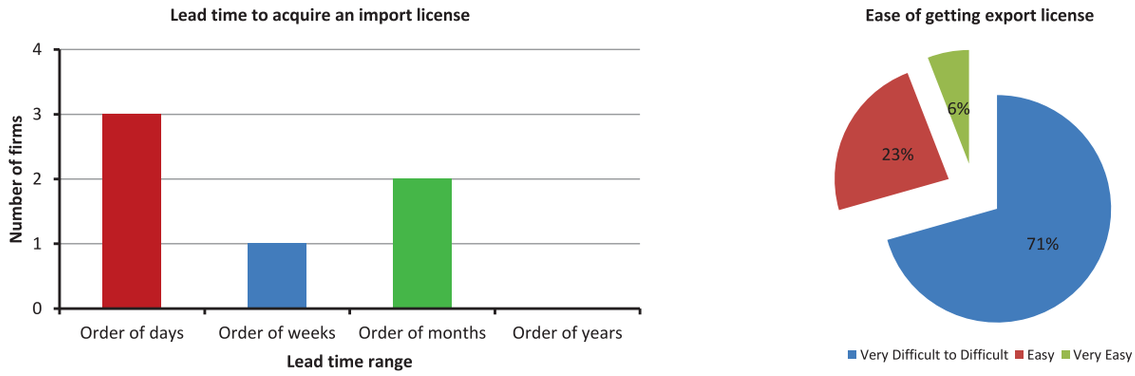

Figure 5.75: Ease of getting import and export license in the engineering iron and steel sector of Zimbabwe.

A few firms responding to the ease with which an import license could be obtained indicated that it was fairly easy to obtain one once one's application had been approved, taking the order of day or weeks in most cases. About 71% of the 17 firms that responded on the ease of getting an export license said that it was difficult or very difficult to obtain one. This was a major cause for concern, considering that exports in the sector were very low and there was need to increase exports.

5.9.4 Practices of competitors in the informal sector and corruption

The views of firms with regards to practices of competitors in the informal sector and corruption are presented in Figure 5.76 below.

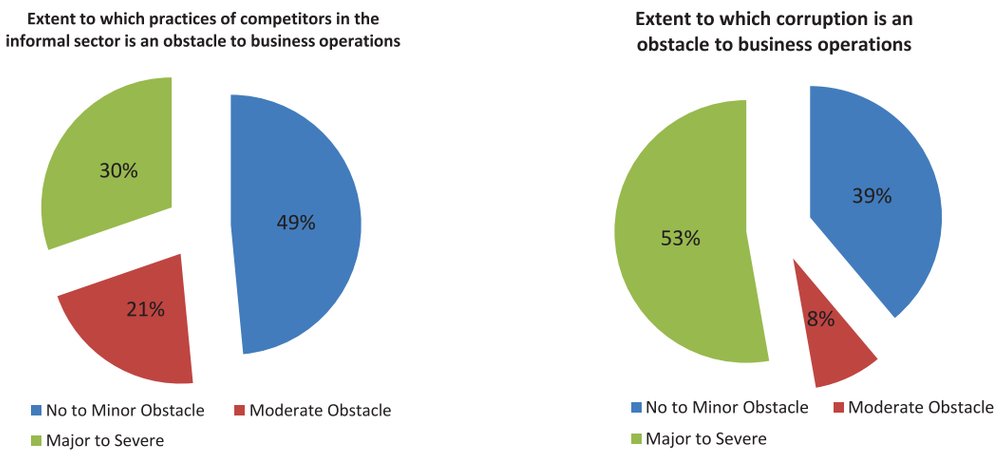

Figure 5.76: Impact of informal sector malpractices and corruption to the engineering iron and steel sector of Zimbabwe

The malpractices of the informal sector was viewed by a marginal majority to be an obstacle to the business operations, with a significant 30% saying it was a major or severe obstacle to operations. This was an area for major concern and initiatives to formalize the informal sector as well as harmonization of their business activities with those of well-established formal players wherever possible may improve the business operating environment. Of major concern also was corruption which was perceived by the majority of firms (53%) as a major or severe obstacle to their business operations. This calls for strong governance structures in the engineering iron and steel sector to monitor and curb malpractices with government support.

5.9.5 Political landscape and crime, theft and disorder

The views of the firms on political landscape and crime, theft and disorder are presented in Figure 5.77 below.

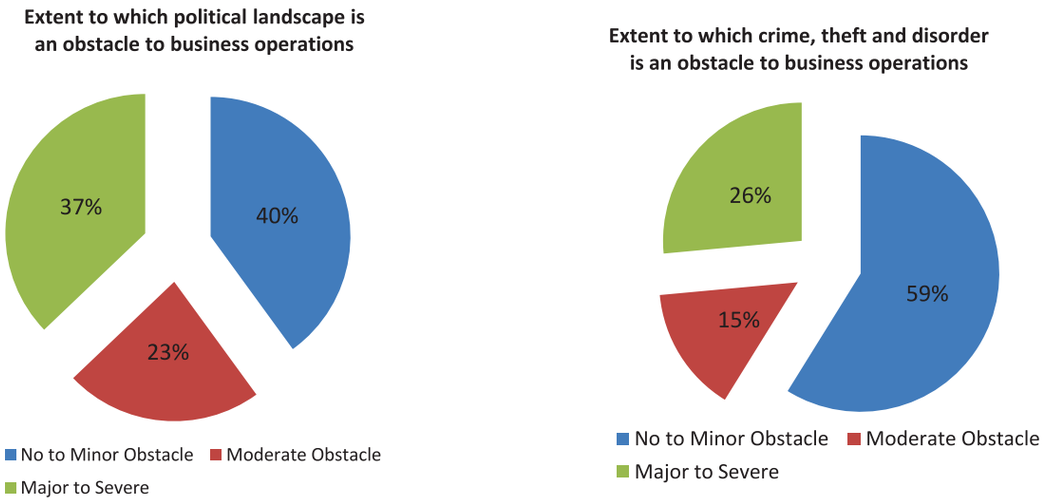

Figure 5.77: Impact of political landscape and crime, theft and disorder to the engineering iron and steel sector of Zimbabwe

The political landscape was perceived by 60% of the firms as an obstacle to business operations. Although the majority of firms viewed crime, theft and disorder as no to minor obstacle to business operations, it was worrying that 26% of firms were seriously affected by crime, theft and disorder.

5.9.6 Labour regulations and health; and education of workforce

The impact of labour regulations and health issues as well as education of workforce is presented in Figure 5.78 below.

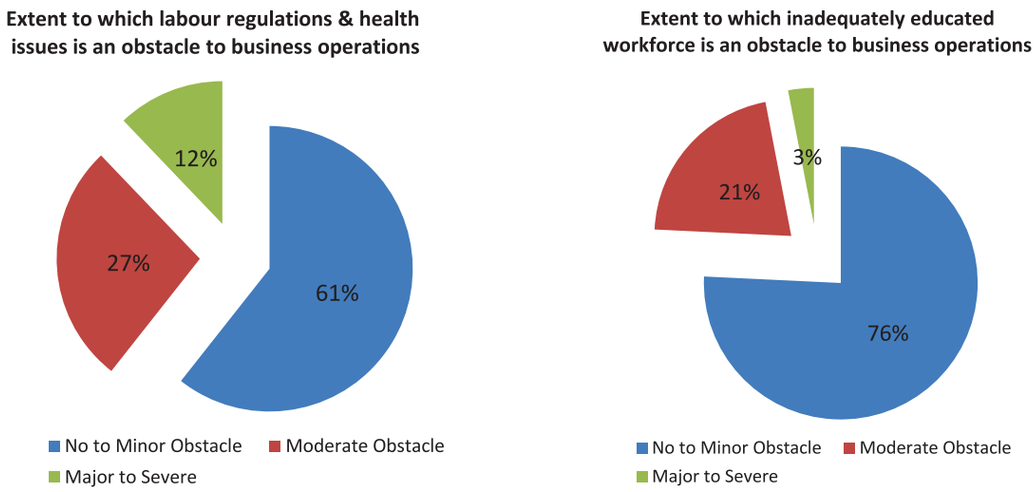

Figure 5.78: Impact of labour regulations, health issues and uneducated workforce to the engineering iron and steel sector of Zimbabwe

As shown in Figure 5.78 above, labour regulations, health issues and uneducated workforce were not major issues for firms in the engineering iron and steel sector of Zimbabwe.

Chapter 6: Value chain selection in the engineering iron and steel sector Zimbabwe

Considering that we have over 60 product categories in the engineering iron and steel sector across over 15subsectors, selection of the most attractive value chains become complex. This is further complicated by the dynamic changes on both the local regional and international market as well as rapid advancement in technology rendering products obsolete in short periods of time. Thus the selection process of value chains require the involvement of key stakeholders who include the relevant government ministries like the Ministry of Industry and Commerce, industry representatives, majors firms, research and development, professional bodies, funding institutions, amongst others. At times subsectors that seem to be dominant historically may be overtaken by new ones which may seem insignificant today, and hence the need for inclusive participation of all key stakeholders.

6.1 Value chain selection criteria

The sector development strategists may consider the following criteria (Table 6.1) in selecting the most attractive subsectors or product value chains. This exercise is vital since it forms the basis upon which strategic clusters are formed. The selected subsectors and value chains become the heart-beat of the engineering iron and steel sector.

Table 6.1: Selection criteria for the most attractive subsectors

Subsector Characteristic	Criteria for Assessment	Subsectors to consider (based on diagnostic study)
Subsector Attractiveness	- Historical production growth rate	basic iron and steel products; electrical engineered goods; automotive industry; electronic products; fabricated metal products; agricultural products; mining, quarrying and construction machinery; water pumping machinery; general purpose machinery
	- Size of domestic demand	
	- Labour intensity	
Self Sufficiency	- Import/Domestic demand	automotive industry; electronic and related products; electrical engineered goods; fabricated metal products; primary steel products; Agricultural equipment
	- Growth in imports versus growth in market	
Export Competitiveness	- Share of Zimbabwe in global exports	primary iron and steel products; air and space craft machinery; jewellery; automotive; household appliances; mining, quarrying and construction machinery; electrical engineered goods; agricultural and forestry equipment
	- Growth of Zimbabwean exports versus growth in global exports	

The selection criteria for the most attractive product value chains are presented in Table 6.2 below.

Criteria	Key Attributes
1. Market Demand and growth potential	- Evidence of strong effective demand for products being produced
	- Suppliers have ready market for products but are unable to meet demand
	- Unmet demand from municipal authorities or large public works projects
2. Potential Increase in Income and Wealth	- Potential for increased revenues at all levels of value chain
	- Projected increases in sales, profits or returns to labour
3. Opportunities for linkages	- Potential forward/backward linkages between large and small enterprises
	- Large enterprises are overlooking MSMEs as a source of supply or are unable to organise them to meet their demands
4. Potential for employment generation	- Potential for enterprise to create new employment as value chain develops/expands
5. Number of MSMEs	- Number of MSMEs operating in the value chain
6. Value added potential	- Potential of MSMEs to add value to raw materials and get higher earnings
7. Potential for increase in productivity	- Potential for technologies/management systems to increase productivity and earnings of enterprise in the value chain
8. Government/Donor Interest/Existing support programmes	- Government interest in value chain can lead to favourable linkages with government services and favourable policies
	- Existing programs that can provide synergies and complementary linkages within actors
9. Competitiveness	- Competitiveness of the value chain on the world market and/or of the MSMEs in the value chain

Based on the above criteria, a weighted objective method of evaluation is created by a balanced panel of key sector stakeholders to selective the most attractive subsectors and product value chains. Weights are assigned to each criterion by the evaluating panel and a score is determined for each criterion. Table 6.3 presents an example of the scoring and weighting table.

Table 6.3: Weighting and scoring of the value chains and subsectors

Weight Description	Weight/10
Very Strong Weight	8to10
Strong Weight	6to8
Middle Weight	4to6
Light Weight	1to4
Score Description	**Score/10**
Very Good	9to10
Good	7to8
Fair	5to6
Poor	3to5
Very Poor	1to3

It is worth mentioning that the value chain selection process at sector is not an individual assignment, but requires a candid evaluation by the relevant multi-stakeholder forum moderated by a fair facilitating institution.

Chapter 7: Conclusions, strenghts, weakness, opportunities and threats

7.1 Introduction

The diagnostic study has managed to establish the status of the sector in terms of structure and main subsectors; size and spatial distribution; employment levels; size of sector by gross annual value; main products; import substitution potential; export potential; existing value chain map; identification of main constraints and opportunities based on the UNIDO 7 diagnostic dimension approach as well as insights into value chain selection. This diagnostic work, therefore becomes an important precursor to the development of the Engineering Iron and Steel Sector Strategy, which must involve all the key stakeholders for the sector, which include; the firms and their representative associations; government support institutions; business networks and industry associations; professional bodies; academia and research and development institutions; and regulatory bodies amongst others. A provocative guideline of sector strategy development aspects that may be considered is presented in the next Chapter.

In concluding the diagnostic study, the sector general overview; the major constraints; weaknesses; opportunities and strengths of the sector are summarized.

7.2 Sector overview summary

7.2.1 General

In conclusion, the sector overview key notes are as follows;

- Between 500 and 600firms exist in the engineering iron and steel sector of Zimbabwe, with the majority of the firms (77%) based in Harare (51%) and Bulawayo (26%).
- The majority of firms are predominantly shareholding companies with non-traded shares or shares traded privately; with a notable number being limited partnership and sole proprietorship.
- The majority of the firms are into engineering services, repairs and maintenance; assembling of general, special purpose and industrial parts and the machining thereof; and fabrication of metal and structural steel products.
- The majority of firms have high space requirement, typically over 5000 square metres. Most firms did not own operating premises (about 78%) and hence mainly relying on rentals averaging about USD32,380 per annum (about 2% of average annual revenues)
- The majority of the firms (67%) were micro-scale, with the remaining share almost equally shared amongst small scale, medium and large scale.
- Over 13,000 are formally employed by the sector, with about 12% being female employees. Harare and the Eastern region employed about 61% of total employment with 39% employed by the Bulawayo and Western region.
- The major employers by subsector are; the electrical engineered goods; assembled goods – general & special purpose machinery and goods; fabricated metal and structural steel products; agricultural equipment and foundry and engineering; engineering services and primary steel production
- The majority of firms were formed during the GNU Era (2009 – 2013).
- About 22% of firms in the sector closed shop, with Bulawayo (51%) and Harare (24%) dominating the closures. The major subsectors affected by closures included; engineering services, repairs and maintenance; assemble goods – general & special purpose machinery and goods; fabricated metal and structural steel products; agricultural equipment and foundry and engineering; automotive industry and electrical engineered goods, transformers, motors, etc.

7.2.2 Production, imports, exports and balance of trade

- The estimated annual value of the engineering iron and steel sector is between USD3Billion and 4Billion (Precision is hampered by a lot of informal activity in the sector)
- Local production constitutes about 55% (USD2.2Billion per annum) of gross value, with imports at about 45% (USD1.8Billion per annum). About 7% (USD284Million per annum) is exported.
- Imports were dominated by; automotive industry (motor vehicles –USD542Million); electronic components, boards and computers; fabricated metal and structural products; electrical motors, generators and transformers, transmission and distribution equipment; flat rolled, sections and bars and rods; machinery for mining, quarrying and construction; assembled goods – general & special purpose machinery and goods and water and pumping machinery.
- Raw materials and spares were the major constituents of imports at every level of the value chain
- The major sources of imports are; South Africa; China; Zambia; Europe (UK, German and Sweden); and India
- Export competitiveness was very low with an export to imports ratio of 16%. The products with high export potential are; basic iron and steel products; jewellery; air and space craft machinery; motor vehicles; machinery for mining, quarrying and construction; household appliances; electrical motors, generators and transformers, transmission and distribution equipment; and agricultural and forestry products.

7.3 Major constraints/weaknesses/threats

The major constraints, classified according to diagnostic dimensions are concluded as follows;

Sources of inputs: The main constraints are as follows; scarcity and inconsistency of supply of the inputs locally; local price of inputs and supplies too high; iii) inferior quality of local inputs; inputs not produced locally.

Production capacity and technology use:

- ***Capacity utilization:*** Majority of firms are working on a 5working day shift and only utilizing 1 shift per day instead of 3. Average capacity utilization under this working pattern is low at 55%. The major reasons for low capacity utilization are; drawbacks from the current economic context; power and water shortages; lack of raw materials; competition from imports; antiquated machinery and breakdowns; low local demand; and high cost of doing business.
- ***Technology competitiveness.*** Technology used is not competitive against global technologies, and is typically old, heavily manual, and low on energy efficiency and environmental friendliness.
- ***New product development.*** It is constrained by; lack of funding; lack of technical support; lack of skills; obsolete technology; lack of research; and government policy.
- ***Use of ICT in the sector.*** Very low use of ICT in manufacturing, CAD, CAM and CAPP are marginally used in the sector.

Human capital development: The major constraints and weaknesses were; absence of active research and development in the firms; weak collaboration between research and development institutions and firms; limited relevance of research and development institutions; and low levels of intellectual property protection and awareness.

End markets and trade

- Low product demand in the sector is mainly attributable to; high product/service price as compared to import price; consumers preferring import or substitute goods; competitor product/ service more advanced; consumers of product/service out of business; and product/ service was outdated and no longer relevant.
- High product price is mainly driven by; cost of raw materials; cost of labour; cost of utilities; cost of processing; and transportation.
- ***Average annual sales turnover.*** The majority of firms are in the range of USD200, 000 to USD1Million per annum revenue. The major obstacles to growth of products and markets are; lack of growing local demand for its product; stiff competition from foreign products on the local market and threat of substitutes; lack of financing mechanisms; lack of access to funding for mechanization; insufficient production capacity to expand; and high cost of transport.

Sustainable production and energy use:

- The main constraints at resource supply stage are; low availability of electricity and high cost; low availability of water due to constrained capacity of water supply institutions and old water supply infrastructure; poor quality of coal, high cost of coal and low availability (due to constrained capacities of coal producers).
- Limited environmental management and monitoring

Value chain governance

The major constraints and weaknesses are;

- Limited number of industry representatives
- Low number of firms belonging to industry associations, business networks and professional bodies due to factors such as; lack of information and awareness; poor quality of service from institutions; firms failing to meet requirements for membership; firms failure to pay subscription fees; and absence of services locally amongst others
- Lack of government support to institutions
- Low levels of synergies and clusters in the sector

Value chain finance

- The annual financial requirements mainly range from USD100, 000 to 500,000 per firm, the majority of funds going to working capital and retooling. There is no access to bank funding for many firms due to the following major reasons; unfavourable interest rates (typically greater than 20% and short to medium term); ii) collateral requirements were too high; iii) application procedures too complex; iv) line of business not supported; and vi) size of business not supported; amongst others.

Business and socio-economic context

The major constraints are; difficulties in getting an exporting license; corruption; practices of competitors in the informal sector; political landscape; and crime, theft and disorder.

7.4 Main opportunities/strengths

The main opportunities/ strengths, classified according to the 7 diagnostic dimensions are as follows;

Sources of inputs and supplies

- Capacity to produce locally buoyed by; shorter lead times than imports; high transport and shipping costs for imports; high prices of imported inputs and supplies; lack of technical and aftersales support for imported goods; and procurement policies that favour local production, taking full advantage of COVID restrictions.
- Revamping existing idle capacity of primary iron and steel production facilities and foundries to produce basic products for the downstream industry. Over 15 foundries are idle; ZISCO can be resuscitated and upgraded; new iron and steel production plants can be constructed
- Capacitation of coal producers and backward integration to produce adequate coal (coking and non-coking) for the sector. The natural resource is available in abundance

Production capacity and technology use

- High capacity utilization for some attractive value chains, catalyzed by; high local demand; local availability of raw materials; availability of working capital; state of the art machinery; growing export market; and support from government. It is therefore shown that the availability of the major raw materials locally, particularly primary iron and steel products has the potential to increase capacity utilization; backed by investment in new and competitive technologies and support from government.
- At the current 1 shift/day; 5days per week; 55% capacity utilization; there is potential to more than treble production and hence increase the value of the sector from the current USD4Billion (circa) to more than USD12Billion; and employment from about 13,000 to more than 39,000.
- Existing synergies through subcontracting enhance the chances of developing clusters around attractive value chains with the multiplier effect advantages, employment creation, and cost effective and efficient production.
- Existing technologies with capacity for new product development
- Taking advantage of resilient and robust companies within the sector to champion sector revival.

Human capital development

The major strengths and opportunities are as follows;

- Strong local institutions with adequate capacity to train relevant skills, distributed evenly around the country. These include universities; polytechnics; vocational training; industrial training; apprenticeships; and professional boards.
- Plenty of young and educated workforce, which is easy to train and upgrade professionally
- Take advantage of the vast Zimbabwean diaspora in different training, academic, research and development and leading technological institutions to link up and form strong collaborations around attractive global value chains.

End markets and trade

The major strengths and opportunities are as follows;

- High demand of products due to; high quality product/service; competitive product/service price; brand loyalty; efficient product and service distribution; and product and service backed by government.
- Take advantage of the National Trade Policy (NTP) and National Export Strategy (NES) which aim at import substitution and export promotion with the iron and steel sector prioritized. The products with highest potential for import substitution are; manufacture of motor vehicles; manufacture of machinery for mining, quarrying and construction; manufacture of electronic components and boards; manufacture of electric motors, generators, transformers, electricity distribution and control apparatus; and manufacture of general purpose machinery. The products with highest potential for exports are; basic iron and steel products; manufacture of jewellery and related articles; manufacture of air and spacecraft and related machinery; manufacture of other fabricated parts; manufacture of motor vehicles; and manufacture for machinery for mining, quarrying and construction.
- Take advantage of the National Development Strategy which guarantees the government support to resuscitate the engineering iron and steel industry through the; i) securing of investors in the iron and steel industry; resuscitation of steel foundries and use of modern technologies in the sector; processing of scrap metals into new steel products; promotion of manufacturing of steel billets from scrap metal; facilitation of increased supply of coal and electricity to the iron and steel industry; enhanced coke production for local foundries; resuscitation of the machine tools and accessories manufacturing subsector; industrial support to increase the supply of domestically manufactured buses and delivery trucks; and intermediate products to support the USD12Billion Mining Industry Road Map.
- Opportunities provided by the Agriculture Policy Framework and Draft Agriculture Policy to produce agricultural equipment (farm mechanization, harvesting and post-harvest technologies; and irrigation equipment)
- Opportunities presented by the ZETDC System Development Plan and the Renewable Energy Policy to ensure availability of electrical power to the country for economic growth and hence stimulating demand for electrical engineered goods like transmission and distribution cables; transformers and power evacuation accessories; turbine components; fabricated and structural steel products for thermal power plants and solar PV Plants; solar PV components including panels, inverters, batteries, etc. amongst others.
- Resuscitation of the National Railway System by NRZ to provide opportunities for rolling stock; railway sidings; and wagons amongst others.

Sustainable production and energy use

Opportunities lie in the following areas;

- Abundance of local coal (coking and non-coking coal) resources. Combined with cleaner and modern extraction and processing technologies, together with cogeneration of power, price competitive power and coal can enhance the competitiveness of the sector.
- Existence of abundant resources of coal bed methane can present cleaner and cost competitive energy resource for power generation for the energy intensive sector as well as the use of advanced direct iron reduction technologies in iron and steel making.
- Abundant solar resource which could add clean and sustainable energy to the energy supply mix for the sector.
- Implementation of Demand Side Management initiatives like advanced energy efficient technologies; energy monitoring and effective energy management programs could reduce the energy intensity and enhance competitiveness of the sector.
- Abundant water resources which can be tapped efficiently, used and recycled especially in primary steel production where a lot of water is used
- Sustainable Offtaker agreements; backward integration initiatives and PPPs that ensure security and reliability of supply for key resources to the sector namely coal; electricity and water.

Value chain governance

The main opportunities and strengths include the following;

- Existence of well-structured and experience professional bodies; industrial associations and business networks for the sector
- Opportunities for strengthening of these institutions to offer necessary support services to the industry
- Taking advantage of existing synergies and contractual agreements within clusters (formal and informal) to enhance the competitiveness of the sector, e.g. Designated Economic Zones.
- Taking advantage of the resilient and robust companies in the sector to champion cluster based sector revival, driven by attractive value chains.
- Convenient spatial locations of firms, e.g. Bulawayo Belmont area; and Harare's Msasa, Willowvale, Southerton, Workington, Graniteside, etc., making it easy to implement and monitor programs

Value chain finance

The main strengths include;

- Majority of firms being well structured, formalized and having audited financial reports and hence making it easy to structure financial packages and models.
- Existence of a significant number of companies that can adequately fund their operations and hence can become champions around which clusters are formed and hence minimizing the funding risks for attractive value chains
- Existence of bankable value chains/ products that are market driven and hence presenting minimal risks to the funders/investors.

Business and socio-economic context

The major strengths and opportunities are as follows;

- A generally favourable tax rate and administration regime
- Generally favourable labour regulations and educated workforce

Chapter 8: Engineering iron and steel sector strategy development insights

This chapter gives a generic guideline that might help in the development of the sector strategy. The key activities are presented in bulleted form as follows;

- Formation of the implementation task force
    - Constituted by firm representatives (industry associations); Business Support Network, Governance, Regulators, professional organisation; policy makers, energy and power, transport; academic; research and training institutions
    - Establish Scope and Key Result Areas for every member
- Development the implementation road map with clear timelines and goals
- Selection of the most attractive value chains using predefined criteria. Key factors to consider in selection of the value chains include self-sufficiency and import substitution; export potential and employment creation.
- Formation of clusters around the most attractive value chains. The clusters to be inclusive and market oriented. They can be part of global or regional value chains. Consideration for participation of SMEs, research and development, training institutes and academia. Resilient and robust companies within the cluster may become, "Champion Producers" on which the cluster/value chain pivots on. The Champions will be supported by SMEs, and other key stakeholders including financiers.
- Strengthening of industry associations to fully represent the clusters, as well as providing adequate business support network.
- Strengthening of human capital and capacity building institutions for sustainable production, growth and continuous improvement of sector competitiveness. All to be centred around the most attractive value chains and the clusters
- Preparation of bankable business cases for strategic product categories – e.g. primary iron and steel production, other iron and steel making plants e.g. – ZISCO, Foundry and the Agro-industry as well as mining and heavy machinery, Automotive industry, etc.; including the relevant supporting services like uninterrupted electricity supply, reliable supply of coal and coke; reliable and efficient rail and transport network, etc. Work closely with major firms and clusters in the value chain.
- Development/establishment of relevant business models and packages to fund the attractive business cases
- Sourcing of funding for bankable business cases and models and closing of financial deals
- Implementation of the bankable business cases via the well-structured clusters. This includes supervision work, support, follow up, key liaison and coordination
- Performance Review, Monitoring and Continuous Improvement
- Strategy Review and Redesign

Annex 1: Engineering iron and steel subsectors and the distribution of active firms

EIS Subsector	Harare	Bulawayo	Gweru	Kwekwe	Mutare	Masvingo	Hwange & VF	Zvishavane	Rest of Manicaland	Mash East	Rest of Mash West	Mash Central	Rest of Midlands	Country Total
Engineering Services & General Contracting, Repairs and Maintenance	35	13	0	3	6	1	14	0	9	0	5	1	1	**88**
Machinery parts & metal fabrication, assembly & engineering	35	15	0	4	2	0	3	4	0	2	0	0	0	**65**
Steel Fabrication & Manufacture, Installations, Repairs & Maintenance, etc	33	11	0	4	1	0	1	0	0	0	0	1	1	**52**
Foundry & Engineering	10	9	2	2	1	0	0	0	0	0	3	0	0	**27**
Refrigeration & Airconditioning, Installations, Repairs, Maintenance, etc	19	4	0	1	0	1	0	0	2	0	0	0	0	**27**
Electrical Engineered Goods, Transformers, Motors, etc	15	5	0	2	2	0	0	0	0	2	0	0	0	**26**
Electrical Engineering Services, Repairs& Installations	10	12	0	0	0	0	0	0	0	1	2	0	0	**25**
Water Engineering, Fabrication, Installations, Repairs & Maintenance	12	7	0	0	0	1	0	0	3	0	0	0	0	**23**
Light Industrial Steel Works, Welding, Fabrication and Engineering	15	7	0	0	0	0	0	0	0	0	0	0	0	**22**
Structural Steel Fabrication & Manufacture, Installations, Repairs & Maintenance, etc	10	7	0	0	0	0	1	1	0	1	1	0	0	**21**
Mining & Mineral Processing Machinery Engineering, Fabrication,Assembly, Services, Repairs & Installations	8	10	1	1	0	0	0	0	0	0	0	0	0	**20**
Automotive & Industrial equipment manufacturing & services	11	4	0	0	1	0	1	0	0	0	1	0	0	**18**
Wire and Fencing fabrication, Installations, Services & Repairs	9	6	0	1	0	0	0	1	0	0	0	0	0	**17**
Primary Steel Production	5	2	0	2	0	2	0	0	0	1	0	0	0	**12**
Agricultural equipment manufacture	5	1	0	0	0	1	0	0	0	0	3	0	0	**10**
Tubes, Pipes & Pressure Vessels Fabrication, Engineering and Maintenance Services	4	4	0	0	0	1	0	0	0	0	0	0	0	**9**
Steel supply and distribution	5	2	0	0	0	0	0	0	0	0	0	1	0	**8**
Bolts and Nuts Manufacturing & Distribution	3	3	1	0	0	0	0	0	0	0	0	0	0	**7**
Earthmoving Equipment	3	0	0	1	0	0	0	0	0	0	0	0	0	**4**
Door Frames & Windows Fabrication	0	2	0	1	0	0	0	0	0	0	0	0	0	**3**
Household Appliances Fabrication & Assembly	0	2	0	0	0	0	0	0	0	0	0	0	0	**2**
Totals	**247**	**126**	**4**	**22**	**13**	**7**	**20**	**6**	**14**	**7**	**15**	**3**	**2**	**486**

Annex 2: Distribution of engineering iron and steel subsectors by province

EIS Subsector	Harare	Bulawayo	Matebeleland	Midlands	Masvingo	Mashonaland	Manicaland	Country Total
Engineering Services & General Contracting, Repairs and Maintenance	35	13	14	4	1	6	15	**88**
Machinery parts & metal fabrication, assembly & engineering	35	15	3	8	0	2	2	**65**
Steel Fabrication & Manufacture, Installations, Repairs & Maintenance, etc	33	11	1	5	0	1	1	**52**
Foundry & Engineering	10	9	0	4	0	3	1	**27**
Refrigeration & Airconditioning, Installations, Repairs, Maintenance, etc	19	4	0	1	1	0	2	**27**
Electrical Engineered Goods, Transformers, Motors, etc	15	5	0	2	0	2	2	**26**
Electrical Engineering Services, Repairs& Installations	10	12	0	0	0	3	0	**25**
Water Engineering, Fabrication, Installations, Repairs & Maintenance	12	7	0	0	1	0	3	**23**
Light Industrial Steel Works, Welding, Fabrication and Engineering	15	7	0	0	0	0	0	**22**
Structural Steel Fabrication & Manufacture, Installations, Repairs & Maintenance, etc	10	7	1	1	0	2	0	**21**
Mining & Mineral Processing Machinery Engineering, Fabrication,Assembly, Services, Repairs & Installations	8	10	0	2	0	0	0	**20**
Automotive & Industrial equipment manufacturing & services	11	4	1	0	0	1	1	**18**
Wire and Fencing fabrication, Installations, Services & Repairs	9	6	0	2	0	0	0	**17**
Primary Steel Production	5	2	0	2	2	1	0	**12**
Agricultural equipment manufacture	5	1	0	0	1	3	0	**10**
Tubes, Pipes & Pressure Vessels Fabrication, Engineering and Maintenance Services	4	4	0	0	1	0	0	**9**
Steel supply and distribution	5	2	0	0	0	1	0	**8**
Bolts and Nuts Manufacturing & Distribution	3	3	0	1	0	0	0	**7**
Earthmoving Equipment	3	0	0	1	0	0	0	**4**
Door Frames & Windows Fabrication	0	2	0	1	0	0	0	**3**
Household Appliances Fabrication & Assembly	0	2	0	0	0	0	0	**2**
Totals	**247**	**126**	**20**	**34**	**7**	**25**	**27**	**486**

Annex 3: Firm classification and employment levels

	Bulawayo and Western Region							HARARE & EASTERN REGION TOTALS							GRAND NATIONAL TOTALS						
EIS Subsectors	Large Scale	Medium Scale	Small Scale	Micro Scale	Totals	Total Employment	Average Employment/firm	Large Scale	Medium Scale	Small Scale	Micro Scale	Totals	Total Employment	Average Employment /firm	Large Scale (>50pple)	Medium Scale (21to50)	Small Scale (11to20)	Micro Scale (1to10)	Totals	Total Employment	Average Employment/firm
Primary Steel Production	2	2	0	0	**4**	**202**	**51**	3	4	0	1	**8**	**467**	**58**	5	6	0	1	**12**	**669**	**56**
Steel supply and distribution	2	2	1	0	**5**	**65**	**13**	2	2	1	1	**6**	**283**	**47**	4	4	2	4	**14**	**348**	**25**
Foundry & Engineering	3	3	0	7	**13**	**448**	**34**	2	2	2	4	**10**	**247**	**25**	5	5	2	26	**38**	**695**	**18**
Steel Fabrication & Manufacture, Installations, Repairs & Maintenance, etc	3	0	3	10	**16**	**479**	**30**	4	3	7	19	**33**	**793**	**24**	7	3	10	15	**35**	**1272**	**36**
Structural Steel Fabrication & Manufacture, Installations, Repairs & Maintenance, etc	5	0	0	3	**8**	**350**	**44**	4	1	2	5	**12**	**483**	**40**	9	1	2	5	**17**	**833**	**49**
Tubes, Pipes & Pressure Vessels Fabrication, Engineering and Maintenance Services	0	0	1	3	**4**	**23**	**6**	1	0	2	2	**5**	**129**	**26**	1	0	3	3	**7**	**152**	**22**
Door Frames & Windows Fabrication	0	0	1	1	**2**	**19**	**10**	0	0	0	0	**0**	**0**	**0**	0	0	1	4	**5**	**19**	**0**
Wire and Fencing fabrication, Installations, Services & Repairs	2	1	2	2	**7**	**305**	**44**	1	2	0	3	**6**	**143**	**24**	3	3	2	13	**21**	**448**	**21**
Light Industrial Steel Works, Welding, Fabrication and Engineering	0	1		6	**7**	**57**	**8**	0	1	5	11	**17**	**136**	**8**	0	2	5	6	**13**	**193**	**15**
Bolts and Nuts Manufacturing & Distribution	0	1	3		**4**	**59**	**15**	0	1	2	0	**3**	**63**	**21**	0	2	5	20	**27**	**122**	**5**
Machinery parts & metal fabrication, assembly & engineering	2	5	4	16	**27**	**813**	**30**	4	6	9	20	**39**	**768**	**20**	6	11	13	19	**49**	**1581**	**32**
Agricultural equipment manufacture	1	0	0	0	**1**	**172**	**172**	2	4	1	3	**10**	**741**	**74**	3	4	1	11	**19**	**913**	**48**
Water Engineering, Fabrication, Installations, Repairs & Maintenance	0	0	1	6	**7**	**45**	**6**	0	2	3	11	**16**	**194**	**12**	0	2	4	11	**17**	**239**	**14**
Mining & Mineral Processing Machinery Engineering, Fabrication,Assembly, Services, Repairs & Installations	1	3	4	3	**11**	**250**	**23**	2	1	0	5	**8**	**309**	**39**	3	4	4	3	**14**	**559**	**40**
Household Appliances Fabrication & Assembly	1	0	0	1	**2**	**1054**	**527**	0	0	0	0	**0**	**0**	**0**	1	0	0	6	**7**	**1054**	**0**
Automotive & Industrial equipment manufacturing & services	1	0	0	4	**5**	**66**	**13**	2	1	2	5	**10**	**436**	**44**	3	1	2	17	**23**	**502**	**22**
Refrigeration & Airconditioning, Installations, Repairs, Maintenance, etc	0	1	1	3	**5**	**56**	**11**	1	1	4	13	**19**	**231**	**12**	1	2	5	14	**22**	**287**	**13**
Electrical Engineered Goods, Transformers, Motors, & Services, etc	0	3	2	17	**22**	**148**	**7**	6	4	7	11	**28**	**1495**	**53**	6	7	9	18	**40**	**1643**	**41**
Medical Equipment	0	0	0	0	**0**	**0**	**0**	0	0	0	1	**1**	**6**	**6**	0	0	0	2	**2**	**6**	**3**
Earth moving equipment	0	0	0	0	**0**	**0**	**0**	0	1	0	2	**3**	**120**	**40**	0	1	0	42	**43**	**120**	**3**
Engineering Services & General Contracting, Repairs and Maintenance	3		4	23	**30**	**272**	**9**	2	4	11	42	**59**	**667**	**11**	5	4	15	182	**206**	**939**	**5**
Totals	**26**	**22**	**27**	**105**	**180**	**4883**	27	**36**	**40**	**58**	**159**	**293**	**7711**	26	**62**	**62**	**85**	**422**	**631**	**12594**	20

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