OCCUPATIONAL FRAMEWORK

SECTION C: MANUFACTURING

DIVISION 24: MANUFACTURE OF BASIC METALS

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Occupational Framework

Manufacture of Basic Metals

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ABSTRACT

An Occupational Framework (OF) based on MSIC 2008 under Division E24, Manufacture of Basic Metals for Group 241, 242 and 243 was developed to provide an overall view of the manufacture of basic metals industry for occupational structure (OS), skills in demand, job titles related to the Industrial Revolution (IR), occupational descriptions (OD) and critical jobs that would assist in further understanding of skills requirements and responsibilities of the industry activities. The upsurge in metal prices due to great demand and hike in raw material prices of world supply chain disruptions. This creates a pressing need for the development of future references and curriculum in this Technical and Vocational Education and Training (TVET) sector. This document is used to identify the view of the basic metals and related industry's Occupational Structure (OS), skills required, jobs titles and critical jobs. The OF was developed using three research phases: information gathering, expert view and expert verification. The methods employed in developing this OF are document analysis, Focus Group Discussion (FGD) and survey. This research utilised a multi-approach method that involves quantitative and qualitative approaches to ensure the data collection, analysis, and interpretation were successful. The qualitative approach was applied through document analysis and FGD sessions with 15 industry experts specialised in their respective principles. At the same time, the quantitative approach was applied by using the questionnaire survey and successfully obtaining 111 respondents and used as support data for qualitative findings as well as strengthening the argument of the research. This document concluded that the total number of job areas identified was 10, with a total of 60 job titles. Forty (40) job titles were identified as critical jobs, and two (2) job titles were identified as jobs related to the Industrial Revolution (IR). A total of 16 established National Occupational Skills Standards (NOSS) were identified NOSS registered on 21 April 2022 and mapped onto the developed OS. These findings will turn the basis of reference on the cycles of development curriculum as a guide to fulfilling the industry need.

ABSTRAK

Kerangka Pekerjaan (*Occupational Framework* (OF)) berdasarkan MSIC 2008 di bawah bahagian E24, Pembuatan Logam Asas untuk Kumpulan 241, 242 dan 243 telah dibangunkan untuk menyediakan penelitian menyeluruh untuk Struktur Pekerjaan (*Occupational Structure* (OS)), kemahiran yang diperlukan, jenis pekerjaan yang berkaitan dengan Revolusi Perindustrian, penerangan pekerjaan (*Occupational Description* (OD)) dan pekerjaan kritikal yang akan membantu pemahaman yang lebih mendalam mengenai keperluan kemahiran pekerjaan dan tanggungjawab bagi pelbagai aktiviti industri. Kenaikan harga logam adalah disebabkan oleh permintaan yang tinggi dan kenaikan harga bahan mentah akibat dari gangguan raitaian bekalan dunia. Ini mewujudkan desakan untuk membangunkan bahan rujukan dan kurikulum untuk masa hadapan dalam sektor Pendidikan dan Latihan Teknikal dan Vokasional (*Technical and Vocational Education and Training* (TVET)). Dokumen ini digunakan untuk mengenal pasti Struktur Pekerjaan (OS) industri yang berkaitan, kemahiran yang diperlukan, jawatan pekerjaan dan pekerjaan kritikal dari sisi pandang industri Logam Asas. OF ini dibangunkan menggunakan tiga fasa penyelidikan yang dijalankan iaitu, pengumpulan maklumat, pandangan pakar dan pengesahan pakar. Kaedah yang digunakan dalam pembangunan OF ini ialah Analisis Dokumen, Perbincangan Kumpulan Berfokus (*Focus Group Discussion* (FGD)) dan tinjauan soal selidik. Kajian ini menggunakan pelbagai kaedah pendekatan yang melibatkan pendekatan kuantitatif dan kualitatif untuk memastikan pengumpulan data, analisis dan pentaksiran dilaksanakan dengan berkesan. Pendekatan kualitatif diterapkan melalui analisis dokumen, di mana sesi FGD telah disertai oleh 15 pakar industri yang berfokus dalam bidang kepakaran masing-masing. Manakala pendekatan kuantitatif pula dijalankan dengan menggunakan kaedah tinjauan soal selidik dan telah berjaya mendapat seramai 111 orang responden bagi digunakan sebagai data sokongan untuk dapatan maklumat kualitatif serta mengukuhkan lagi hujah kajian. Kesimpulannya, dokumen ini telah merekodkan 10 jenis bidang pekerjaan, berserta 60 jenis pekerjaan. 40 jenis pekerjaan juga telah dikenal pasti sebagai pekerjaan kritikal dan 2 jenis pekerjaan telah dikenal pasti sebagai pekerjaan yang berkaitan dengan Revolusi Perindustrian (*Industrial Revolution* (IR)). Sebanyak 16 Piawai Kemahiran Pekerjaan Kebangsaan (*National Occupational Skills Standards* (NOSS)) telah dikenal pasti daripada senarai NOSS yang didaftarkan pada 21 April 2022, dan seterusnya dipetakan pada OS yang dicadangkan.

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ABBREVIATION

3D	Dirty, Dangerous, Difficult
5R	Refuse, Reduce, Reuse, Repurpose, and Recycle
5S	Sort, Set in Order, Shine, Standardise, Sustain
AR	Augmented Reality
DRI	Direct Reduction Iron
E&E	Electrical and Electronic
FDI	Foreign Direct Investment
FGD	Focus Group Discussions
FZ	Free Zone
GDP	Gross Domestic Product
GHG	Green House Gases
IMP	Industrial Master Plan
ISO	International Standardization Organization
IT	Information Technology
ISIC	International Standard Industrial Classification
OSHA	Occupational Safety Health Administration
JPC3	*Jawatankuasa Pengecualian Cukai*
LMW	Licensed Manufacturing Warehouse
MASCO	Malaysia Standard Classification of Occupations
MIGHT	Malaysian Industry-Government Group for High Technology
M&E	Mechanical & Electrical
ML	Manufacturing Licenses
MOSQF	Malaysia Occupational Skills Qualification Framework
MSCS	Malaysian Skills Certification System
MSIC 2008	Malaysia Standard Industrial Classification 2008
NCS	National Competency Standards
NGT	Nominal Group Technique
NOSS	National Occupational Skill Standards
OA	Occupational Analysis
OD	Occupational Description
OF	Occupational Framework

OR	Occupational Responsibilities
OS	Occupational Structure
OT	Operational Technology
R&D	Research and Development
SHEQ	Safety, Health, Environment and Quality
SOP	Standard Operating Procedure
SPSS	Statistical Package Social Sciences
TMT	Thermo-Mechanically Treated
QIS	Quality Improvement System
VR	Virtual Reality

GLOSSARY

Billet	A semi-finished steel form used for "long" products: bars, channels or other structural shapes. A billet is different from a slab because of its outer dimensions; billets are normally 50 to 180 mm square. Both shapes are generally continually cast, but they may differ greatly in their chemistry composition.
Bloom	A semi-finished steel form with a rectangular cross-section that is more than 200 mm. This large cast steel shape is broken down in the mill to produce the familiar I-beams, H-beams, and sheet piling. Blooms are also part of the high-quality bar manufacturing process: Reduction of bloom to a much smaller cross-section can improve the quality of the metal.
Casting	A product whose shapes and final dimensions, apart from any dressing or machining, are obtained directly by solidifying liquid steel cast in sand moulds, fire clay or other refractory materials, or more rarely, in metal or graphite permanent moulds.
Coating	The process of covering steel with another material (tin, chrome, and zinc), primarily for corrosion resistance.
Cold-Rolling	A process of reducing the thickness of the hot rolled coil at room temperature.
Ferrous	Metals that consist primarily of iron.
Forging	A malleable metal part is worked to a predetermined shape by one or more processes, such as hammering, pressing, or rolling.
Hot-Rolling	Rolling steel slabs into flat-rolled steel after it has been reheated.
Ingot	A metal block is cast in a particular shape for convenient further processing.
Midstream	The processing includes storing, transporting and marketing.
Pig Iron	The product results from smelting iron ore with a high-carbon fuel such as coke.
Plate	Sheet steel with a width of more than eight inches, with a thickness ranging from one-quarter of an inch to more than one foot.
Scrap Metal	Scrap metal is used metal that is an important source of industrial metals and alloys, particularly in the production of steel, copper, lead, aluminium, and zinc. Smaller amounts of tin, nickel, magnesium and precious metals are also recovered from scrap.
Scrap Steel	Scrap Steel is one of the steel industry's most important raw materials. It comes from all steel-containing products that reach the end of their life (post-

	consumer scrap), from demolished structures to end-of-life vehicles, packaging, white goods and machinery, and the yield losses in the steelmaking and manufacturing processes (pre-consumer scrap). It can also include iron scrap. All steel can be recycled into new steel. All new steel contains some steel scrap.
Sheet Piling	A product obtained by hot rolling or cold forming (e.g., drawing, bending, roll forming) to a shape such that, by interlocking of the joints or fitting of longitudinal grooves or by means of special fasteners, it forms partitions or continuous walls.
Sintering	A process that combines ores too fine for efficient blast furnace use with flux stone. The mixture is heated to form clumps, which allow a better draft in the blast furnace.
Slab	The most common type of semi-finished steel. Traditional slabs measure 250 mm thick and 760 – 2160 mm wide (and average about 6100 mm), while the output of the recently developed “thin-slab” casters is approximately 50 mm thick. Subsequent to casting, slabs are sent to the hot-strip mill to be rolled into coiled sheet and plate products.
Stainless Steel	A distinguished from carbon steel by its chromium (ferritic steel) content and, in certain cases, nickel (austenitic steel). Adding chromium to carbon steel makes it more rust and stain-resistant, and when nickel is added to chromium stainless steel, it enhances its mechanical properties, for example, its density, heat capacity and strength.

CHAPTER I

INTRODUCTION

1.1. Research Background

Malaysia's manufacturing industry is still essential to the nation's economic development. Despite the global economy's uncertainty, its contributions to export earnings and employment creation guaranteed the nation's growth. Malaysia's Gross Domestic Product (GDP) was worth RM 442.7 billion in the second quarter of 2022 at current prices and RM 366.2 billion at constant prices. The manufacturing and services industries drove the economy's performance this quarter, followed by the construction sector[1]. Furthermore, Industrial Revolution and talent pool development continue to be Malaysia's manufacturing sector's primary priority areas, revitalising several mature industries and creating new prospects for other sectors.

Manufacturing of basic metals is one of the sectors of the manufacturing sector in Malaysia that significantly contributes to economic expansion. The industry consists of the manufacturing of basic iron and steel, the manufacture of basic precious and other non-ferrous metals and the casting of metals. Basic metals production is the process of smelting or refining ferrous, precious, and other non-ferrous metals from ore or scrap using metallurgical methods. It also includes creating metal alloys and super-alloys from pure metals by adding specific chemical components.

Alongside the nation's industrial development, this industry has undergone significant changes over the years. In Malaysia, the iron and steel products sub-sector is

[1]Department of Statistic Malaysia (2022, August 12). Quarterly Gross Domestic Product. Page 7.

advancing toward Industrial Revolution, which is an essential step for the sub-sustainability sectors and long-term competitiveness.

This chapter initiates with considering the problem statement, the objective of the research, the scope of research, and justification of Malaysia Standard Industrial Classification 2008 (MSIC 2008) selection of the Occupational Framework (OF) specifically for the Manufacture of Basic Metals industry in Malaysia.

1.2. Problem Statement

The manufacturing sector, including Malaysia's basic metal industry, faces some major problems or challenges towards economic transformation. Lack of innovation, competitiveness, labour-intensive industry and insufficient enablers are the main challenges facing the manufacturing sector[2]. One of the main issues facing the manufacturing sector is the lack of innovation in resources for Research and Development (R&D), risk-averseness and intellectual property. The lack of innovation is caused by businesses' lack of initial investment in product and process upgrades. Then, manufacturers' businesses' sustainability is threatened by a lack of product diversification.

Dependence on low-skilled immigrant workers has caused labour-intensive industries to grow. The country's overall population of immigrant workers ranges from 26% to 43% of the official workforce in the manufacturing sector. Furthermore, in the basic metal industry, the scrap metal and recycling industry needs about 3000 workers, which comes from foreigners due to locals' belief that the industrial metals offer "3D" jobs, which stands for dirty, dangerous and difficult[3]. This significant inflow goes against the nation's aspirations since the 12th Malaysia Plan (2021-2025) states that the proportion of foreigners in the country's labour market must not surpass 15% of the workforce in 2020[4]. Finally, the inadequate enables due to poor logistic support and insufficient infrastructure.

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[2] Putra (2018). Manufacturing in Malaysia: Main Issues and Challenges. Retrieved from https:// www.cedar.my/images/industryarticles.

[3]The Star (2021, September 25). Retrieved from https :// www.thestar. com.my/ news / nation/ 2021/09 /25 / scrap-metal-sector-needs-foreign-workers

[4]Devadason, E. S. (2020). Foreign Labour Policy and Employment in Manufacturing: The Case of Malaysia. Journal of Contemporary Asia, 1–21.

The first Occupational Analysis for the metal-based industry was developed in 2008. Since this OS is an old version, the requirement of the new OS in this industry must be established and aligned with the current progress from the Manufacture of Basic Metals in Malaysia. The OS was developed in the Occupational Framework (OF) document based on the Malaysia Standard Industrial Classification 2008 (MSIC 2008). Even though MSIC 2008 has described the overall economic activities in the Manufacture of Basic Metals, it still does not cover the current job available in Malaysia. Years by year, manufacturing is still facing the same problem, with the skills requirement from employers being mismatched to the industry needs, including the basic metal industry. Many employees are either under- or overqualified for their positions or work in fields unrelated to their academic interests. These skill gaps might significantly impact productivity[5].

Other than that, manufacturing of basic metals in Malaysia is growing and establishing the need to parallel the Industrial Revolution. It significantly affects the industrial sector by bringing advances pertinent to smart and futuristic manufacturing[6]. However, many jobs are still irrelevant to the nine (9) pillars of the Industrial Revolution due to stakeholders' lack of awareness of the Industrial Revolution. Furthermore, the critical job in the basic metals industry needs to be revised, reviewed and updated for the current industry situation and future. The critical job needs to be emphasised to enhance and fulfil the requirement of the basic metal industry.

[5]Ricardo & Marieke (2019). Reducing skills imbalances to foster productivity growth of Malaysia economics department working papers. Page 7.
[6]Fathy Elsayed (2021). Industry 4.0 and Its Implications: Concept, Opportunities, and Future Directions. Supply Chain. Page 2.

1.3. Objective of Study

The objectives of the research are as follows:

a) To develop an Occupational Structure (OS) in the Manufacture of Basic Metals industry based on MSIC 2008;
b) To determine the skills in demand of Manufacture of Basic Metals industry;
c) To determine the jobs titles of the Manufacture of Basic Metals industry in each group based on MSIC 2008 that is relevant to the Industrial Revolution;
d) To determine the critical jobs in the Manufacture of Basic Metals industry; and
e) To determine Occupational Descriptions (OD) of the Manufacture of Basic Metals for critical jobs based on the developed Occupational Structure (OS).

1.4. Scope of Study

This research aims to create the Occupational Framework (OF) structure for the Manufacture of Basic Metals industry in Malaysia based on MSIC 2008 Division C24. The research document covers three main groups: the manufacture of basic iron and steel, the manufacture of basic precious and non-ferrous metals and the casting of metals. About 1,557 companies are registered under the basic metal industry in Malaysia, according to the Department of Statistics Malaysia (DOSM)[7].

In this research, the respondents are from industry players in Malaysia. The research focuses on the Manufacture of Basic Metals respondents under MSIC 2008 Division C24 nationwide. Industry representatives are the unit of analysis in this study. The investigation begins by examining the most current state of the sector through document analysis, then consulting with and interviewing relevant industry representatives to gain their expert ideas and input. The industry's long-term demand can then be calculated using this information.

[7]Department of Statistics, Malaysia. (2017, July). Manufacturing, Economic Census 2016. Page 67-68.

1.5. Structure of Chapters

This chapter concludes with a brief overview of the entire study, which includes:

a) Chapter 1

This chapter explains the research introduction, which includes an overview of the basic metals industries, a problem statement, a research objective, a research scope, and justifications based on two digits. Division 24 of the MSIC 2008: Manufacture of Basic Metals.

b) Chapter 2

This chapter provides an overview of the research that provides a deeper understanding of the research objective by drawing on data from DOSM, MITI, MIDA and other local and international sources.

c) Chapter 3

This chapter describes the overall methodology used to accomplish the research goals, including focus group discussions with subject matter experts from the basic metal industries, surveys from companies involved in the sector, and document analysis based on published data.

d) Chapter 4

This chapter shows the results and findings of the research based on the approach and method deployed in this chapter.

e) Chapter 5

This chapter explains the discussion, summary and conclusion of the research done. Besides that, recommendations from industry experts are also listed here.

CHAPTER II

LITERATURE REVIEW

2.1 Introduction

This chapter focuses on the explanation of the acts and regulations of the development of the Occupational Framework (OF) in the Manufacture of Basic Metals in Malaysia, as well as related activities, key stakeholders, legislation, policies, initiatives, industry and market intelligence, a list of NOSS relevant to MSIC 2008. Additionally, an overview of the second-largest economy in the world, China, was narrated. China is the first rank in the world in the basic metal industry, with advanced GDP of 8.1 % and a total value of about 17.73 trillion USD in 2021. Another neighbouring South Asian country, Indonesia, was chosen for its impressive economic performance recently and placed as the 10th largest economy in terms of purchasing power equivalence[8].

2.2 Malaysia Skills Certification System

The Malaysian Skills Certification System (MSCS) is a certification system for work-based learning that is attained through training and assessment. It is given as a formally recognised certificate to people who have demonstrated abilities that have learned or practised with competence to perform a task or work, typically in the form of fundamental occupational skills. Figure 2.1 shows the cycle for the development of curriculum concepts.

[8]The World Bank (2022, April 5). Retrieved from *https://www.worldbank.org/en/country/indonesia/overview.*

Figure 2.1: Cycle for the Development of Curriculum Concepts
(Source: (Department of Skills Development, 2022))

2.2.1. National Skills Development Act 2006 (Act 652)

The National Skills Development Act 2006 (Act 652), which was officially published in the official gazette on June 29, 2006, went into effect on September 1st, 2006, intending to foster, via skill growth, the development and improvement of a person's talents necessary for vocation, as well as to provide for other things related to that. Act 652 is notable because it is the first national legislation adopted entirely and exclusively for skills training and development in Malaysian history. Additionally, the definition and scope of skills training have been made clear and given a legal interpretation that can be utilised to set it apart from

other parts of the nation's national education and training system. Act 652 also provides for the implementation of an MSCS, leading to the award of five (5) levels of national skills qualification, namely Malaysian Skills Certificate Level 1, 2, and 3; Malaysian Skills Diploma; and Malaysian Skills Advanced Diploma[9].

2.2.2. Malaysian Occupational Skills Qualification Framework (MOSQF)

Malaysia Occupational Skills Qualification Framework (MOSQF) defines and categories occupational skills into eight (8) competency levels. Each competency level correlates to a distinct amount of complexity, expertise, and autonomy needed to demonstrate competence in line with that level's knowledge, experience, and application versatility. The details of MOSQF are shown in Annex 1.

2.2.3. Occupational Framework (OF)

The OF is the outcome of research on a specific industry sector's occupational analysis and study. The contents of an OF shall include occupational structure, definitions, job descriptions, human resources requirements and industry intelligence. The occupational structure (OS), a matrix, will display the career routes and occupational areas for a specific occupation. A holistic comprehension of the sector's occupational domains is partly owing to the information on workforce skill needs, Occupational Descriptions (OD), and industry intelligence. Workforce skill requirements are used to determine labour skill gaps and shortages. Industry intelligence is based on real qualitative and quantitative data collected from the industry to support and bolster the data's validity. As a result, well-thought-out development and analysis produce the OF exact and accurate, ensuring that it is a trustworthy source of information for further industry analysis and the creation of NOSS and training needs[10].

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[9] National Skills Development Act 652 (2020, October 14). Retrieved from http://www.agc.gov.my/agcportal/index.php.

[10] Department of Skills Development (2019, August 27). Retrieved from https://www.dsd.gov.my/jpkv4/index.php/my/perkhidmatan/noss.

2.2.4. National Occupational Skills Standards (NOSS)

The National Occupational Skills Standards (NOSS), which was published in Part IV of the National Skills Development Act 652, defines it as a specification of the competencies expected of a skilled worker who is gainfully employed in Malaysia for an occupational area, level, and pathway to achieve the competencies. The performance of current industry workers and trainees is evaluated based on standards for granting Malaysian Skills Certificates, which are designed by industry experts based on the needs of the industry and used as the key tool in the implementation of MSCS[11].

In this research, The Department of Skills Development (DSD) has developed 21 NOSS documents related to the Manufacture of Basic Metals based on MSIC 2008 Division 24 as of April 2020. The summary of the NOSS title, according to NOSS Registry April 2020, is provided in Table 2.1 below.

Table 2.1: Summary of NOSS developed under Division 24
(Sources: NOSS Registry April 2022)

MSIC Group 2008	**Corresponding NOSS/ Level**	
241 Manufacture of Basic Iron and Steel	1. C241-001-5:2017	Forming Production Technical Management L5
	2. C241-001-4:2017	Forming Production Implementation and Control L4
	3. C241-001-3:2017	Forming Production Supervision L3
	4. C241-001-2:2017	Forming Production Line Operation L2
	5. C241-001-1:2017	Iron and Steel Production Support L1
	6. C241-002-5:2017	Steel Melt Shop Management L5
	7. C241-002-4:2017	Steel Melt Shop Management L4
	8. C241-002-3:2017	Steel Melt Shop Operation Supervision L3
	9. C241-002-2:2017	Steel Melt Shop Operation L2
	10. C241-003-5:2018	Steel Hot Rolling Mill Operation Management L5
	11. C241-003-4:2018	Steel Hot Rolling Mill Operation Control L4
	12. C241-003-3:2018	Steel Hot Rolling Mill Operation Supervision L3

[11] Department of Skills Development (2019, August 27). Retrieved from https://www.dsd.gov.my/jpkv4/index.php/my/.

MSIC Group 2008	Corresponding NOSS/ Level	
	13. C241-003-2:2018	Steel Hot Rolling Mill Operation L2
	14. C241-004-5:2020	Steel Cold Rolling Mill Management L5
	15. C241-004-4:2020	Steel Cold Rolling Mill Operation Control L4
	16. C241-004-3:2020	Steel Cold Rolling Mill Operation Supervision L3
	17. C241-004-2:2020	Steel Cold Rolling Mill Operation L2
243 Casting of Metals	1. MC-070-5:2013	Foundry Operation Management L5
	2. MC-070-4:2013	Foundry Operation Administration L4
	3. MC-070-3:2013	Foundry Production Supervision L3
	4. MC-070-2:2013	Foundry Production L2

2.2.5. Malaysia Standard Industrial Classification 2008 (MSIC 2008)

The MSIC 2008 is designed to be a standard classification of productive economic activities. Its main objective is to provide a set of activity categories for gathering and presenting statistics based on such activities. As a result, MSIC 2008 attempts to present this set of activity categories so that entities can be categorised based on the economic activity they perform. For international comparability purposes, the MSIC 2008 Version 1.0 conforms closely to the International Standard Industrial Classification (ISIC) of All Economic Activities Revision 4, published by the United Nations Statistics Division, with some modifications to suit national requirements.

The objective of an industrial classification system is to classify data in respect of the economy according to categories of activities and similar characteristics. The MSIC 2008 is a classification of all types of economic activities and is not a classification of goods & services or occupations[12].

[12]Department of Statistics Malaysia (2009, December). Malaysia Standard Industrial Classification 2008 Version 1.0 (MSIC 2008).

2.3 The Value Chain for Basic Metal Industry in Malaysia

The value chain is described as "a chain of value-added activities; items flow through the activities in a series that increases in value over time. Value chains are used to describe the supply chains of certain firms. It must be a value addition for every activity the product or service undertakes during the life cycle of a product. Porter created a broad value chain that manufacturing companies can use as a tool for analysis to observe the connections between their activities. In basic metal manufacturing, steel is produced in integrated steel factories using fundamental raw materials such as iron ore, coal, scrap and fluxes like lime stone and dolomite. The primary manufacturing facilities include a raw material processing facility, coke ovens, a sinter plant, blast furnace for iron making. The secondary manufacturing facilities can be Basic Oxygen Furnace (BOF) or Electric Arc Furnace (EAF), followed by Ladle Furnace (LF) and Continuous Casting Machine (CCM) for making steel into slabs, blooms and billets, as shown in Figure 2.3. Blooms and Billets will be hot rolled in rolling mills to produce long products such as structural, merchant bars, wire rods and special bars or hot forming and rolling into seamless tubes.[13] The slabs will be hot rolled in the hot strip mill to produce flat products such as hot rolled sheets or hot rolled coils, as shown in Figure 2.4.

Hot metal produced in the blast furnace is transformed into steel via a primary oxidation process, which removes impurities in the hot metal. The secondary refining facilities in the steel melt shop refine this steel further. Steel melt shops produce slabs, blooms and billets, which are then transformed into various finished products, such as wire rods, rebars, rounds, structurals, squares, etc., in rolling mills. These products are referred to as long products utilised in the manufacturing and construction industries[14]. Porter creates the value chain specifically for the basic metal industry with five (5) primary activities and six (6) supporting activities, as shown in Figure 2.2.

[13]S G, A., Subbaiah, K. V., & Rao, K. N. (2015). Value Chain Model for Steel Manufacturing Sector: A Case Study. International Journal of Managing Value and Supply Chains, 6(4), Page 47.
[14]S G, A., Subbaiah, K. V., & Rao, K. N. (2015). Value Chain Model for Steel Manufacturing Sector: A Case Study. International Journal of Managing Value and Supply Chains, 6(4), Page 48.

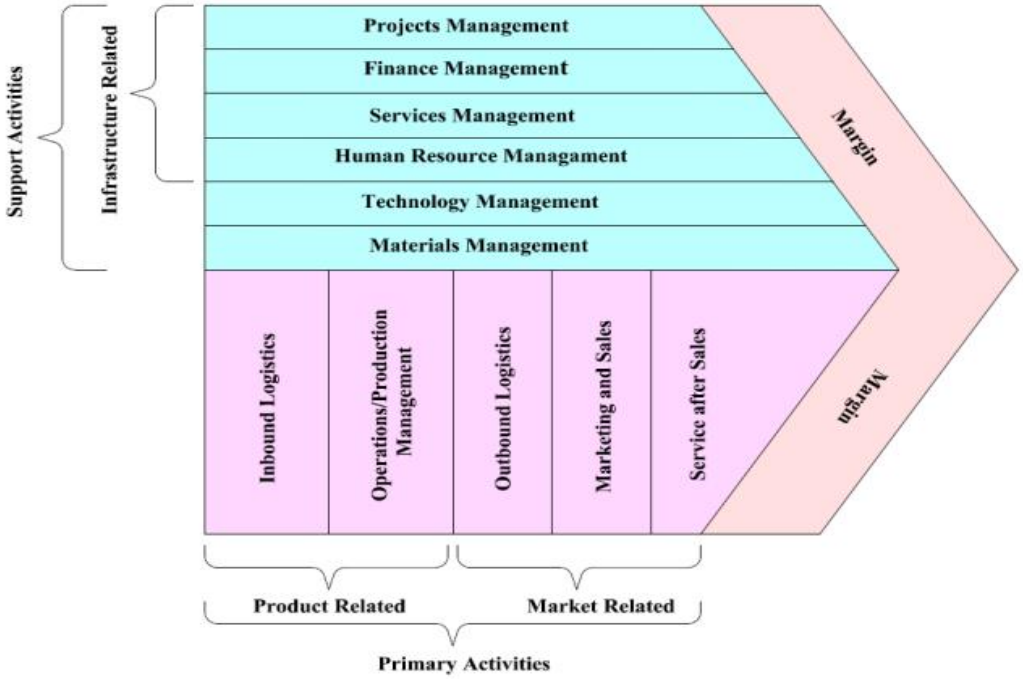

Figure 2.2: Value Chain for Steel Manufacturing Sector
(Source: Porter, 2015)

Based on the value chain proposed by Porter, this research focusses on the margin of operation/production management in the basic metal industry. The handling and processing of raw materials (including the receiving and handling of significant raw materials such as coking coal, iron ore, fluxes, etc.; crushing, lump ore crushing and screening); the production of coke, sinter, lime and calcined dolomite; production of iron and steel, production of blooms, billets, etc., production of wire rods, bar, rounds, squares, and structural (angles, channels, and beams)[15] including the maintenance in the operations.

The operation/production in terms of the value chain in the basic metal industry consists of upstream, midstream and downstream, as shown in Figures 2.3, 2.4 & 2.5. The upstream focuses on obtaining and pre-treating raw materials such as coal, limestone, iron ore and steel scrap for iron and steel making to produce slabs, blooms and billets. The midstream processes focus on converting input materials (slabs, blooms and billets) into products such as wire rods, hot-rolled coils, rebar, structural, cold-drawn wire & bar, cold-

[15]S G, A., Subbaiah, K. V., & Rao, K. N. (2015). Value Chain Model for Steel Manufacturing Sector: A Case Study. International Journal of Managing Value and Supply Chains, 6(4), Page 48.

rolled wire and coil. Lastly, downstream focuses on product applications in construction and various industrial application such as machinery frames, mechanical equipment, automotive parts, home appliances, electrical & electronics parts and mechanical components.

This research covers upstream and midstream parts in processing the raw materials based on Section C, Division 24 in MSIC 2008 Version 1. The summary of the Iron and Steel-Making processes involved can be illustrated in Figure 2.3[16]. The left side consists of iron ore, coal injection, coal, and coke oven, which are classified as material handling where they are the input material for the following process, known as the upstream process. The upstream process can either proceed via Direct Reduction Iron (DRI) or Blast Furnace that will eventually produce iron or steel in the form of slabs, thin slabs, blooms and billets. Then, these upstream products undergo the following process, known as the midstream process.

The midstream processes are illustrated in Figure 2.4 and Figure 2.5[16]. The slabs, thin slabs, blooms and billets are conveyed into mills such as Hot Strip Mill, Rolling Mill, Pipe Mill and Structural Mill to produce midstream products such as plates, pipe products, hot rolled sheets, hot rolled coils, pickled coils, cold rolled coils, seamless tube, bars rods and many more. Panels experts have listed some industries, such as Eastern Steel Sdn. Bhd., Alliance Steel (M) Sdn. Bhd., Alliance Steel Kuantan Plant, Lion Steel Sdn. Bhd[17,18,19]. and many more that operate as the processes illustrated in Figure 2.3. The Lion Steel Sdn Bhd. was observed to operate via Direct Reduction Iron (DRI), where Eastern steel and Alliance operate via blast furnace.

[16] Marinerspointpro (2023, February 1). Retrieved from https://marinerspointpro.com/steel-making-process-steps-flowchart/
[17] Eastern Steel Sdn Bhd. (2023, January 20). Retrieved from http://www.easternsteel.com.my/en/project-development2.html
[18] Alliance Steel (M) Sdn. Bhd. (2023, January 20). Retrieved from http://alliancesteel.com.my/
[19] Global Energy Wiki Monitor (2023, January 20). Retrieved from https://www.gem.wiki/Alliance_Steel_Kuantan_plant

Figure 2.6 shows the process flow chart for aluminium production to produce aluminium foil or sheet products. At an aluminium smelter, alumina is poured into a reduction chamber at a high temperature of 950 ºC with molten cryolite. This process caused the liquid aluminium to settle at the bottom of the reduction chamber. The primary aluminium then goes through a casting, rolling, trimming and annealing furnace to improve ductility and machinability and reduce brittleness. Finally, the rolled form of aluminium undergoes several processes such as slitting, shearing and forming to produce sheet and foil/fin aluminium products.

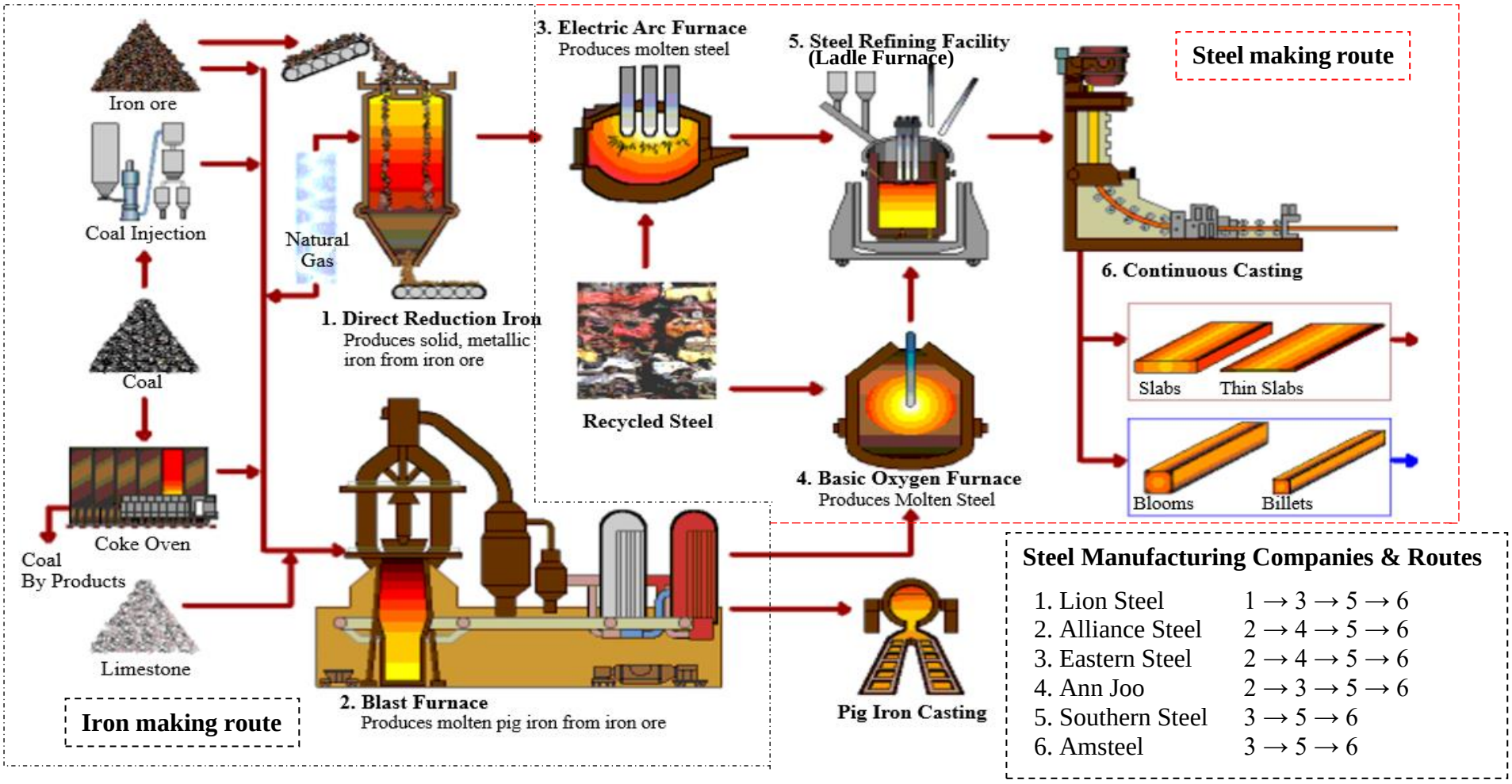

Figure 2.3: Iron and Steel-Making Process (Upstream)

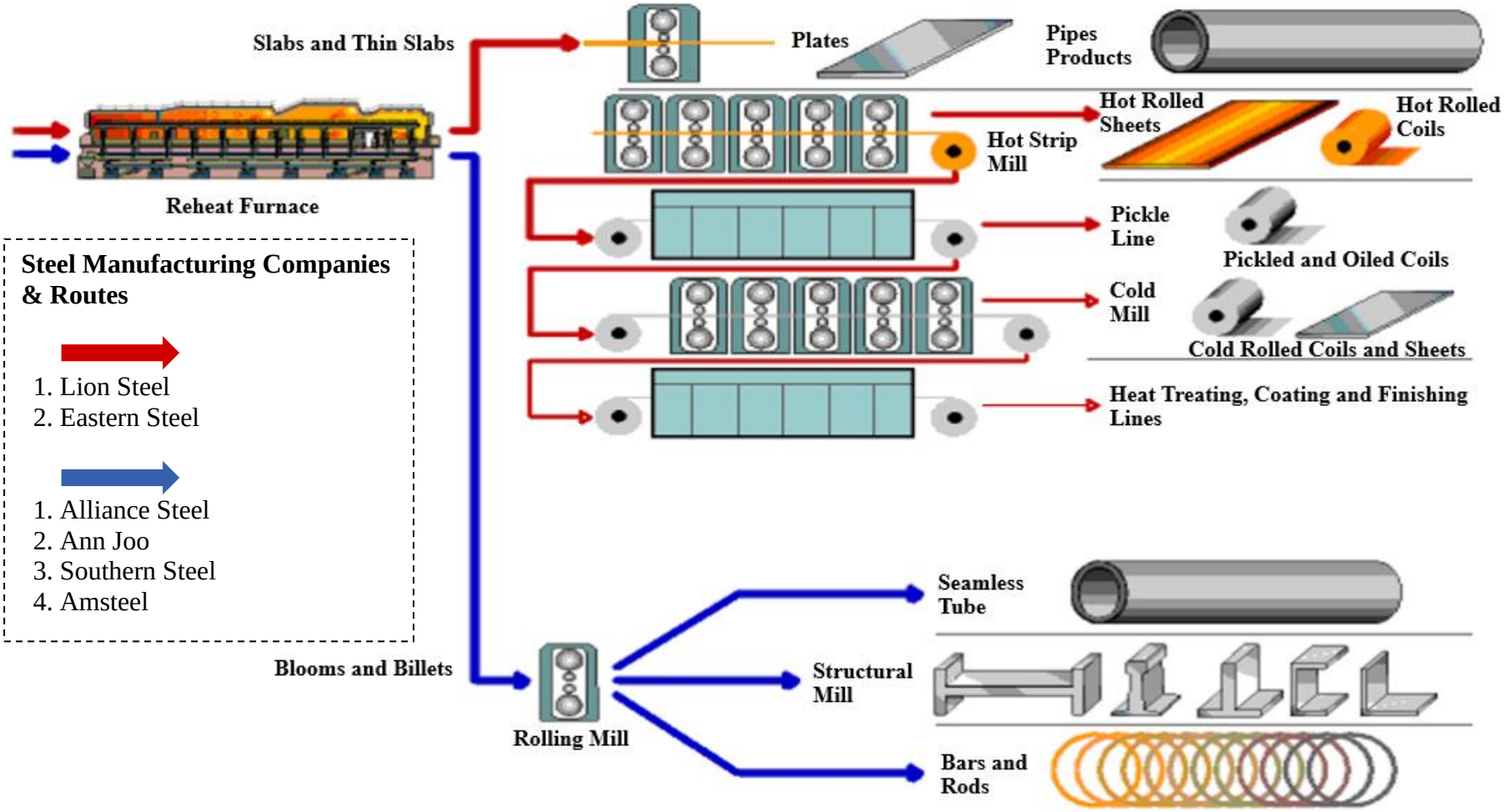

Figure 2.4: Rolling Process (Midstream)

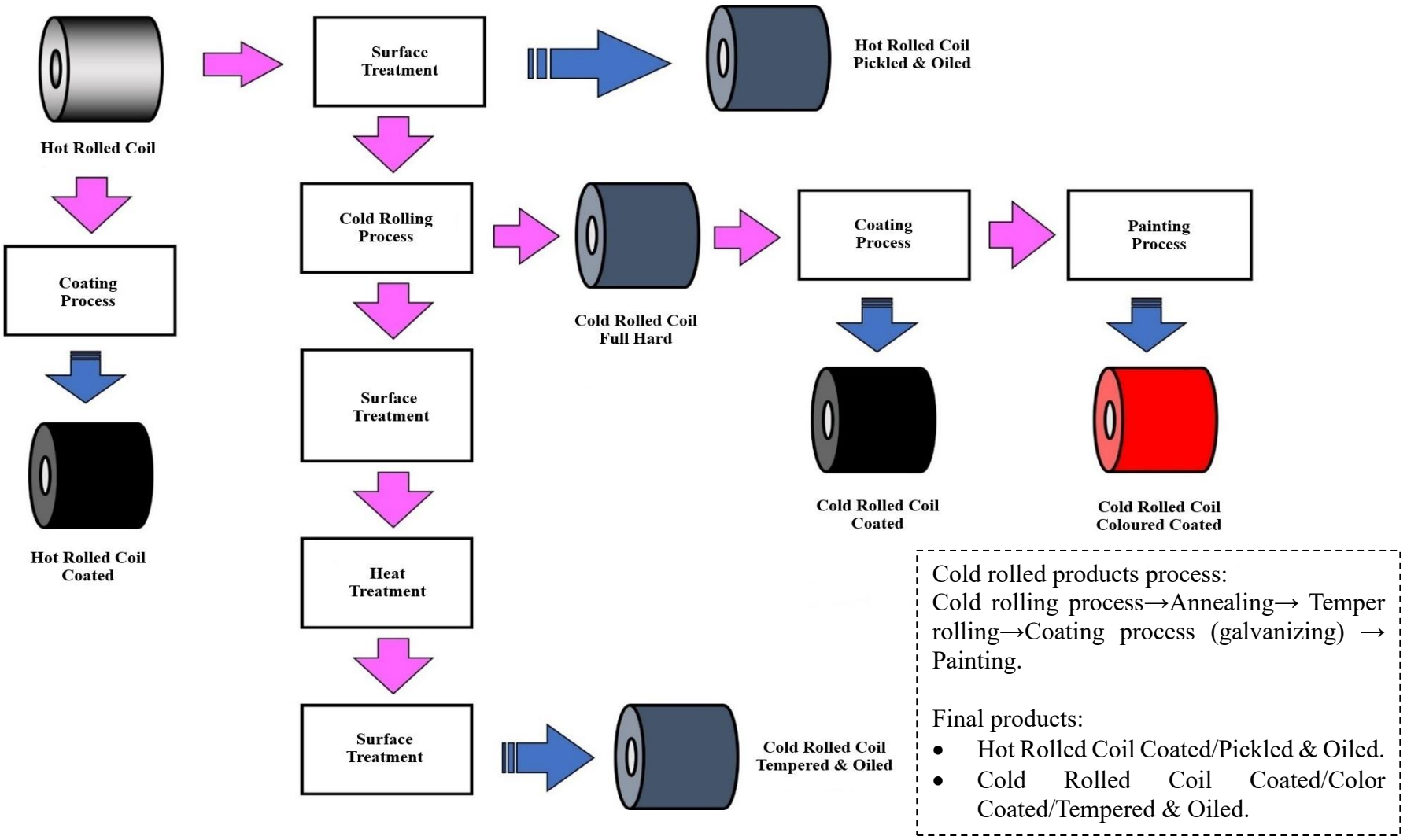

Figure 2.5: Summary of Cold Rolled Product Material Flow (Midstream)

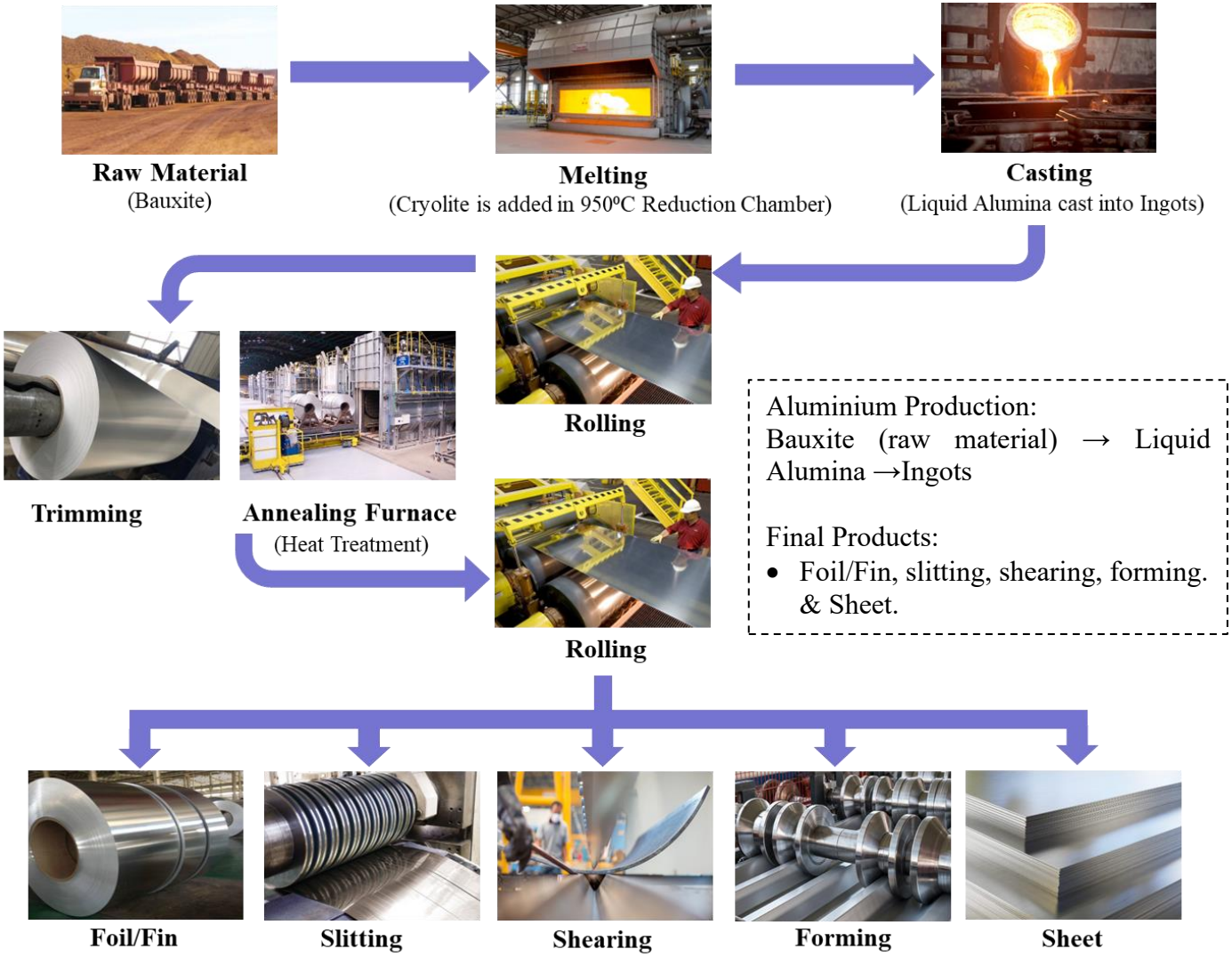

Figure 2.6: Process Flow Chart for Aluminium Production

2.4 Scope of Occupational Framework Based on MSIC 2008

The Malaysia Standard Industrial Classification 2008 (MSIC 2008) provides a standard framework for classifying establishments and other statistical units in the given industry in all official statistics. It also serves as a standard reference to users of official statistics on the type of economic activities included under the various categories of industries. This section defines the MSIC 2008 based on DOSM and the criteria for the title selection for this research.

2.4.1 MSIC 2008 Overview

The definition of the basic metals industry must be clearly stated in order to ensure that the scope of the Manufacture of Basic Metals is comprehensively covered in this OF research. Under MSIC 2008, the area being researched falls under the Section and Division listed in Table 2.2.

Table 2.2: MSIC 2008 by Section, Division and Group
(Source: MSIC 2008)

Section	**C**	**Manufacturing**
Division	**24**	Manufacture of Basic Metals
Group	**241**	Manufacture of Basic Iron and Steel
	242	Manufacture of Basic Precious and Other Non-ferrous Metals
	243	Casting of Metals

Table 2.3 below provides the structure for this particular OF based on MSIC 2008 for the different groups and items.

Table 2.3: MSIC 2008 by Section, Division, Group, Item and Class

(Source: MSIC 2008)

Section	**C**	**Manufacturing**
Division	**24**	Manufacture of basic metals
Group	**241**	Manufacture of basic iron and steel
Class	**2410**[(1)]	Manufacture of basic iron and steel
Items	**24101**[(2)]	Production of pig iron and spiegeleisen in pigs, blocks or other primary forms
	24102[(3)]	Production of bars and rods of stainless steel or other alloy steel
	24103[(4)]	Manufacture of seamless tubes, by hot rolling, hot extrusion or hot drawing, or by cold drawing or cold rolling
	24104[(5)]	Manufacture of steel tube fittings
	24109[(6)]	Manufacture of other basic iron and steel products N.E.C.

(1) Exclude:

- **a)** Manufacture of tubes, pipes and hollow profiles and of tube or pipe fittings of cast-iron, see 24311.
- **b)** Manufacture of seamless tubes and pipes of steel by centrifugal, casting, see 2431.
- **c)** Manufacture of tube or pipe fittings of cast-steel, see 2431.

(2) Includes:

- **a)** Production of ferro-alloys.
- **b)** Production of semi-finished products of iron or non-alloy steel.
- **c)** Production of ingots, other primary forms and semi-finished products of stainless steel or other alloy steel.

(3) Includes:

- **a)** Production of angles, shapes and sections of stainless steel or other alloy steel.
- **b)** Production of bars and rods of iron or non-alloy steel.
- **c)** Production of flat-rolled products of iron or non-alloy steel.
- **d)** Production of angles, shapes and sections of iron or non-alloy steel.
- **e)** Manufacture of steel bars or solid sections by cold drawing, grinding or turning.

(4) Includes:

Manufacture of welded tubes by cold or hot forming and welding, by forming and cold drawing, or by hot forming and reducing.

(5) Includes:

Manufacture of open section by progressive cold forming on a roll mill or folding on a press of flat-rolled products of steel.

(6) Includes:

a) Operation of blast furnaces, steel converters, rolling and finishing mills.

b) Production of sheet piling of steel and welded open sections of steel.

c) Production of railway track materials (unassembled rails) of steel.

d) Manufacture of steel wire by cold drawing or stretching.

e) Production of granular iron and iron powder; production of iron of exceptional purity by electrolysis or other chemical processes.

f) Remelting ferrous waste and scrap.

Group	**242**	Manufacture of basic precious and other non-ferrous metals
Class	**2420(1)**	Manufacture of basic precious and other non-ferrous metals
Items	**24201**	Tin smelting
	24202(2)	Production of aluminium from alumina
	24209(3)	Manufacture of other basic precious and other non ferrous metals N.E.C.

(1) Excludes:

Casting of non-ferrous metals, see 2432 and manufacture of precious metal jewellery, see 3211.

(2) Includes:

Production of aluminium from electrolytic refining of aluminium waste and scrap, production of aluminium alloys, semi-manufacturing of aluminium, production of aluminium oxide (alumina), production of aluminium wrapping foil, manufacture of aluminium (tin) foil laminates made from aluminium (tin) foil as primary component.

(3) Includes:

a) Production of basic precious metals such as gold, silver, platinum, etc.

b) Production of precious metal alloys.

c) Production of precious metal semi-products.

d) Production of silver rolled onto base metals.
e) Production of gold rolled onto base metals or silver.
f) Production of platinum and platinum group metal rolled onto gold, silver or base metals.
g) Production of lead, zinc and tin from ores.
h) Production of lead, zinc and tin from electrolytic refining of lead, zinc and tin waste and scrap.
i) Production of lead, zinc and tin alloys.
j) Semi-manufacturing of lead, zinc and tin.
k) Production of copper from ores.
l) Production of copper from electrolytic refining of copper waste and scrap.
m) Production of copper alloys.
n) Manufacture of fuse wire or strip.
o) Semi-manufacturing of copper.
p) Production of chrome, manganese, nickel, etc. From ores or oxides.
q) Production of chrome, manganese, nickel, etc. From electrolytic and aluminothermic refining of chrome, manganese, nickel, etc., waste and scrap.
r) Production of alloys of chrome, manganese, nickel, etc.
s) Semi-manufacturing of chrome, manganese, nickel, etc.
t) Production of mattes of nickel.
u) Production of uranium metal from pitchblende or other ores.
v) Smelting and refining of uranium.
w) Manufacture of wire of these metals by drawing.
x) Manufacture of precious metal foil laminates.

Group	**243**	**Casting of metals**
Class	**2431(1)**	**Casting of iron and steel**
Items	**24311(2)**	**Casting of iron**
	24312(3)	**Casting of steel**
Class	**2432**	**Casting of non-ferrous metals**
Items	**24320(4)**	**Casting of non-ferrous metals**

(1) Includes:

Manufacture of seamless tubes and pipes of steel by centrifugal casting, manufacture of tube or pipe fittings of cast-steel.

Excludes:

Manufacture of finished cast products (e.g., boilers and radiators), see 2512 and cast household items, see 2599.

(2) Includes:	
a)	Casting of semi-finished iron products.
b)	Casting of grey iron castings.
c)	Casting of spheroidal graphite iron castings.
d)	Casting of malleable cast-iron products.
e)	Manufacture of tubes, pipes and hollow profiles and of tube or pipe fittings of cast-iron.
(3) Includes:	
a)	Casting of semi-finished steel products.
b)	Casting of steel castings.
(4) Includes:	
a)	Casting of semi-finished products of aluminium, magnesium, titanium, zinc, etc.
b)	Casting of light metal castings.
c)	Casting of heavy metal castings.
d)	Casting of precious metal castings.
e)	Die-casting of non-ferrous metal castings.

2.5 Key Stakeholders

The most important stakeholders in a specific firm are the primary stakeholders in a corporation. Any professional impacted by a company's operations, initiatives, and successes is a stakeholder. The kind and degree of interest that stakeholders have in a company varies. The function of a major stakeholder inside a company depends on various variables. The obligations of important stakeholders may include providing financial support, business initiatives and contributing during a meeting. The key stakeholders in Malaysia's Manufacture of Basic Metals industry are government agencies, regulatory bodies and industry associations.

2.5.1 Government Agencies and Regulatory Bodies

A government or state agency is a permanent or semi-permanent body within the presidency's machinery responsible for overseeing and administering specified responsibilities. There is a distinctive group of agency kinds. In comparison, the regulatory body is a public organisation or government agency responsible for legally regulating

components of an act. Eight (8) government agencies and regulatory bodies are relevant and related to this industry under the Manufacture of Basic Metals Industry, as shown in Table 2.4.

Table 2.4: List of Government Agencies / Regulatory Agencies for Manufacture of Basic Metals

No.	Government Agencies/ Regulatory Bodies	Roles, function and responsibilities
1	Ministry of International Trade and Industry (MITI)	The MITI oversees all laws and regulations on the country's numerous sectors and overseas trade. The MITI functions related to the Manufacture of Basic Metals are establishing and implementing industrial basic metal growth, foreign trade, and investment policies to boost national productivity and competitiveness, especially in the industrial and service sectors, and to encourage and hasten the implementation of digitalisation and cutting-edge technology[20].
2	Ministry of Human Resources (MOHR)	MOHR is a Malaysian government ministry in charge of skills development, labour, occupational safety and health, trade unions, industrial relations, industrial court, labour market information and analysis, and social security. The MOHR functions related to the Manufacture of Basic Metals are to update

[20] Ministry of International Trade and Industry (2019, Jun 10). Retrieved from https://www.miti.gov.my/index.php/pages/view/2047?mid=705.

No.	Government Agencies/ Regulatory Bodies	Roles, function and responsibilities
		and implement occupational safety and health rules and laws to ensure a healthy workplace and modernise and effectively execute social safety infrastructure to guarantee a strong safety net for workers[21].
3	Ministry of Higher Education (MOHE)	MOHE was formally re-established in compliance with the Act's higher education-related requirements on 9 March 2020. In order to create the finest higher education ecosystem possible, MOHE collaborates with public universities, private institutions, polytechnics, and community colleges[22]. These institutions are key elements of the nation's education and training ecosystem, producing trained and semi-skilled workers according to their different duties as well as thinkers, scientists, and scholars.
4	Malaysian Investment Development Authority (MIDA)	MIDA is incorporated as a statutory body under the Malaysian Industrial Development Authority (Incorporation) Act 1965. MIDA evaluated the following applications for manufacturing-related initiatives: manufacturing licenses, tax incentives, expatriate posts, duty exemption

[21] Ministry of Human Resources (2022, August 11). Retrieved from https://www.mohr.gov.my/index.php/en/corporate-info/profile-us.
[22] Ministry of Higher Education (2020, December 14). Retrieved from https://www.mohe.gov.my/en/corporate/about-us/introduction.

No.	Government Agencies/ Regulatory Bodies	Roles, function and responsibilities
		on raw materials & components, and regional establishments[23].
5	Royal Malaysian Customs Department (RMCD)	RMCD is the government body administering the country's indirect tax policy[24]. The RMCD is responsible for assisting registered manufacturers and industries from the basic metals industry in comprehending sales tax on manufacturing, importation of goods, sales, and transportation of goods in line with sales tax regulations and legislation[25].
6	SIRIM QAS International Sdn. Bhd.	SIRIM QAS International is a testing, inspection, and certification body accredited by the National Accreditation Body, standards Malaysia, and the United Kingdom Accreditation Service (UKAS)[26]. In manufacturing basic metals, SIRIM QAS International is responsible for certifying, testing, and inspecting the metal product under severe criteria while creating basic metals[27].

[23] Malaysian Investment Development Authority (2022, October 1). Retrieved from https://www.mida.gov.my/about-mida/our-principles/.
[24] Royal Malaysian Customs Department (2022, September 30). Retrieved from http://www.customs.gov.my/en/ci/Pages/ci_vmv.aspx.
[25] Royal Malaysian Customs Department (2018, August 23). Retrieved from Guide on Manufacturing import / export.
[26] SIRIM QAS International (2022, October 1). Retrieved from https://www.sirim-qas.com.my/about-us/overview.
[27] SIRIM QAS International (2022, October 1). Retrieved from https://www.sirim-qas.com.my/business-sector/regulated-products/metal-products/.

No.	Government Agencies/ Regulatory Bodies	Roles, function and responsibilities
7	Malaysia Steel Institute (MSI)	MSI is an institute supported and funded by the Ministry of International Trade and Industry (MITI) on a shared responsibility basis. MSI is responsible for restructuring and assisting the environment required for a sustainable iron and steel sector, promoting and growing the Malaysian iron and steel industry's competitiveness, resiliency, and sustainability and encouraging the standardisation and use of iron and steel products in Malaysia[28].

[28]Malaysia Steel Institute (2022, October 1). Retrieved from https://malaysiasteelinstitute.com/about-msi/.

2.5.2 Industry Associations

This section contains information on industry associations and professional bodies pertaining to the basic metal industry. Six (6) industry associations are related to the Manufacture of Basic Metals, as shown in Table 2.5.

Table 2.5: List of Industry Associations for the Manufacture of Basic Metals

No.	Industry Associations	Roles, Function and Responsibilities
1	Malaysian Iron and Steel Industry Federation (MISIF)	MISIF is the national industry association for manufacturers of iron and steel products[29]. The functions of MISIF in the basic metals industry include compiling the Malaysian iron and steel industry statistics, interacting and collaborating with established steel organisations worldwide, such as the World Steel Association and promoting Malaysian iron and steel through trade[30].
2	Malaysian Structural Steel Association (MSSA)	MSSA is a non-government organisation that was established on March 8, 1996. The main function of MSSA in the basic metal industry is to encourage the use of structural steel in the building, steelmaking, and oil and gas industries and to promote the spread of knowledge and the discussion of ideas in the global and domestic structural steel sector[31].

[29]Malaysian Iron and Steel Industry Federation (2022, October 1). Retrieved from https://misif.org.my/about-us/.
[30]Malaysian Iron and Steel Industry Federation (2022, October 1). Retrieved from https://misif.org.my/misifs-mission/.

[31] Malaysian Structural Steel Association (2022, October 2). Retrieved from https://www.mssa.org.my/about.php.

No.	Industry Associations	Roles, Function and Responsibilities
3	Malaysia Steel Association (MSA)	The MSA is an association to protect the interests of upstream steel firms and provides a forum for knowledge sharing to foster mutual goodwill, cooperation, and unity for the benefit of all members in the Malaysian steel sector[32]. In the Manufacture of Basic Metals, MSA also promotes the development of the Malaysia Steel Industry and transforms Malaysia into a steel powerhouse to achieve self-sufficiency and produce high export revenue [33].
4	Malaysian Tin Products Manufacturers Association (MTPMA)	MTPMA was established by the Tin Industry (Research and Development) Board as part of its activity programme to develop the downstream tin-based products manufacturing industry. The Association was responsible for encouraging, promoting, and protecting the interests of tin product companies, promoting legislation for industry enhancement, and supporting or opposing revisions to existing laws[34].

[32] Ministry of International Trade and Industry (2022, October 1). Retrieved from https://www.miti.gov.my/index.php/glossary/term/126.
[33]Malaysia Steel Work (KL) bhd. (2022, October 1). Retrieved from https://www.masteel.com.my/about-2/malaysia-steel-association-msa/.
[34] Malaysian Tin Products Manufacturers Association (2022, October 3). Retrieved from https://mtpma.org.my/maintenance/home.html.

No.	Industry Associations	Roles, Function and Responsibilities
5	Malaysia Non-Ferrous Metals Association (MNMA)	MNMA was created and registered with the Registrar of Societies as *'Persatuan Logam Bukan Ferus Malaysia.'* MNMA was established to unify the nation's non-ferrous industries under one organisation. The Association was founded under this entity to coordinate and standardise with government agencies, particularly for hazardous and non-hazardous waste, importing non-ferrous metals and encouraging downstream firms to invest in Malaysia by encouraging the growth of the upstream industry[35].
6	Federation of Malaysian Foundry and Engineering Industries Associations (FOMFEIA)	FOMFEIA is the national representative body for foundry-related industries in Malaysia. Under this association, FOMFEIA is responsible for assisting members in resolving issues arising from government policy implementation and participating in the initiatives of public and private organisations that are relevant to the sector[36].

2.5.3 Training Centres

Human Capital Development is crucial to the basic metals industry's long-term viability. In this regard, several agencies, such as specialised training schools, meet the labour needs of the basic metals sector. These agencies are included in Table 2.6.

[35]Malaysia Non-Ferrous Metals Association (2022, October 3). Retrieved from https://mnma.com.my/.
[36]Federation of Malaysian Foundry and Engineering Industries Associations (2022, October 3). Retrieved from http://fomfeia.org.my/v2/introduction/.

Table 2.6: List of the Training Centre for the Manufacture of Basic Metals

No.	Training Centre	Roles, Function and Responsibilities
1.	*Institusi Latihan Jabatan Tenaga Manusia* (ILJTM)	ILJTM is administered by Jabatan Tenaga Manusia (JTM). It comprises Institusi Latihan Perindustrian (ILP), Advance Technology Training Centre ADTEC, and Japan Malaysia Technical Institute (JMTI). ILJTM is in charge of planning and coordinating pre-job skill training to meet the need for skilled workers and improve the calibre of skilled workers for the basic metal industry. These programmes are designed to develop experienced and competitive workers[37].
2.	SIRIM Training Services Sdn. Bhd. (STS)	STS is a registered training provider with the Human Resources Development Cooperation (HRD Corp). SIRIM Sdn. Bhd. has established STS to meet industries' growing demand for Technology and Quality Human Capital development. STS is responsible for enhancing the customers' competitiveness through technology and quality training programmes and higher education courses[38].
3.	*Institusi Latihan Kemahiran Belia dan Sukan (ILKBS)*	The Ministry of Youth and Sports created ILKBS to produce highly skilled and disciplined youth in line with the government's desire to focus on human capital development in RMK-12. The goal

[37] *Jabatan Tenaga Manusia* (2023, February 11). Retrieved from https://www.trainingmalaysia.com/provider/display_prof.php?prov=JTM.
[38] SIRIM Training Services (2022, October 3). Retrieved from https://www.trainingmalaysia.com/provider/display.

No.	Training Centre	Roles, Function and Responsibilities
		of ILKBS in the basic metal manufacturing programme is to conduct integrated training with the implementation of the approach covering skill training (theory and practical), entrepreneurship, politics, leadership, religion/morality, sports/recreation and community service [39].

2.6 Legislations, Policies and Initiatives

Legislation, policy and initiatives can be seen as a problem-solving process with the following steps problem identification, objective identification, strategy formulation, strategy evaluation, decision and execution[40]. This research must refer to laws, regulations, and other rules relevant to the basic metals manufacturing sector.

2.6.1 Government Legislations

Basic Metals industries in Malaysia are governed by the following legislation, as shown in Table 2.7.

Table 2.7: Relevant Legislation for the Manufacture of Basic Metals

No.	Legislation	Description
1	Employment Act 1955	The Employment Act of 1955 was amended to form the Employment (Amendment) Act of 2022. Significant changes to the manufacture of basic metals were made by the Amendment Act[41].

[39] *Institut Kemahiran Belia Negara* (2022, October 15). *Retrieved from* http://kemahiran.kbs.gov.my/ms/.

[40] Rood, S. A. (1989). Legislative-policy initiatives as a problem-solving process: The case of technology transfer. The Journal of Technology Transfer, 14(1), 14–25.

[41] Federal Legislation (2023, February 11). Retrieved from https://lom.agc.gov.my/act-detail.php?type=amendment&act=A1651&lang=BI.

No.	Legislation	Description
2	Trade Descriptions (Amendment) Act of 2021	On January 11, 2022, the Trade Descriptions (Amendment) Act of 2021 (referred to as "the Amendment Act") went into effect. The act aims to promote good business practices by preventing inaccurate trade descriptions, false or misleading statements, actions, and practices in selling goods and services[42].
3	Factory and machinery act 1967 (revised 1974)	An Act to provide for the control of factories with respect to matters relating to the safety, health, and welfare of persons therein, the registration and inspection of machinery and for matters connected therewith[43].
4	Occupational Safety and Health (Amendment) Act (OSHA) 2022	An Act to amend the Occupational Safety and Health Act 1994. The amendment of the Act related to the basic metal industry includes the higher protection of employees and empowerment & accountability of competent persons and OSH training providers[44].
5	Industrial Coordination Act 1975	The Industrial Coordination Act of 1975 governs Malaysia's manufacturing sector. Companies that plan to be active in the manufacturing business must comply with several regulations mandated by the Industrial Coordination Act of 1975. The compliance demands are put in place to aid in the correct regulation of the manufacturing sector by the relevant agencies.

[42] Trade Descriptions Act 2011 – A New Lease of Life. (2022, October 2). Retrieved from https://henrygoh.com/trade-descriptions-act-2011-a-new-lease-of-life/.
[43]Department Occupational Safety and Health (2022, October 3). Laws of Malaysia Act 139 Factories and Machinery Act 1967 (Revised - 1974).
[44] Laws of Malaysia, Occupational Safety and Health (Amendment) Act 2022 (2022, March 16). Page 3.

No.	Legislation	Description
		Additionally, it promotes the manufacturing sector's orderly growth and minimises manufacturing practices and activities that could be detrimental to society, such as managing hazardous waste and other environmental concerns[45].
6	Environmental Quality Act 1974	An Act relating to the prevention, mitigation, control, and improvement of pollution and the environment, and for purposes related therewith[46]. It also refers to the norms and requirements for environmental protection and the management of wastes, discharges, emissions, and other forms of pollution that affect or may affect the environment's quality[47].
7	Minimum Wages Order 2022	The Minimum Wage Order 2022 ("the Order") was published in the Gazette on April 27, 2022. Beginning on May 1, 2022, Malaysia's national minimum wage has increased from RM 1,200 to RM 1,500[48]. The minimum wage increase only applies to employees employed by employers with five or more employees and those employed by employers that carry out a professional activity categorised under the

[45] Mahwengkwai & Associates (2022, October 15). Retrieved from https://mahwengkwai.com/regulatory-compliance-for-the-manufacturing-industry-in-malaysia/
[46] Department of Environment (2022, October 3). Environmental Quality Act, 1974.
[47] International Energy Agency (2020, December 20). Retrieved from https://www.iea.org/policies/11902-environmental-quality-act-1974.
[48] Federal Legislation. National Wages Consultative Council Act 2011, Minimum Wages Order. Page 5.

No.	Legislation	Description
		Malaysia Standard Classification of Occupations ("MASCO")[49].

2.6.2 Government Policies and Initiatives

This section provides information on related government policies and initiatives for the Manufacture of Basic Metals.

a) National Policy on Industrial Revolution

The National Policy on Industrial Revolution is a national policy for transforming the manufacturing sector and related services from 2018 to 2025. This policy contains three visions for making Malaysia, as shown below[50]:

i) Strategic partner for smart manufacturing and related services in the Asia Pacific;
ii) A leading location for high-tech industrial investment; and
iii) Total solution provider of cutting-edge technology solutions.

The government and businesses have launched many programmes and organisations to create action plans to support the national, state, and regional manufacturing sectors. It is crucial to support and prioritise industrial companies. However, these programmes were primarily created separately and frequently have overlapping goals and target industries.

To speed Malaysia's transition towards a cutting-edge manufacturing system, there is a need for a more streamlined and unifying national agenda under which these programmes and organisations can be integrated. Along with this, there is a need for more coordination between government, academia, and research and development about funding for priority industries, specific objectives, and enabling activities. With this in mind, Malaysia has

[49] Coventus law (2023, February 11). Retrieved from https://conventuslaw.com/report/minimum-wages-order-2022-key-changes-in-malaysias-employment-law/.
[50] Ministry of International Trade and Industry (2018, October 31). Retrieved from https://www.miti.gov.my/industry4wrd.

implemented the National Policy on Industrial Revolution, also known as Industry 4WRD, which offers a coordinated and all-encompassing transformation plan for the manufacturing industry and its connected services[51]. The national policy on Industrial Revolution has three objectives that refer to three key goals A.C.T as shown in Figure 2.7.

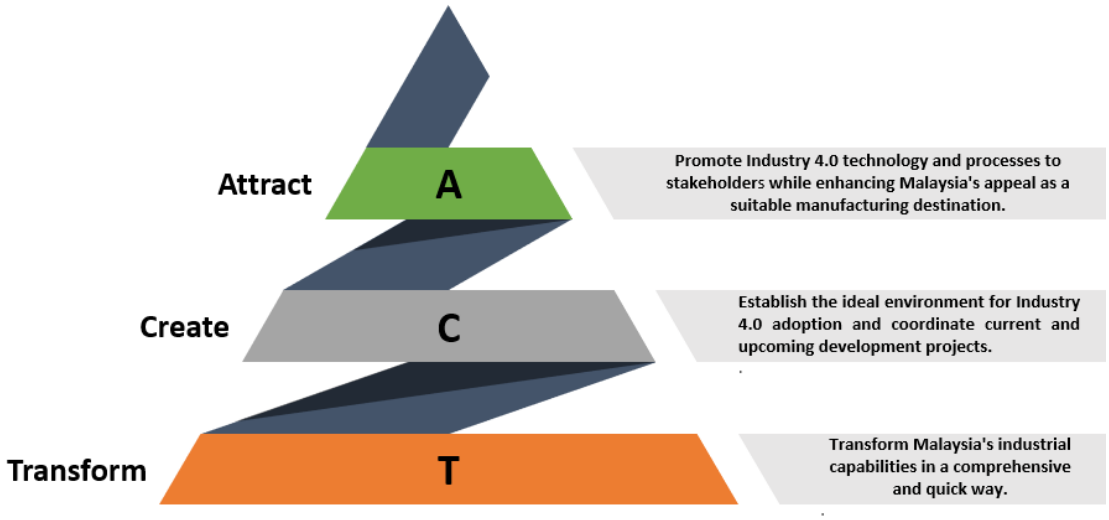

Figure 2.7: The National Policy on Industrial Revolution (Three Key Goals: A-C-T)
(Source: Ministry of International Trade and Industry, 2018)

From the objective shown in the policy, the first key, “Attract,” is to attract stakeholders, including the adoption of the Industrial Revolution, SME inclusion and preferred manufacturing location. The second key, “Create,” refers to creating the right ecosystem regarding talent supply & skill levels, collaborative platforms, digital infrastructure, funding support, data availability & sharing and innovation capacity. The industry characteristics discussed in the final key, "Transform," include labour productivity, cost-effectiveness, the proportion of high-skilled positions, technology & innovation capabilities, and local technology. The primary outcomes of this key include increased manufacturing sector participation, high value-added products, and continued Foreign Direct Investment (FDI)[52].

[51]Ministry of International Trade and Industry (2018, October 31). Industry 4WRD National Policy on Industry 4.0. Page 36.

[52]Ministry of International Trade and Industry (2018, October 31). Industry 4WRD National Policy on Industry 4.0. Page 37

b) **Policy Review of the Iron and Steel Industry**

The updated iron and steel strategy was presented to the Cabinet for consideration on November 13, 2020. It was approved by the Cabinet, according to information from MITI. For the benefit of the members, the modifications' specifics are listed below[53]:

i) The impact on current industry stakeholders, particularly for the segment of comparable products, will be taken into consideration when tighter requirements are applied to the issue of new Manufacturing Licenses (ML);

ii) The present import tariff system, which includes long and flat products with rates ranging from 5-15%, is extended until December 31, 2021;

iii) Establishment of a 15% export duty on ferrous scrap along with a mechanism for export licences for monitoring;

iv) Possibilities for applying for an import duty exemption through "*Jawatankuasa Pengecualian Cukai"* (JPC3) or for a duty drawback facility for exporting goods through a Licensed Manufacturing Warehouse (LMW) or Free Zone (FZ);

v) The merit of the project and its potential implications on the current domestic supply chain will be considered when determining whether to provide an ML and an exemption from ML (ICA10) for scrap metal recycling activities; and for the importation of metal scrap.

According to MITI's distributed letter, the government has also decided that the amended iron and steel policy will remain in effect until December 31, 2021. Therefore, the policy iron and steel industry has been changed from the old phase (Industrial Master Plan 3 (2006-2020) to the new policy direction under the New Industrial Master Plan 2021-2030. However, the MITI is currently preparing the New IMP, which will chart the future direction of industrial development in Malaysia from 2021 to 2030. Additionally, the Malaysian Industry-Government Group for High Technology (MIGHT) has been chosen by MITI to carry out research for the New IMP. In order to develop plans and efforts for the study, input from various industrial sectors will be gathered[54].

[53]Malaysian Iron and Steel Industry Federation (2020, December 31). C26-2020: Updated Iron and Steel Policy from MITI. Retrieved from https://misif.org.my/c26-2020-updated-iron-and-steel-policy-from-miti/.

[54] American Malaysian Chamber of Commerce. (2022, October 5). Retrieved from https://amcham.com.my/survey-for-the-new-industrial-masterplan-nimp-2021-203/.

c) National Green Technology and Zero Carbon initiatives

The country's environmental concern in manufacturing needs to be reduced through efficient use of energy and resources as well as minimising waste output in order to prepare for the expansion of the manufacturing sector. These preventive actions comprise the main programmes of the "Green Manufacturing" idea. Manufacturing, energy production and supply, buildings, transportation, waste management, and water supply are a few main sectors that must be constantly monitored to reduce carbon emissions. In all these important sectors, the government has already launched various programmes. The government has increased its efforts to minimize Green House Gases (GHG) emissions from the manufacturing industry by encouraging energy efficiency, green processes, and the use of green products and services[55]. The existing government initiatives classifications are outlined as follows in Table 2.8.

Table 2.8: Classification of Government Initiatives in Green Technology

Classification	Government Initiatives
Green Energy	1. Efficient Management of Energy Efficiency Regulation 2008 (EMEER); 2. Industrial Energy Efficiency for Malaysian Manufacturing Sector (IEEMS); 3. Energy Audit Grant for the Industrial sector (Energy Efficiency program under 11th Malaysia Plan); 4. Energy Management Gold Standard (EMGS); and 5. ASEAN Energy Management Scheme (AEMAS)
Green Products	1. Environmental Declaration Scheme for Construction and Building Materials; 2. Malaysia Energy Efficiency and Solar Thermal Application (MAEESTA) Project; and 3. MyHIJAU SME & Entrepreneur Development Programme and other green certification schemes.
Green management	1. ISO 14001 Certification Related clauses: a) Leadership – Environmental Policy, Organisational Roles, Responsibilities and Authorities. b) Planning - Environmental Objectives and Planning to achieve them.

[55] Green Technology Master Plan Malaysia 2017-2030. Page 59.

Classification	Government Initiatives
	c) Support – Resources, Competence, Awareness, Communication and Documented Information. d) Operation - Operational planning and control. e) Performance evaluation - Monitoring, measurement, analysis and evaluation, Internal Audit.

2.7 Industry and Market Analysis

Industry intelligence is gathering and disseminating information on a particular industry through various channels. In contrast, marketing intelligence is the external data that a firm gathers about a specific market that it desires to penetrate to make a decision. Before making investment decisions, the corporation analyses this first batch of data. This section will provide information on the Manufacture of Basic Metals based on industrial growth and employment statistics.

2.7.1 Growth of the Basic Metal Industry

The GDP at current and constant prices in 2015 for the manufacture of basic metals is compared, as shown in Figure 2.8. Both data show the increases in prices in 2021 compared to the previous year. About 12.83 % (2020:RM 8,801 million; 2021:RM 9,930 million) increase shown for GDP at current prices[56] while 3.01% (2020:RM 8,071 million; 2021: RM 8,314 million) increase for GDP at constant prices in 2015[57].

[56]Department of Statistics Malaysia (2022, May 13). Annual Gross Domestic Product 2015-2021. Page 16.
[57]Department of Statistics Malaysia (2022, May 13). Annual Gross Domestic Product 2015-2021. Page 20.

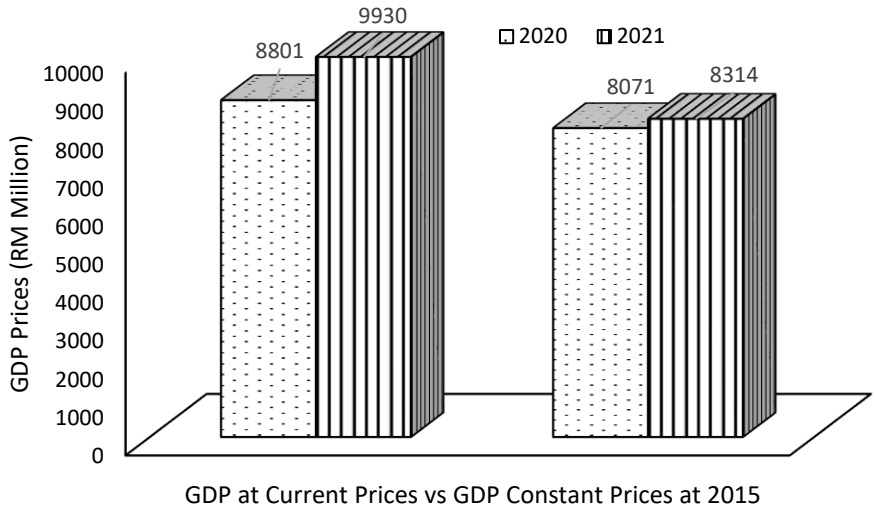

Figure 2.8: Gross Domestic Products of Manufacture of Basic Metals in current prices and constant prices in 2015

(Source: Department of Statistics Malaysia, 2022)

The sales value of the basic metals industry's manufacturing sector increased to RM11,987 million in Q2 2022 compared to the RM10,295 million reported a year ago, a 16.44% increase, as shown in Figure 2.9[58].

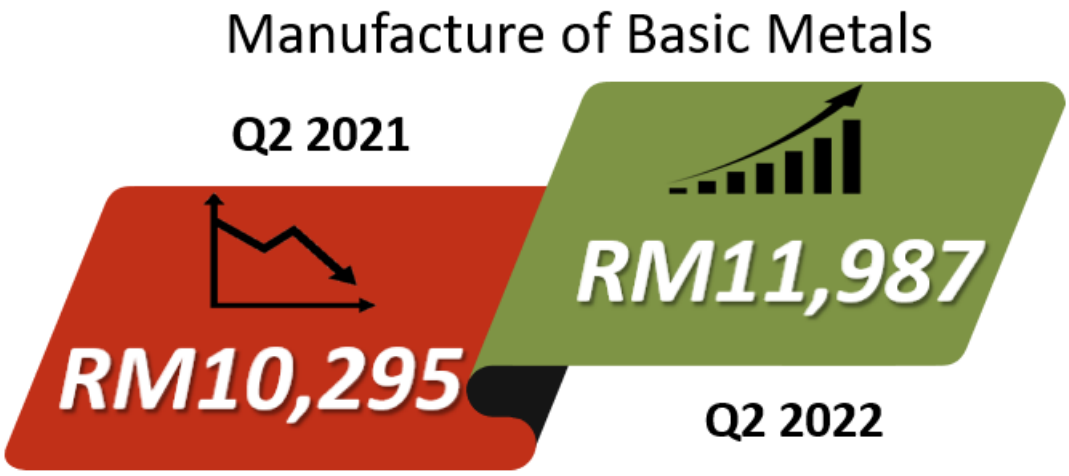

Figure 2.9: Manufacturing of Sales Value for Manufacturing in Basic Metals

(Source: Department of Statistics Malaysia, 2022)

[58]Department of Statistics Malaysia (2022, September 9). Monthly Manufacturing Statistics. Page 11.

The sales value by the group in the manufacture of basic metals shows a rise in all group sectors in Q2 2022 compared to Q2 2021, as shown in Figure 2.10. Manufacturing of basic iron and steel, manufacturing of basic precious and other non-ferrous metals, and casting metals show sales values climbed by 17.53 %, 24.60 %, and 14.99 %, respectively, to RM 6,323 million, RM 157 million, and RM 5,507 million[59].

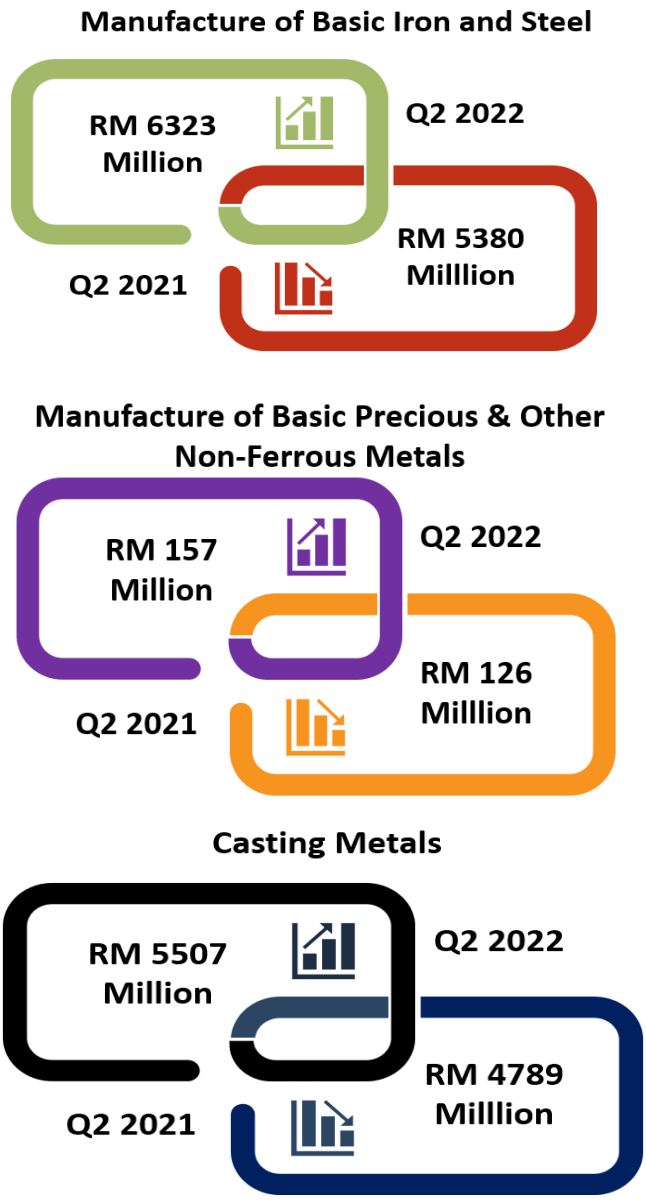

Figure 2.10: Manufacturing of Sales Value by the group in Manufacture of Basic Metals (Source: Department of Statistics Malaysia, 2022)

[59]Department of Statistics Malaysia (2022, September 9). Monthly Manufacturing Statistics. Page 40.

2.8 Comparison Development Between Malaysia, China and Indonesia in the Manufacture of Basic Metals Worldwide

This section provides a concise summary of developing countries of basic metals industries. China and Indonesia were discussed in this section due to their strong performance in the basic metals industry and the projection to be world-class producers. China is the largest producer of steel and other metals worldwide. Yet, global demand for steel and other metals goods is still rising. China's metal production is still driven by this demand, particularly in the construction, automotive, and aerospace sectors. China manufacturers have the infrastructure and equipment to handle huge orders of all metal components and products made of iron, steel, stainless steel, aluminium, and other metals[60]. All the countries selected are the top country in manufacturing basic metals globally. A detailed comparison of these countries is discussed with Malaysia regarding manufacturing in the basic metals industry in Chapter 4. Figure 2.11 below compares selected major steel-producing countries in 2020 and 2021. Malaysia is the 26th country in the world with 6.9 million tonnes of steel production, while Indonesia and China are at the higher rank due to their much bigger geographical land size[61].

[60] Innovation Transforming Industry (ITI) Manufacturing (2022, October 5). Current Metal Product Manufacturing in China.

[61] World Steel Association (2022, October 24). Retrieved from *https://worldsteel.org/steel-topics/statistics/world-steel-in-figures-2022.*

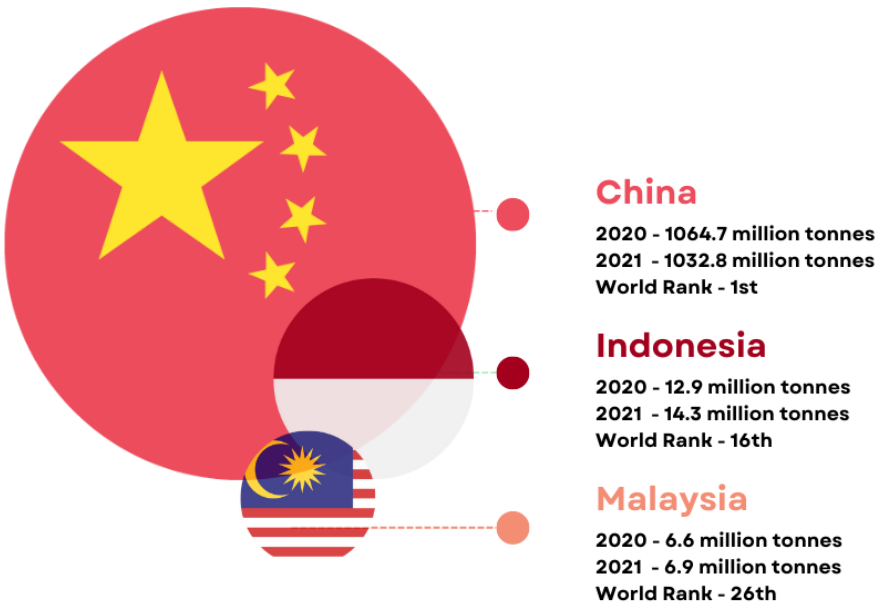

Figure 2.11: Comparison of the Development of Steel-producing Countries in 2020 and 2021

Figure 2.12 below shows the Gross Domestic Product (GDP) growth in annual % of China, Indonesia and Malaysia from 1990 to 2021[62]. The GDP growth fell significantly in 2020, resulting from the indirect impact of the Covid-19 lockdown, and the latter showed a remarkable recovery in 2021. Steel production during this pandemic period was not affected much, while the market conditions were causing significant job losses in the industry[63]. Figure 2.13 below shows the imports & exports trade comparison of selected countries from 2019 to 2021[64]. China is the top world economic power with the highest trading imports and exports values. Meanwhile, Malaysia and Indonesia have comparable trading values, and these two neighbouring countries have advantages in terms of language, religion, socio-politics, workforce and distance relationships.

[62] The World Development Indicator (2022, October 24). Retrieved from: https://databank.worldbank.org/source/world-development-indicators
[63] OECD (2022, October 24). Retrieved from https://www.oecd.org/industry/oecd-steel-committee-gravely-concerned-about-impact-of-covid-19-crisis-on-steel-market.htm.
[64] Country Comparison (2023, January 4). Retrieved from: https://countryeconomy.com/

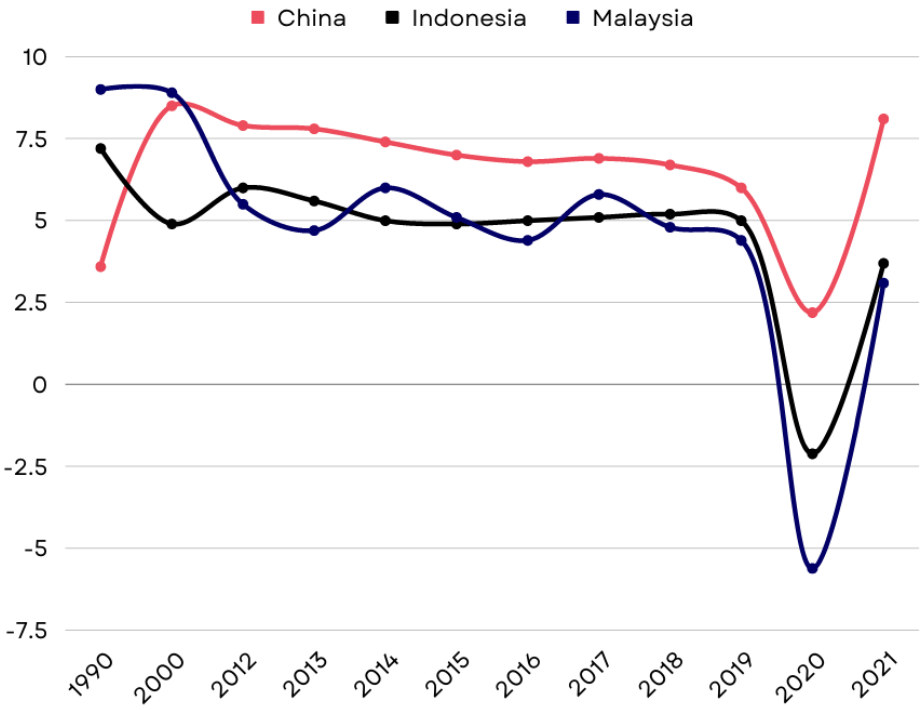

Figure 2.12 Comparison of the Gross Domestic Product (GDP) growth in annual % from 1990 to 2021

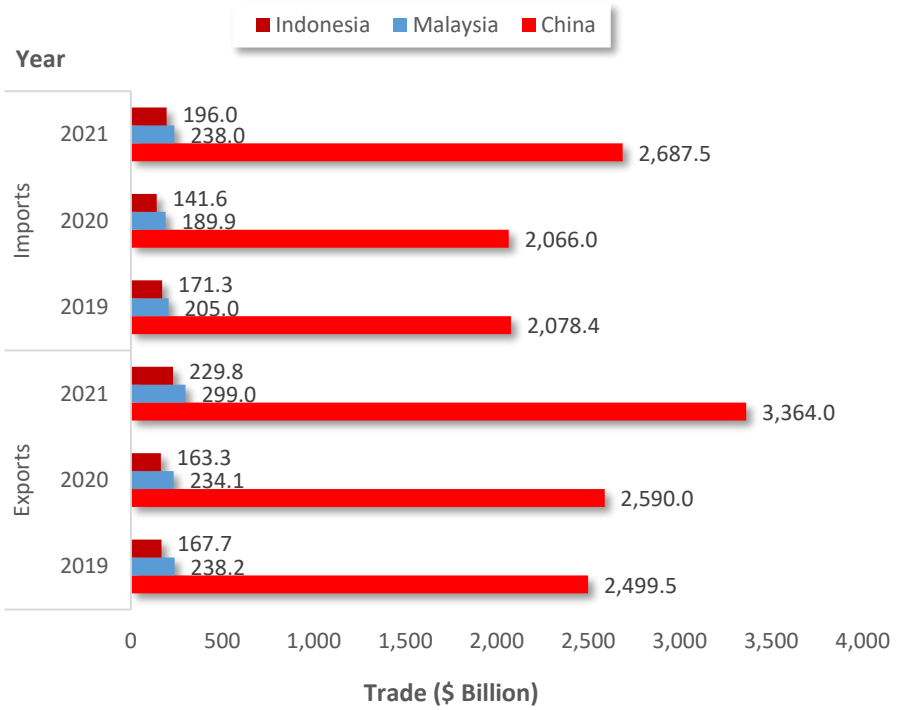

Figure 2.13: Imports & Exports Trade Comparison of Selected Countries from 2019 to 2021

2.9 Relation of Industrial Revolution with the Manufacture of Basic Metals in Malaysia

The Industrial Revolution is based on a set of technologies that are quickly advancing and integrating. These are pushing the limits of what can be produced with additive manufacturing and advanced materials. Through big data analytics, these technologies are allowing richer insights. Simulations are used to obfuscate the boundaries between the actual and digital worlds. Human potential is being enhanced through robotic autonomy. Finally, system integration influences how information technology is used[65].

Many of these technologies are established or have been in the process for a long time. However, these technologies are interacting and convergent in ways that are unparalleled in speed and scope. These crossings may result in the emergence of entirely new industries. As a result, these are referred to as Industrial Revolution technologies.

The industrial environment is given a new dimension by Industrial Revolution, enabling technologies and leading to a sharp rise in industrial productivity. In the traditional industrial system, the relationships between suppliers, manufacturers, machines and customers, as well as between people, are changing. The introduction of digital technology would result in complete integration and automation of the manufacturing systems, which would change the industrial environment.

The environment will become more cohesive as a result of the interactions that can take place between and within connected systems, allowing for self-configuration, failure prediction, and greater adaptability to changes. Figure 2.14 shows an overview of the Industrial Revolution related to the Manufacture of Basic Metals in Malaysia.[66]

[65]Ministry of International Trade and Industry (2018, October 31). Industry 4WRD, National Policy on Industry 4.0 Page 16.
[66]Ministry of International Trade and Industry (2018, October 31). Industry 4WRD, National Policy on Industry 4.0 Page 17.

Figure 2.14: Overview of the Industrial Revolution Related to the Manufacture of Basic Metals in Malaysia

Based on the research review, there are four (4) main pillars of the Industrial Revolution related to the Manufacture of Basic Metals in Malaysia: Autonomous robots, Big Data Analytics, System Integration and Simulation. Each element of the Industrial Revolution related to the manufacture of basic metals has been discussed in detail in Table 4.3 in Chapter 4.

New robot technology is having a major impact on manufacturing, especially in the basic metals industry. Robots are now more autonomous than ever owing to developments like machine vision, which enable them to undertake activities on their own that previously required human assistance or supervision. The industry could benefit significantly from allowing faster and less labour-intensive metal processing. With the ability to better handle persistent supply shortages, increased demand, and labour scarcity, these new developments may help transform the metals manufacturing business[67].

Big Data Analytics is advancing by making it possible to predict the demand for personalised items accurately. It can help producers generate customised products virtually as effectively as commodities sold at a larger scale by detecting changes in customer behaviour. Big Data Analytics also gives manufacturers the tools consumers need to identify points in the production process where they can successfully integrate custom processes using in-house resources. It can delay production to allow partners to customise before the manufacturing process is complete[68].

[67] IPF Online (2022, January 29). Will autonomous robots change metal manufacturing? Retrieved from https://www.ipfonline.com/news/detail/industrynews/willautonomousrobotschange-metal-manufacturing.
[68] Anblicks (2021, January June 1). How Big Data Analytics in Manufacturing Strengthens the Industry? Retrieved from https://www.anblicks.com/blog/how-big-data-analytics-in-manufacturing-strengthens-the-industry.

Through lines made by system integrators enable automated systems to converse with operators and one another more effectively. Many industries, especially manufacturing, implement system integration to achieve more efficient processes. Industrial control systems assist in automating production processes, and integration frequently connects these control systems by merging the responsibilities of each separate component, such as network security and software infrastructure[69].

In manufacturing, the simulation uses computer modelling to simulate test manufacturing practices, including production, assembly, inventory, and transportation operations. This technique drastically reduces the time and expenses associated with physically testing a manufacturing system. A manufacturing system's performance can be predicted using simulation software, which can also be used to compare fixes for any design issues that may arise. Because of this, firms can test various scenarios without having to invest in expensive tooling, reserve production space, or coordinate other time-consuming production resources[70].

[69] Indus labs (2020, July 23). Why is system integration important for your business? Retrieved from https://www.industlabs.com/news/2020/7/23/why-is-system-integration-important-for-your-busines.

[70] Siemens (2022, October 6). Manufacturing Simulation. Retrieved from https://www.plm.automation.siemens.com/global/en/our-story/glossary/manufacturing-simulation/27068.

2.10 Conclusion

The basic metals industry is an essential and critical component of Malaysia's manufacturing sector. The section, division, group, class and items for the Manufacture of Basic Metal have been defined and elaborated according to MSIC 2008, which also provides an overview of the basic metal sector. The value of the chain of Manufacture of Basic Metals was clearly and properly defined with support from MSIC 2008. The main key stakeholders, industry association, training centre and updated legislation, policy and initiatives have been determined specifically for the development of the manufacture of basic metals.

In the industry and market intelligence, the manufacturing industry's growth shows rapid GDP development at constant 2015 prices of about RM 337.2 billion, with support from the GDP of the basic metal industry (RM 8,314 million) in 2021. The increase in GDP of the basic metal industry enhanced the sales values up to RM 11,987 in Q2 2022. Overall, the intelligent market and industry in the manufacture of basic metals were improving and stabilized in the manufacturing sector to contribute towards the GDP of Malaysia in 2022 compared to previous years.

Malaysia's basic metal industry's rapid development is compared with other main developed countries. China and Indonesia are the countries that show significant and fast growth in the manufacturing of basic metals. The increment of development in the basic metal industry needs to be in line with the growth of technologies in future to sustain and enhance the industry’s performance. This chapter implements and elaborates on the Industrial Revolution of the basic metal industry in order to achieve this performance. The details of comparison with other countries and the relationship of the Industrial Revolution with the basic metal industry will be discussed in Chapter 4 with expertise Industry and survey questionnaire.

As concluded in this chapter, the information and data from the research review will be discussed in Chapter 3 for designing suitable and efficient methodologies and to achieve the main objective in Chapter 4 for rebuilding the occupational structure, identifying skills in demand, identifying critical job titles and job titles that relevant to Industrial Revolution pillars.

CHAPTER III

METHODOLOGY

3.1 Introduction

A combination of research methods, or multi methods, are utilised to better understand the current development of the Manufacture of Basic Metals industry in Malaysia. This combination ensures the data collection and findings are relevant to the research investigation. The quantitative approach is used to gain a deeper understanding of the conclusions drawn from the qualitative data. A crucial component of the process includes document analysis and Focus Group Discussions (FGD) with industry experts, which makes it easier to comprehend the important aspects that could influence the industry. The qualitative approach is considered a desirable method for describing the research results in real-world contexts[71]. As a result, semi-structured interviews appear to be a highly useful method for reflecting the realities of the research under consideration.

The design of this study relies on a semi-quantitative approach, and Focus Group Discussion (FGD) as a research methodology enables the deliberate selection of a panel of experts, where the respondents are professionals in domains connected to the basic metal industry. The design is based on systematic literacy highlighting, FGD, and in-depth interviews on each subject to satisfying the research's scope and objectives. Table 3.1 provides an overview of the research technique used to carry out the goals and parameters of the study. This study is conducted in seven phases (sequential). The next section discusses how each phase is put into practice.

[71]Miles M.B. & Huberman (1994). A.M. Qualitative Data Analysis 2nd Edition. SAGE publications.

Table 3.1 Research Techniques and Research Objectives Mapping

Objective	Information data	Method	Reference	Method Analysis
a) To develop an Occupational Structure (OS) in the basic metal industry based on MSIC 2008.	Primary	• Focus Group Discussion Session 1 (FGD 1). • Nominal Group Technique (NGT). • Expert view. • Specific Interview Protocol.	• Malaysian basic metal industry expert. • Confirmation by DSD. • Technical Category & Human Resource in Industry. • DOSM & SOCSO.	• Brainstorming session; • Evaluation and agreement among professionals in the basic metal industry; • Review and assessment in accordance with MSIC 2008; and • Review/Reference MOSQF.
b) To determine the skills in demand in the basic metal industry.	Primary	• Focus Group Discussion Session 2 (FGD 2). • Nominal Group Technique (NGT). • Expert view. • Specific Interview Protocol.	• Malaysian basic metal industry expert. • Confirmation by DSD. • Technical Category & Human Resource in Industry. • DOSM & SOCSO.	• Brainstorming session; • Evaluation and agreement among professionals in the basic metal industry; • Review and assessment in accordance with MSIC 2008; and • Review/Reference MOSQF.
c) To determine the job titles for the basic metal industry that is relevant to Industrial Revolution.	Primary	• Focus Group Discussion Session 2 (FGD 2). • Nominal Group Technique (NGT). • Specific Interview Protocol.	• Malaysian basic metal industry expert. • Confirmation by DSD. • DOSM & SOCSO.	• Brainstorming session; and • Evaluation and agreement among professionals in the basic metal industry.
	Primary	• Survey Questionnaires.	• Distribution to the Malaysian basic metal industry. • Technical Category & Human Resources and	• Analisa Face & Contents Validity; • Review Questionnaires Reliability (Pilot Test); and • SPSS (Cronbach Alpha).

Objective	Information data	Method	Reference	Method Analysis
			Above (Decision Making Group) in Industry.	
d) To determine the critical jobs in the basic metal industry.	Primary	• Survey Questionnaires. • Specific Interview Protocol.	• Distribution to the Malaysian basic metal industry. • Technical Category & Human Resources and Above (Decision Making Group) in Industry.	• Analysis (SPSS); Min & Median.
e) To determine Occupational Descriptions (OD) of the basic metal industry for critical jobs based on developed OS.	Primary	• Focus Group Discussion Session 2 (FGD 2). • Nominal Group Technique (NGT). • Expert view. • Specific Interview Protocol.	• Malaysian basic metal industry expert. • Confirmation by DSD. • Technical Category & Human Resource in Industry. • DOSM & SOCSO.	• Brainstorming session; • Evaluation and agreement among professionals in the basic metal industry; • Review and assessment in accordance with MSIC 2008; and • Review/Reference MOSQF.

Data gathering for the cross-sectional and quantitative methodologies relied primarily on surveys. The scale is developed to support the research industry. The questionnaires are directly administered to all the selected respondents in the Manufacture of the Basic Metals industry.

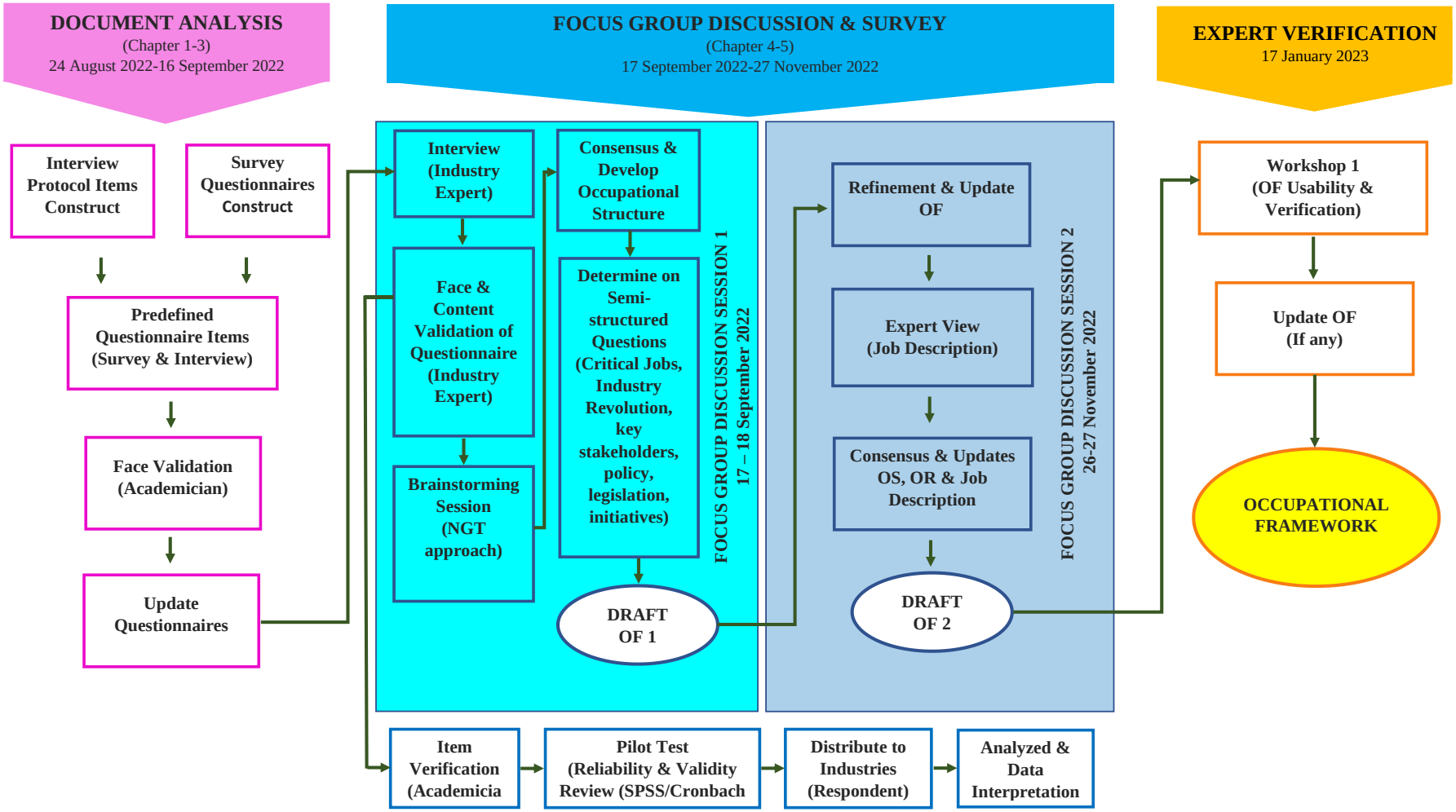

Figure 3.1: Research Framework of Manufacture of Basic Metals Industry

The structure of the research plan is clearly illustrated by the research framework, which also aids in the development of pertinent research questions. It usually serves as a guide for researchers to help narrow the scope of their research.[72] The research is divided into three phases, and each phase's output is an input to the next phase, as shown in Figure 3.1 above. Phase 1 is based on document analysis. Phase 2 is based on FGD session 1 and FGD session 2, which involves a face-to-face interview, brainstorming, pilot test, survey and data validation. In contrast, Phase 3 involves expert verification and feedback on the developed C24 OF. The further explanation for each phase is as follows:

Phase 1: Information Gathering consists of identifying the research problem through preliminary data gathering, which includes secondary data and a literature review. Then a broad problem area was defined. It also involved literacy highlights and digital benchmarking through bibliographic research, with components of adaptation and modification based on study objectives. The published data relevant to the basic metal industry from websites, archives, annual reports and journal publications were reviewed. The findings will be used to construct semi-structured questions for interview protocol items and predefined survey questionnaires

Phase 2: Expert View consists of the interview approach that takes the shape of a semi-structured questionnaire created in accordance with the research's goals. The researcher and co-researcher developed the interview approach. FGD was conducted where respondents come from basic metals industry experts and practitioners.

Phase 3: Expert Verification consists of verification and usability activity for OF for C24 through an industry & stakeholder engagement session by means of verifying and considering the usability of developed OF as a reference to the future resembling development activities.

[72] Akanbi, O. A., Amiri, I. S., & Fazeldehkordi, E. (2015). Research Methodology. A Machine-Learning Approach to Phishing Detection and Defense, 35–43

3.2 Research Approach

The four main methods of data collecting are chosen for the current research in the Manufacture of Basic Metals to be effectively utilised as follows:

a) Document Analysis;
b) Focus Group Discussion;
c) Survey; and
d) Expert Verification.

3.2.1 Document Analysis

This strategy calls for a thorough analysis of the body of research that responds to a specific question. The review thoroughly searches, identifies, collects, evaluates, and synthesis document research information from academic papers, trade journals, and other related journals. The information gathered using this method will address an overview of the industry pertinent to Industrial Revolution requirements and industrial needs, specifically the basic metal industry.

a) Data Collection Strategy

The main data or information used in the document analysis of this research consists of three sources which are the economic census, official reports and databases from relevant public and Private agencies and research articles and newspapers.

i) Economic Census

The data pertaining to Malaysia's labour markets or demand, including GDP, sales values, job employment, salaries and wages in the Manufacture of Basic Metals, are extremely pertinent to this research. Thus, the information from the Department of Statistics Malaysia (DOSM) – MSIC 2008 and Occupation categories at 1-digit MASCO, 12th Malaysia Plan (RMK-12), National Budget and Talent Corporation must be gathered, analysed and reported.

Information from the Economic Census serves three purposes:

- To provide a quick overview of the current and prospects of the basic metals industry.
- To serve updated data information by monthly and years as an indicator for the growth of the basic metal industry.
- To serve as baseline data and control figures for analysing information from the online survey.

ii) Official reports and databases from relevant public and Private agencies

Along with the Economic Census reports, data from other local and international government agencies pertinent to manufacturing basic metals will be acquired and analysed. According to preliminary research, the following databases have information that is pertinent to the sector:

- Local database – Department Skills Development (DSD), Ministry of International Trade and Industry (MITI) and Department of Statistics Malaysia (DOSM).
- International database – Organisation for Economic Co-operation and Development (OECD), World Development Indicator, World Steel Association and Innovation Transforming Industry.

Additionally, statistics and information from internet resources published by regional and global organisations were gathered as supportive information for the basic metal industry in Malaysia.

iii) Research articles and newspaper

The Research article and newspaper are the significant and relevant components in this research that gives the latest information for future prediction in the Manufacture of Basic Metal in Malaysia.

An article from a journal that reports on research is referred to as a research article. Primary sources are always journaled papers. The journal that publishes a research article determines whether or not peer review is required.[73] Furthermore, most of the research article is more specific and advanced due to reports by the R & D department, University and private agencies, which analyse in detail about the topic.

Other than research articles, the newspaper also can be relevant references. Most of the updated information from government departments and private agencies will be first published compared to other sources. The newspaper can extract information related to the basic metal industry from "The Star".

b) Data Analysis Procedure

The following data analysis steps are anticipated to be completed using the sources of data and information:

i) Analysing the economic performances of the industry by looking at several macroeconomic indicators (such as GDP and sales values).
ii) Analysing the industry prospect in relation to regional and global perspectives.
iii) Reviewing technological development in the industry (such as robotics & automation as well as the element of the Industrial Revolution that is relevant to the basic metal industry).

[73] University Library (2022, October 17). Retrieved from https://academicguides.waldenu.edu/library/evaluating/researcharticles.

3.2.2 Focus Group Discussion

A series of industry engagements based on focus group discussion (FGD) will be conducted to enable in-depth discussions on the issues relating to the industry workforce position. The FGD involves the discussion on the Occupational Structure (OS), Occupational Description (OD), skills in demand, jobs title, job title to relevant Industrial Revolution and critical job; accreditation and qualification based on industrial needs suitable to MOSQF framework, potential workforce challenges and strategic recommendations to be proposed.

In this research, the focus group will be combined with the Nominal Group Technique (NGT), potentially offering more benefits than a focus group alone. NGT is a group performance method wherein a face-to-face group session is prefaced by a nominal-group phase during which individuals work alone to generate ideas[74]. Furthermore, NGT combines qualitative and quantitative data collection in a group setting and avoids problems of group dynamics associated with other group methods such as brainstorming, Delphi and focus groups[75]. Using a combination approach with NGT provide questions for further exploration, initial data analysis and increased ownership of the process by practitioners. Furthermore, NGT can minimise blocking and loafing by reducing interdependence among members; it achieves this by starting with a nominal group phase before turning into a group session.

According to Tobias O. Nyumba, the ideal number of FGD participants are between 8 - 15 experts with consistent experience in their respective fields.[76] The researcher will lead the FGD in order to encourage conversation among the panels while also managing the conversation. The researcher needs to create occupational standards in accordance with the predetermined criteria. In contrast, the industry experts need to work for a firm registered with *Suruhanjaya Syarikat Malaysia* (SSM) and have at least five years of industry experience.

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[74]Varga-Atkins. M et al. (2011). The Nominal Group Technique a practical guide for facilitators.
[75] Gruppendynamik (2003). Organizational development as a topic in adult education and supervision curricular.
[76]Tobias. O. Nyumba et.al (2018). The Use of FGD Methodology: Insights from Two Decades of Application in Conversion; Methods Ecology & Evolution; British Ecological Society; wileyonlinelibrary.com/journal/mee3.

The semi-structured questions developed by the researcher and co-researcher will validate in FGD based on OS, OD, skills in demand, job titles, critical jobs, and other related issues.

Five main semi-structured questions are constructed as follows:

1. What will be the industry Occupational Structure (OS) looks like?
2. How to determine the skills in demand for the basic metals industry?
3. How to determine the job title for the basic metals industry relevant to Industrial Revolution?
4. How to determine the critical jobs for the basic metals industry?
5. What will be the Occupational Descriptions (OD) for each job title?

a) Data Collection Strategy

In the process of gathering the input, the Nominal Group Technique (NGT) with the combination of the focus group is applied. There are three (3) common steps used in NGT, which are individual response, clarification & consolidation and ranking responses[77]. In step 1, each respondent trades ideas in a round-robin format; each respondent states a concept, which is assigned an identifying letter and written beneath the issue statement, after which the next person adds his or her input. Secondly, each issue is discussed by the group, with the main emphasis being on clarification. Finally, the respondent ranks the top five solutions, noting their selections on index cards. The group is then informed of the results once the researcher has collected all the cards and averaged the ranks.

During the FGD process, the round-robin brainstorming technique is adopted and attended by development panel members who discuss the different areas and sub-sectors. By round robin's brainstorming, it can generate ideas in a more structured way, allowing everyone to use their ideas. The development panel members are also informed of any facts gleaned from the document analysis. The information gathered is subsequently incorporated into the relevant sub-Occupational sector's Framework (OF). During the development of OF

[77]Donelson R. F. (2010). Group Dynamics 5th Edition. Belmont, CA: Wadsworth Cengage Learning.

on Manufacture of Basic Metals industry, workshops and face-to-face interviews in group discussion are held in FGD session 1, as shown in Figure 3.2. The list of development panels involved in FGD session 1 is in Table 3.2.

More than that, to confirm the OS, OD, job critical and conclusions of OF documents, follow-up conversations with the expert industry are conducted in FGD session 2, as shown in Figure 3.3. Table 3.3 shows a list of development panels involved in FGD 2.

Table 3.2: List of Development Panel during FGD 1

NO	NAME	POSITION	ORGANISATION/COMPANY	AREA OF EXPERTISE
1	Lee Hooi Lan	Senior Manager	MALAYSIA STEEL INSTITUTE	241
2	Goh Yee Pheng	Personnel Section Executive	CSC STEEL SDN. BHD.	241, 243
3	Tan Sook Eng	Personnel Section Executive	CSC STEEL SDN. BHD.	241, 243
4	Lai Fei Sin	Head Of Supply Chain	MYCRON STEEL CRC SDN BHD	241
5	Mohd Hisyam Bin Mohamed	Assistant Manager Production	MYCRON STEEL CRC SDN BHD	241
6	Tengku Ahmad Zulkifli Bin Tengku Sulaiman	Managing Director	DUTA EDGE SDN BHD	241
7	Mohd Iskandar Itam	Senior Designer	INGRESS KATAYAMA TECHNICAL CENTRE SDN BHD	241, 242
8	Zulpakhar Bin Arshad	Assistant Manager	INGRESS KATAYAMA TECHNICAL CENTRE SDN BHD	241, 242
9	Chew Bee Ling	General Manager	ANN JOO RESOURCES BERHAD	241
10	Lin Wai Hoong	Manager	KIAN JOO CAN FACTORY BERHAD	241, 243
11	Khairul Nizam	Manager	ALUMINIUM COMPANY OF MALAYSIA BERHAD (ALCOM)	242
12	Raihan Ashikin Binti. Mohd Nor	Data Management Analyst	PERKESO	-
13	Dr Amin Safwan Alikasturi	Researcher	PFH RESOURCES(M) SDN BHD	-
14	Muhammad Hilman Bin Abdul Mustapa	Assistant Researcher	PFH RESOURCES(M) SDN BHD	-

Figure 3.2: Focus Group Discussions Session 1

Table 3.3: List of Development Panel during FGD 2

NO	NAME	POSITION	ORGANISATION/COMPANY	AREA OF EXPERTISE
1	Lee Hooi Lan	Senior Manager	MALAYSIA STEEL INSTITUTE	241
2	Hj. Ir Sabrudin Suren	Senior Manager	AMSTEEL MILLS SDN. BHD.	241, 243
3	Siti Zahayu Ahmad Zam Zam	Human Resource Manager	MYCRON STEEL CRC SDN BHD	241
4	Mohd Hisyam B. Mohamed	Assistant Manager Production	MYCRON STEEL CRC SDN BHD	241
5	Tengku Ahmad Zulkifli Bin Tengku Sulaiman	Managing Director	DUTA EDGE SDN BHD	241
6	Mohd Iskandar Itam	Senior Designer	INGRESS KATAYAMA TECHNICAL CENTRE SDN BHD	241, 242
7	Rosli Bin Yaakob	Manager	LION STEEL SDN BHD	241, 243
8	Zaidin Mat Hussin	Section Head Steel Making Plant Refractory and Slide Gate Production	LION STEEL SDN BHD	241, 243
9	Lin Wai Hoong	Manager	KIAN JOO CAN FACTORY BERHAD	241, 243
10	Suria Azlin Binti Kasim	Senior Assistant Director	DOSM	-
11	Mohd Arif Bin Aziz	Administrative Officer	PERKESO	-
12	Dr Amin Safwan Alikasturi	Researcher	PFH RESOURCES(M) SDN BHD	-

Figure 3.3: Focus Group Discussions Session 2

b) Data Analysis Procedure

The following analyses are expected to be carried out during FGD session 1 and FGD session 2:

Session 1: Focus group discussion:

i) Determine the area, job titles, critical job titles and job titles relevant to the Industrial Revolution in the Occupational Structure (OS) of the manufacture of the basic metals industry.
ii) Review and validate the questionnaire by the industry expert that the researcher and co-researcher developed.

Session 2: Focus group discussion:

i) Review the obtained OS, job title, job title relevant to Industrial Revolution and critical job title from FGD session 1.
ii) Determine the Occupational Responsibilities (OR), Occupational Description (OD), skills in demand and Industrial Revolution pillar for the manufacture of the basic metals industry.
iii) Highlight any important sub-sectors, including the current problem situation of the basic metal industry in Malaysia.

3.2.3 Survey

This research will also employ an online survey to achieve the five (5) key critical information, which are industrial qualifications, occupational qualifications, skills in demand, Industrial Revolution pillar and related issues. Google Forms will be used as a platform for the online survey. The survey will specifically be distributed to the related organisation base on the organisational level.

Section 1: Industrial Qualifications

This section explores the details in the classification of the basic metal industry in the core, critical jobs, job demand, and shortage of employees and competition in the future.

Section 2: **Occupational Qualifications**

This section explores the occupational qualification for each competency description listed in the industry.

Section 3: Skills in Demand

This section explores the skills that are required by the industry. Another objective of this section is to figure out the skills gap and how to overcome the gap.

Section 4: Industrial Revolution

This section determines the readiness of industry players and workers at the advent of the Industrial Revolution. The technological drives or pillars of the Industrial Revolution are listed, and the respondents must decide the relevancy of each element in their line of duty.

Section 5: Related Issues

This section explores the common issues surrounding the industry. The respondents are asked to suggest ways of overcoming those issues.

a) Establishment and sampling procedure

The establishment of this research consists of the Manufacture of Basic Metals in Malaysia. According to Economic Census 2016, there are 1,557 companies established, which come from group 241 (Manufacture of Basic Iron and Steel, 798 companies), group 242 (Manufacture of basic precious and other non-ferrous, 421 companies)[78] and group 243 (Casting of Metals, 338 companies)[79] in Malaysia as shown in Table 3.5. This data represents the total establishment for the Manufacture of Basic Metals in this research.

[78]Department of Statistics, Malaysia. (2017, July). Manufacturing, Economic Census 2016. Page 67.
[79]Department of Statistics, Malaysia. (2017, July). Manufacturing, Economic Census 2016 Page 68.

This research should be in tally with the research objectives, problem statements, and research questions. This research used companies as a unit of analysis, and the respondents will be owners/managers of the companies in Malaysia. Owner/managers are chosen because they are usually involved in the day-to-day running of the businesses. Therefore they are in a better position to provide the needed, available, and accurate information about their companies.

In this research, probability random sampling will be used. Due to the necessity to generalize the results of this research, the probability sampling strategy is chosen over non-probability sampling. Additionally, this sampling strategy is best suited for this research because every part of the sampled establishment will have an equal chance of being chosen. The sample will be chosen using a simple random sampling method. With this sampling strategy, the researcher needs a list of every sample establishment in order to gain access to any potential sample. Being simple poses the least bias and offers the most generalisability; thus, it is the best single way to obtain a representative sample[80].

In social science research, Krejcie and Morgan's approach is frequently used to determine the sample size. It presents a formula for calculating the sample size depending on the population's size and the required level of precision, as shown in Table 3.4. The formula considers the population's variability and the required degree of assurance in the findings[81].

Based on 1,557 companies established in the basic metal industry, about 260, 205 and 181 respondents are the sample size as referred to Krejcie and Morgan's approach representing the establishment of each group in this research. According to Krejcie and Morgan's methodology, the number of actual respondents from the survey for each group is insufficient. However, according to Roscoe (1975), which implies that a sample size greater than 30 but less than 500 is appropriate for most behavioural studies, will be used as a reference for targeted respondents for this study. Therefore, each group's target number of

[80]Sekaran, U, (2004). Research Methods for Business: A Skill Building Approach. 4th edition. New York: John Wiley and Sons.

[81] Krejcie, R. v., & Morgan, D. W. (1970). Determining Sample Size for Research Activities. *Educational and Psychological Measurement*, *30*(3), 607–610.

responses should be higher than 30. Based on Table 3.5, the number of actual respondents for each group revealed by the survey is greater than the number of target respondents for groups 241 and 242, except for group 243, which fell short. The majority of respondents from background casting of metals also involve in groups 241 and 242, which accounts for the low number of respondents in group 243.

Table 3.4: Sampling Size

(Source: Krejcie & Morgan, 1970)

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—*N* is population size. *S* is sample size.

Source: Krejcie & Morgan, 1970

Table 3.5: Number of Targeted Respondents According to MSIC 2008

MSIC SECTION	C	MANUFACTURING	TOTAL NUMBER OF ESTABLISHMENT	NUMBER OF SAMPLES DISTRIBUTED	NUMBER OF TARGET RESPONDENTS	NUMBER OF ACTUAL RESPONDENTS
MSIC DIVISION	**24**	Manufacture of Basic Metals				
MSIC GROUP	**241**	Manufacture of basic iron and steel	**1557**	**798**	**260**	**30**	**58**
	242	Manufacture of basic precious and other non-ferrous metals		**421**	**205**	**30**	**33**
	243	Casting of metals		**338**	**181**	**30**	**20**

b) Questionnaire design

For this research, the questionnaires are designed earlier by the researcher. They will validate and recommend by two selected experts and all experts basic metals industry from FGD which are based on the three crucial pieces of information: skills in demand, Industrial Revolution and related issues. The questionnaire comprises closed-ended questions with interval scales that are appropriate for the instrument to boost response rates and ensure response consistency.

c) Measure and Instrumentation

Before employing a survey questionnaire, it is essential to establish its validity and reliability because doing so can help to ensure that the results are accurate and raise the credibility of the research findings.

The two validity tests that are most typically utilised are content validity and construct validity. Content validity or face validity is the extent to which the required constructs are reflected in the measurement and the extent to which other people believe the measurement makes sense or corresponds to the stated notion.[82]

Construct validity is the degree to which a scale accurately measures what it is intended to measure. Factor analysis can be used to determine the construct validity.[83] Factor analysis helps to reduce the number of variables into a significant, interpretable and controllable set of factors.[84]

[82]Pallant, J. (2007). SPSS survival manual—A step by step guide to data analysis using SPSS for windows (3rd ed.). Maidenhead: Open University Press.
[83]Hair, J.F., Black, W.C., Babin, B.J., & Anderson, R.E. (2010). Multivariate Data Analysis. Seventh Edition. Prentice Hall, Upper Saddle River, New Jersey.
[84]Cavana, R., Delahaye, B., & Sekaran, U. (2001). Applied Business Research: Qualitative and Quantitative Methods (3rd ed.). Australia: John Wiley & Sons.

The questionnaire is divided into five sections, namely: Section 1, Section 2, Section 3, Section 4 and Section 5.

Section 1 discusses the industrial classification that is composed of the industrial core, the jobs in demand and industry competition in the future that is difficult to fill in the basic metals industry.

Section 2 discusses the occupational qualifications that compose critical academic qualifications and technical & vocational critical qualifications in the basic metals industry.

Section 3 discusses the skills in demand measured using a four-interval scale from numbers of 4 (Highly Required), 3 (Required), 2 (Less Required) and 1 (Not Required), measuring the intensity of skills in demand against supply or labour.

Section 4 discusses the Industrial Revolution, which refers to the 11 technological pillars of the Industrial Revolution that composed the effect of the Industrial Revolution on the basic metal industry.

Section 5 discusses related issues regarding the basic metal industry and a four-interval scale ranging from 4 (Strongly Agree), 3 (Agree), 2 (Disagree) and 1 (Strongly disagree) measuring the key issues in the Manufacture of Basic Metals industry.

d) Data Collection Strategy

The consultation with related organisations decided that a nationally representative survey would not be feasible. Our research seeks to boost industry participation rates rather than aiming for a nationally representative sample.

The methods for data collection are by approaching the members of the relevant associations. The questionnaire will be distributed by the secretariat of each association, as agreed. Industrial engagements and meeting online are done to enlist their support in distributing the online survey to the members of the relevant associations.

e) Data Analysis

The survey questionnaire data were analysed for reliability, and revision of the constructed instrument can also be obtained by analytical testing. This value not only contributes to the level of reliability but also helps to give the researcher confidence in the instrument provided in the research.

3.2.4 Expert Verification

Expert verification is the final phase for this OF development to verify and test its usability to the stakeholders. An engagement session was conducted on 17th January 2023 at Hotel Bangi Resort with the invited industry experts and stakeholders, as shown in Figure 3.4. The recommendations and input from experts and stakeholders were recorded due to this activity. Then the OF documents were edited for final verification before being distributed to prospective users. The panels and event information list are shown below in Table 3.6.

Table 3.6: List of Development Panel during Industrial Engagement

BIL	NAME	POSITION	ORGANISATION/COMPANY
1	Lee Hooi Lan	General Manager	MALAYSIA STEEL INSTITUTE
2	Hj. Ir Sabrudin Suren	Senior Manager	AMSTEEL MILLS SDN. BHD.
3	Tengku Ahmad Zulkifli Bin Tengku Sulaiman	Managing Director	DUTA EDGE SDN BHD
4	Tengku Ahmad Zaki Bin Tengku Ahmad Zulkifli	Manager	DUTA EDGE SDN BHD
5	Mohd Iskandar Itam	Senior Designer	INGRESS KATAYAMA TECHNICAL CENTRE SDN BHD
6	Chew Bee Ling	General Manager	ANN JOO RESOURCES BERHAD
7	Zaidin Mat Hussin	Section Head Steel Making Plant Refractory and Slide Gate Production	LION STEEL SDN BHD

Figure 3.4: Industrial Engagement

3.3 Conclusion

The justification for each chosen research methodology will be covered in this section. The research approaches chosen include document analysis, focus group discussion, surveys and questionnaires.

Document analysis is chosen as a data collection method because it is efficient and effective. After all, documents are practical and controllable resources. Documents are ordinary and available in several formats, making them a very accessible and trustworthy source of information. Getting and analysing documents is often much less expensive and time-consuming than performing research and experiments. Document analysis is a suitable method for this research because this research requires more additional data, such as current statistics for the associated industry and the industry’s expansion.

Additionally, focus group discussion using the nominal group technique is deployed in this research due to free and open conversation among respondents, which leads to the development of fresh ideas that may be very helpful for making decisions. It is a quick approach to finding out what jobs title are available in the related industry. This strategy is a quick and efficient technique to collect data from several sources.

Finally, since surveys and questionnaires can be completed in private or anonymously, they may be more useful for gathering sensitive information or for obtaining statistical information on the opinions of most of a specific set of people. The results will be more useful if the questionnaire is shorter, more precise, and more targeted in terms of the respondents.

In particular, data from FGDs, surveys, and questionnaires from each respondent will be discussed in Chapter 4, together with all other outcomes obtained from the method's use. The conclusions about the current state of the Malaysian manufacture of the basic metal industry's development and employment will be more thoroughly explained and documented in the following chapter.

CHAPTER IV

FINDINGS

4.1 Introduction

This chapter discusses the outcome of the research. The study's objectives were to produce an OS from document analysis, survey, and Focus Group Discussions (FGD); to identify the critical jobs for the basic metals industry, to identify the skills in demand, and the job titles related to the Industrial Revolution and to determine the job responsibilities of each job title from the OS.

4.2 Findings Analysis

This section analyses data from focus groups and surveys done for this study. The findings analysis for the manufacture of basic metals industry comprises jobs in demand, skills in demand, Industrial Revolution, and related issues for the Manufacture of Basic Metal Industry.

4.2.1 FGD and Survey Findings

The research's conclusions came from document analysis, survey questionnaires, and FGD with industry representatives present during workshop sessions where the OS and Occupational Description (OD) are produced. The discussions have also identified the jobs in demand, skills in demand, Related Industrial Revolution pillar and related issues for the Manufacture of Basic Metals industry.

4.2.2 Jobs in Demand

Jobs in demand are occupations that are desired by industry establishments. Various variables influence the demand, including a lack of supply, a need for particular skills or qualifications, and changes in governmental policies and programmes. Jobs in demand were identified from the job areas during the FGD and are presented in Table 4.1.

Table 4.1: Jobs in Demand from Job Area in Basic Metal Industry

No.	Group	Job Area	Factor Contributing to The Demand	Job in Demand
1.	Manufacture of Basic Iron and Steel	Production of Iron and Steel Products	a) Cost-effectiveness & productivity to compete with foreign companies/overseas. b) Product quality acceptance and consistency. c) Global supply & demand increase. d) High employees turnover e) Shortage of skilled personnel in the basic metal industry.	a) Iron/Steel Making Manager b) Iron/Steel Making Engineer/ Executive c) Iron/Steel Making Supervisor d) Technician e) Operator
		Manufacture of Hot and Cold Work	a) Cost-effectiveness & productivity to compete with foreign companies/overseas. b) Product quality acceptance and consistency. c) Global supply & demand increase. d) High employee turnover. e) Shortage of skilled personnel in the basic metal industry.	a) Rolling Manager b) Rolling Engineer/ Executive c) Rolling Supervisor d) Rolling Technician e) Operator
		Manufacture of Steel Tube and Fitting	a) Efficient utilization of material and labour. b) Increase material	a) Plant Manager. b) Plant Engineer/ Executive.

No.	Group	Job Area	Factor Contributing to The Demand	Job in Demand
			productivity. c) Production cost control. d) Quality improvement and control. e) Market demand. f) Machine new technology. g) Operational Cost saving. h) New product development. i) High employee turnover. j) Lack of competent personnel. a) High salary expectation.	c) Plant Supervisor d) Technician. e) Operator
		Manufacture of Other Basic Iron and Steel Products	a) Cost-effectiveness & productivity to compete with foreign companies/overseas. b) Product quality acceptance and consistency. c) Global supply & demand increase. d) High employee turnover. e) Shortage of skilled personnel in the basic metal industry.	a) Plant Manager. b) Plant Engineer/ Executive. c) Supervisor. d) Technician. e) Operator.
2.	Manufacture of Basic Precious and Other Non-Ferrous Metals	Tin Smelting	a) Cost-effectiveness & productivity to compete with foreign companies/overseas. b) Product quality acceptance and consistency. c) High employee turnover. d) Shortage of skilled personnel in the basic metal industry.	a) Process Engineer/Executive b) Supervisor c) Technician d) Operator

No.	Group	Job Area	Factor Contributing to The Demand	Job in Demand
		Production of Aluminium from Alumina	a) Cost-effectiveness & productivity to compete with foreign companies/overseas. b) Product quality acceptance and consistency. c) Global supply & demand increase. d) High employee turnover. e) Shortage of skilled personnel in the basic metal industry.	a) Process Engineer/Executive b) Hot Rolling Supervisor c) Hot Rolling Technician d) Hot Rolling Operator
		Manufacturing of Basic Precious and other Non-Ferrous Metals	a) Product quality acceptance and consistency. b) Shortage of skilled personnel in the basic precious and other non-ferrous metals.	a) Process Engineer/ Executive b) Operator
3.	Casting of Metals	Casting of Iron	a) Product quality acceptance and consistency. b) High employee turnover. c) Shortage of skilled personnel in the basic metal industry. d) Cost-effectiveness & productivity.	a) Foundry Engineer/ Executive b) Technician c) Operator
		Casting of steel	a) Product quality acceptance and consistency. b) High employee turnover. c) Shortage of skilled personnel in the basic metal industry. d) Cost-effectiveness & productivity.	a) Foundry Engineer/ Executive b) Technician c) Foundryman d) Operator
		Casting of Non-Ferrous Metal	a) Product quality acceptance and consistency.	a) Foundry Process Engineer b) Supervisor

No.	Group	Job Area	Factor Contributing to The Demand	Job in Demand
			b) Shortage of skilled personnel in the non-ferrous metal industry.	

Table 4.1 shows that each group of Manufacture of Basic Metals consists of jobs in demand that have been decided by panel expertise from the FGD session. By referring to each job area, the factor contributing to the demand has been listed. All the job in demand from each job area was used in the questionnaire survey. According to survey respondents, the majority of respondents chose technician job titles as a job in demand. This survey can be shown in Figure 4.1, where 81 respondents chose Hot Rolling Technician as the job title, which is high in demand, followed by the technician and rolling technician with 70 and 69 respondents.

Additionally, operator job titles also recorded a high selection, with 58 and 51 respondents choosing Hot Rolling Operator and Operator as a job in demand for the manufacture of basic metals. Furthermore, the manager-level positions with the lowest vote totals for job titles were the Iron/Steel Making Manager (8 respondents), Rolling Manager, and Plant Engineer/Executive (14 respondents). As a result, it can be stated that the highest job in demand in the basic metal industry refers to the technician level, with the majority of respondents in the survey selecting the job title from the technician background as high in demand.

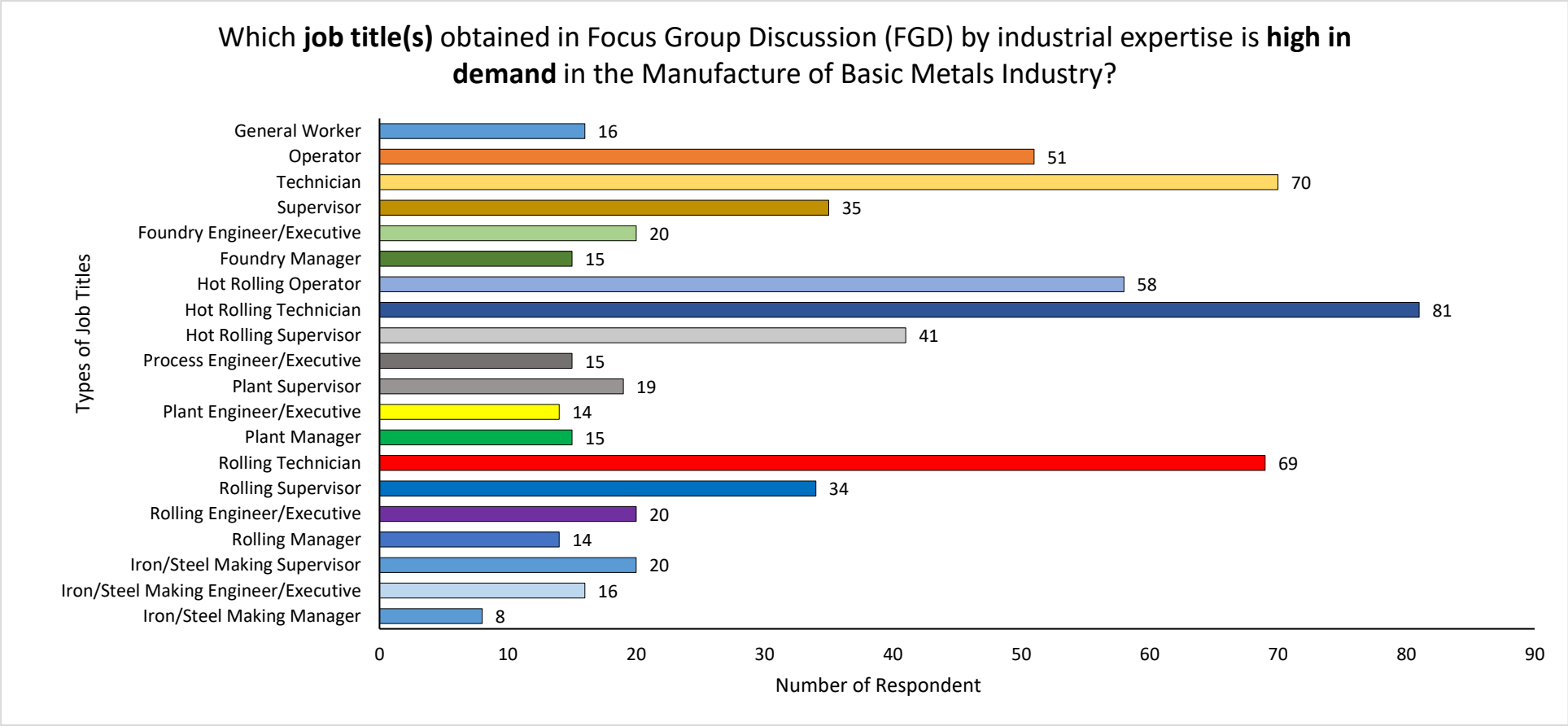

Figure 4.1: Job in Demand for Manufacture of Basic Metals

4.2.3 Skills in Demand

In addition to employees' talents, the existing workforce needs additional training courses and schemes in management, supervision, and social skills. Based on FGD, Table 4.2 lists the skills in demand based on job classification (Executive & Above, Supervisors & Technicians, Operators) in the manufacturing of basic metals. A survey was conducted to confirm the FGD findings, and the results are shown in Figure. 4.2-4.4.

Table 4.2: Skills in Demand in Basic Metal Industry from FGD based on job classification

No.	JOB CLASSIFICATION	SKILLS IN DEMAND	IMPROVEMENT RECOMMENDATION
1	Executive & Above (Levels 5 & 6)	a) Basic metal manufacturing knowledge. b) Product costing skills. c) Raw material handling. d) Basic Operation & Maintenance. e) Production operation/process. f) Basic Quality assurance. g) General attitude towards work (commitment, resourcefulness, teamwork, etc.). h) Competent in IT literacy. i) Technology skills. j) Troubleshooting /problem-solving skills. k) Communication & Interpersonal skills. l) Strong technical aptitude (natural ability) / manual dexterity (hands-on). m) Competent in using electronic or mechanical devices and tools. n) Specialized technical skills.	i) Training in relevant or comparable fields, i.e., latest Information & Technology and Management Systems. ii) Review of training curriculum at training facilities/providers. iii) Form a partnership with industry players to provide facilities and exposure to current technologies. iv) Invite industry players to collaborate on joint programme implementation. v) Review employment policies (Enhance skill workers incentives).

No.	JOB CLASSIFICATION	SKILLS IN DEMAND	IMPROVEMENT RECOMMENDATION
2	Supervisors & Technicians (Levels 3 & 4)	a) Basic metal manufacturing knowledge. b) Strong technical aptitude. c) Raw material & handling. d) Competent in Information Technology (IT) literacy. e) Production operation/process. f) Troubleshooting/problem solving skills. g) Basic Quality assurance. h) General attitude towards work (commitment, resourcefulness, teamwork, etc.)	i) Training in relevant or comparable fields, i.e., latest Information & Technology and Quality Assurance & Quality Control ii) Join any improvement/education programmes. iii) Implement daily team meetings. iv) Communication and Engagement with operators and technicians. v) Upgrade Supervisor qualifications.
3	Operators (Levels 1 & 2)	a) Basic metal manufacturing knowledge. b) Raw material & handling. c) Basic Operation & Maintenance. d) Strong Technical aptitude. e) Communication & interpersonal skills. f) General attitude towards work.	i) Training in relevant or comparable fields, i.e., latest knowledge of basic metal manufacturing process. ii) Formal mentoring or coaching program. iii) Join any improvement/education programmes.

Based on survey data, the data was divided into three categories: Executive & Above, Supervisor & Technician, and Operator, as shown in Figure 4.2-4.4. According to Figure 4.2, respondents identified the top 3 selected high skills in demand for Executives & Above is product costing skills, with 70 respondents as the most important skills for Executives & Above, followed by production operation/process (68 respondents) and strong technical aptitude with the 66 of respondents. The high votes for skills that are not required in the basic metal industry for Executive & Above parts are raw material handling (10 respondents), competent in using electronic or mechanical devices and tools (9 respondents), followed by technology skills (8 respondents).

More than that, as skills in demand for supervisor & technician parts, respondents have chosen competent in Information Technology (IT) literacy (66 respondents) as a highly required skill, followed by strong technical aptitude (58 respondents), troubleshooting/problem-solving skills and general attitude towards work and basic quality assurance with the same number of respondents (55 respondent). Raw material handling and competence in utilising electrical or mechanical equipment and tools are the highest chosen skills that are not necessary for supervisors and technicians in the basic metal sector, with 9 and 7 respondents, respectively.

As skills in demand for operators, basic metal manufacturing knowledge is chosen as a highly required skill in demand with 61 respondents, followed by strong technical aptitude (49 respondents), basic operation & maintenance (48 respondents), communication and interpersonal skills (42 respondent) and general attitude towards work (41 respondent). However, 63 and 36 respondents strongly disagree that product costing skills and raw material handling are not required for basic metal industry operators.

As an outcome, the skills in demand mentioned by the panel of experts in the FGD session as being in demand in the basic metal industry are consistent with the results from survey respondents according to each job classification. The most in-demand talent for executives and above is related to product costing skills, while Information Technology (IT) literacy is crucial for supervisor and technician roles. For operator roles, basic metal manufacturing knowledge is needed at that level.

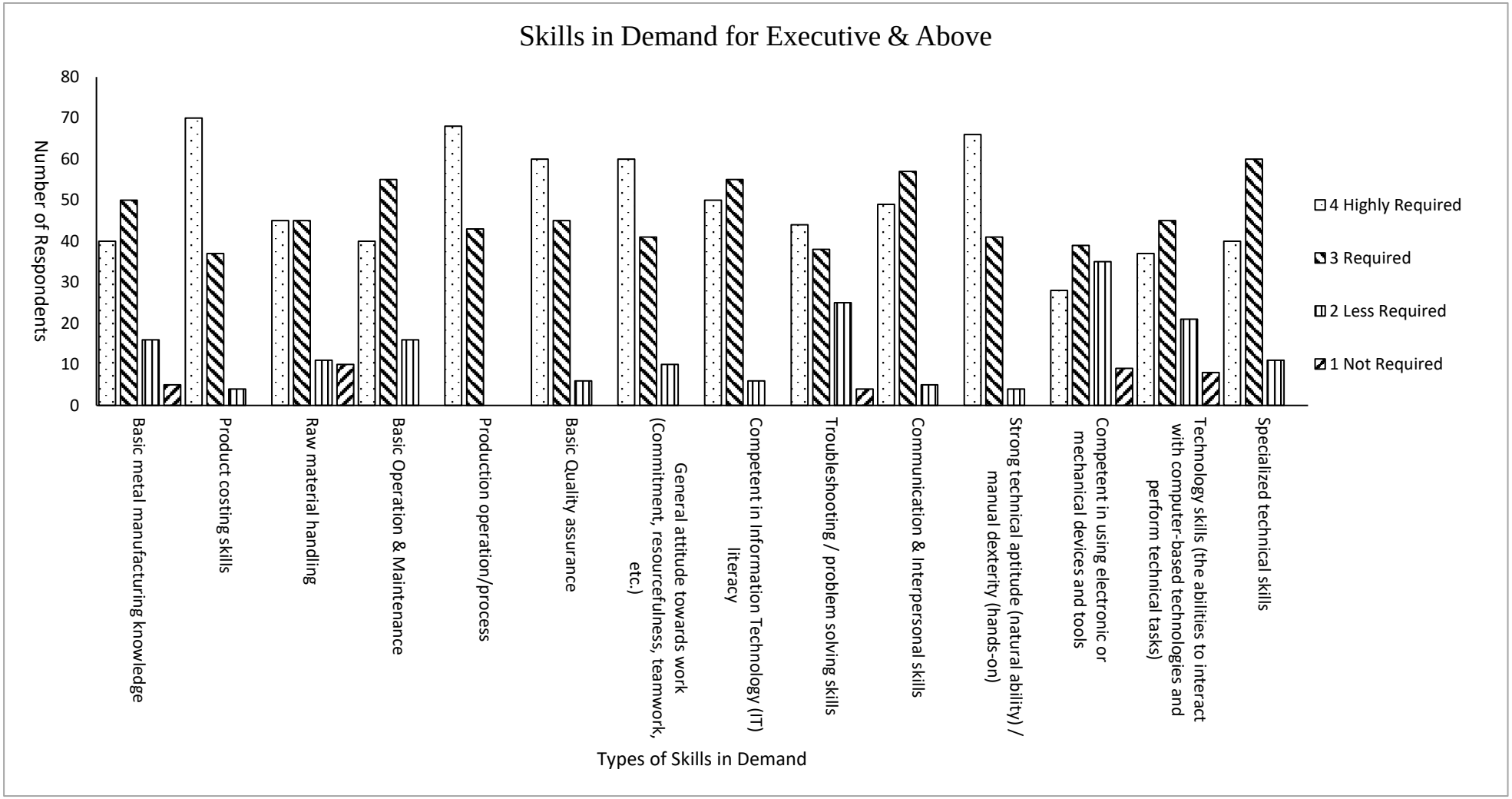

Figure 4.2: Skills in Demand for Executive & Above

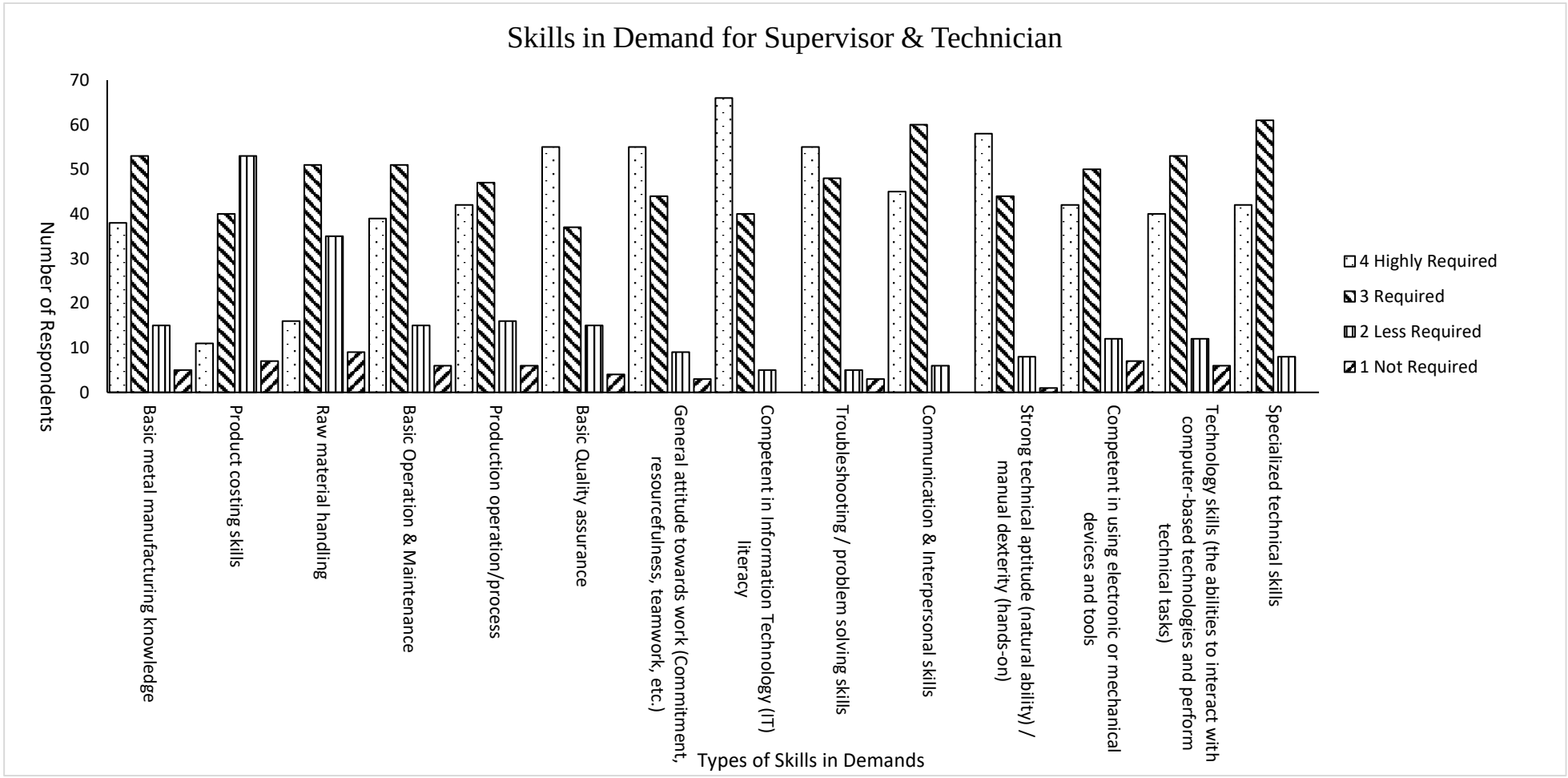

Figure 4.3: Skills in Demand for Supervisor & Technician

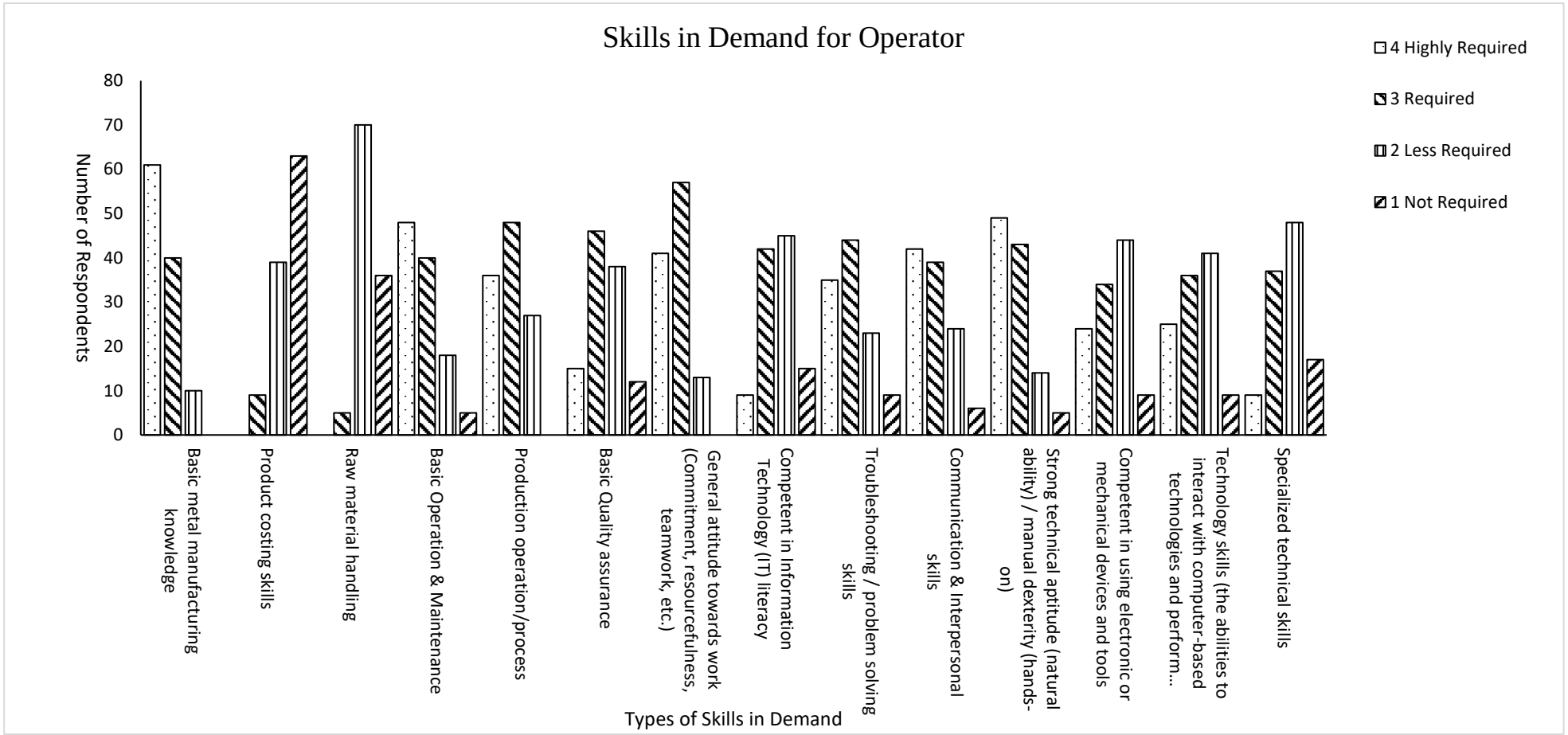

Figure 4.4: Skills in Demand for Operator

4.2.4 Industrial Revolution Pillar Related to the Manufacture of Basic Metals

The Industrial Revolution is expected to be crucial in the manufacturing sector soon due to recent developments, trends, and research studies. According to the FGD, Table 4.3 lists the Industrial Revolution on job areas and job titles related to the manufacture of basic metals industry.

Table 4.3: Industrial Revolution Related to Basic Metal Industry

No.	Industrial Revolution Pillar	Job Areas	Job Titles Related to Industrial Revolution Pillar	Reason for Required Industrial Revolution
1	a) Autonomous Robot. b) Big Data Analytics.	Manufacture of Other Basic Iron and Steel Products	Plant Manager	a) To boost the production of metal products b) To reduce operational costs. c) To boost effectiveness in the production process. d) To minimize human error for massive production. e) High consistency of finished products.
	a) Autonomous Robot. b) Big Data Analytics. c) Simulation. d) System Integration.		Plant Engineer/ Executive	a) To boost the production of metal products b) To reduce operational costs. c) To boost effectiveness in the production process. d) To minimize human error for massive production. e) High consistency of finished products. f) For fast decision-making via computerise algorithms: i) For digitalisation/digitisation, a system powered by artificial intelligence and

No.	Industrial Revolution Pillar	Job Areas	Job Titles Related to Industrial Revolution Pillar	Reason for Required Industrial Revolution
				analytics self-diagnoses to understand its optimization requirements. ii) Every single piece of data across the value chain is visualised and visible.

Based on FGD findings, as shown in Table 4.3, the Plant Manager and Plant Engineer/Executive from the Manufacture of Other Basic Iron and Steel Products area are two (2) job titles currently related to the Industrial Revolution and four (4) main pillars of Autonomous Robot, Big Data Analytics, Simulation and System Integration are Industrial Revolution related to the manufacture of the basic metals industry.

As for survey findings on Industrial Revolution in the basic metal industry shown in Figure 4.5, the results are separated into two parts which are upstream and midstream. As for upstream, system integration is highly selected with 80 respondents as the Industrial Revolution that most affected the upstream part, while for midstream, simulation is selected with 90 respondents as the Industrial Revolution that most affected the midstream part for the manufacture of basic metals. The lowest for upstream and midstream in this basic metal industry, respondents agreed on augmented reality with less than 32 respondents.

In addition, the findings from the survey show that for the Industrial Revolution's upstream and midstream in the basic metal industry, the respondent's top selected were also system integration, simulation, big data analytics, and autonomous robot. These findings indicate that the expert panel's recommendation during FGD aligns with the findings produced by the 111 respondents.

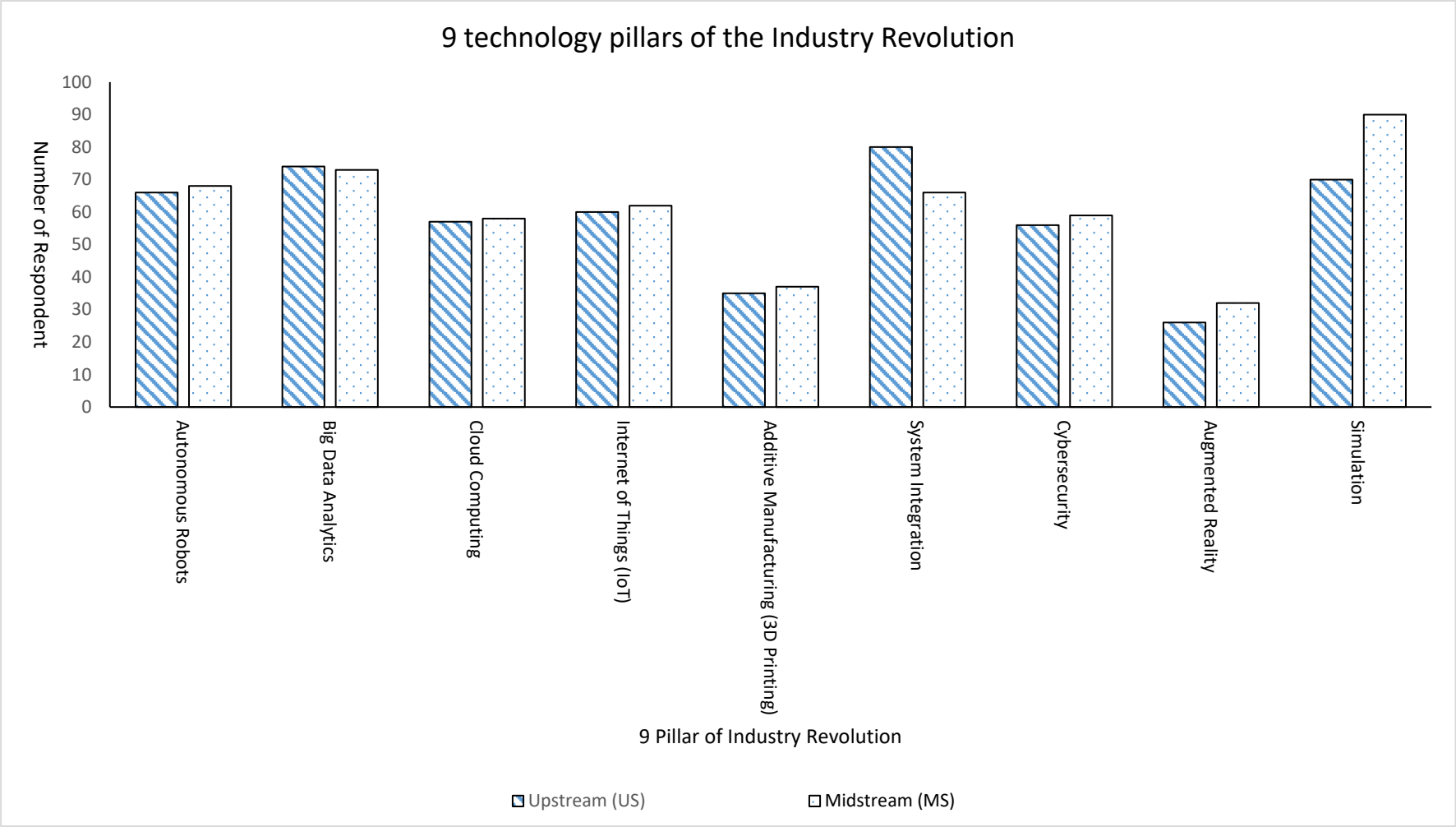

Figure 4.5: Industries that were affected by Industrial Revolution

4.2.5 Related Issues in the Manufacture of Basic Metals Industry

This section delves into the basic metal industry's most typical problems. The current related issues in the basic metals industry are identified in FGD. Table 4.4 depicts a list of the key issues.

Table 4.4: Related Issues in Basic Metal Industry

NO.	KEY ISSUES	REASON	SUGGESTION
1.	High production cost	a) Increase in electricity tariff surcharge b) Reduction of working hours per week from 48-45 hours according to the Employment Act 1955. c) Increase of worker Overtime pay. d) High-salary worker.	a) Introduce tariff electricity rebates for metal industries. b) Increase government initiatives such as tax reduction for metal industries. c) Revise the workers' salary and overtime pay.
2.	Lagging Technological Upgrade/Change	a) Current digital transformation era of machines for metal production (i.e., Control Systems, IT, etc.) b) Lack of capital investment in the metal industry.	a) Collaboration with Global Top Rank companies in iron and steel. b) Financial facilities by the government and non-government agencies.
3.	High Manpower Turnover	a) Work nature is classified as 3D (Dirty, Dangerous, Difficult). b) Unattractive wages and fringe benefits. c) Low motivation and rewards. d) The mismatch between skills training and industrial requirements. e) The current emergence of the Gig economy gives higher earnings.	a) Improve work conditions according to Employment Act. b) Government encouragement and intervention to the employees. c) Improve salaries. d) Providing employees with adequate skills align with the industrial requirement. e) Awareness of long-term career pathways.

The survey results of related issues in the basic metal industry will be represented by two main parts, which are upstream and midstream, as shown in Figures 4.6 and 4.7. For the upstream part, the most highlighted issues that have been voted is insufficient manpower (25 respondents), followed by poor facilities and amenities for workers and low skilled & low-performance workforce with the same number of respondents (22 respondents), technical training and technological upgrade/change also with same votes (18 respondent). While for midstream, the most highlighted issues that have been voted on is poor facilities and amenities for the worker (19 respondent), followed by insufficient manpower (18 respondent), lack of infrastructure support, high dependency on foreign labour and technological upgrade/change with the same number of respondents (16 respondent).

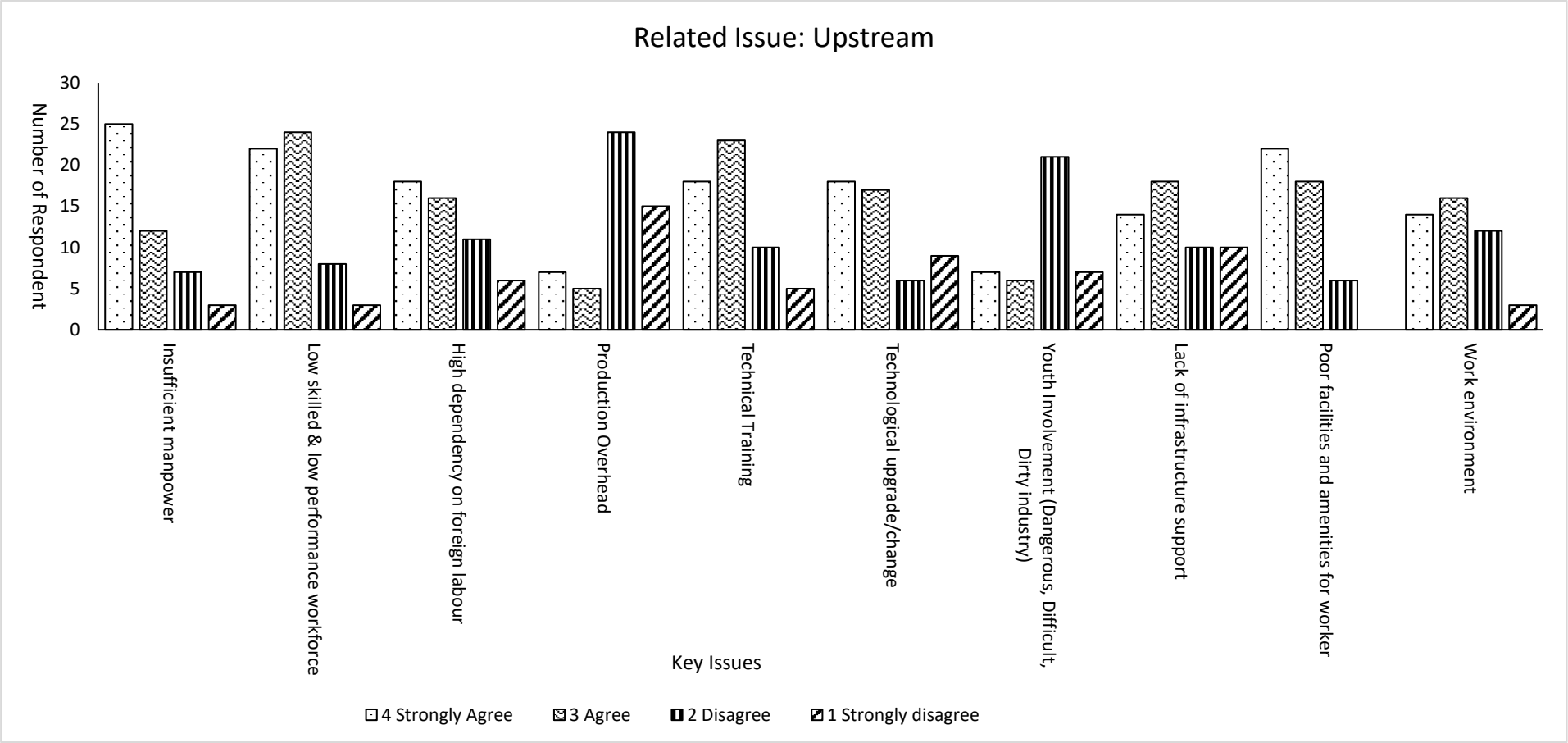

Figure 4.6: Related Issues for the Manufacture of Basic Metals (Upstream)

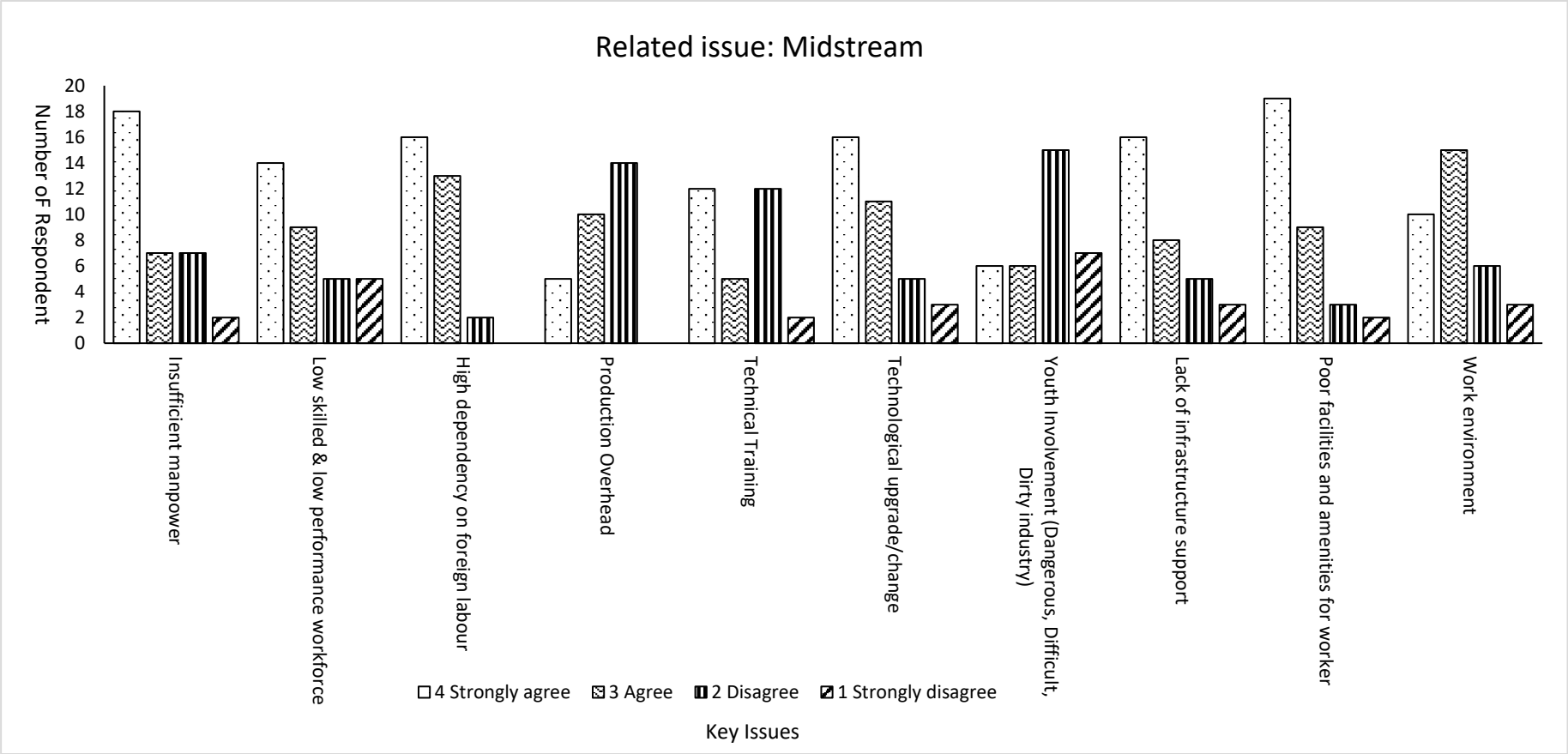

Figure 4.7: Related Issues for the Manufacture of Basic Metals (Midstream)

4.3 Occupational Structure

Occupational Structures (OS) is a job classification in which comparable or related occupations are grouped based on particular characteristics such as skills, functions, and employment based on MSIC 2008 Group. As for the manufacture of the basic metals industry, the developed OS is in the form of the process due to FGD panel consensus, which indicates the production of basic metals process are similar and differ in the type of product that will be produced. It cannot be specified into a specific area or product because it depends on the work area and activities of the company. The description of each division and group is based on MSIC 2008, as shown in Table 4.5.

Table 4.5: The Description of Division and Group in the Basic Metal Industry

Section	C	Description
Division	**24**	**Manufacture of Basic Metals** This division includes the activities of Smelting and/or refining ferrous and non-ferrous metals from ore, pig, or scrap utilising electrometallurgical and other process metallurgical processes. As part of this section, pure metals are combined with other chemical constituents to create metal alloys and super-alloys. The output of smelting and refining is used in rolling, drawing, extruding, and other processes to create hollow profiles, plates, sheets, strips, bars, rods, and other basic metal products. It is also utilised in molten form to create castings and other basic metal products.
Group	**241**	**Manufacture of Basic Iron and Steel** This group includes processes that convert iron ore through a reduction in blast furnaces and oxygen converters, ferrous waste and scrap in electric arc furnaces, or directly by reducing iron ore without fusion.

Section	C	Description
		The crude steel produced is then smelted and refined in a ladle furnace before being poured and solidified in a continuous caster to create semi-finished flat or long products that are used after reheating, rolling, drawing, and extruding operations.
	242	**Manufacture of Basic Precious and Other Non-ferrous Metals** This group includes the production of basic precious metals, precious metal alloys, precious metal semi-products, silver rolled onto base metals, gold rolled onto base metals or silver, platinum and platinum group metals rolled onto silver or base metals, aluminium produced from alumina, aluminium produced from the electrolytic refining of aluminium waste and scrap, and aluminium produced from aluminium alloys, production of copper alloys, manufacture of fuse wire or strip, semi-manufacturing of copper, production of chrome, manganese, nickel, etc. from ores or oxides, production of chrome, manganese, nickel, etc. from electrolytic and aluminothermic refining of chrome, manganese, nickel, etc., waste and scrap, production of alloys of chrome, manganese, nickel, etc., semi-manufacturing of chrome, manganese, nickel, etc., production of mattes of nickel, production of uranium metal from pitchblende or other ores, manufacture of wire of these metals by drawing, production of aluminium oxide (alumina), production of aluminium's wrapping foil, manufacture of aluminium's (tin) foil laminates made from aluminium (tin) foil as primary component and manufacture of precious metal foil laminates.
	243	**Casting of Metals** This group includes the manufacture of semi-finished products and various casting by a casting processes.

In Group 241, it discussed the OS in the manufacture of basic iron and steel, which consists of four (4) job areas which is the Production of iron and Steel Products, Manufacture

of Hot and Cold Work, Manufacture of Steel Tube and Fitting, Manufacture of Other Basic Iron and Steel Products. Based on MSIC 2008 Ver 1.0, items 24101 and 24102 (Table 2.3) are combined and covered under the Production of Iron and Steel Products area. The whole process can be referred to in Figure 2.3 - 2.6. The OS for group 241 can be referred to in Table 4.6. For subject matter experts for Group 241, FGD panels had identified personnel at level 6 as the highest level in the career pathway and also known as subject matter experts for the respected area.

Group 242 discusses the OS in the manufacture of basic precious and other non-ferrous metals, which consists of three (3) job areas which are Tin Smelting, Production of Aluminium from Alumina and Manufacturing of Basic Precious and Other Non-Ferrous Metals. The OS for Group 242 can be referred to in Table 4.7. For subject matter experts for Group 242, FGD panels had identified personnel at level 6 as the highest level in the career pathway and also known as subject matter experts for the respected area.

Group 243 discusses the OS in casting of metals which consists of three (3) job areas which are the Casting of Iron, Casting of Steel and Casting of Non-Ferrous Metal. The OS for Group 243 can be referred to in Table 4.8. For subject matter experts for Group 243, FGD panels had identified personnel at level 6 as the highest level in the career pathway and also known as subject matter experts for the respected area. In all Groups 241, 242 and 243, there are no job titles for levels 7 & 8 because the position requires no technical job. Hence it will go to the corporate ladder or managerial post structure as refer in the MOSQF description. The summary of the job titles in each group is shown in Table 4.9.

Table 4.6: Group 241 Occupational Structure

SECTION	(C) MANUFACTURING			
DIVISION	(24) MANUFACTURE OF BASIC METALS			
GROUP	(241) MANUFACTURE OF BASIC IRON AND STEEL			
AREA	Production of Iron and Steel Products	Manufacture of Hot and Cold Work	Manufacture of Steel Tube and Fitting	Manufacture of Other Basic Iron and Steel Products
LEVEL 8	No Job Title	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title	No Job Title
LEVEL 6	Iron/Steel Making Manager*	Rolling Manager*	Plant Manager*	Plant Manager***
LEVEL 5	Iron/Steel Making Engineer/Executive*	Rolling Engineer/Executive*	Plant Engineer/Executive*	Plant Engineer/Executive***
LEVEL 4	Iron/Steel Making Supervisor*	Rolling Supervisor*	Plant Supervisor*	Supervisor*
LEVEL 3	Technician*	Rolling Technician*	Technician*	Technician*
LEVEL 2	Operator*	Operator*	Operator*	Operator*
LEVEL 1	General Worker**	General Worker**	General Worker**	General Worker**

* Critical Job Titles

** Designation depends on company/plant

*** Critical Job Titles and Jobs Relevant to Industrial Revolution

Table 4.7: Group 242 Occupational Structure

SECTION	(C) MANUFACTURING		
DIVISION	(24) MANUFACTURE OF BASIC METALS		
GROUP	(242) MANUFACTURE OF BASIC PRECIOUS AND OTHER NON-FERROUS METALS		
AREA	Tin Smelting	Production of Aluminium from Alumina	Manufacturing of Basic Precious and other Non-Ferrous Metals
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	Plant Manager	Plant Manager	Plant Manager
LEVEL 5	Process Engineer/Executive*	Process Engineer/Executive*	Process Engineer/Executive*
LEVEL 4	Supervisor*	Hot Rolling Supervisor*	Supervisor
LEVEL 3	Technician*	Hot Rolling Technician*	Technician
LEVEL 2	Operator*	Hot Rolling Operator*	Operator*
LEVEL 1	General Worker**	General Worker**	General Worker**

* Critical Job Titles
** Designation term depends on company/plant
*** Critical Job Titles and Jobs Relevant to Industrial Revolution

Table 4.8: Group 243 Occupational Structure

SECTION	(C) MANUFACTURING		
DIVISION	(24) MANUFACTURE OF BASIC METALS		
GROUP	(243) CASTING OF METALS		
AREA	Casting of Iron	Casting of Steel	Casting of Non-Ferrous Metal
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	Foundry Manager	Foundry Manager	Foundry Manager
LEVEL 5	Foundry Engineer/Executive*	Foundry Engineer/Executive*	Foundry Process Engineer*
LEVEL 4	Supervisor	Supervisor	Supervisor*
LEVEL 3	Technician*	Technician*	Technician**
LEVEL 2	Operator*	Operator/Foundryman*	Operator**
LEVEL 1	General Worker**	General Worker**	General Worker**

* Critical Job Titles
** Designation term depends on company/plant
*** Critical Job Titles and Jobs Relevant to Industrial Revolution

Table 4.9: Summary of Job Titles

No.	Job Area	Level								Total Identified Job Titles	Total Critical Job Titles	Total Job Titles relevant to Industrial Revolution
		1	2	3	4	5	6	7	8			
(241) Manufacture of Basic Iron and Steel												
1	Production of Iron and Steel Products	1	1	1	1	1	1	NJT	NJT	6	5	0
2	Manufacture of Hot and Cold Work	1	1	1	1	1	1	NJT	NJT	6	5	0
3	Manufacture of Steel Tube and Fitting	1	1	1	1	1	1	NJT	NJT	6	5	0
4	Manufacture of Other Basic Iron and Steel Products	1	1	1	1	1	1	NJT	NJT	6	5	2
(242) Manufacture of Basic Precious and Other Non-Ferrous Metals												
1	Tin Smelting	1	1	1	1	1	1	NJT	NJT	6	4	0
2	Production of Aluminium from Alumina	1	1	1	1	1	1	NJT	NJT	6	4	0
3	Manufacturing of basic precious and other non-ferrous metals	1	1	1	1	1	1	NJT	NJT	6	2	0
(243) Casting of Metals												
1	Casting of Iron	1	1	1	1	1	1	NJT	NJT	6	3	0
2	Casting of Steel	1	1	1	1	1	1	NJT	NJT	6	3	0
3	Casting of Non-Ferrous Metal	1	1	1	1	1	1	NJT	NJT	6	4	0
Grand Total of Identified Job Titles										**60**	**40**	**2**

NJT – No Job Title

4.4 Occupational Responsibilities

This section details the occupational responsibilities for each job title listed in the OS. The occupational responsibilities specified in this section may be part of the actual duties for any job listed in this OF, but they are not required. Tables 4.10 and 4.13, which correspond to each job title, show specifics of the duties of each occupation.

Division: C24 Manufacture of Basic Metals

Group: 241 Manufacture of Basic Iron and Steel

Table 4.10: List of Responsibilities for Group 241 based on Occupational Structure in Table 4.6 (1 of 2)

AREA	Production of Iron and Steel Products	Manufacture of Hot and Cold Work
LEVEL 8	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title
LEVEL 6	**Iron/Steel Making Manager** 1) Determine, implement and monitor organisation strategies, policies and plans. 2) Plan details of production activities in terms of output quality and quantity, cost, time available and labour requirements. 3) Control the operation of plant and quality procedures through the planning of maintenance, designation of operating hours and supply of parts and tools. 4) Establish and manage budgets, monitor organisation output and costs, and adjust processes and resources to minimize costs. 5) Coordinate with other managers about production matters. 6) Control the preparation of production records and reports. 7) Adhere to the implementation of occupational health and safety requirements accordingly. 8) Implement business plans and products to be manufactured. 9) Identify and implement regulatory and statutory	**Rolling Manager** 1) Determine, implement and monitor organisation strategies, policies and plans. 2) Plan details of production activities in terms of output quality and quantity, cost, time available and labour requirements. 3) Control the operation of plant and quality procedures through the planning of maintenance, designation of operating hours and supply of parts and tools. 4) Establish and manage budgets, monitor organisation output and costs, and adjust processes and resources to minimize costs. 5) Coordinate with other managers about production matters. 6) Control the preparation of production records and reports. 7) Adhere to the implementation of occupational health and safety requirements accordingly. 8) Implement business plans and products to be manufactured. 9) Identify and implement regulatory and statutory

AREA	Production of Iron and Steel Products	Manufacture of Hot and Cold Work
	requirements affecting manufacturing operations and the environment. 10) Oversee the provision of technical specifications and the serving contract for procurement. 11) Oversee the staff development, training and performance of staff. 12) Identify areas for continuous improvement plans and implement changes in line with KPIs. 13) Control costs without sacrificing safety, quality and productivity. 14) Create and promote a conducive working environment to ensure that employee issues are heard and addressed.	requirements affecting manufacturing operations and the environment. 10) Oversee the provision of technical specifications and the serving contract for procurement. 11) Oversee the staff development, training and performance of staff. 12) Identify areas for continuous improvement plans and implement changes in line with KPIs. 13) Control costs without sacrificing safety, quality and productivity. 14) Create and promote a conducive working environment to ensure that employee issues are heard and addressed.
LEVEL 5	**Iron/Steel Making Engineer/Executive** 1) Review and fulfil production schedules, processes, specifications, related information, and the client's technical documentation and requirements. 2) Optimise production processes and control systems that maximize efficiency and reduce waste. 3) Identify and implement process improvements and technological upgrades. 4) Adherence to production standards in line with the company's KPI. 5) Prepare material and equipment lists, purchase orders, cost analyses, and estimated production costs. 6) Improve facilities and determine personnel requirements. 7) Train staff for new processes and provide instructions and manuals. 8) Manage process documentation and prepare production reports.	**Rolling Engineer/Executive** 1) Review Client's technical documentation and requirements. 2) Maintains project technical files. 3) Controls subcontracted discipline engineering documents. 4) Prepares design specifications. 5) Prepares technical documentation for steel structure material requisition and assists the procurement department in technical evaluations. 6) Controls manufacturer's shop drawings and connection calculation notes and details. 7) Supervises/Approves steel structure drawings issued by designers and draftsmen. 8) Develops studies and calculation notes for steel structures and structural steel buildings. 9) Implements discipline follow-up activities. 10) Implements field engineering activities.

AREA	Production of Iron and Steel Products	Manufacture of Hot and Cold Work
	9) Lead and manage supervisors and workforce.	
LEVEL 4	**Iron/Steel Making Supervisor** 1) Request, receive, and record materials according to the material requisition form (MRF). 2) Organise and schedule the daily work by taking into consideration manpower and material availability. 3) Provide data on consumable items for cost estimation. 4) Promote a safe workplace according to OSHA requirements. 5) Supervise and practice proper quality system controls for any changes in processes, materials, and suppliers. 6) Responsible for training, mentoring and coaching senior technicians and technicians. 7) Identify and coordinate repair and maintenance work. 8) Conduct toolbox briefing.	**Rolling Supervisor** 1) Plan work and setting production targets. 2) Troubleshoot production problems with maintenance technicians. 3) Work out improvements to the production process. 4) Plan work and setting production targets. 5) Provide both formal and on-the-job training. 6) Keep records of all the safety training employees receive. 7) Provide all necessary protective systems and equipment and enforce their use. 8) Encourage employees to report any perceived hazards or problems as early as possible. 9) Investigate or refer these hazard concerns to the appropriate individual promptly.
LEVEL 3	**Technician** 1) Maintain, operate, and improve unique research equipment and systems involving materials processing, such as melting. 2) Interact well with craft supervisors and personnel to get equipment and systems repaired and/or compliant with the environment, safety, health, and quality requirements to ensure the integrity of research activities. 3) Maintain documentation of lab/research activities. 4) Maintain lab equipment, facilities, and systems in compliance with environment, safety, health, and quality program requirements and ensure availability for researchers.	**Rolling Technician** 1) Receive work orders, identify faulty equipment, and acquire parts and equipment to complete repairs. 2) Communicate accurately any repair steps taken, parts ordered, and time estimated until completion. 3) Review work orders. 4) Keep work areas clean. 5) Install, maintain, troubleshoot and repair a broad range of mechanical systems and equipment. 6) Assist supervisors with shift planning and work schedule. 7) Improve stability and help the hourly workforce to troubleshoot and tackle technical issues accurately.

AREA	Production of Iron and Steel Products	Manufacture of Hot and Cold Work
	5) Communicate (verbally and written) clearly with other technicians and researchers.	8) Measure and meter new posts and ensure all measurements are accurately conducted to guarantee a safe and accurate start/restart.
LEVEL 2	**Operator** 1) Monitor the re-melting process to ensure stability and efficiency and react as necessary to undesirable conditions. 2) Designated facilities maintenance, cleaning and reassembly. 3) Move material as needed. 4) Perform department housekeeping. 5) Ensure adherence to safety procedures and rules. 6) Provide high-quality work to all internal and external customers related to their position output.	**Operator** 1) Operate a variety of processing equipment. 2) Operate a wide variety of material handling equipment. 3) Perform routine daily maintenance/inspection/production works of torches and equipment. 4) Communicate with the supervisor for daily operation schedule. 5) Perform preparations for start-up following established procedures and fill out daily maintenance log sheets. 6) Sort and move material as necessary. 7) Shutdown the loader following established procedures. 8) Ensure good housekeeping practices are carried out in job areas and grounds. 9) Provide high-quality work to all internal and external customers related to their position output.
LEVEL 1	**General Worker** 1) Designated facilities maintenance, cleaning and reassembly. 2) Move material as needed. 3) Perform department housekeeping. 4) Ensure adherence to safety procedures and rules.	**General Worker** 1) Work on a variety of processing equipment. 2) Perform routine daily production works 3) Communicate with the supervisor for daily operation schedule. 4) Perform preparations for start-up following established procedures and fill out daily maintenance log sheets. 5) Ensure good housekeeping practices are carried out in job areas and grounds.

Table 4.10: List of Responsibilities for Group 241 based on Occupational Structure in Table 4.6 (2 of 2)

AREA	Manufacture of Steel Tube and Fitting	Manufacture of Other Basic Iron and Steel Products
LEVEL 8	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title
LEVEL 6	**Plant Manager** 1) Determine, implement and monitor organisation strategies, policies and plans. 2) Plan details of production activities in terms of output quality and quantity, cost, time available and labour requirements. 3) Control the operation of plant and quality procedures through the planning of maintenance, designation of operating hours and supply of parts and tools. 4) Establish and manage budgets, monitor organisation output and costs, and adjust processes and resources to minimize costs. 5) Coordinate with other managers about production matters. 6) Control the preparation of production records and reports. 7) Adhere to the implementation of occupational health and safety requirements accordingly. 8) Implement business plans and products to be manufactured. 9) Identify and implement regulatory and statutory requirements affecting manufacturing operations and the environment. 10) Oversee the provision of technical specifications and the serving contract for procurement. 11) Oversee the staff development, training and performance of	**Plant Manager** 1) Ensure that supervisors and all EAF/LMF employees are trained to perform their duties in compliance with Health and Safety policy and program requirements. 2) Responsible for the safety training of all EAF/LMF employees. 3) Implement and monitor the adherence to all Environmental standards and requirements. 4) Creates the environment to ensure that employee issues are heard and addressed. 5) Identifies areas for continuous improvement plans and implements change. 6) Focus area on Continuous Improvement projects and tracking of all area KPIs. 7) Ability to work effectively with diverse and cross-functional teams. 8) Enable team members to achieve maximum potential through coaching, training and mentoring.

AREA	Manufacture of Steel Tube and Fitting	Manufacture of Other Basic Iron and Steel Products
	staff. 12) Identify areas for continuous improvement plans and implement changes in line with KPIs. 13) Control costs without sacrificing safety, quality and productivity. 14) Create and promote a conducive working environment to ensure that employee issues are heard and addressed.	
LEVEL 5	**Plant Engineer/Executive** 1) Analyse workflows within and across departments to determine how processes can be more efficient and effective. 2) Review the KPI monitoring systems and determine ways to improve their ability to maintain company operations. 3) Create an analytical process that justifies business decisions. 4) Design, run, test and upgrade systems and processes. 5) Analyse capital expenditures and project designs to help find ways to cut costs. 6) Develop best practices, routines and innovative solutions to improve production rates and output quality. 7) Demonstrate project management skills for process improvement and/or product development. Reports potentially unsafe conditions.	**Plant Engineer/Executive** 1) Review Client's technical documentation and requirements. 2) Maintained project technical files. 3) Control subcontracted discipline engineering documents. 4) Prepare design specifications. 5) Prepare technical documentation for steel structure material requisition and assists the procurement department in technical evaluations. 6) Control manufacturer's shop drawings and connection calculation notes and details. 7) Supervise/approve steel structure drawings issued by designers and draftsmen. 8) Develop studies and calculation notes for steel structures and structural steel buildings. 9) Implement discipline follow-up activities. 10) Implement field engineering activities.

AREA	Manufacture of Steel Tube and Fitting	Manufacture of Other Basic Iron and Steel Products
LEVEL 4	**Plant Supervisor** 1) Plan work and setting production targets. 2) Troubleshoot production problems with maintenance technicians. 3) Work out improvements to the production process. 4) Plan work and setting production targets. 5) Provide both formal and on-the-job training. 6) Keep records of all the safety training employees receive. 7) Provide all necessary protective systems and equipment and enforce their use. 8) Encourage employees to report any perceived hazards or problems as early as possible. 9) Investigate or refer these hazard concerns to the appropriate individual promptly.	**Supervisor** 1) Promote a safe workplace. 2) Complete a Safety Inspection each month. 3) Tracking of all open safety issues along with weekly updates to senior management. 4) Conduct monthly Occupational Safety Health Administration (OSHA) safety training with employees. 5) Manage the daily repair of ladles and melt furnaces. 6) Check the operation and condition of the equipment. 7) Ensures proper quality system controls are adhered to for any changes in processes, materials, and suppliers. 8) Maintain a proper raw material inventory. 9) Direct management of the Melting department employees. 10) Responsible for training, mentoring and coaching employees. 11) Engage operators in creating problem-solving. 12) Schedule and oversee the furnace repairs.
LEVEL 3	**Rolling Technician** 1) Receive work orders, identify faulty equipment, and acquire parts and equipment to complete repairs. 2) Communicate accurately any repair steps taken, parts ordered, and time estimated until completion. 3) Review work orders. 4) Keep work areas clean. 5) Install, maintain, troubleshoot and repair a broad range of mechanical systems and equipment.	**Technician** 1) Maintain, operate, and improve unique research equipment and systems involving materials processing, such as melting. 2) Interact well with craft supervisors and personnel to get equipment and systems repaired and/or compliant with the environment, safety, health, and quality requirements to ensure the integrity of research activities. 3) Maintain documentation of lab/research activities.

AREA	Manufacture of Steel Tube and Fitting	Manufacture of Other Basic Iron and Steel Products
	6) Assist supervisors with shift planning and work schedule. 7) Improve stability and help the hourly workforce to troubleshoot and tackle technical issues accurately. 8) Measure and meter new posts and ensure all measurements are accurately conducted to guarantee a safe and accurate start/restart.	4) Maintain lab equipment, facilities, and systems in compliance with environment, safety, health, and quality program requirements and ensure availability for researchers. 5) Communicate (verbally and written) clearly with other technicians and researchers. 6) Maintain strong dedication to the implementation and perpetuation of values and ethics.
LEVEL 2	**Operator** 1) Operate a variety of processing equipment. 2) Operate a wide variety of material handling equipment. 3) Perform routine daily maintenance/inspection of torches and equipment. 4) Communicate with the supervisor for daily operation schedule. 5) Perform preparations for start-up following established procedures and fill out daily maintenance log sheets. 6) Sort and move material as necessary. 7) Shutdown the loader following established procedures. 8) Ensure good housekeeping practices are carried out in job areas and grounds. 9) Provide high-quality work to all internal and external customers related to their position output.	**Operator** 1) Monitor the re-melting process to ensure stability and efficiency and react as necessary to undesirable conditions. 2) Furnace maintenance, cleaning and reassembly. 3) Move material as needed. 4) Perform department housekeeping. 5) Shutdown the loader following established procedures. 6) Ensure adherence to safety procedures and rules. 7) Provide high-quality work to all internal and external customers related to their position output.

AREA	Manufacture of Steel Tube and Fitting	Manufacture of Other Basic Iron and Steel Products
LEVEL 1	**General Worker** 1) Work on a variety of processing equipment. 2) Work on a wide variety of material handling equipment. 3) Perform routine daily production works 4) Communicate with the supervisor for daily operation schedule. 5) Perform preparations for start-up following established procedures and fill out daily maintenance log sheets.	**General Worker** 1) Designated facilities maintenance, cleaning and reassembly. 2) Move material as needed. 3) Perform department housekeeping. 4) Ensure adherence to safety procedures and rules.

Division: C24 Manufacture of Basic Metals

Group: 242 Manufacture of Basic Precious and Other Non-Ferrous Metals

Table 4.11: List of Responsibilities for Group 242 based on Occupational Structure in Table 4.7

AREA	Tin Smelting	Production of Aluminium from Alumina	Manufacturing of Basic Precious and other Non-Ferrous Metals
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	**Plant Manager** 1) Plan, organise, direct and run optimum day-to-day operations to exceed our customers' expectations by overseeing shipping, receiving production and maintenance activities. 2) Increase production, assets capacity and flexibility while minimizing unnecessary costs and maintaining current quality standards. 3) Allocate resources effectively and fully utilise assets to produce optimal results. 4) Monitor operations and trigger corrective actions. 5) Collect and analyse data to find places of waste or overtime.	**Plant Manager** 1) Plan, organise, direct and run optimum day-to-day operations to exceed our customers' expectations by overseeing shipping, receiving production and maintenance activities. 2) Increase production, assets capacity and flexibility while minimizing unnecessary costs and maintaining current quality standards. 3) Allocate resources effectively and fully utilise assets to produce optimal results. 4) Monitor operations and trigger corrective actions. 5) Collect and analyse data to find places of waste or overtime.	**Plant Manager** 1) Plan, organise, direct and run optimum day-to-day operations to exceed our customers' expectations by overseeing shipping, receiving production and maintenance activities. 2) Increase production, assets capacity and flexibility while minimizing unnecessary costs and maintaining current quality standards. 3) Allocate resources effectively and fully utilise assets to produce optimal results. 4) Monitor operations and trigger corrective actions. 5) Collect and analyse data to find places of waste or overtime.

AREA	Tin Smelting	Production of Aluminium from Alumina	Manufacturing of Basic Precious and other Non-Ferrous Metals
	6) Commit to plant safety procedures and hold others accountable for adherence. 7) Enforce and support company policies and procedures, escalating matters of importance. 8) Ensure International Standardization Organisation (ISO) standards and regulations are adhered to. 9) Inspect the plant floor and equipment to ensure everything works properly, including the grounds and truck yard.	6) Commit to plant safety procedures and hold others accountable for adherence. 7) Enforce and support company policies and procedures, escalating matters of importance. 8) Ensure ISO standards and regulations are adhered to. 9) Inspect the plant floor and equipment to ensure everything works properly, including the grounds and truck yard.	6) Commit to plant safety procedures and hold others accountable for adherence. 7) Enforce and support company policies and procedures, escalating matters of importance. 8) Ensuring ISO standards and regulations are adhered to. 9) Inspect the plant floor and equipment to ensure everything works properly, including the grounds and truck yard.
LEVEL 5	**Process Engineer/Executive** 1) Develop new technology to improve Melting operations. New technology includes operational practices, raw materials, and process design. 2) Support Process Engineering groups and Manufacturing in troubleshooting process problems. 3) Reporting/communications during tank trials: status, issues, troubleshooting plans. 4) Assess engineering and long-term manufacturability of new technologies. 5) Collaboration with Melting Research and Development.	**Process Engineer/Executive** 1) Optimise process equipment to improve quality and capacity. 2) Solve equipment and process problems for Arconic's rolling plants. 3) Develop and deploy Standard Practices for the different hot rolling processes, assist in identifying improvement opportunities, and facilitate technology transfer. 4) Maintain a working relationship with vendors of hot rolling equipment and be knowledgeable of external developments in hot rolling processes.	**Process Engineer / Executive** 1) Lead communication meetings for current spares, concerns, and readiness. 2) Audit spares condition regularly and documents the audit process. 3) Track parts out for repair, whether internal or external. 4) Prioritize and drives completion based on needs. 5) Participate in developing quality job plans by working with planners as needed. 6) Maintain an Action Register of expedited items with daily updates of

AREA	Tin Smelting	Production of Aluminium from Alumina	Manufacturing of Basic Precious and other Non-Ferrous Metals
	6) Design and implementation of process experimentation. 7) Conduct technical analysis of melting and delivery processes.	5) Provide engineering and operational support for large capital improvement projects. 6) Sponsor, participate, and occasionally lead hot rolling development projects. 7) Be relied upon by plant resources for advice and direction on capital and process solutions. 8) Participate in technical assessments of facilities and individual pieces of equipment. 9) Provide equipment, control, and process training to the technical base.	the current status of each outstanding item. 7) Perform quality checks on parts ready to return from vendors to ensure the accuracy of repairs made to parts returning to the site. 8) Trains/Mentors/Coaches as needed. 9) Benchmark and best practices in all areas and develop standards. 10) Audit spares condition regularly and documents the audit process.
LEVEL 4	**Supervisor** 1) Oversight of all areas of the production line. 2) Provide work assignments for preventive equipment maintenance and/or repair equipment when necessary. 3) Troubleshoot machine functions to improve the quality of the product. 4) Manage the production schedule, making changes as needed for efficiency. 5) Determine schedules, sequences, and assignments for work activities based	**Hot Rolling Supervisor** 1) Facilitate training sessions for operators under a maintained training matrix on compliance standards. 2) Coach and develop the team at failure analysis and support the Quality Improvement System (QIS) methodology. 3) Develop performance expectations, audit performance, document findings, and establish corrective action plans. 4) Conduct trend analysis, compile, and analyse symptoms and failures.	**Supervisor** 1) Facilitate training sessions for operators under a maintained training matrix on compliance standards. 2) Coach and develop the team at failure analysis and support the Quality Improvement System (QIS) methodology. 3) Develop performance expectations, audit performance, document findings, and establish corrective action plans.

AREA	Tin Smelting	Production of Aluminium from Alumina	Manufacturing of Basic Precious and other Non-Ferrous Metals
	on work priority, equipment quantity, and personnel skill. 6) Perform Root Cause Analysis to determine failures and implement corrective actions. 7) Repair or maintain the operating condition of industrial production, processing machinery, or equipment.	5) Administer all safety activities. 6) Coordinates all emergency preparedness practices, policies, and procedures. 7) Track performances on control items, ensure compliance, design and implement new as well as update existing standards. 8) Audit performance, document findings, and develop corrective action plans. 9) Oversee, contribute to, and support daily routine management activities. 10) Establish and negotiate cell goals and manage Action Plans for the area of responsibility.	4) Conduct trend analysis, compile, and analyse symptoms and failures. 5) Administer all safety activities. 6) Coordinate all emergency preparedness practices, policies, and procedures. 7) Track performances on control items, ensure compliance, design and implement new as well as update existing standards. 8) Audit performance, document findings, and develop corrective action plans. 9) Oversee, contribute and support daily routine management activities. 10) Establish and negotiate cell goals and manage action plans for the area of responsibility.
LEVEL 3	**Technician** 1) Inspect coated areas of products for defects such as blemishes, uneven coverage of optical coating or failure to meet any customer specification. 2) Perform visual inspections for coated devices. 3) Provide cross-functional support and perform additional duties as assigned or required.	**Hot Rolling Technician** 1) Maintain all Mechanical Systems related to the Rolling Process. 2) Troubleshoot and repair High-Pressure Hydraulic Systems. 3) Work with Operations/Maintenance groups to ensure continued production. 4) Work with computer-based Maintenance Systems.	**Technician** 1) Maintain all Mechanical Systems related to the Rolling Process. 2) Troubleshoot and repair High-Pressure Hydraulic Systems. 3) Work with Operations/Maintenance groups to ensure continued production. 4) Work with computer-based Maintenance Systems.

AREA	Tin Smelting	Production of Aluminium from Alumina	Manufacturing of Basic Precious and other Non-Ferrous Metals
	4) Write coating procedures and/or other work instructions. 5) Assist in troubleshooting equipment. 6) Prepare products for the coating process, including inspecting, cleaning, routing and buffing. 7) Maintain daily production records. 8) Keep an organised written record of any activities. 9) Maintain housekeeping and cleanliness of equipment and department. 10) Reliable attendance by attending work as scheduled and in a timely manner.	5) Service the equipment as needs arises and follow the lead's instructions. 6) Work as a leader in safety, supporting and directing the work of facility and equipment contractors.	5) Service the equipment as needs arises and follow the lead's instructions. 6) Work as a leader in safety, supporting and directing the work of facility and equipment contractors.
LEVEL 2	**Operator** 1) Perform work following specific job work instructions. 2) Follow written and verbal instructions with accuracy. 3) Correctly fix any defects to ensure compliance with the standard. 4) Perform all job functions as outlined in the Functional Job Analysis. 5) Follow all safety protocols and wear all required PPE.	**Hot Rolling Operator** 1) Maintain work areas and be prepared for housekeeping and safety audits at all times. 2) Performs mechanical and lubrication preventive maintenance. 3) Check furnace temperatures to assure proper metal heat. 4) Responsible for starting up, shutting down, operating lubrication and setting up of rolling mill.	**Operator** 1) Maintain work areas and be prepared for housekeeping and safety audits at all times. 2) Performs mechanical and lubrication preventive maintenance. 3) Check furnace temperatures to assure proper metal heat. 4) Responsible for starting up, shutting down, operating lubrication and setting up of rolling mill.

AREA	Tin Smelting	Production of Aluminium from Alumina	Manufacturing of Basic Precious and other Non-Ferrous Metals
		5) Change roll clearance to conform to standard practices or as directed to obtain the required product. 6) Sets up the mill for hot rolling of ingots, inserts ingots into the furnace, assures proper furnace heats, removes ingots from the furnace with tongs or other related equipment and passes ingots through rolls. 7) Maintain records of production and records of inventories according to the supervisor's instructions. 8) Follow all company safety policies and procedures and report accidents, hazards and equipment problems. 9) Keeps work area neat and orderly.	5) Changes roll clearance to conform to standard practices or as directed to obtain the required product. 6) Sets up the mill for hot rolling of ingots, inserts ingots into the furnace, assures proper furnace heats, removes ingots from the furnace with tongs or other related equipment and passes ingots through rolls. 7) Maintains records of production and records inventories according to supervisor's instructions. 8) Keeps work area neat and orderly.
LEVEL 1	**General Worker** 1) Perform work following specific job work instructions. 2) Follow written and verbal instructions with accuracy. 3) Perform all job functions as outlined in the Functional Job Analysis. 4) Follow all safety protocols and wear all required PPE.	**General Worker** 1) Maintain work areas and be prepared for housekeeping and safety audits at all times. 2) Performs mechanical and lubrication preventive maintenance. 3) Check furnace temperatures to assure proper metal heat. 4) Keeps work area neat and orderly.	**General Worker** 1) Maintain work areas and be prepared for housekeeping and safety audits at all times. 2) Performs mechanical and lubrication preventive maintenance. 3) Check furnace temperatures to ensure proper metal heat. 4) Responsible for starting up, shutting down, operating lubrication and setting up of rolling mill.

Division: C24 Manufacture of Basic Metals

Group: 243 Casting of Metals

Table 4.12: List of Responsibilities for Group 243 based on Occupational Structure in Table 4.8

AREA	Casting of Iron	Casting of Steel	Casting on Non-Ferrous Metal
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	**Foundry Manager** 1) Manages assigned areas/departments within the facility. 2) Responsible for maintaining housekeeping, Sort, Set in Order, Shine, Standardise, Sustain (5S) and continuous improvement initiatives. 3) Ensures assigned teams are operating within the designed fabrication plans. 4) Assists in improvements to the efficiency of the work. 5) Works with HR to ensure a firm understanding of company policies, communicates to teams clearly and leads by example. 6) Plan work and manages labour to ensure efficient execution. 7) Arrange the schedule with a sense of urgency and with sincere concern for	**Foundry Manager** 1) Manages assigned areas/departments within the facility. 2) Responsible for maintaining housekeeping, 5S and continuous improvement initiatives. 3) Ensures assigned teams are operating within the designed fabrication plans. 4) Assists in improvements to the efficiency of the work. 5) Works with HR to ensure a firm understanding of company policies, communicates to teams clearly and leads by example. 6) Plan work and manages labour to ensure efficient execution. 7) Arrange the schedule with a sense of urgency and with sincere concern for	**Foundry Manager** 1) Manages assigned areas/departments within the facility. 2) Responsible for maintaining housekeeping, 5S and continuous improvement initiatives. 3) Ensures assigned teams are operating within the designed fabrication plans. 4) Assists in improvements to the efficiency of the work. 5) Works with HR to ensure a firm understanding of company policies, communicates to teams clearly and leads by example. 6) Plan work and manages labour to ensure efficient execution. 7) Arrange the schedule with a sense of urgency and with sincere concern for

AREA	Casting of Iron	Casting of Steel	Casting on Non-Ferrous Metal
	safety, quality, timeliness, impact and cost. 8) Maintain required documentation on all projects for assigned areas. 9) Communicate with employees regularly and seeks their input on problem solving.	safety, quality, timeliness, impact and cost. 8) Maintain required documentation on all projects for assigned areas. 9) Communicate with employees regularly and seeks their input on problem solving.	safety, quality, timeliness, impact and cost. 8) Maintain required documentation on all projects for assigned areas. 9) Communicate with employees regularly and seeks their input on problem solving.
LEVEL 5	**Foundry Engineer/Executive** 1) Develop and maintain material flow and storage of products from receiving, warehousing, line-side production and shipping. 2) Drive manpower efficiency, including the balancing of all Material Handling operators. 3) Perform the necessary time studies on process improvements and changes. 4) Develop warehousing models. 5) Estimate and quote capital costs associated with launches and order capital items in a timely manner. 6) Support initiatives to reduce inventory and overflow. 7) Develop detailed material flow models for new and existing products to project material flow headcount. 8) Develop innovative, cost-effective solutions with the packaging team for part presentation, packing density,	**Foundry/Executive** 1) Collaborate with cross-functional teams to gather requirements. 2) Define furnace cleaning practices to maximize metal quality and increase dross recovery. 3) Drive the definition of requirements for metal transfer systems. 4) Developing and implementing foundry processes with moulding, melting and casting capabilities for new and legacy products. 5) Generating furnace charges from chemical analysis of raw material. 6) Collaborate with internal and external stakeholders to ensure functional requirements are fulfilled during the design phase. 7) Commission and troubleshoot new equipment, ensuring performance requirements.	**Foundry Engineer** 1) Work with casting suppliers to develop and qualify castings to meet Engineering requirements. 2) Provide technical guidance to Engineering Designers in the selection of casting, inclusive of material heat treatment conditions and acceptance testing. 3) Collaborate with Design Engineers to propose destructive testing plans to obtain material property data to support part qualification. 4) Provide design guidance to Engineering Design in the creation of casting drawings. 5) Provide design guidance to foundries in creating gating systems, tooling, and casting process design. 6) Perform failure analysis on discrepant castings and processing.

AREA	Casting of Iron	Casting of Steel	Casting on Non-Ferrous Metal
	and sustainability in automated and manual solutions. 9) Develop keep-out zones for material handling paths and anticipated equipment while a factory launches utilities and support space. 10) Work with internal manufacturing engineering teams to ensure equipment and layout designs align with the factory's overall material flow plan and vision. 11) Perform other duties as required.	8) Lead the investigation and adoption of new metal cleaning concepts and process improvements across all foundry processes, from incoming scrap material to delivery to casting operations. 9) Incorporating Lean Manufacturing best practices and working in a culture focused on continuous improvement.	7) Execute casting material process and qualification plans.
LEVEL 4	**Supervisor** 1) Manage various process equipment as directed by management with minimum supervision as stipulated in the work procedure. 2) Report equipment process parameters to the Process Leader. 3) Strictly adhere to all Safety, Health, Environment and Quality (SHEQ) legislation regarding safety and machine maintenance as well as chemical and lead hazards by wearing full PPE at all times. 4) Arrange and manage stock count preparations.	**Supervisor** 1) Achieve daily attainment requirements. 2) Ensure that training matrices are maintained and updated. 3) Record downtime and scraps, and determine team efficiency. 4) Ensure daily process documentation is filled out and within specification. 5) Understand and administer HR policies. 6) Coach and counsel employees with performance concerns and/or commend excellent performance, including safety, quality, standardised work, scrap, and 5S.	**Supervisor** 1) Enforce all plant safety rules and policies. 2) Follow, comply and enforce all operational procedures/policies as stated in the employee Environmental Health and Safety programs. 3) Ensure employees are properly trained and adhering to such policies, enforce disciplinary actions when safety infractions occur, and conduct Team Safety Talks as required. 4) Ensure weekly safety talks in pre-shift meetings are conducted, with employees signing safety training rosters.

AREA	Casting of Iron	Casting of Steel	Casting on Non-Ferrous Metal
	5) Manages culture of working as a team to maximise Smelter Secondary outputs. 6) Manages an effective transfer of skills within the department. 7) Ensure that daily production targets are achieved & feedback is provided to the supervisor. 8) Ensure safe storage of material in bags and assist with stocktake preparations. 9) Ensure that all products and by-products generated are weighed and sent for sampling for metal balance purposes. 10) Manage & practice a culture of safe work practices.	7) Maintain the 5S checklist and ensure 5S performance 8) Perform pre-shift meetings, which must include safety talks. 9) Perform regular workplace safety inspections. 10) Immediately notify EHS of any accidents or incidents.	5) Ensure daily pre-shift inspections are completed, conduct unplanned inspection audits on a weekly basis and planned inspection audits. 6) Coordinate, and direct the activities of employees to ensure that production levels and quality standards are met. 7) Monitor throughout the day and make adjustments to support operations. 8) Plan and direct the utilization and use of all equipment and manpower to achieve the most effective results. 9) Attend to all accidents and injuries and initiate the accident and injury investigation program.
LEVEL 3	**Technician** 1) Participate in various process projects and provide research for all developmental teams. 2) Generate equipment notifications. 3) Carry out housekeeping in his area of responsibility to the highest 5s standards. This activity includes cleaning equipment and related work areas. 4) Attend HSE training; translate the learning into action on the job.	**Technician** 1) Maintain equipment in the assigned work area. 2) Operate and maintain furnaces and pouring equipment. Assist in the pouring of molten metal into moulds. 3) Sort scrap and new metal for melting. 4) Perform duties to a specified standard of craftsmanship by utilising a wide variety of bits and abrasives. 5) Load, unload, operate and maintain burnout kilns.	**Technician** 1) Set up and operation of miscellaneous investment foundry-related machines and equipment. 2) Tests parts according to engineering and customer standards and specifications. 3) Maintain accurate and reliable documentation. 4) Participate in establishing manufacturing methods, including machine, test, material and tooling requirements.

AREA	Casting of Iron	Casting of Steel	Casting on Non-Ferrous Metal
	5) Handle equipment maintenance and Tagout as per the standard operating procedure. 6) Monitoring any variables within the process and making adjustments when required. 7) Ensure quality sampling is in place and the samples are taken on time to the laboratory.	6) Dispense unusable mould materials and other by-products of the casting process. 7) Assist in other departments/areas depending on project and workload demands. 8) Breakout and clean castings from investments and cages.	5) Perform inspection and/or testing-related activities to ensure that parts are produced following manufacturing standards and specifications. 6) Provide input and recommendations for selecting, installing, and adjusting various foundry-related equipment to ensure they are consistent with the material's type and size. 7) Remove burrs, sharp edges, flashes, etc., from manufactured parts to ensure they are following engineering requirements. 8) Maintain proper parts identification per planning specifications and ensure that accurate and reliable records and documentation are maintained.
LEVEL 2	**Operator** 1) Perform operating duties in the smelting process while working around hot furnaces and wearing proper PPE, including respirators. 2) Work safely following the standard operating process. 3) Loads raw materials into machines. 4) Manually on and off bears materials from/to machines.	**Operator/Foundryman** 1) Monitor the furnace controls. 2) Ensure all treatments are done to correct procedures & parameters. 3) Monitor the furnaces for alarms & report all furnace faults to the maintenance department. 4) Record all quench data and supply relevant data to the supervisors & maintenance department.	**Operator** 1) Regulate fuel, air, and water coolant supplies to heat furnaces and adjust temperatures. 2) Draw smelted metal samples from furnaces or kettles for analysis, and calculate types and amounts of materials needed to ensure that materials meet specifications.

AREA	Casting of Iron	Casting of Steel	Casting on Non-Ferrous Metal
	5) Assists operator in monitoring pasting machine function. 6) Perform visual inspections for quality and quantity; enters data into the data collector. 7) Operate forklift to move materials; complete any required documentation. 8) Maintain communication with co-workers through two-way radio and hand signals.	5) Ensure the quench is done to the correct time scale. 6) Prepare and maintain stock of thermocouple attachments. 7) Organise the marking up & placement of thermocouples, including welding contact nuts to the casting. 8) Set out the furnace bogie, including bearers if needed to receive castings. 9) Keep the furnace area & furnace bogies clean.	3) Weigh materials to be charged into furnaces using scales. 4) Record production data and maintain production logs. 5) Observe air and temperature gauges or metal colour/fluidity, and turn fuel valves or adjust controls to maintain required temperatures. 6) Inspect furnaces and equipment to locate defects and wear. 7) Drain, transfer, or remove molten metal from furnaces. 8) Remove impurities from the surface of molten metal. 9) Observe operations inside furnaces, using television screens, to ensure that problems do not occur.
LEVEL 1	**General Worker** 1) Perform operating duties in the smelting process while working around hot furnaces and wearing proper PPE, including respirators. 2) Loads raw materials into machines. 3) Manually on and off bears materials from/to machines. 4) Operate forklift to move materials; complete any required documentation.	**General Worker** 1) Monitor the furnaces for alarms & report all furnace faults to the maintenance department. 2) Record all quench data and supply relevant data to the supervisors & maintenance department. 3) Ensure the quench is done to the correct time scale. 4) Keep the furnace area & furnace bogies clean.	**General Worker** 1) Regulate fuel, air, and water coolant supplies to heat furnaces and adjust temperatures. 2) Draw smelted metal samples from furnaces or kettles for analysis, and calculate types and amounts of materials needed to ensure that materials meet specifications. 3) Weigh materials to be charged into furnaces using scales.

AREA	Casting of Iron	Casting of Steel	Casting on Non-Ferrous Metal
	5) Maintain communication with co-workers through two-way radio and hand signals.		4) Maintain communication with co-workers through two-way radio and hand signals.

4.5 Mapping OS to Available NOSS

The mapping between OS and the most recent version of NOSS is provided in this section. The current NOSS identified under Groups 241 & 243 must be reviewed to determine the suitable area based on MSIC 2008 document. Group 242 is still not available. About 16 NOSS are found to be available in total, and each of them is mapped onto the suggested OS. For group 241, there is additional information for area production of iron and steel products and hot and cold work manufacturing. The job titles for levels 2 and 1 were merged and embedded based on current NOSS development[85]. Details of the mapping are depicted in Tables 4.13 and 4.14, respectively.

[85] Malaysia Steel Institute (2023, February 15). Retrieved from https://malaysiasteelinstitute.com/noss-development/.

Table 4.13: Mapping OS versus NOSS Available in Group 241

SECTION	(C) MANUFACTURING			
DIVISION	(24) MANUFACTURE OF BASIC METALS			
GROUP	(241) MANUFACTURE OF BASIC IRON AND STEEL			
AREA	Production of Iron and Steel Products	Manufacture of Hot and Cold Work	Manufacture of Steel Tube and Fitting	Manufacture of Other Basic Iron and Steel Products
LEVEL 8	No Job Title	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title	No Job Title
LEVEL 6	Iron/Steel Making Manager	Rolling Manager	Plant Manager	Plant Manager
LEVEL 5	C241-002-5:2017	C241-003-5:2018	C241-004-5:2020	Plant Engineer/Executive
LEVEL 4	C241-002-4:2017	C241-003-4:2018	C241-004-4:2020	Supervisor
LEVEL 3	C241-002-3:2017	C241-003-3:2018	C241-004-3:2020	Technician
LEVEL 2	C241-002-2:2017	C241-003-2:2018	C241-004-2:2020	Operator
LEVEL 1			General Worker	General Worker

Table 4.14: Mapping OS versus NOSS Available in Group 243

SECTION	**(C) MANUFACTURING**		
DIVISION	**(24) MANUFACTURE OF BASIC METALS**		
GROUP	**(243) CASTING OF METALS**		
AREA	**Tin Smelting**	**Production of Aluminium from Alumina**	**Manufacturing of basic precious and other non-ferrous metals**
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	Plant Manager	Plant Manager	Plant Manager
LEVEL 5	Process Engineer/Executive	MC-070-5:2013	Process Engineer/Executive
LEVEL 4	Supervisor	MC-070-4:2013	Rolling Supervisor
LEVEL 3	Technician	MC-070-3:2013	Rolling Technician
LEVEL 2	Operator	MC-070-2:2013	Rolling Operator
LEVEL 1	General Worker	General Worker	General Worker

4.6 Occupational Description

Occupational Description (OD) is a wide, generic, and textual statement of a specific work based on job analysis findings. It often comprises the job's title, tasks, purpose, responsibilities, scope, and working circumstances, as well as the name or designation of the person to whom the employee reports. Currently, there are 60 job titles found in the Manufacture of Basic Metals during the FGDs session. The OD provided in **Annex 6** are the 40 job titles that have been identified as critical or hard-to-fill jobs, as suggested by industry representatives from FGD.

4.7 Conclusion

The OS of the industry is produced in this chapter based on discussions with 15 expert panels during development workshops and a survey questionnaire with 111 respondents. The outcome from this chapter is that the OF structure on each group in the basic metal industry based on MSIC 2008 has been developed with a total of 60 job titles, 40 critical job titles and two (2) job titles relevant to the Industrial Revolution.

Furthermore, the list of jobs in demand, skills in demand, Industrial Revolution pillar and related issues to the basic metal industry has been identified and confirmed through FGD session and survey questionnaire. The next chapter will explain the result’s discussion, recommendation and conclusion.

CHAPTER V

DISCUSSION, RECOMMENDATIONS AND CONCLUSION

5.1 Discussion

Based on the findings obtained throughout the Occupational Analysis of the industry, job areas have been defined and validated to be in tandem with 2-digit MSIC 2008 Division 24: Manufacture of Basic Metals. This study has discovered ten (10) job areas, comprising 60 job titles, 40 critical jobs, and two (2) jobs related to the Industrial Revolution. There are 16 established NOSS already developed under 2-digit MSIC 2008 Division 24: Manufacture of Basic Metals is presented in Table 2.1 in Chapter 2. This research presents a more thorough understanding of the industry's skill development needs and can help plan the development of skills for other critical job areas. The justification of each finding from the FGD session and questionnaire from respondents is discussed in this chapter.

5.1.1 Jobs in Demand

Based on the FGD discussion on job demand, ten (10) job areas are defined, with the jobs in demand mentioned in each job area and their contributing factors. According to the respondents' questionnaire, the most in-demand jobs are at the technician level, which includes Hot Rolling Technician, Technician, and Rolling Technician. Steel Making Manager, Rolling Manager, and Plant Engineer/Executive are the lowest in-demand jobs at the managerial level.

The supervisor and technician received the most votes as jobs in demand, which can be attributed to factors discussed in the FGD session, such as cost-effectiveness & productivity to compete with foreign companies/overseas, product quality acceptance and

consistency, global supply & demand increases, high employee's turnover and shortage of skilled personnel in the manufacture of basic metals industry.

5.1.2 Skills in Demand

During the FGD session, the panel experts highlighted 14 skills in demand in the basic metal industry. The questionnaire survey results are then used to analyse it further, and the top three (3) skills in demand for executives and above in the basic metal industry are product costing skills, production operation/process, and strong technical attitudes. According to the FGD session, most of the skills in demand are required at this higher level. The main recommendations for meeting the skills in demand are training in relevant or comparable fields and reviewing the training curriculum at the training provider.

Respondents' main skills in demand for supervisors and technicians include Information Technology (IT) literacy, strong technical aptitude, troubleshooting/problem-solving skills, a positive attitude towards work, and basic quality assurance. The outcomes of the focus group are consistent with the top five total votes given in the survey by respondents. The main recommendation from FGD to achieve the skills in demand for this level is to participate in education programmes and upgrade supervisor qualifications.

Nevertheless, the survey questionnaire results for operators show that the main skills in demand are basic metal manufacturing knowledge, strong technical aptitude, basic operation & maintenance, communication & interpersonal skills, and a general attitude towards work. It is consistent with the FGD discussion that all skills are highly required at this level except for raw material handling, which was voted to be less required than others. Formal mentoring or coaching programmes and participation in education programmes are recommended to improve the skilled workers at this level.

In conclusion, each skill in demand recommended by panel expertise from the FGD session aligns with the survey respondents' responses. The primary skills in demand in each category, which include product costing skills (Executive & Above), Information Technology (IT) literacy (Supervisor & Technician), and basic metal manufacturing knowledge (Operator), must be highlighted and reinforced in the manufacture of basic metals industry.

5.1.3 Industrial Revolution

Experts in FGD sessions emphasised the four Industrial Revolutions (autonomous robots, big data analytics, simulation, and system integration). According to the findings of the focus group, there are two job titles (plant manager and plant engineer/executive) related to the Industrial Revolution in the basic metal industry. The questionnaire responses are used for further analysis, which reveals that system integration is the most selected pillar of the Industrial Revolution in the basic metal industry for upstream. At the same time, simulation skills rank highest among the other skills for midstream.

Both skills have been chosen as the most important Industrial Revolution in the basic metal industries because they can increase productivity and effectiveness, reduce costs, minimise human error, make quick decisions, and produce consistent results.

5.1.4 Related Issues in the Manufacture of Basic Metals

High production costs, lagging technological upgrades/changes, and high manpower turnover are three (3) major current issues in the basic metal industry that have been discussed and decided in FGD sessions by panel experts. According to a questionnaire survey, insufficient manpower issues received the most votes for upstream, while poor facilities and amenities for workers were chosen as the most serious problems in the basic metal industry for midstream. Insufficient manpower in upstream industries results in high votes from respondents due to demanding work, 3D work nature (Dirty, Dangerous, Difficult), high wages and fringe benefits, particularly among the younger generation. For midstream, most respondents agreed on poor worker facilities and amenities, which could directly impact high worker turnover and labour shortages.

In conclusion, the findings from the FGD and the survey agree that technicians and operators are the most in demand for basic metal manufacturing. FGD panels suggested technicians and operators as jobs in demand because they are hard to fill and always in short supply, which is supported by survey responses from Malaysian manufacturers of basic metals. Product costing skills (Executive & Above), competence in Information Technology (IT) literacy (Supervisor & Technician), and basic metal manufacturing knowledge (Operator) are the highest in demand for each of their categories. Subsequently, based on FGD and survey results, simulation and system integration have been identified as the two main pillars of the Industrial Revolution.

5.2 Recommendations

This OF is expected to serve as a guide for NOSS development and an important approach to producing qualified employees. When it comes to regulating workforce demand and supply, there are several options. For example, collaboration with other agencies, departments, or educational institutions can be formed and maintained to improve external talent pools. Existing employees may also require retraining to meet changing new skill requirements.

The autonomous robot, system integration, simulation and big data analytics are the Industrial Revolutions pillars that have been identified throughout this OF development. These pillars are highly useful for transforming basic metal industries Malaysia toward advanced technologies and highly skilled employees.

The steel demand is increasing daily, and significant amounts of steel are imported to meet the demand. As a result, increased production is required to conserve foreign currency and support the development of our nation's infrastructure. However, Malaysian manufacturing of basic metal industries is fully responsible for ensuring that the Green Technology Master Plan Malaysia 2017-2030 is implemented.

Several recommendations should be prioritised to improve the manufacture of basic metals industries.

a) Continuously optimize the efforts to build skills for all employment areas in the basic metal sectors. This effort includes creating NOSS for each work area's designated important job titles.

b) Examine current regulations and initiatives to safeguard regional industries to enlist the government's aid and support.

c) Potential employees in the field of basic metals manufacturing should get guidance and the most recent information to help them prepare for the knowledge and skills needed by the industries.

d) Recommend all organisational jobs that correspond to the job titles from this OF development as guidance.

5.3 Conclusion

The conclusion is based on the OF's stated objectives, which are detailed below:

Objective 1: To develop an Occupational Structure (OS) in the Manufacture of Basic Metals Industry based on MSIC 2008.

The Manufacture of Basic Metals Industry OF, which was carried out in conjunction with 15 expert panellists from several organisations, resulted in the identification of 10 job areas, 60 job titles, 40 critical job titles, and two (2) job titles relevant to the Industrial Revolution. It is intended that a consistent supply of locally skilled and qualified workers will be provided by planning and carrying out the training and certification of this sector's personnel shortly. The full details regarding the OS can be found in Chapter 4.

Objective 2: To determine the skills in demand in the Manufacture of Basic Metals industry.

From FGD sessions, the panels expert has come out with some skills and knowledge required in the Manufacture of Basic Metals Industry as follows:

a) Basic metal manufacturing knowledge.
b) Product costing skills.

c) Raw material handling.
d) Basic Operation & Maintenance.
e) Production operation/process.
f) Basic Quality assurance.
g) General attitude towards work (commitment, resourcefulness, teamwork, etc.).
h) Competent in Information Technology (IT) literacy.
i) Technology skills.
j) Troubleshooting /problem-solving skills.
k) Communication & Interpersonal skills
l) Strong technical aptitude (natural ability) / manual dexterity (hands-on).
m) Competent in using electronic or mechanical devices and tools.
n) Specialized technical skills.

For survey results, the respondents have highlighted the top skills in demand for each category which is raw materials and procurement for executive & above. For supervisors & technicians, respondents have chosen competent in information technology and basic metal manufacturing knowledge for the operator.

It is concluded that these are the top skills in demand for the manufacture of basic metals industry based on FGD and survey analysis results. Related companies or organisations are encouraged to hone these suggested skills to ensure this industry development.

Objective 3: To determine the job titles for the Manufacture of Basic Metals industry that is relevant to the Industrial Revolution.

The FGD panels have reviewed the Industrial Revolution pillar and decided that the related pillar for the manufacture of the basic metals industry are Autonomous Robots, Big Data Analytics, Simulation and System Integration.

The FGD panels also reviewed the list and specified the job titles related to the Industrial Revolution in the manufacture of the basic metals industry. There are just two (2) jobs defined for Industrial Revolution, respectively. The job titles associated with Industrial

Revolution are described in detail in **Annex 5**.

Objective 4: To determine the critical jobs in the Manufacture of Basic Metals industry

The FGD panels have identified the 40 critical job titles for this OF. The critical job titles are described in detail in **Annex 4**. Survey data also support the data obtained from the FGD session and highlighted technician and operator job titles in high demand. The criticality of these job titles is based on hard-to-fill jobs requiring a special set of skills.

Objective 5: To determine Occupational Descriptions (OD) of the Manufacture of Basic Metals for critical jobs based on the developed Occupational Structure (OS)

All critical job titles' ODs were obtained during the workshops and afterwards confirmed by the FGD members. These ODs will also act as a resource for the job description and the necessary skills for NOSS development. Details of OD can be found in **Annex 6**.

Last but not least, close cooperation between industry stakeholders needs to be strengthened to address the issues revealed by this study. To advance the industry, participants in the sector, educational institutions, governmental bodies, and employees must all play their parts well to ensure the development of the manufacture of the basic metals industry.

The output of this OF research and development project will serve as a guide for carrying out future plans to train locals in the manufacture of basic metals and certify them in order to improve the goods and services offered by industry players.

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ANNEX 1: MOSQF LEVEL DESCRIPTORS

Malaysian Occupational Skills Qualification Framework (MOSQF) Level Descriptor

Level	Level Descriptors
8	Achievement at this level reflects the ability to develop original understanding and extend a sub-area of knowledge or professional practice. It reflects the ability to address problematic situations that involve many complexes, interacting factors through initiating, designing and undertaking research, development or strategic activities. It involves the exercise of broad autonomy, judgement and leadership in sharing responsibility for the development of a field of work or knowledge, or for creating substantial professional or organisational change. It also reflects a critical understanding of relevant theoretical and methodological perspectives and how they affect the field of knowledge or work.
7	Achievement at this level reflects the ability to reformulate and use relevant understanding, methodologies and approaches to address problematic situations that involve many interacting factors. It includes taking responsibility for planning and developing courses of action that initiate or underpin substantial change or development, as well as exercising broad autonomy and judgment. It also reflects an understanding of theoretical and relevant methodological perspectives, and how they affect their sub-area of study or work.
6	Achievement at this level reflects the ability to refine and use relevant understanding, methods and skills to address complex problems that have limited definition. It includes taking responsibility for planning and developing courses of action that are able to underpin substantial change or development, as well as exercising broad autonomy and judgment. It also reflects an understanding of different perspectives, approaches of schools of thought and the theories that underpin them.
5	Achievement at this level reflects the ability to identify and use relevant understanding, methods and skills to address broadly-defined, complex problems. It includes taking responsibility for planning and developing courses of action as well as exercising autonomy and judgment within broad parameters. It also reflects understanding of different perspectives, approaches or schools of thought and the reasoning behind them.
4	Achievement at this level reflects the ability to identify and use relevant understanding, methods and skills to address problems that are well defined but complex and non-routine. It includes taking responsibility for overall courses of action as well as exercising autonomy and judgment within fairly broad parameters. It also reflects under-standing of different perspective or approaches within a sub-area of study or work.
3	Achievement at this level reflects the ability to identify and use relevant understanding, methods and skills to complete task and address problems that are well defined with a measure of complexity. It includes taking responsibility

Level	Level Descriptors
	for initiating and completing tasks and procedures as well as exercising autonomy and judgments within limited parameter. It also reflects awareness of different perspectives or approaches within a sub-area of study or work.
2	Achievement at this level reflects the ability to select and use relevant knowledge, ideas, skills and procedures to complete well-defined tasks and address straightforward problem. It includes taking responsibility for completing tasks and procedures, and exercising autonomy and judgment subject to overall direction or guidance.
1	Achievement at this level reflects the ability to use relevant knowledge, skills and procedures to complete routine and predictable tasks that include responsibility for completing tasks and procedures subject to direction or guidance.

(Source: Department of Skills Development)

ANNEX 2: LIST OF CONTRIBUTORS

LIST OF OCCUPATIONAL FRAMEWORK DEVELOPMENT COMMITTEE FOR MANUFACTURE OF BASIC METALS

NO.	NAME	POSITION	ORGANISATION
1.	Lee Hooi Lan	General Manager	Malaysia Steel Institute
2.	Goh Yee Pheng	Personnel Section Executive	CSC Steel Sdn. Bhd.
3.	Tan Sook Eng	Personnel Section Executive	CSC Steel Sdn. Bhd.
4.	Lai Fei Sin	Head of Supply Chain	Mycron Steel CRC Sdn. Bhd.
5.	Sabrudin Suren	Senior Manager	Malaysia Steel Association
6.	Mohd Hisyam bin Mohamed	Assistant Manager Production	Mycron Steel CRC Sdn. Bhd.
7.	Tengku Ahmad Zulkifli bin Tengku Sulaiman	Managing Director	Dute Edge Sdn. Bhd.
8.	Mohd Iskandar Itam	Senior Designer	Ingress Katayama Technical Centre Sdn. Bhd.
9.	Zulpakhar bin Arshad	Assistant Manager	Ingress Katayama Technical Centre Sdn. Bhd.
10.	Chew Bee Ling	General Manager	Ann Joo Resources Berhad
11.	Lin Wai Hoong	Manager	Kian Joo Can Factory Berhad
12.	Khairul Nizam	Manager	Aluminium Company of Malaysia Berhad (ALCOM)
13.	Siti Zahayu Ahmad Zam Zam	Human Resource Manager	Mycron Steel CRC Sdn Bhd
14.	Rosli Bin Yaakob	Manager	Lion Steel Sdn Bhd

LIST OF OCCUPATIONAL FRAMEWORK TECHNICAL EVALUATION COMMITTEE FOR MANUFACTURE OF BASIC METALS

NO.	NAME	ORGANISATION
1.	Albert Chan Kim Tee	Malaysia Smelting Corporation Berhad
2.	Chua Seok Cheng	Southern Steel Berhad
3.	Ir. Ts. Dr Mohd Shamsuri Khalid	Universiti Teknologi Malaysia Kuala Lumpur
4.	Ts. Dr. Nurul Amin bin Badrul	Centre of Instructors and Advanced Skills Training (CIAST)
5.	Mohd Azizi bin Mohd Nasir	*Pejabat Tenaga Kerja* Subang Jaya
6.	Dr. Saidi bin Zain	Centre of Instructors and Advanced Skills Training (CIAST)
7.	Norhaili binti Kamsan	Ministry of Human Resources (MoHR)
8.	Azati Syima binti Azini	Ministry of Human Resources (MoHR)

LIST OF DEPARTMENTS OF SKILLS DEVELOPMENT (DSD) OFFICERS INVOLVED IN OCCUPATIONAL FRAMEWORK DEVELOPMENT FOR THE MANUFACTURE OF BASIC METALS

NO.	NAME	POSITION	ORGANISATION
1.	Khadijah binti Isaak	Principal Assistant Director	Department of Skills Development (DSD)
2.	Ahmad Azran bin Ranaai	Senior Assistant Director	Department of Skills Development (DSD)
3.	Noor Azura bin Adnan	Senior Assistant Director	Department of Skills Development (DSD)
4.	Nazrul Hilmi bin Mohammad	Senior Assistant Director	Department of Skills Development (DSD)
5.	Ts. Nor Aini binti Abdullah	Senior Skills Development Officer	Department of Skills Development (DSD)
6.	Yuhazreen bin Yusof	Skills Development Officer	Department of Skills Development (DSD)

LIST OF OCCUPATIONAL FRAMEWORK INTERNAL TECHNICAL COMMITTEE FOR THE MANUFACTURE OF BASIC METALS

NO.	NAME	POSITION	ORGANISATION
1.	Dr. Ghalip bin Spahat	Director	Department of Skills Development (DSD)
2.	Dr. Zool Hilmi bin Mohamed Ashari	Deputy Director	Department of Skills Development (DSD)
3.	Ts. Dr. Suhaila binti Ali	Deputy Director	Department of Skills Development (DSD)
4.	Dr. Norhuda binti Salim	Head of Programme Skills Instructor Development Programme (PPK)	Centre of Instructors and Advanced Skills Training (CIAST)
5.	Ts. Dr. Wan Nasarudin bin Wan Jalal	Principal Assistant Director (Policy Coordination)	Department of Skills Development (DSD)
6.	Dr. Khuzainey binti Ismail	Senior Assistant Director (Policy Planning 2)	Department of Skills Development (DSD)
7.	Dr. Fairus Atida binti Said	Senior Assistant Director (SLDN Assessment)	Department of Skills Development (DSD)
8.	Dr. Nor Salwa binti Hamdan	Senior Assistant Director (SLaPB Accreditation)	Department of Skills Development (DSD)
9.	Ts. Dr. Norhayati binti Yahaya	Head of Unit (Competencies Advancement and Quality Assurance) Skills Professional Development (SPD) Programme	Centre of Instructors and Advanced Skills Training (CIAST)
10.	Ts. Dr. Nurul Amin bin Badrul	Head of Unit (Research and Innovation)	Centre of Instructors and Advanced Skills Training (CIAST)
11.	Dr. Saidi bin Zain	Innovation Coordinator Research and Innovation Unit	Centre of Instructors and Advanced Skills Training (CIAST)

LIST OF WORKFORCE TEAM IN OCCUPATIONAL FRAMEWORK DEVELOPMENT FOR THE MANUFACTURE OF BASIC METALS

NO.	NAME	POSITION	ORGANISATION
1.	Ts. Ah Faezal Husni Bin Arshad	Project Director	PFH Resources (M) Sdn. Bhd.
2.	Ts. Dr. Zulkifli Mohd Sidi	Lead Researcher	PFH Resources (M) Sdn. Bhd.
3.	Akhsan Kamil Azizi Bin Lokman Hakim	Project Executive	PFH Resources (M) Sdn. Bhd.
4.	Dr. Amin Safwan Alikasturi	Researcher	PFH Resources (M) Sdn. Bhd.
5.	Muhammad Hilman Bin Abdul Mustapa	Assistant Researcher	PFH Resources (M) Sdn. Bhd.
6.	Junaidah binti Ahmad Ghazali	Proofreader Team	PFH Resources (M) Sdn. Bhd.

ANNEX 3: QUESTIONNAIRE

PFH Resources (M) Sdn. Bhd.

&

Jabatan Pembangunan Kemahiran (JPK)

Ministry of Human Resources

C – 24 Manufacture of Basic Metal

Occupational Framework Survey

The Department of Skills Development (DSD), Ministry of Human Resources is currently conducting an analysis of the Occupational Framework (OF) of the industry. From this analysis, the industry framework, occupational structure, occupational job titles, and job description will be summarised for the use of the government, private sector, investors, employers, employees, educators or any personnel involved either directly or indirectly with the industry.

The main objectives of this research are to:

1. Determine the skills in demand in the Manufacture of Basic Metal;
2. Determine the Job Titles in the Manufacture of Basic Metal;
3. Determine the critical jobs in the Manufacture of Basic Metal; and
4. Determine related current & future issues in the Manufacture of Basic Metal.

It will also provide a reference competency for skills required by workers to perform as required in the industry.

This survey will be used as field data in order to conduct a comprehensive analysis of the industry's Occupational Framework (OF).

The target group for this survey is the organisation's representative either from the Human Resource Department or personnel at the Management level.

We would like to extend our heartfelt gratitude for your cooperation in answering this survey. Please fill in where necessary in the forms provided. There will be further communication with survey respondents in order to verify our findings. We are also subject to Act 709 where all personal information and data relating to the respondents are **CONFIDENTIAL**. All the given information and finding of the study are Malaysian Government property enabling the planning of the TVET development and reflecting the national economy.

Survey Respondent Details

Name: …….

Position: ……...

Organisation: ……
(With Stamping)

Date :

Please answer the questions below in the space provided, additional pages may be added if necessary.

There are 5 Sections in these 7 pages survey.

SECTION 1: INDUSTRIAL CLASSIFICATION

1.1 Which of the classification is your **core** in the Manufacture of Basic Metal Industry? (Can ✓ more than once)

a.	Production of pig iron & spiegeleisen in pigs, blocks/other primary forms	
b.	Production of bars & rods of stainless steel/other alloy steel	
c.	Manufacture of seamless tubes, by hot rolling, hot extrusion/hot drawing/by cold drawing/cold rolling	
d.	Manufacture of steel tube fittings	
e.	Manufacture of other basic iron & steel products	
f.	Tin smelting	
g.	Production of aluminium from alumina	
h.	Manufacture of other basic precious & other non-ferrous metals	
i.	Casting of iron	
J.	Casting of steel	
k.	Casting of non-ferrous metals	

1.2 Which classification is needed by the Manufacture of Basic Metal Industry to be more **competitive** in the future? (✓ once only)

a.	Production of pig iron & spiegeleisen in pigs, blocks/other primary forms	
b.	Production of bars & rods of stainless steel/other alloy steel	
c.	Manufacture of seamless tubes, by hot rolling, hot extrusion/hot drawing/by cold drawing/cold rolling	
d.	Manufacture of steel tube fittings	
e.	Manufacture of other basic iron & steel products	
f.	Tin smelting	
g.	Production of aluminium from alumina	
h.	Manufacture of other basic precious & other non-ferrous metals	
i.	Casting of iron	
J.	Casting of steel	
k.	Casting of non-ferrous metals	

1.3 Which of the job title is **high job demanding** in Manufacture of Basic Metal Industry? (can ✓ more than once)

a.	Iron/Steel Making Manager	
b.	Iron/Steel Making Engineer/Executive	
c.	Iron/Steel Making Supervisor	
d.	Rolling Manager	
e.	Rolling Engineer/Executive	
f.	Rolling Supervisor	
g.	Rolling Technician	
h.	Plant Manager	
i.	Plant Engineer Executive	
j.	Plant Supervisor	
k.	Process Engineer/Executive	
l.	Hot Rolling Supervisor	
m.	Hot Rolling Technician	
n.	Hot Rolling Operator	
o.	Foundry Manager	
p.	Foundry Engineer/Executive	
q.	Supervisor	
r.	Technician	
s.	Operator	
t.	General Worker	

SECTION 2: OCCUPATIONAL QUALIFICATION

2.1 Which of the **Academic critical qualifications are** to be met in the Manufacture of Basic Metal Industry? (✓ one only)

a.	Certificate	
b.	Diploma	
c.	Degree	
d.	Master	
e.	PhD	

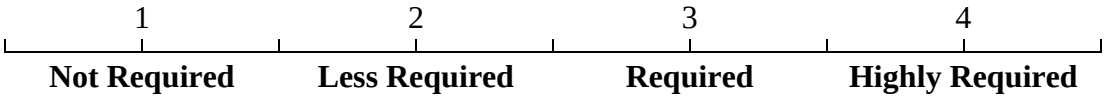
2.2 Which of the **Technical & Vocational critical qualifications are** to be met in the **Manufacture of Basic Metal Industry**? (✓ one only)

a.	Certificate	
b.	Skill Diploma (Technical/Skill Colleges)	
c.	Skill Advanced Diploma (Technical/Skill Colleges)	
d.	Others ……..	

SECTION 3: SKILLS IN DEMAND

3.1 Below are set of skill categories based on the personnel involved in the **Manufacture of Basic Metal Industry**. Rate the level of demand for the set of skills by using the Likert scale below:

Category of Skills	Description
Skilled Workers	Managers, Executive, Specialist, and Professional
Semi-Skilled Workers	Supervisor & Technician
Low Skilled Workers	Operator



No	Competency	Low-Skilled Workers	Semi-Skilled Workers	Skilled Workers
a	Basic metal manufacturing knowledge			
b	Product costing skills			
c	Raw material handling			
d	Basic Operation & Maintenance			
e	Production operation/process			
f	Basic Quality assurance			
g	General attitude towards work (Commitment, resourcefulness, teamwork, etc.)			
h	Competent in Information Technology (IT) literacy			
i	Troubleshooting / problem-solving skills			
j	Communication & Interpersonal skills			
k	Strong technical aptitude (Natural ability) / manual dexterity (hands-on)			
l	Competent in using electronic or mechanical devices and tools			
n	Technology skills (the ability to interact with computer-based technologies and perform technical tasks)			

o	Specialized technical skills			

3.2 Based on your observation, do you think the workers possess the skills required by the Manufacture of Basic Metal Industry?

[__] Yes

[__] No

If No, please provide your opinions …….

SECTION 4: INDUSTRIAL REVOLUTION

4.1 Do you think Industry Revolution (e.g. Digitalization) would have an impact on the economic activities of the **Manufacture of Basic Metal Industry**?

[__] Yes

[__] No

[__] Not sure

4.2 The **Manufacture of Basic Metal Industry** contains two major areas, which are **Upstream and Midstream**. All the category is described in the table below.

Category of Stream	Description
Upstream	Involves the use of iron ore, scrap and/or coal to produce molten steel liquid in a blast furnace, which will then be cast into billets, blooms and slabs.
Midstream	Involves the rolling of billets, blooms and slabs to form hot-rolled and cold-rolled and galvanised steel coils, plates, bars and wire rods and sections.

Listed below are the 11 technology drives/pillars of the Industry Revolution.

Which **Manufacture of Basic Metal Industry** job area is likely to be affected by this Industry Revolution? Tick (✓) where applicable, may (✓) more than once.

No.	TECHNOLOGY DRIVES / PILLARS	JOB AREAS	
		Upstream (US)	**Midstream** (MS)
a	**Autonomous Robots** (coordinated and automated actions of robots to complete tasks intelligently, with minimal human input)		
b	**Big Data Analytics** (the analysis of ever larger volumes of data. Circulation, collection, and analysis of information is a necessity because it supports productivity growth based on a real-time decision-making process)		
c	**Cloud Computing** (storing and accessing data and programs over the Internet instead of your computer's hard drive)		
d	**Internet of Things (IoT)** (all machines and systems connected to the production plant (as well as other systems) must be able to collect, exchange and save these massive volumes of information, in a completely autonomous way and without the need for human intervention)		
e	**Additive Manufacturing (3D Printing)** (use in prototyping, design iteration and small-scale production and often described as "rapid prototyping" - produce the desired components faster, more flexibly and more precisely than ever before)		

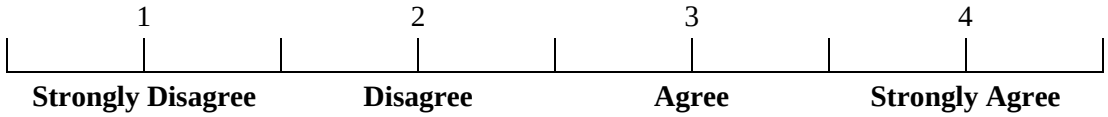
No.	TECHNOLOGY DRIVES / PILLARS	JOB AREAS	
		Upstream (US)	**Midstream** (MS)
f	**System Integration** (the process of linking together different computing systems and software applications physically or functionally to act as a coordinated whole via the Internet of Things-IoT)		
g	**Cybersecurity** (with the increased connectivity and use of standard communications protocols, the need to protect critical industrial systems and manufacturing lines from cybersecurity threats is increasing)		
h	**Augmented Reality** (Augmented-reality-based systems support a variety of services, such as selecting parts in a warehouse and sending repair instructions over mobile devices - provide workers with real-time information to improve decision-making and work procedures)		
i	**Simulation** (simulations will leverage real-time data to mirror the physical world in a virtual model, which can include machines, products, and humans. This allows operators to test and optimize the machine settings for the next product in line in the virtual world before the physical changeover, thereby driving down machine setup times and increasing quality)		
j	**Horizontal and Vertical Integration** Horizontal: Integrate through network & value chain from Suppliers, the company itself, and the customers. Vertical: Integrate through network & value chain across functional departments, i.e., Sales, R&D, Procurement until customer services		

k	**New Business Models** The business model is a combination of two functions: the process of value creation and the process of value capture. The process of value creation refers to the process of creating value for the target consumer. The process of value capture refers to converting market opportunities into performance outcomes for the firm, which then justifies value creation		

SECTION 5: RELATED ISSUES

5.1 What is/are the key issue/s related to **Manufacture of Basic Metal Industry**?

Please rate **ALL** the key issues by using the Likert scale below.



No	KEY ISSUES	JOB AREAS	
		Upstream (US)	**Midstream** (MS)
a	Insufficient manpower		
b	Low-skilled & low-performance workforce		
c	High dependency on foreign labour		
d	Production overload		
e	Technical Training		
f	Technological upgrade/change		
g	Youth Involvement (Dangerous, Difficult, Dirty industry)		
h	Lack of infrastructure support		
i	Poor facilities and amenities for worker		
j	Work environment		

End of Questionnaire

ANNEX 4: LIST OF CRITICAL JOB TITLES

LIST OF CRITICAL JOBS

No.	Critical Job Title	Group/Area	Level
Manufacture of Basic Iron and Steel			
1	Iron/Steel Making Manager	Production of Iron and Steel Products	6
2	Iron/Steel Making Engineer/Executive	Production of Iron and Steel Products	5
3	Iron/Steel Making Supervisor	Production of Iron and Steel Products	4
4	Technician	Production of Iron and Steel Products	3
5	Operator	Production of Iron and Steel Products	2
6	Rolling Manager	Hot Work Process (Upstream)	6
7	Rolling Engineer/Executive	Manufacture of Hot and Cold Work	5
8	Rolling Supervisor	Manufacture of Hot and Cold Work	4
9	Rolling Technician	Manufacture of Hot and Cold Work	3
10	Operator	Manufacture of Hot and Cold Work	2
11	Plant Manager	Manufacture of Steel Tube and Fitting	6
12	Plant Engineer/ Executive	Manufacture of Steel Tube and Fitting	5
13	Rolling Supervisor	Manufacture of Steel Tube and Fitting	4
14	Technician	Manufacture of Steel Tube and Fitting	3
15	Operator	Manufacture of Steel Tube and Fitting	2
16	Plant Manager	Manufacture of Other Basic Iron and Steel Products	6
17	Plant Engineer/ Executive	Manufacture of Other Basic Iron and Steel Products	5
18	Supervisor	Manufacture of Other Basic Iron and Steel Products	4

19	Technician	Manufacture of Other Basic Iron and Steel Products	3
20	Operator	Manufacture of Other Basic Iron and Steel Products	2
Manufacture of Basic Precious and Other Non-Ferrous Metals			
21	Process Engineer/Executive	Tin Smelting	5
22	Supervisor	Tin Smelting	4
23	Technician	Tin Smelting	3
24	Operator	Tin Smelting	2
25	Process Engineer/Executive	Production of Aluminium from Alumina	5
26	Hot Rolling Supervisor	Production of Aluminium from Alumina	4
27	Hot Rolling Technician	Production of Aluminium from Alumina	3
28	Hot Rolling Operator	Production of Aluminium from Alumina	2
29	Process Engineer/Executive	Manufacturing of Basic Precious and Other Non-Ferrous Metals	5
30	Operator	Manufacturing of Basic Precious and Other Non-Ferrous Metals	2
Casting of Metals			
31	Foundry Engineer/Executive	Casting of Iron	5
32	Technician	Casting of Iron	3
33	Operator	Casting of Iron	2
34	Foundry Engineer/Executive	Casting of Steel	5
35	Technician	Casting of Steel	3
36	Operator/ Foundryman	Casting of Steel	2
37	Foundry Process Engineer	Casting of Non-ferrous Metal	5

38	Supervisor	Casting of Non-Ferrous Metal	4
39	Technician	Casting of Non-ferrous Metal	3
40	Operator	Casting of Non-ferrous Metal	2

ANNEX 5: JOB TITLES RELEVANT TO INDUSTRIAL REVOLUTION

LIST OF JOB TITLES RELATED TO THE INDUSTRIAL REVOLUTION

No.	Job Title Related to Industrial Revolution	Group/Area	Level
1	Plant Manager	Manufacture of Other Basic Iron and Steel Products	6
2	Plant Engineer/Executive	Manufacture of Other Basic Iron and Steel Products	5
3	Technician	Casting of Non-ferrous Metal	3
4	Operator	Casting of Non-ferrous Metal	2

ANNEX 6: OCCUPATIONAL DESCRIPTION (OD)

SECTION : (C) MANUFACTURING

DIVISION : (24) MANUFACTURE OF BASIC METALS

GROUP : (241) MANUFACTURE OF BASIC IRON AND STEEL

MSIC GROUP : 241
AREA : Production of Iron and Steel Products
JOB TITLE : Iron/Steel Making Manager
LEVEL : 6

RESPONSIBILITIES

Iron/Steel Making Manager is responsible for determining, implementing and monitoring organisation strategies, policies and plans; planning details of production activities in terms of output quality and quantity, cost, time available and labour requirements; controlling the operation of plant and quality procedures through planning of maintenance, designation of operating hours and supply of parts and tools; establishing and managing budgets, monitoring organisation output and costs, and adjusting processes and resources to minimize costs; coordinating with other managers about production matters; controlling the preparation of production records and reports; adhering the implementation of occupational health and safety requirements accordingly; implement business plan and products to be manufactured; identifying and implementing regulatory and statutory requirements affecting manufacturing operations and the environment; overseeing the provision of technical specification and the serving contract for the procurement; overseeing the staff development, training and performance of staff; identifying areas for continuous improvement plans, and implement changes in line with KPI's; controlling costs without sacrificing safety, quality and productivity; and creating and promote conducive working environment to ensure that employee issues are heard and addressed.

Knowledge:

- Related Safety, Health and Environment regulation.
- Company policies and Standard Operating Procedure (SOP).
- Related Employment regulation.
- Management systems (waste, energy, water)
- Iron or steel melting process.
- Iron and steel market dynamic.
- Iron and steel manufacturing process flow.
- The supply chain of Iron and steel domestically and internationally.

- Operating and development expenditure.
- Analytical skills
- Digital & IT knowledge.

Skills:

- Prepare and review budget and cost estimates.
- Able to apply communication and problem-solving skills.
- Provide technical advice and instruction to staff and customers.
- Benchmarking and evaluation of co-workers within internal and external organisations.
- Understand the organisation's product cost structure.
- Plan, review, coordinate maintenance schedules, design documentation and operational reports and charts.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environment regulations and product quality standards.
- Excellent communication and problem-solving with co-workers.
- Excellent interpersonal skills.
- Excellent management skills.
- Excellent team building and high level of commitment.

MSIC GROUP : 241
AREA : Production of Iron and Steel Products
JOB TITLE : Iron/Steel Making Engineer/Executive
LEVEL : 5

RESPONSIBILITIES

Iron/Steel Making Engineer/Executive is responsible for reviewing and fulfilling production schedules, processes, specifications, related information and the Client's technical documentation and requirements; optimising production processes and control systems that maximize efficiency and reduce waste; identifying and implementing process improvements and technological upgrades: adherence to production standards in line with company's KPIs; preparing material and equipment lists, purchase orders, cost analyses, and estimated production costs; improving facilities and determining personnel requirements; training staff for new processes and providing instructions and manuals; managing process documentation and preparing production reports; and leading and managing supervisors and workforce.

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Management systems (waste, energy, water)
- Iron or steel melting process.
- Iron and steel manufacturing process flow.
- Analytics.
- Information Technology (IT).
- Product and input material specifications.
- Digital & IT knowledge.

Skills:

- Review and improvise Standard Operating Procedure (SOP).
- Prepare budget and cost estimate.
- Able to apply communication and problem-solving skills.

- Provide technical training and instruction to staff.
- Execute maintenance schedules, design documentation and operational reports.
- Review production report.
- Verify production line checklists.
- Data sourcing/mining.
- Verify machine parameter setting.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Good communication and problem-solving with co-workers.
- Good interpersonal skills.
- Good team building and high level of commitment.
- High level of dedication and responsibility.

MSIC GROUP : 241
AREA : Production of Iron and Steel Products
JOB TITLE : Iron/Steel Making Supervisor
LEVEL : 4

RESPONSIBILITIES

Iron/Steel Making Supervisor is responsible for materials requesting, receiving, and recording according to the material requisition form (MRF); organising and scheduling the daily work by taking into consideration manpower and material availability; providing data on consumable items for cost estimation; promote a safe workplace for yourself and your fellow employees according to OSHA requirement; supervise and practice proper quality system controls for any changes of processes, materials, and suppliers; responsible for training, mentoring and coaching senior technicians and technicians; identify and coordinate repair and maintenance work; and conduct toolbox briefing.

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Quantification and monitoring (waste, energy, water).
- Iron or steel melting process.
- Product and input material specifications.

Skills:

- Manage production workforce.
- Implement production operation scheduling.
- Assist daily production data collection.
- Coordinate daily production operation and inspection of tools and equipment preparation.
- Prepare and coordinate preventive and corrective maintenance activities for machines and equipment.
- Confirm machine parameter setting.
- Perform supervisory functions.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Effective communication and problem-solving with co-workers.
- Effective interpersonal skills.
- Effective team building and high level of commitment.
- High level of dedication and responsibility.

MSIC GROUP : 241
AREA : Production of Iron and Steel Products
JOB TITLE : Technician
LEVEL : 3

RESPONSIBILITIES

Technician is responsible for maintaining and operating equipment and systems involving materials processing of iron or steel melting; interacts well with craft supervisors and personnel to get equipment and systems repaired and quality requirements; compliant with safety, health and environment; updates data of daily production operation; set up machine parameter setting; performing minor repairs and reporting breakdowns in a timely manner; keeping equipment maintenance logs, as well as maintaining a safe and tidy work environment; and attend toolbox briefing. The technician also should communicate (verbally and written) clearly with other technicians and workers.

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Quantification and monitoring (waste, energy, water).
- Iron or steel melting activities.
- Product and input material specifications.
- Overall Equipment Effectiveness (OEE).
- Autonomous production maintenance.
- Concept of 5S.

Skills:

- Perform effective production activities.
- Perform daily production operations and inspection of tools and equipment preparation.
- Perform preventive and corrective maintenance activities for machines and equipment.
- Set up machine parameters setting.

- Handle personal tools for the job, including up-to-date documented personal tool lists.
- Assist supervisor job.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Effective communication and problem-solving with co-workers.
- Effective interpersonal skills.
- Effective team building and high level of commitment.
- High dedication to the implementation and perpetuation of values and ethics.
- Perform production-related activities on time.

MSIC GROUP : 241
AREA : Production of Iron and Steel Products
JOB TITLE : Operator
LEVEL : 2

RESPONSIBILITIES

Operator is responsible for optimising production efficiency by adjusting machinery and equipment settings as instructed, performing minor repairs and reporting breakdowns. Operators can also monitor the re-melting process to ensure stability and efficiency and react as necessary to undesirable conditions. The operators should also perform department housekeeping, move material as needed, perform furnace maintenance, cleaning and reassembling and lastly, adhere to the safety procedure and rules.

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Iron or steel melting activities.
- Product and input material specifications.
- Overall Equipment Effectiveness (OEE).
- Autonomous production maintenance.
- Concept of 5R.
- Concept of 5S.

Skills:

- Perform effective production activities.
- Perform daily production operations and inspection of tools and equipment preparation.
- Perform preventive and corrective maintenance activities for machines and equipment.
- Set up machine parameters setting.
- Handle personal tools for the job, including up-to-date documented personal tool lists.

- Assist supervisor job.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Effective communication and problem-solving with co-workers.
- Effective interpersonal skills.
- Effective team building and high level of commitment.
- High dedication to the implementation and perpetuation of values and ethics.
- Perform production-related activities on time.

MSIC GROUP : 241
AREA : Manufacture of Hot and Cold Work
JOB TITLE : Rolling Manager
LEVEL : 6

RESPONSIBILITIES

Rolling Manager is responsible for determining, implementing and monitoring organisation strategies, policies and plans; planning details of production activities in terms of output quality and quantity, cost, time available and labour requirements; controlling the operation of plant and quality procedures through planning of maintenance, designation of operating hours and supply of parts and tools; establishing and managing budgets, monitoring organisation output and costs, and adjusting processes and resources to minimize costs; coordinating with other managers about production matters; controlling the preparation of production records and reports; adhering the implementation of occupational health and safety requirements accordingly; implement business plan and products to be manufactured; identifying and implementing regulatory and statutory requirements affecting manufacturing operations and the environment; overseeing the provision of technical specification and the serving contract for the procurement; overseeing the staff development, training and performance of staff; identifying areas for continuous improvement plans, and implement changes in line with KPIs; controlling costs without sacrificing safety, quality and productivity; and creating and promote conducive working environment to ensure that employee issues are heard and addressed.

Knowledge:

- Related Safety, Health and Environment regulation.
- Company policies and Standard Operating Procedure (SOP).
- Management systems (waste, energy, water).
- Steel hot rolling process (Flat/Long Product).
- Steel market (Flat/Long Product).
- Steel manufacturing process flow.
- The supply chain of steel domestically and internationally.
- Related Employment regulation.

- Operating and development expenditure.
- Analytics.
- Digital & IT knowledge.

Skills:

- Prepare and review budget and cost estimates.
- Able to apply communication and problem-solving skills.
- Provide technical advice and instruction to staff and customers.
- Benchmarking and evaluation of co-workers within internal and external organisations.
- Understand the organisation's product cost structure.
- Plan, review and coordinate maintenance schedules, design documentation and operational reports and charts.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environment regulations and product quality standards.
- Excellent communication and problem-solving with co-workers.
- Excellent interpersonal skills.
- Excellent management skills.
- Excellent team building and high level of commitment.

MSIC GROUP : 241
AREA : Manufacture of Hot and Cold Work
JOB TITLE : Rolling Engineer/Executive
LEVEL : 5

RESPONSIBILITIES

Rolling Engineer/Executive is responsible for reviewing and fulfilling production schedules, processes, specifications, related information and the Client's technical documentation and requirements; optimising production processes and control systems that maximize efficiency and reduce waste; identifying and implementing process improvements and technological upgrades: adherence to production standards in line with company's KPIs; preparing material and equipment lists, purchase orders, cost analyses, and estimated production costs; improving facilities and determining personnel requirements; training staff for new processes and providing instructions and manuals; managing process documentation and preparing production reports; and leading and managing supervisors and workforce.

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Management systems (waste, energy, water)
- Steel hot rolling process (Flat/Long Product).
- Steel manufacturing process flow.
- Analytics.
- Product and input material specifications.
- Digital & IT knowledge.

Skills:

- Review and improvise Standard Operating Procedure (SOP).
- Prepare budget and cost estimate.
- Able to apply communication and problem-solving skills.
- Provide technical training and instruction to staff.

- Execute maintenance schedules, design documentation and operational reports.
- Review production report.
- Verify production line checklists.
- Data sourcing/mining.
- Verify machine parameter setting.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Good communication and problem-solving with co-workers.
- Good interpersonal skills.
- Good team building and high level of commitment.
- High level of dedication and responsibility.

MSIC GROUP : 241
AREA : Manufacture of Hot and Cold Work
JOB TITLE : Rolling Supervisor
LEVEL : 4

RESPONSIBILITIES

Rolling Supervisor is responsible for materials requesting, receiving, and recording according to the material requisition form (MRF); organising and scheduling the daily work by taking into consideration manpower and material availability; providing data on consumable items for cost estimation; promoting a safe workplace for yourself and your fellow employees according to OSHA requirement; supervise and practice proper quality system controls for any changes of processes, materials, and suppliers; responsible for training, mentoring and coaching senior technicians and technicians; identify and coordinate repair and maintenance work; and conduct toolbox briefing.

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Quantification and monitoring (waste, energy, water).
- Steel hot rolling process (Flat/Long Product).
- Product and input material specifications.

Skills:

- Manage production workforce.
- Implement production operation scheduling.
- Assist daily production data collection.
- Coordinate daily production operation and inspection of tools and equipment preparation.
- Prepare and coordinate preventive and corrective maintenance activities for machines and equipment.
- Confirm machine parameter setting.

- Perform supervisory functions.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Effective communication and problem-solving with co-workers.
- Effective interpersonal skills.
- Effective team building and high level of commitment.
- High level of dedication and responsibility.

MSIC GROUP : 241
AREA : Manufacture of Hot and Cold Work
JOB TITLE : Rolling Technician
LEVEL : 3

RESPONSIBILITIES

Rolling Technician is responsible for maintaining and operating equipment and systems involving materials processing of hot rolling steel; interacting well with craft supervisors and personnel to get equipment and systems repaired and quality requirements; compliant with safety, health and environment; updating data of daily production operation; set up machine parameter setting; performing minor repairs and reporting breakdowns in a timely manner; keeping equipment maintenance logs, as well as maintaining a safe and tidy work environment; and attend toolbox briefing.

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Quantification and monitoring (waste, energy, water).
- Steel hot rolling activities (Flat/Long Product).
- Product and input material specifications.
- Overall Equipment Effectiveness (OEE).
- Autonomous production maintenance.
- Concept of 5S.

Skills:

- Perform effective production activities.
- Perform daily production operations and inspection of tools and equipment preparation.
- Perform preventive and corrective maintenance activities for machines and equipment.
- Set up machine parameters setting.

- Handle personal tools for the job, including up-to-date documented personal tool lists.
- Assist supervisor job.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Effective communication and problem-solving with co-workers.
- Effective interpersonal skills.
- Effective team building and high level of commitment.
- High dedication to the implementation and perpetuation of values and ethics.
- Perform production-related activities on time.

MSIC GROUP : 241
AREA : Manufacture of Hot and Cold Work
JOB TITLE : Operator
LEVEL : 2

RESPONSIBILITIES

Operator is responsible for optimizing production efficiency by adjusting machinery and equipment settings as instructed, performing minor repairs and reporting breakdowns in a timely manner. Keeping equipment maintenance logs, as well as maintaining a safe and tidy work environment as well as updating productivity records

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Steel hot rolling activities (Flat/Long Product).
- Product and input material specifications.
- Overall Equipment Effectiveness (OEE).
- Autonomous production maintenance.
- Concept of 5R.
- Concept of 5S.

Skills:

- Perform effective production activities.
- Perform daily production operations and inspection of tools and equipment preparation.
- Perform preventive and corrective maintenance activities for machine and equipment
- Set up machine parameters setting.
- Handle personal tools for the job, including up-to-date documented personal tool lists.

- Assist supervisor job.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Effective communication and problem-solving with co-workers.
- Effective interpersonal skills.
- Effective team building and high level of commitment.
- High dedication to the implementation and perpetuation of values and ethics.
- Perform production-related activities on time.

MSIC GROUP : 241
AREA : Manufacture of Steel Tube and Fitting
JOB TITLE : Plant Manager
LEVEL : 6

RESPONSIBILITIES

Plant Manager is responsible for determining, implementing and monitoring organisation strategies, policies and plans; planning details of production activities in terms of output quality and quantity, cost, time available and labour requirements; controlling the operation of plant and quality procedures through planning of maintenance, designation of operating hours and supply of parts and tools; establishing and managing budgets, monitoring organisation output and costs, and adjusting processes and resources to minimize costs; coordinating with other managers about production matters; controlling the preparation of production records and reports; adhering the implementation of occupational health and safety requirements accordingly; implement business plan and products to be manufactured; identifying and implementing regulatory and statutory requirements affecting manufacturing operations and the environment; overseeing the provision of technical specification and the serving contract for the procurement; overseeing the staff development, training and performance of staff; identifying areas for continuous improvement plans, and implement changes in line with KPIs; controlling costs without sacrificing safety, quality and productivity; and creating and promote conducive working environment to ensure that employee issues are heard and addressed.

Knowledge:

- Related Safety, Health and Environment regulation.
- Company policies and Standard Operating Procedure (SOP).
- Management systems (waste, energy, water).
- Steel cold rolling process.
- Steel market (Flat Product).
- Steel manufacturing process flow.
- The supply chain of steel domestically and internationally.

- Related Employment regulation.
- Operating and development expenditure.
- Analytics
- Digital & IT knowledge.

Skills:

- Prepare and review budget and cost estimates.
- Able to apply communication and problem-solving skills.
- Provide technical advice and instruction to staff and customers.
- Benchmarking and evaluation of co-workers within internal and external organisations.
- Understand the organisation's product cost structure.
- Plan, review and coordinate maintenance schedules, design documentation and operational reports and charts.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environment regulations and product quality standards.
- Excellent communication and problem-solving with co-workers.
- Excellent interpersonal skills.
- Excellent management skills.
- Excellent team building and high level of commitment.

MSIC GROUP : 241
AREA : Manufacture of Steel Tube and Fitting
JOB TITLE : Plant Engineer/Executive
LEVEL : 5

RESPONSIBILITIES

Plant Engineer/Executive is responsible for reviewing and fulfilling production schedules, processes, specifications, related information and the Client's technical documentation and requirements; optimising production processes and control systems that maximize efficiency and reduce waste; identifying and implementing process improvements and technological upgrades: adherence to production standards in line with company's KPIs; preparing material and equipment lists, purchase orders, cost analyses, and estimated production costs; improving facilities and determining personnel requirements; training staff for new processes and providing instructions and manuals; managing process documentation and preparing production reports; and leading and managing supervisors and workforce.

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Management systems (waste, energy, water).
- Steel cold rolling process.
- Steel manufacturing process flow.
- Analytics.
- Product and input material specifications.
- Digital & IT knowledge.

Skills:

- Review and improvise Standard Operating Procedure (SOP).
- Prepare budget and cost estimate.
- Able to apply communication and problem-solving skills.

- Provide technical training and instruction to staff.
- Execute maintenance schedules, design documentation and operational reports.
- Review production report.
- Verify production line checklists.
- Data sourcing/mining.
- Verify machine parameters setting.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Good communication and problem-solving with co-workers.
- Good interpersonal skills.
- Good team building and high level of commitment.
- High level of dedication and responsibility.

MSIC GROUP : 241
AREA : Manufacture of Steel Tube and Fitting
JOB TITLE : Plant Supervisor
LEVEL : 4

RESPONSIBILITIES

Plant Supervisor is responsible for materials requesting, receiving, and recording according to the material requisition form (MRF); organising and scheduling the daily work by taking into consideration manpower and material availability; providing data on consumable items for cost estimation; promoting a safe workplace for yourself and your fellow employees according to OSHA requirement; supervise and practice proper quality system controls for any changes of processes, materials, and suppliers; responsible for training, mentoring and coaching senior technicians and technicians; identify and coordinate repair and maintenance work; and conduct toolbox briefing.

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Quantification and monitoring (waste, energy, water).
- Steel cold rolling process.
- Product and input material specifications.

Skills:

- Manage production workforce.
- Implement production operation scheduling.
- Assist daily production data collection.
- Coordinate daily production operation and inspection of tools and equipment preparation.
- Prepare and coordinate preventive and corrective maintenance activities for machine and equipment

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- Confirm machine parameters setting.
- Perform supervisory functions.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Effective communication and problem-solving with co-workers.
- Effective interpersonal skills.
- Effective team building and high level of commitment.
- High level of dedication and responsibility.

MSIC GROUP : 241
AREA : Manufacture of Steel Tube and Fitting
JOB TITLE : Technician
LEVEL : 3

RESPONSIBILITIES

Technician is responsible for maintaining and operating equipment and systems involving materials processing of cold rolling steel; interacts well with craft supervisors and personnel to get equipment and systems repaired and quality requirements; compliant with safety, health and environment; updating data of daily production operation; set up machine parameters setting; performing minor repairs and reporting breakdowns in a timely manner; keeping equipment maintenance logs, as well as maintaining a safe and tidy work environment; and attend toolbox briefing.

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Quantification and monitoring (waste, energy, water).
- Steel cold rolling activities.
- Product and input material specifications.
- Overall Equipment Effectiveness (OEE).
- Autonomous production maintenance.
- Concept of 5S.

Skills:

- Perform effective production activities.
- Perform daily production operations and inspection of tools and equipment preparation.

- Perform preventive and corrective maintenance activities for machines and equipment.

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- Set up machine parameters setting.
- Handle personal tools for the job, including up-to-date documented personal tool lists.
- Assist supervisor job.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Effective communication and problem-solving with co-workers.
- Effective interpersonal skills.
- Effective team building and high level of commitment.
- High dedication to the implementation and perpetuation of values and ethics.
- Perform production-related activities on time.

MSIC GROUP : 241
AREA : Manufacture of Steel Tube and Fitting
JOB TITLE : Operator
LEVEL : 2

RESPONSIBILITIES

Operator is responsible for optimizing production efficiency by adjusting machinery and equipment settings as instructed, performing minor repairs and reporting breakdowns in a timely manner. Keeping equipment maintenance logs, as well as maintaining a safe and tidy work environment as well as updating productivity records.

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Steel cold rolling activities.
- Product and input material specifications.
- Overall Equipment Effectiveness (OEE).
- Autonomous production maintenance.
- Concept of 5R.
- Concept of 5S.

Skills:

- Perform effective production activities.
- Perform daily production operations and inspection of tools and equipment preparation.
- Perform preventive and corrective maintenance activities for machines and equipment.
- Set up machine parameters setting.

- Handle personal tools for the job, including up-to-date documented personal tool lists.
- Assist supervisor job.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Effective communication and problem-solving with co-workers.
- Effective interpersonal skills.
- Effective team building and high level of commitment.
- High dedication to the implementation and perpetuation of values and ethics.
- Perform production-related activities on time.

MSIC GROUP : 241
AREA : Manufacture of Other Basic Iron and Steel Products
JOB TITLE : Plant Manager
LEVEL : 6

RESPONSIBILITIES

Plant Manager is responsible for determining, implementing and monitoring organisation strategies, policies and plans; planning details of production activities in terms of output quality and quantity, cost, time available and labour requirements; controlling the operation of plant and quality procedures through planning of maintenance, designation of operating hours and supply of parts and tools; establishing and managing budgets, monitoring organisation output and costs, and adjusting processes and resources to minimize costs; coordinating with other managers about production matters; controlling the preparation of production records and reports; adhering the implementation of occupational health and safety requirements accordingly; implement business plan and products to be manufactured; identifying and implementing regulatory and statutory requirements affecting manufacturing operations and the environment; overseeing the provision of technical specification and the serving contract for the procurement; overseeing the staff development, training and performance of staff; identifying areas for continuous improvement plans, and implement changes in line with KPI's; controlling costs without sacrificing safety, quality and productivity; and creating and promote conducive working environment to ensure that employee issues are heard and addressed.

Knowledge:

- Related Safety, Health and Environment regulation.
- Related Employment regulation.
- Company policies and Standard Operating Procedure (SOP).
- Management systems (waste, energy, water).
- Steel value-added process (bar, pipe, section, tube, shape, angle product).
- Steel market (bar, pipe, section, tube, shape, angle product).

- Steel forming process (bar, pipe, section, tube, shape, angle product).
- The supply chain of steel domestically and internationally.
- Operating and development expenditure.
- Analytics.
- Digital & IT knowledge.

Skills:

- Prepare and review budget and cost estimates.
- Able to apply communication and problem-solving skills.
- Provide technical advice and instruction to staff and customers.
- Benchmarking and evaluation of co-workers within internal and external organisations.
- Understand the organisation's product cost structure.
- Plan, review and coordinate maintenance schedules, design documentation and operational reports.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environment regulations and product quality standards.
- Excellent communication and problem-solving with co-workers.
- Excellent interpersonal skills.
- Excellent management skills.
- Excellent team building and high level of commitment.

MSIC GROUP : 241
AREA : Manufacture of Other Basic Iron and Steel Products
JOB TITLE : Plant Engineer/Executive
LEVEL : 5

RESPONSIBILITIES

Plant Engineer/Executive is responsible for reviewing and fulfilling production schedules, processes, specifications, related information and client's technical documentation and requirements; optimising production processes and control systems that maximize efficiency and reduce waste; identifying and implementing process improvements and technological upgrades: adherence to production standards in line with company's KPIs; preparing material and equipment lists, purchase orders, cost analyses, and estimated production costs; improving facilities and determining personnel requirements; training staff for new processes and providing instructions and manuals; managing process documentation and preparing production reports; and leading and managing supervisors and workforce.

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Management systems (waste, energy, water).
- Steel value-added process (bar, pipe, section, tube, shape, angle product).
- Steel market (bar, pipe, section, tube, shape, angle product).
- Steel forming process (bar, pipe, section, tube, shape, angle product).
- The supply chain of steel domestically and internationally.
- Operating and development expenditure.
- Analytics.
- Product and input material specifications.
- Digital & IT knowledge.

Skills:

- Review and improvise Standard Operating Procedure (SOP).
- Prepare budget and cost estimate.
- Able to apply communication and problem-solving skills.
- Provide technical training and instruction to staff.
- Execute maintenance schedules, design documentation and operational reports.
- Review production report.
- Verify production line checklists.
- Data sourcing/mining.
- Verify machine parameters setting.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Good communication and problem-solving with co-workers.
- Good interpersonal skills.
- Good team building and high level of commitment.
- High level of dedication and responsibility.

MSIC GROUP : 241
AREA : Manufacture of Other Basic Iron and Steel Products
JOB TITLE : Supervisor
LEVEL : 4

RESPONSIBILITIES

Supervisor is responsible for materials requesting, receiving, and recording according to the material requisition form (MRF); organising and scheduling the daily work by taking into consideration manpower and material availability; providing data on the consumable item for cost estimation; promoting a safe workplace for yourself and your fellow employees according to OSHA requirement; supervise and practice proper quality system controls for any changes of processes, materials, and suppliers; responsible for training, mentoring and coaching senior technicians and technicians; identify and coordinate repair and maintenance work; and conduct toolbox briefing.

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Quantification and monitoring (waste, energy, water).
- Steel value-added process (bar, pipe, section, tube, shape, angle product).
- Product and input material specifications.

Skills:

- Manage production workforce.
- Implement production operation scheduling.
- Assist daily production data collection.
- Coordinate daily production operation and inspection of tools and equipment preparation.

- Prepare and coordinate preventive and corrective maintenance activities for machines and equipment.
- Confirm machine parameters setting.
- Perform supervisory functions.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Effective communication and problem-solving with co-workers.
- Effective interpersonal skills.
- Effective team building and high level of commitment.
- High level of dedication and responsibility.

MSIC GROUP : 241
AREA : Manufacture of Other Basic Iron and Steel Products
JOB TITLE : Technician
LEVEL : 3

RESPONSIBILITIES

Technician is responsible for maintaining and operating equipment and systems involving the steel value-added products; interacts well with craft supervisors and personnel to get equipment and systems repaired and quality requirements; compliant with safety, health and environment; updates data of daily production operation; set up machine parameters setting; performing minor repairs and reporting breakdowns in a timely manner; keeping equipment maintenance logs, as well as maintaining a safe and tidy work environment; and attend toolbox briefing.

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Quantification and monitoring (waste, energy, water).
- Steel value-added activities (bar, pipe, section, tube, shape, angle product).
- Product and input material specifications.
- Overall Equipment Effectiveness (OEE).
- Autonomous production maintenance.
- Concept of 5S.

Skills:

- Perform effective production activities.
- Perform daily production operations and inspection of tools and equipment preparation.
- Perform preventive and corrective maintenance activities for machines and equipment.

- Set up machine parameters setting.
- Handle personal tools for the job including up-to-date documented personal tool lists.
- Assist supervisor job.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Effective communication and problem-solving with co-workers.
- Effective interpersonal skills.
- Effective team building and high level of commitment.
- High dedication to the implementation and perpetuation of values and ethics.
- Perform production-related activities on time.

MSIC GROUP : 241
AREA : Manufacture of Other Basic Iron and Steel Products
JOB TITLE : Operator
LEVEL : 2

RESPONSIBILITIES

Operator is responsible for optimizing production efficiency by adjusting machinery and equipment settings as instructed, performing minor repairs and reporting breakdowns in a timely manner. Keeping equipment maintenance logs, as well as maintaining a safe and tidy work environment as well as updating productivity records.

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Steel value-added activities (bar, pipe, section, tube, shape, angle product).
- Product and input material specifications.
- Overall Equipment Effectiveness (OEE).
- Autonomous production maintenance.
- Concept of 5R.
- Concept of 5S.

Skills:

- Perform effective production activities.
- Perform daily production operations and inspection of tools and equipment preparation.
- Perform preventive and corrective maintenance activities for machines and equipment.
- Set up machine parameters setting.
- Handle personal tools for the job including up-to-date documented personal tool lists.

- Assist supervisor job.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Effective communication and problem-solving with co-workers.
- Effective interpersonal skills.
- Effective team building and high level of commitment.
- High dedication to the implementation and perpetuation of values and ethics.
- Perform production-related activities on time.

SECTION : (C) MANUFACTURING

DIVISION : (24) MANUFACTURE OF BASIC METALS

GROUP : (242) MANUFACTURE OF BASIC PRECIOUS AND OTHER NON-FERROUS METALS

MSIC GROUP : 242
AREA : Tin Smelting
JOB TITLE : Process Engineer/Executive
LEVEL : 5

RESPONSIBILITIES

Process Engineer/Executive is responsible for reviewing and fulfilling production schedules, processes, specifications, related information and client's technical documentation and requirements; optimising production processes and control systems that maximize efficiency and reduce waste; identifying and implementing process improvements and technological upgrades: adherence to production standards in line with company's KPIs; preparing material and equipment lists, purchase orders, cost analyses, and estimated production costs; improving facilities and determining personnel requirements; training staff for new processes and providing instructions and manuals; managing process documentation and preparing production reports; and leading and managing supervisors and workforce.

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Management systems (waste, energy, water).
- Tin value-added process.
- Tin market.
- Tin forming process.
- The supply chain of tin domestically and internationally.
- Operating and development expenditure.
- Analytics.
- Product and input material specifications.
- Problem solving & decision making.
- Digital & IT knowledge.

Skills:

- Prepare budget and cost estimate.
- Able to apply communication and problem-solving skills.
- Provide technical training and instruction to staff.
- Execute maintenance schedules, design documentation and operational reports.
- Review production report.
- Verify production line checklists.
- Review and improvise Standard Operating Procedure (SOP).
- Data sourcing/mining.
- Acknowledge machine parameters setting.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Good communication and problem-solving with co-workers.
- Good interpersonal skills.
- Good team building and high level of commitment.
- High level of dedication and responsibility.

MSIC GROUP : 242
AREA : Tin Smelting
JOB TITLE : Supervisor
LEVEL : 4

RESPONSIBILITIES

Supervisor is responsible for materials requesting, receiving, and recording according to the material requisition form (MRF); organising and scheduling the daily work by taking into consideration manpower and material availability; providing data on consumable items for cost estimation; promoting a safe workplace for yourself and your fellow employees according to OSHA requirement; supervise and practice proper quality system controls for any changes of processes, materials, and suppliers; responsible for training, mentoring and coaching senior technicians and technicians; identify and coordinate repair and maintenance work; and conduct toolbox briefing.

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Quantification and monitoring (waste, energy, water).
- Tin value-added process.
- Product and input material specifications.

Skills:

- Supervision production workforce.
- Implement production operation scheduling.
- Assist daily production data collection.
- Coordinate daily production operation and inspection of tools and equipment preparation.
- Prepare and coordinate preventive and corrective maintenance activities for machines and equipment.

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- Verify machine parameters setting.
- Perform supervisory functions.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Effective communication and problem-solving with co-workers.
- Effective interpersonal skills.
- Effective team building and high level of commitment.
- High level of dedication and responsibility.

MSIC GROUP : 242
AREA : Tin Smelting
JOB TITLE : Technician
LEVEL : 3

RESPONSIBILITIES

Technician is responsible for maintaining and operating equipment and systems involving the steel value-added products; interacts well with craft supervisors and personnel to get equipment and systems repaired and quality requirements; compliant with safety, health and environment; updates data of daily production operation; set up machine parameters setting; performing minor repairs and reporting breakdowns in a timely manner; keeping equipment maintenance logs, as well as maintaining a safe and tidy work environment; and attend toolbox briefing.

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Quantification and monitoring (waste, energy, water).
- Tin value-added activities
- Product and input material specifications.
- Overall Equipment Effectiveness (OEE).
- Autonomous production maintenance.
- Concept of 5S.

Skills:

- Perform effective production activities.
- Perform daily production operations and inspection of tools and equipment preparation.
- Perform preventive and corrective maintenance activities for machines and equipment.

- Set up machine parameters setting.
- Handle personal tools for job including up-to-date documented personal tool lists.
- Follow supervisor instructions.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environment regulations and product quality standards.
- Effective communication and problem-solving with co-workers.
- Effective interpersonal skills.
- Effective team building and high level of commitment.
- High dedication to the implementation and perpetuation of values and ethics.
- Perform production-related activities on time.

MSIC GROUP : 242
AREA : Tin Smelting
JOB TITLE : Operator
LEVEL : 2

RESPONSIBILITIES

Operator is responsible for optimizing production efficiency by adjusting machinery and equipment settings as instructed, performing minor repairs and reporting breakdowns in a timely manner. Keeping equipment maintenance logs, as well as maintaining a safe and tidy work environment as well as updating productivity records.

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Product and input material specifications.
- Overall Equipment Effectiveness (OEE).
- Autonomous production maintenance.
- Concept of 5R.
- Concept of 5S.

Skills:

- Perform effective production activities.
- Perform daily production operations and inspection of tools and equipment preparation.
- Perform preventive and corrective maintenance activities for machines and equipment.
- Set up machine parameters setting.
- Handle personal tools for the job including up-to-date documented personal tool lists.
- Assist operator job.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Effective communication and problem-solving with co-workers.
- Effective interpersonal skills.
- Effective team building and high level of commitment.
- High dedication to the implementation and perpetuation of values and ethics.
- Perform production-related activities on time.

MSIC GROUP : 242
AREA : Production of Aluminium from Alumina
JOB TITLE : Process Engineer/Executive
LEVEL : 5

RESPONSIBILITIES

Process Engineer/Executive is responsible for reviewing and fulfilling production schedules, processes, specifications, related information and Client's technical documentation and requirements; optimising production processes and control systems that maximize efficiency and reduce waste; identifying and implementing process improvements and technological upgrades: adherence to production standards in line with company's KPIs; preparing material and equipment lists, purchase orders, cost analyses, and estimated production costs; improving facilities and determining personnel requirements; training staff for new processes and providing instructions and manuals; managing process documentation and preparing production reports; and leading and managing supervisors and workforce.

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Management systems (waste, energy, water).
- Alumina hot rolling process.
- Alumina manufacturing process flow.
- Analytics.
- Product and input material specifications.
- Problem solving & decision making.
- Digital & IT knowledge.

Skills:

- Prepare budget and cost estimate.
- Able to apply communication and problem-solving skills.
- Provide technical training and instruction to staff.
- Execute maintenance schedules, design documentation and operational reports.
- Review production report.
- Verify production line checklists.
- Review and improvise Standard Operating Procedure (SOP).
- Data sourcing/mining.
- Acknowledge machine parameters setting.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Good communication and problem-solving with co-workers.
- Good interpersonal skills.
- Good team building and high level of commitment.
- High level of dedication and responsibility.

MSIC GROUP : 242
AREA : Production of Aluminium from Alumina
JOB TITLE : Hot Rolling Supervisor
LEVEL : 4

RESPONSIBILITIES

Hot Rolling Supervisor is responsible for materials requesting, receiving, and recording according to the material requisition form (MRF); organising and scheduling the daily work by taking into consideration manpower and material availability; providing data of consumable items for cost estimation; promoting a safe workplace for yourself and your fellow employees according to OSHA requirement; supervise and practice proper quality system controls for any changes of processes, materials, and suppliers; responsible for training, mentoring and coaching senior technicians and technicians; identify and coordinate repair and maintenance work; and conduct toolbox briefing.

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Quantification and monitoring (waste, energy, water).
- Alumina hot rolling process.
- Product and input material specifications.

Skills:

- Supervision production workforce.
- Implement production operation scheduling.
- Assist daily production data collection.
- Coordinate daily production operation and inspection of tools and equipment preparation.

- Prepare and coordinate preventive and corrective maintenance activities for machines and equipment.
- Verify machine parameters setting.
- Perform supervisory functions.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Effective communication and problem-solving with co-workers.
- Effective interpersonal skills.
- Effective team building and high level of commitment.
- High level of dedication and responsibility.

MSIC GROUP : 242
AREA : Production of Aluminium from Alumina
JOB TITLE : Hot Rolling Technician
LEVEL : 3

RESPONSIBILITIES

Hot Rolling Technician is responsible for maintaining and operating equipment and systems involving materials processing of steel hot rolling; interacting well with craft supervisors and personnel to get equipment and systems repaired and quality requirements; compliant with safety, health and environment; updating data of daily production operation; set up machine parameters setting; performing minor repairs and reporting breakdowns in a timely manner; keeping equipment maintenance logs, as well as maintaining a safe and tidy work environment; and attend toolbox briefing.

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Quantification and monitoring (waste, energy, water).
- Alumina hot rolling activities.
- Product and input material specifications.
- Overall Equipment Effectiveness (OEE).
- Autonomous production maintenance.
- Concept of 5S.

Skills:

- Perform effective production activities.
- Perform daily production operations and inspection of tools and equipment preparation.
- Perform preventive and corrective maintenance activities for machines and equipment.

- Set up machine parameters setting.
- Handle personal tools for the job including up-to-date documented personal tool lists.
- Assist supervisor job.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Effective communication and problem-solving with co-workers.
- Effective interpersonal skills.
- Effective team building and high level of commitment.
- High dedication to the implementation and perpetuation of values and ethics.
- Perform production-related activities on time.

MSIC GROUP : 242
AREA : Production of Aluminium from Alumina
JOB TITLE : Hot Rolling Operator
LEVEL : 2

RESPONSIBILITIES

Hot Rolling Operator is responsible for optimizing production efficiency by adjusting machinery and equipment settings as instructed, performing minor repairs and reporting breakdowns in a timely manner. Keeping equipment maintenance logs, as well as maintaining a safe and tidy work environment as well as updating productivity records

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Alumina hot rolling activities.
- Product and input material specifications.
- Overall Equipment Effectiveness (OEE).
- Autonomous production maintenance.
- Machine operation.
- Concept of 5R.
- Concept of 5S.

Skills:

- Perform effective production activities.
- Perform daily production operations and inspection of tools and equipment preparation.
- Perform preventive and corrective maintenance activities for machines and equipment.
- Set up machine parameters setting.

- Handle personal tools for the job including up-to-date documented personal tool lists.
- Assist supervisor job.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Effective communication and problem-solving with co-workers.
- Effective interpersonal skills.
- Effective team building and high level of commitment.
- High dedication to the implementation and perpetuation of values and ethics.
- Perform production-related activities on time

MSIC GROUP : 242
AREA : Manufacturing of Basic Precious and other Non-Ferrous Metals
JOB TITLE : Process Engineer/Executive
LEVEL : 5

RESPONSIBILITIES

Process Engineer/Executive is responsible for reviewing and fulfilling production schedules, processes, specifications, related information and Client's technical documentation and requirements; optimising production processes and control systems that maximize efficiency and reduce waste; identifying and implementing process improvements and technological upgrades: adherence to production standards in line with company's KPIs; preparing material and equipment lists, purchase orders, cost analyses, and estimated production costs; improving facilities and determining personnel requirements; training staff for new processes and providing instructions and manuals; managing process documentation and preparing production reports; and leading and managing supervisors and workforce.

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Management systems (waste, energy, water).
- Product and input material specifications.
- Overall Equipment Effectiveness (OEE).
- Analytic.
- Autonomous production maintenance.
- Concept of 5S.
- Problems solving & decision making.
- Digital & IT knowledge.

Skills:

- Review and improvise Standard Operating Procedure (SOP).
- Prepare budget and cost estimate.
- Able to apply communication and problem-solving skills.
- Provide technical training and instruction to staff.
- Execute maintenance schedules, design documentation and operational reports.
- Review production report.
- Verify production line checklists.
- Data sourcing/mining.
- Acknowledge machine parameters setting.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Good communication and problem-solving with co-workers.
- Good interpersonal skills.
- Good team building and high level of commitment.
- High level of dedication and responsibility.

MSIC GROUP : 242
AREA : Manufacturing of Basic Precious and other Non-Ferrous Metals
JOB TITLE : Operator
LEVEL : 2

RESPONSIBILITIES

Cold Rolling Operator is responsible for optimizing production efficiency by adjusting machinery and equipment settings as instructed, performing minor repairs and reporting breakdowns in a timely manner. Keeping equipment maintenance logs, as well as maintaining a safe and tidy work environment as well as updating productivity records

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Product and input material specifications.
- Overall Equipment Effectiveness (OEE).
- Autonomous production maintenance.
- Concept of 5R.
- Concept of 5S.

Skills:

- Perform effective production activities.
- Perform daily production operations and inspection of tools and equipment preparation.
- Perform preventive and corrective maintenance activities for machines and equipment.
- Set up machine parameters setting.
- Handle personal tools for the job including up-to-date documented personal tool lists.
- Assist supervisor job.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Effective communication and problem-solving with co-workers.
- Effective interpersonal skills.
- Effective team building and high level of commitment.
- High dedication to the implementation and perpetuation of values and ethics.
- Perform production-related activities on time.

SECTION : (C) MANUFACTURING

DIVISION : (24) MANUFACTURE OF BASIC METALS

GROUP : (243) CASTING OF METALS

MSIC GROUP : 243
AREA : Casting of Iron
JOB TITLE : Foundry Engineer/ Executive
LEVEL : 5

RESPONSIBILITIES

Foundry Engineer is responsible for applying technology and engineering principles to develop and design manufacturing concepts to improve productivity and quality standards. They conduct structural and assembly analyses, build prototypes, evaluate performance, identify problems, and make improvements.

Knowledge:

- Management systems (waste, energy, water).
- CAD / CAM software.
- Technical drawing engineering.
- Rapid Prototyping.
- Automation Skills.
- Problem solving & decision making.
- Workplace Safety and Health.
- Digital & IT knowledge.

Skills:

- Review production schedules, processes, specifications, and related information.
- Design a production process that maximizes efficiency and minimizes waste.
- Develop and implement process improvements and the latest technology.
- Design control systems to reduce costs and production problems.
- Develop design and production standards together with management and users.
- Prepare material and equipment lists, purchase orders, cost analyses, and production cost estimates.

- Determining personnel requirements.
- Train staff on new processes and provide instruction manuals.
- Manage process documentation and prepare production reports.

Attributes (Attitude/Safety/Environmental):

- Investigation - Likes to engage in investigations involving theory, research, and intellectual investigation.
- Realistic -Enjoys working outside and does not involve a lot of paperwork or working closely with others.
- Enterprising - Enjoys getting involved in starting and running projects and often deals with business.
- Creative and Innovative**.**
- Good team player and able to work with all levels of the cross-functional team.
- High level of dedication and responsibility.
- Non-disclosure of the company’s confidential information.

MSIC GROUP : 243
AREA : Casting of Iron
JOB TITLE : Technician
LEVEL : 3

RESPONSIBILITIES

Regulate supplies of fuel and air, or control flow of electric current and water coolant to heat furnaces and adjust temperatures. Drain, transfer, or remove molten metal from furnaces and place it into moulds using hoists, pumps, or ladles. Operate controls to move or discharge metal workpieces from furnaces.

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Quantification and monitoring (waste, energy, water).
- Metals and melting activities.
- Product and input material specifications.
- Overall Equipment Effectiveness (OEE).
- Autonomous production maintenance.
- Concept of 5S.

Skills:

- Perform effective production activities.
- Perform daily production operations and inspection of tools and equipment preparation.
- Perform preventive and corrective maintenance activities for machines and equipment.
- Set up machine parameters setting.
- Handle personal tools for the job including up-to-date documented personal tool lists.

- Assist supervisor job.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Effective communication and problem-solving with co-workers.
- Effective interpersonal skills.
- Effective team building and high level of commitment.
- High dedication to the implementation and perpetuation of values and ethics.
- Perform production-related activities on time.

MSIC GROUP : 243
AREA : Casting of Iron
JOB TITLE : Operator
LEVEL : 2

RESPONSIBILITIES

Operator is responsible for monitoring the process of making metal before it is cast into forms. They control metal making furnaces and direct all activities of furnace operation, including the interpretation of computer data, temperature measurement and adjustment, loading vessels, and adding iron, oxygen, and other additives to be melted into the desired metal composition. They control the chemothermal treatment of the metal in order to reach the standards. In case of observed faults in the metal, they notify the authorised personnel and participate in the removal of the fault.

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Metals melting activities.
- Product and input material specifications.
- Concept of 5R.
- Concept of 5S.

Skills:

- Perform effective production activities.
- Perform daily production operations and inspection of tools and equipment preparation.
- Perform preventive and corrective maintenance activities for machines and equipment.
- Set up machine parameters setting.
- Handle personal tools for the job including up-to-date documented personal tool lists.

- Assist supervisor job.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Effective communication and problem-solving with co-workers.
- Effective interpersonal skills.
- Effective team building and high level of commitment.
- High dedication to the implementation and perpetuation of values and ethics.
- Perform production-related activities on time.

MSIC GROUP : 243
AREA : Casting of Steel
JOB TITLE : Foundry Engineer/Executive
LEVEL : 5

RESPONSIBILITIES

Foundry Engineer is responsible for applying technology and engineering principles to develop and design manufacturing concepts to improve productivity and quality standards. They conduct structural and assembly analyses, build prototypes, evaluate performance, identify problems, and make improvements.

Knowledge:

- Management systems (waste, energy, water).
- CAD / CAM software.
- Technical drawing engineering.
- Rapid Prototyping.
- Automation Skills.
- Problem solving & decision making.
- Workplace Safety and Health.
- Digital & IT knowledge.

Skills:

- Review production schedules, processes, specifications, and related information.
- Design a production process that maximizes efficiency and minimizes waste.
- Develop and implement process improvements and the latest technology.
- Design control systems to reduce costs and production problems.
- Develop design and production standards together with management and users.
- Prepare material and equipment lists, purchase orders, cost analyses, and production cost estimates.

- Determining personnel requirements.
- Train staff on new processes and provide instruction manuals.
- Manage process documentation and prepare production reports.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Effective communication and problem-solving with co-workers.
- Effective interpersonal skills.
- Effective team building and high level of commitment.
- High dedication to the implementation and perpetuation of values and ethics.
- Perform production-related activities on time.

MSIC GROUP : 243
AREA : Casting of Steel
JOB TITLE : Technician
LEVEL : 3

RESPONSIBILITIES

Technician is responsible for performing technical tasks to create moulds, partake in the casting process, monitor correct temperatures, and maintain equipment used in the foundry. Gathering monthly data and information for the mining and quarrying sector. Providing technical assistance in research on and development of processes to determine the properties of metals and new alloys. Assisting in geological and topographical surveys, and in the design of oil, natural gas and mineral ore extraction and transport systems, and processing and refinery plants for minerals and metals. Assisting in the preparation of estimates of quantities and costs of materials and labour required for mineral, oil and natural gas projects and transport and for processing and refining minerals.

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Quantification and monitoring (waste, energy, water).
- Product and input material specifications.
- Overall Equipment Effectiveness (OEE).
- Autonomous production maintenance.
- Product specification.
- Concept of 5S.

Skills:

- Ability to carry out daily work in a safe environment.
- Ability to perform tests to ensure that a product will perform under the specified Standard.

- Proficiency in repairing machines or systems using the needed tools.
- Operation and Control - proficiency in controlling operations of equipment or systems.
- Proficiency involving environmentally friendly products and services.
- Ability to design and build or use machines, tools and technical equipment.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Effective communication and problem-solving with co-workers.
- Effective interpersonal skills.
- Effective team building and high level of commitment.
- High dedication to the implementation and perpetuation of values and ethics.
- Perform production-related activities on time.

MSIC GROUP : 243
AREA : Casting of Steel
JOB TITLE : Operator/Foundryman
LEVEL : 2

RESPONSIBILITIES

Operator/Foundryman is responsible for making the mould by hand or machine, which is a basic step for making casting metal parts by the different moulding processes. Making moulds by hand or using auxiliary machines on a bench for small metal castings, on the foundry floor or in a pit for large castings. Making cores for use in metal moulds. Carrying out inspection, servicing and maintenance (based on field or specialisation) and performing related tasks.

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Product specification.
- Product and input material specifications.
- Concept of 5R.
- Concept of 5S

Skills:

- Proficiency in handling and operating machinery safely.
- Proficiency in lifting, putting down, pushing, pulling, carrying or moving thereof by hand or by bodily force.
- Proficiency in adjusting actions in relation to others' actions.
- Proficiency in communicating effectively in writing/speech as appropriate for the needs of the audience.
- Proficiency in a fabrication or sculptural process that joins materials, usually metals or thermoplastics.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Effective communication and problem-solving with co-workers.
- Effective interpersonal skills.
- Effective team building and high level of commitment.
- High dedication to the implementation and perpetuation of values and ethics.
- Perform production-related activities on time.

MSIC GROUP : 243
AREA : Casting of Iron of Non-ferrous Metal
JOB TITLE : Foundry Process Engineer
LEVEL : 5

RESPONSIBILITIES

Foundry Process Engineer/Quality Assurance is responsible for formulating and set quality policies according to product quality standards. The person also needs to develop and review quality and safety policies and manage audits by third-party inspection on manufacturing facilities for compliance with standards. Additionally, the person also monitors the verification and follow-up of quality issues occurring at the production line and customer sites, ensuring all open non-Conforming issues can be closed in a timely manner.

Knowledge:

- Management systems (waste, energy, water).
- CAD / CAM software.
- Technical drawing engineering.
- Quality Management System.
- Rapid Prototyping.
- Automation Skills.
- Problem solving & decision making.
- Workplace Safety and Health.
- Digital & IT knowledge.

Skills:

- Ensure that products meet standards set by both their companies and regulatory authorities.
- Determine methods to resolve any quality issues that arise.
- Review customer feedback and respond to any quality complaints.
- Manage all incoming material and component inspection activities, develop and

manage new product testing requirements, including new material application tests.

- Manage the disposal of non-conforming material, components and products.
- Inspect facilities for compliance with standards, determining methods to resolve any issues that arise.
- Ensure Quality Awareness training is conducted across the function.
- Advise top management on quality improvement matters.
- Review the budget for efficient Quality Assurance programs.
- Participate in annual internal audit as internal auditor to ensure that quality management system effectiveness is up to Malaysia and international quality standard requirements.

Attributes (Attitude/Safety/Environmental):

- Good team player and able to work together with all levels of the cross-functional team.
- An excellent production planner is well-versed in production procedures and ways to optimise them.
- Well-organised and results-driven.
- High level of dedication and responsibility.

MSIC GROUP : 243
AREA : Casting of Non-ferrous Metal
JOB TITLE : Supervisor
LEVEL : 4

RESPONSIBILITIES

Supervisor is responsible for materials requesting, receiving, and recording according to the material requisition form (MRF); organising and scheduling the daily work by taking into consideration manpower and material availability; providing data on consumable items for cost estimation; promoting a safe workplace for yourself and your fellow employees according to OSHA requirement; supervise and practice proper quality system controls for any changes of processes, materials, and suppliers; responsible for training, mentoring and coaching senior technicians and technicians; identify and coordinate repair and maintenance work; and conduct toolbox briefing. Open non-Conforming issues can be closed in a timely manner.

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Quantification and monitoring (waste, energy, water).
- Non-ferrous metals value-added activities.
- Product and input material specifications.
- Overall Equipment Effectiveness (OEE).
- Autonomous production maintenance.
- Concept of 5S.

Skills:

- Supervision production workforce.
- Implement production operation scheduling.
- Assist daily production data collection.

- Coordinate daily production operation and inspection of tools and equipment preparation.
- Prepare and coordinate preventive and corrective maintenance activities for machines and equipment.
- Verify machine parameters setting.
- Perform supervisory functions.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Effective communication and problem-solving with co-workers.
- Effective interpersonal skills.
- Effective team building and high level of commitment.
- High level of dedication and responsibility.

MSIC GROUP : 243
AREA : Casting of Non-ferrous Metal
JOB TITLE : Technician
LEVEL : 3

RESPONSIBILITIES

Technician is responsible for maintaining and operating equipment and systems involving the steel value-added products; interacts well with craft supervisors and personnel to get equipment and systems repaired and quality requirements; compliant with safety, health and environment; updates data of daily production operation; set up machine parameters setting; performing minor repairs and reporting breakdowns in a timely manner; keeping equipment maintenance logs, as well as maintaining a safe and tidy work environment; and attend toolbox briefing.

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Quantification and monitoring (waste, energy, water).
- Non-ferrous metal value-added activities.
- Product and input material specifications.
- Overall Equipment Effectiveness (OEE).
- Autonomous production maintenance.
- Concept of 5S.

Skills:

- Perform effective production activities.
- Perform daily production operations and inspection of tools and equipment preparation.
- Perform preventive and corrective maintenance activities for machines and equipment.

- Set up machine parameters setting.
- Handle personal tools for the job, including up-to-date documented personal tool lists.
- Assist supervisor job.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Effective communication and problem-solving with co-workers.
- Effective interpersonal skills.
- Effective team building and high level of commitment.
- High dedication to the implementation and perpetuation of values and ethics.
- Perform production-related activities on time.

MSIC GROUP : 243
AREA : Casting of Non-ferrous Metal
JOB TITLE : Operator
LEVEL : 2

RESPONSIBILITIES

Operator is responsible for operating and monitoring equipment which finishes, plates and coats metal articles or parts in order to give them improved resistance to corrosion and abrasion, for decorative purposes, or to impart electrical or magnetic properties. Operating and monitoring equipment which cleans metal articles in preparation for electroplating, galvanising, enamelling or similar processes. Operating and monitoring electroplating equipment. Operating and monitoring hot-dip equipment used to coat iron and steel products. Operating and monitoring machines which automatically coat wire with non-ferrous metal.

Knowledge:

- Safety, Health and Environment related regulation.
- Company policies and Standard Operating Procedure (SOP).
- Non-ferrous metals value-added activities.
- Product and input material specifications.
- Overall Equipment Effectiveness (OEE).
- Autonomous production maintenance.
- Concept of 5R.
- Concept of 5S.

Skills:

- Ability to carry out daily work in a safe environment.
- Proficiency in adjusting actions in relation to others' actions.
- Proficiency in understanding written sentences and paragraphs in work-related documents.

- Proficiency in handling operating machinery safely.
- Proficiency in monitoring gauges or other indicators to make sure a machine is working properly.

Attributes (Attitude/Safety/Environmental):

- Adhere to safety, health and environmental regulations and product quality standards.
- Effective communication and problem-solving with co-workers.
- Effective interpersonal skills.
- Effective team building and high level of commitment.
- High dedication to the implementation and perpetuation of values and ethics.
- Perform production-related activities on time.