Journal of African Interdisciplinary Studies (JAIS): **ISSN 2523-6725** (online)
March 2025 Vol. 9, No. 3
Citation: Jongwe, T; Dumbu, E; Chimwai, L. & Kajongwe, C. (2025). Plastic Pipe Manufacturing and Implications for Business Growth in Zimbabwe. *Journal of African Interdisciplinary Studies*, 9(3), 33 – 46.

Plastic Pipe Manufacturing and Implications for Business Growth in Zimbabwe

By

[1]Jongwe, Thomas; [2]Professor Dumbu, Emmanuel; [3]Dr Chimwai, Ledwin & [4]Dr Collen Kajongwe
[1&3]Great Zimbabwe University
[1& 3]jongwetm@gmail.com:+263772421551
[2]Reformed Church University
[3]Manicaland State University of Applied Sciences, Guthrie Road-Off Vumba Road Private Bag 7001, Fernhill, Mutare.
collen.kajongwe@staff.msuas.ac.zw

Abstract
The study sought to assess business implications of manufacturing diverse plastic pipes on corporate performance in Zimbabwe. The qualitative study purposively selected 20 respondents from five manufacturing companies in Harare Metropolitan Province who have been in operation for the past ten years. Interview guide were used to solicit data which was analysed and presented thematically. Conversely, major findings of the study demonstrated that diverse manufacturing of plastic pipes significantly improves Return On Asset, Return On Investment, Return On Equity of the companies for sustainable development allowing businesses to align their marketing strategies more closely with financial performance goals. Based on the study result, conclusions drawn were that integrating business reengineering focusing on product orientation is essential for business growth. However, it is recommended that plastic pipe manufacturing need to embrace business strategic orientation taking into cognizance innovative mantra to harness performance in the volatile competitive landscape. Therefore, longitudinal study need to be done for all SMEs as they contribute significantly to the global economy.

Key Words: Manufacturing, Plastic Pipes, Sustainable Growth, Corporate Performance

Journal of African Interdisciplinary Studies (JAIS): **ISSN 2523-6725** (online)
March 2025 Vol. 9, No. 3
Citation: Jongwe, T; Dumbu, E; Chimwai, L. & Kajongwe, C. (2025). Plastic Pipe Manufacturing and Implications for Business Growth in Zimbabwe. *Journal of African Interdisciplinary Studies*, 9(3), 33 – 46.

Plastic Pipe Manufacturing and Implications for Business Growth in Zimbabwe

By

Jongwe, Thomas; Professor Dumbu, Emmanuel; Dr Chimwai, Ledwin & Dr Collen Kajongwe

Introduction

Plastic pipe is no longer seen as an "alternative" pipe material and globally it is estimated as contributing significantly to economic growth of many nations (European Business Review, 2024). They are however, used across a wide spectrum of industries including mining, civil, irrigation, industrial, telecommunication and building. Conversely, plastic piping systems are relied upon to provide integral long term and extremely important infrastructure to the country, including sewage, water, telecommunication and electricity supply (United Nation Development Program (UNDDP), 2024). However, globally, the industry has seen negative growth (0.7 percent) despite supply exceeding demand. Industry's current machine utilisation is 65 percent. This situation results in a fight for survival by companies (UNDPP, 2024). As such this calls for this submission to assess the implications of diverse plastic pipe manufacturing for sustainable growth of companies in developing economies, and Zimbabwe in particular.

Background of the Study

Plastic pipe is now seen as an "alternative" pipe material and globally it is estimated to contribute more than 50% to Growth Domestic Product (GDP) of both developed and developing nations (United Nations Development Program (UNDP), 2022). Plastic pipes are used across a wide spectrum of industries including mining, civil, irrigation, industrial, telecommunication and building (Vipulanandan, 2020; Atkinson, 2020). Plastic piping systems are relied upon to provide integral long term and extremely important infrastructure to the country, including sewage, water, telecommunication and electricity supply (Vipulanandan, 2020; Atkinson, 2020). With increasing demand and inconsistent rainfall, huge loses in water pipeline leakages are estimated to be at 40%. This requires reliable, leak-free and durable piping systems that will not corrode (Morris & Cannady, 2020). However, despite the significant contribution made to the economies by plastic pipe manufacturers, most of them closed shop due to global recession disruptions (Severn Trent Water, 2022; Stoianov & Sadowski, 2022; Thompson, 2022; Wilkie, 2022). In addition literature is blindfolded in closing this lacuna and champion strategic business orientation of plastic companies in the context of Zimbabwe through the establishment of an existing business model to enhance performance.

Globally, few studies have looked at demise befalling pipe manufacturing companies. In Europe several players in manufacturing polyvinyl chloride (PVC) pipes have been impacted by volatility in PVC prices, liquidity crisis and working capital constraints, which led them to either minimizes production or close shop (Vipulanandan, 2020; Atkinson, 2020; Rajeev, Kodikara, Robert, Zeman & Rajani, 2021). This has seen big players having retarded growth like Plastics Moulding Technology, founded in 1872 and headquartered in Texas, United States, Plastic Design, Inc. founded in 1976 and is based in North Chelmsford, Massachusetts, New Age Industries began in 1954 and established in Southampton, Pennsylvania (LeBouf & Burns, 2019; LeBouf et al., 2021; Penders et al., 2021; U.S. Department of Labor, 2022).

Other researchers have attributed the business failure of some plastic pipe companies due to financials. The financials of other smaller players (polymer divisions) have been significantly impacted leading to the surge of PVC at market value and as such impacted negatively to all stakeholders in some Asian plastic companies (Rajeev, Kodikara, Robert, Zeman & Rajani, 2021; Rajani & Kleiner, 2021; Rathnayaka, Shannon, Vahid, Guo, Sinclair & Kodikara, 2022). On the other hand it has been observed by other researchers that in Asian economies the market share of big players has increased due to minimal operations by the smaller unorganized players (Severn Trent Water, 2022; Stoianov & Sadowski, 2022; Thompson, 2022; Wilkie, 2022). This has created a global opportunity for sectoral consolidation, while forcing the larger organized players to consolidate their operations as to increase their manufacturing and selling volumes (Walski, Daviau, & Coran, 2022; Vipulanandan, Qiao & Hovsepian, 2022; Savic & Banyard, 2022). However, the lack of a systematic investigation of the development and applicability of business framework to enhance sustainability of polyvinyl chloride (PVC) manufacturing entities has been cancerous for their growth and development which this study sought to establish.

Literature also pointed that the manufacturing plastic pipe sector in developing economies face the same predicament of financial hiccups and competitive challenges and indeed in distress, by-and-large, in regard to both company and overall industry sustainability and performance (Barbour & Ajdari, 2016; LeBouf & Burns, 2019; LeBouf et al., 2021; Matthews et al., 2020; Ra et al., 2018, 2019; Sendesi et al., 2017). Accordingly, a range of contextual factors responsible for specific areas of weakness or underperformance across the plastic pipe manufacturing value chain have been comprehensively identified and described which, cumulatively are responsible for compromised quality of products and services that, in themselves, reflect on industry shortcomings (Li et al., 2019; Noh et al., 2022b; Ra et al., 2019; Sendesi et al., 2017). However, to overcome such business there is need to develop business framework to sustain their growth become imminent. Sustainability will require not only a focus on accelerating industrialization, but also initiating a shift from current production processes to less highly polluting, resource-wasting industries and production processes (Sendesi et al., 2017). It requires investment in rapidly evolving technology that saves on inputs and is more efficient in energy use, that is based on renewable resources and that generates less waste along the life cycle of a product (Sendesi et al., 2017). Promoting improved awareness of environmental issues and cleaner production processes, facilitation access to the necessary technologies and putting in place an appropriate incentive structure is necessary.

By virtue of the fact that manufacturers ‘control only a small portion of the overall pipe system value chain’, they often feel ‘abused’ by designers, contractors and end-users to the point of ‘low productivity and potentially producing products of sub-standard quality (LeBouf & Burns, 2019; Li et al., 2019).For example, some customers demand unrealistic prices and therefore expect manufacturers to do ‘something for nothing’; or, alternatively exert ‘processing time pressure’, with product quality (Bourbour Ajdari, 2016; LeBouf & Burns, 2019; LeBouf et al., 2021; Matthews et al., 2020; Ra et al., 2018, 2020; Sendesi et al., 2021).Industry views on product diversification largely focus on the challenges or impediments to diversification (Stoianov & Sadowski, 2022). Major capital expenditure is perceived as an essential requirement and in itself an important limiting factor. With pipe manufacturing being a volume driven market sector there is consistent production pressure which precludes a company being able to expand into other market sectors (Ra et al., 2019; Sendesi et al., 2017; LeBouf et al., 2021; Matthews et al., 2020).

Globally, fluctuation in raw material supply or availability comprises the single most critical value-chain element affecting plastic pipe manufacturers that is, in 'immediate' and 'physical' ways concerning production (Matthews et al., 2020; Noh et al., 2022b; Ra et al., 2018, 2019; Sendesi et al., 2017). This aspect, unsurprisingly, also represents their greatest vulnerability as they are at the mercy of a host of variables causing supply-chain volatility at any one time as accentuated by the critical shortages in raw materials (Noh et al., 2022a; Ra et al., 2019; Sendesi et al., 2020). Relatedly, studies indicated that there is volatility in the price of raw materials, whether for reasons of supply chain vagaries or unfavourable exchange rate Walski, Daviau, & Coran, 2022. Against this backdrop, the lack of research and development associated with lack of business strategic orientation anchored on a given framework for implementation to achieve growth is largely bemoaned as constituting a critical factor inhibiting sector strength and competitiveness. It is of great interest to understand different types of plastic pipes made by manufacturers in order to get the gist of operational dynamics of the industry. Depending on plastic piping materials, basically, three types of Synthetic Polymer Components have found acceptance in industrial use (Vipulanandan, Qiao & Hovsepian, 2022). The following types of plastic pipes are common and made by plastic pipe manufacturers: thermoplastic piping, thermosets and composite Plastic piping (Vipulanandan, Qiao & Hovsepian, 2022).

The Thermoplastics are Polymer Compounds, which are normally available in crystal form. On the application of heat and pressure, these crystals attain the requisite level of flowability to be able to attain the desired shape by a molding process (Savic & Banyard, 2022). On re-heating, the plastic material can once again undergo the transformation from solid to a flowable state which allows their reprocessing into the desired shape. Some of the commonly used Thermoplastic materials are as follows: Polyethylene (PE), Polypropylene (PP), Polystyrene, Polyvinyl Chloride (PVC) and Fluoro-Plastics. By and large, thermoplastics are structurally weak materials and have limited temperature endurance.in addition Thermosetting Plastics are Polymer compounds (resins), which are normally available in liquid form at ambient temperature (Wilkie, 2022).

With the addition of a Catalyst and an Accelerator, the Resins undergo a chemical transformation into a rigid product that sets into the required shape by the curing process. Some of the commonly used Thermosetting Plastics are as follows: Epoxies, Furans, Phenolic, Polyesters-Bisphenol, Isophthalic, Halogenated, Polyurethane and Vinylesters. Even though Thermosetting Plastics are relatively superior to Thermoplastics in terms of structural strength and temperature endurance, still in their virgin form they find limited use in industrial applications (Stoianov & Sadowski, 2022). An attempt to strike an appropriate balance between the two desired properties of the material (i.e. Mechanical Strength and Corrosion Resistance) therefore has always remained a desirable objective (Zeman & Rajani, 2021). This brought forward the concept of Composite Plastics wherein a reasonable degree of mechanical strength is imparted to the base Polymer which in itself is adequately resistant to Chemical Corrosion, by way of reinforcing it with a suitable reinforcing material (Vipulanandan, Qiao & Hovsepian, 2022).

In Zimbabwe, many companies have closed operations since the downturn of the economy in 2007 (Finscope Survey, 2022). The companies still operating in Zimbabwe are facing many production challenges such as high product costs, high staff turnover and inadequate funds just to mention a few (Murairwa, 2022). The 2023 National Budget Statement (2023 NBS) also revealed that the average time and cost for establishing a business in Zimbabwe was 90 days and 141.20% of income per capita respectively. According to the 2023 NBS, the figures were very high when compared to other African countries such as

South Africa with 19 days and 0.3% of income per capita and Mauritius, 6 days and 3.6% of income per capita. The 2023 NBS also revealed that an investor had to complete on average, 9 procedures to open a business in Zimbabwe against 7.8 in sub–Saharan Africa and 4.8 for developed countries. Therefore, it was difficult to attract new investors to open companies in Zimbabwe. Some of the few remaining companies were failing and shutting down due to production challenges caused by the depressed economy. The phased approach can be used to address the challenges faced by companies in the plastic pipe manufacturing sector in Zimbabwe.

Zimbabwe National Statistics Agency (ZimStats) (2023) asserted that, Zimbabwe's plastic pipe manufacturing sector exhibited positive growth since the adoption of the multi-currency system in 2009. It recorded a growth rate of 10.2% in 2009 before dipping to around 2.5% in 2010 and rising to a high of 13.8% in 2013. Thereafter, it waned, hitting a low of -5% in 2014 before recovering back to positive territory. The sector's growth rate has however failed to gather momentum with a rate of 1.3% being attained in 2018-2022. The manufacturing sector capacity utilization declined to an all-time low of 10% in 2008 and picked up to 57% in 2011 following the introduction of the multicurrency system. Thereafter, capacity utilization fluctuated, dropping to 34.3% in 2015, then rising to 47.4% in 2016 before registering a slight drop to 45.1% in 2017. Average capacity utilization for the period between September 2017 and August 2022 rose by 3.1 percentage points from 45.1% in 2017 to 48.2% in 2023 (Finscope Survey, 2022). Construction activity boosted demand for industry products from a variety of downstream markets, as plastic pipes and parts are used as key components in construction activities. Specifically, the residential construction market's explosive growth has boosted demand for plastic water pipes, fittings and unions. Furthermore, growth in heavy manufacturing industries has helped demand for plastic pipes.

Zimbabwe plastic pipe manufacturing companies are operating below plant design installed capacity. Plastic pipe manufacturing has been going down since 1986, from a high of 27% to 13% in 2010 (Mzumara, 2012). Several companies have closed, with most of them coming to a standstill in 2008 (Hewat and Banda, 2009). After dollarization of the country`s economy, some plastic pipe manufacturing companies were given a lease of life and started operating (Chikobvu & Makarati, 2019). From 2011 more plastic pipe manufacturing companies joined the market for a limited time and closed again, whilst those that continued reported no or negative growth. Some faced competition from imports, others faced viability challenges whilst some titter in the verge of collapse due to use of wrong strategies (Chitotombe, 2020). It is worth noting that some of the plastic pipe manufacturing companies are currently operating below capacity due to shortages of electricity causing high cost of running business as current production is failing to recover costs fully due to production levels (Muchadenyika, 2020). With such volatile, uncertain, complex, and ambiguous market situation (VUCA), the plastic pipe manufacturing companies are failing to realize the growth rates which other countries have since reported a decade ago. Zimbabwean domestic plastic pipes production is not growing as pointed out in 2015 by Shangwa (Shangwa *et al*, 2015).

Orsini et al, (2020 also reported that most of the companies in the plastic pipe manufacturing sector in Zimbabwe are facing management challenges and most of their production capacity is uneven, the production processes are not transparent, and the production progress are not being controlled effectively (Orsini *et al*, 2020). Coupled with the political instability that was in Zimbabwe since 2000, this has made the business environment less friendly for plastic pipe investors as well and this has led to the lack of foreign direct investment flow (FDI) into the country affecting plastic pipe manufacturing growth too (Mangizvo, 2007). Thus, there is a lack of confidence in the market, driven by high currency

exchange rates, consumers resorting to importing and business viability remaining low. Technological challenge has also contributed and affected the plastic pipe manufacturing companies in terms of quality and effectiveness of plastic pipe manufacturing which in turn affects returns for investors (Guo *et al*, 2022).

There are many companies that are facing operational viability in developing and under developed countries (Murairwa, 2022). In Zimbabwe, many companies have closed due to operational challenges caused by the depressed economy (Murairwa, 2022). A number of studies have been conducted in improving company production (Homola, 2021; Read, 2020; Eberhadt & Teal, 2021) but there is no evidence in the literature of researches that attempted to formulate business framework for sustainability of plastic pipe manufacturing companies in Zimbabwe. Eberhardt & Teal (2021) stated that despite the importance of the manufacturing industry for successful development, very few researches investigated this sector. This was in agreement with a survey study by Durlauf, Johnson & Temple (2022) which recognized the limited empirical evidence of work dedicated to cross country empirical analysis.

There is desperate need for home grown solutions to revive and establish business framework for plastic companies in depressed economies in which Zimbabwe falls. However, despite widespread researches on the usage of plastic pipes in Zimbabwe industry, there is paucity of a business framework to be used by plastic pipe manufacturers to sustain and enhance growth in the volatile business environment. This lacuna is bridged by developing a business framework to be used by plastic pipe manufacturers in this domain. This is novel as there is no such a development in the plastic pipe manufacturing industry in Zimbabwe.

Statement of the Problem

The plastic pipe manufacturing industry in Zimbabwe is not sustainable and productive evidenced by 60 percent drop in revenue growth per year ending 2023 (Finscope Survey, 2022). This has indexed Zimbabwe's share of world manufacturing output drop from 0.9% to a still lower figure of 0.8% in the year 2023. The contribution of Zimbabwe plastic pipe manufacturing output and national income is generally low, with the share of manufacturing value added (MVA) in Growth Domestic Product (GDP) in 2023 ranging as low as 0.8% respectively. This has resulted in many plastic pipe companies to encounter huge operational loss leading to lower sales growth, poor growth margins and accruing less revenue. The volumes of domestic sales and exports has dwindled organisational operations which even leading to employee downsizing and reduction of operational days per week. However, this calls for the evaluation of diverse plastic pipe manufacturing on sustainable growth of companies in Zimbabwe.

Research Objective

To evaluate the implications of manufacturing diverse plastic pipes on growth of companies in Zimbabwe.

Theoretical Framework

The study was guided by the Resource Based View theory (RBV) (Hamel and Prahalad, 1996). It is a strategic framework that helps companies understand how to gain and maintain a competitive advantage. It assumes that a company resources are rare, difficult to imitate and cannot be substituted. According to RBV, it is significantly easier to exploit new opportunities using resources and competencies that are already available, rather than having to acquire new skills, traits or functions for each different opportunity. These resources are

the main focus of the RBV model, with its supporters arguing that these should be prioritised within organisational strategy development. And according to its proponents, it is much more feasible to exploit external opportunities using existing resources in a new way rather than trying to acquire new skills for each different opportunity. In RBV model, resources are given the major role in helping companies to achieve higher organizational performance. Relevance of the theory to the study: The rapid growth of the plastic pipe manufacturing industrial sector allows large companies with solid and large-scale capital and creates intense competition between companies in the industry. In reality, the competition can be a healthy or unhealthy competition that can bring down the other party. Unfair competition can be in the form of monopolistic practices or barriers to market entry. In this free business competition, the condition for a company to be successful is to try to achieve the goal of creating and retaining customers. To achieve this goal, every company must produce and deliver the goods and services that consumers want according to their needs and desires.

Review of Related Literature

The implications of manufacturing diverse plastic pipes on growth of companies

The global plastic (PVC) pipes market is estimated to be valued at over $37.34 billion United States Dollars as of 2024 (Business Wire, 2023). Researchers have argued that this high projection was attributable to manufacturing different types of plastic pipes which are gaining favour and demand from the market consumers (United Nations Development Programme Report (UNDP), 2022; Karrer, 2022; Murairwa, 2022; Parry & Graves, 2022; Schoenberg, Collier & Bowman, 2022; Sokovic, Pavletic & Kern-Pipan, 2022). The empirical review in this study purposively selected the following different types of plastic pipes manufactured by companies and how they project sales growth of the organisations: monolayer pipes, multilayer pipes, RTP Reinforced Thermoplastics Pipes, PE Plastic pipes, cross-linked polyethylene pipes.

Monolayer Plastic Pipes

The pipes has an excellent characteristics rigidity, homogeneous joints, high temperatures resistance and impact resistance (Schoenberg, Collier & Bowman, 2022). The simplicity of installation makes the monolayer pipes ideal for plumbing, heating and air conditioning, compressed air system in both civil and industrial for example in private and public housing, residential apartments and condominiums, hotels and resorts, hospitals, schools, commercial buildings, shopping malls, industrial plants in food processing (Stadtler & Kilger, 2021; Slack, Chambers & Johnston, 2021; Hemmati & Rabbani, 2022; Sokovic, Pavletic & Kern-Pipan, 2022; Karrer, 2022). Ever since its invention in the 1980's, the PP-R pipe has taken a large market share in piping all over the world (Hemmati & Rabbani, 2022). Over and above global plastic pipe manufacturing have reached a significant growth in sales profit due to high demand of monolayer plastic pipes (UNDP, 2022). To reflect on the global synopsis of market index sales of monolayer plastic pipes, Indian companies have witnessed sales growth especially those companies specializing in monolayer plastic pipes (Sokovic, Pavletic & Kern-Pipan, 2022). Currently, plastic pipes market is valued at ~Rs 400bn with organized players accounting for ~67% of the market. By end use, 50-55% of the industry's demand is accounted by plumbing pipes used in residential and commercial real estate, 35% by agriculture and 5-10% by infrastructure and industrial projects (Sokovic, Pavletic & Kern-Pipan, 2022).

Multilayer Pipes

The multilayer pipes market is witnessing rapid growth as it revolutionalises the way piping solutions are designed and implemented in diverse industries. Global multilayer pipes was valued at US$600.00 million in 2021, estimated to reach US$1,075.00 million in 2027 with CAGR 7.95% from 2022-2027(UNDP, 2023). The global demand for multilayer pipes is increasing at a high pace due to their superior quality to PVC pipes and the ability to bend to meet end-user requirements. These pipes are three times lighter than copper and have become more popular in the water supply and wastewater management markets in recent years (Parry & Graves, 2022). Moreover, multilayer pipes are easy to install, with manual bending, resulting in higher demand (Collier & Bowman, 2022). Additionally, the increase in population, residential and non-residential construction projects and awareness about the features of multilayer pipes are fueling the market. However, fluctuation in raw material prices may limit the market growth (Sokovic, Pavletic & Kern-Pipan, 2022).

Reinforced Thermoplastics Pipes (RTP)

In recent years, reinforced thermoplastic composite pipe (RTP) is widely sought after because of its high strength and corrosion resistance. The development of a connector that is easy to install and highly reliable is essential for the successful application of RTP. Reinforced thermoplastic composite pipe (RTP), also known as flexible composite pipe, is a kind of coiled continuous pipeline product, which is composed of reinforced thermoplastic lining, reinforced layer and protective layer. Actually, the RTP has been widely used in petroleum, natural gas, aerospace and other fields because of its high strength and good corrosion resistance (Bai et al. 2017). Reinforced thermoplastic pipe (RTP) is a type of pipe reinforced using a high strength synthetic fibre such as glass, aramid or carbon. It was initially developed in the early 1990s by Wavin Repox, Akzo Nobel and by Tubes d'Aquitaine from France, who developed the first pipes reinforced with synthetic fibre to replace medium pressure steel pipes in response to growing demand for non-corrosive conduits for application in the onshore oil and gas industry, particularly in the Middle East.

Typically, the materials used in the construction of the pipe might be Polyethylene (PE), Polyamide-11 or PVDF and may be reinforced with Aramid or Polyester fibre although other combinations are used. More recently the technology of producing such pipe, including the marketing, rests with a few key companies, where it is available in coils up to 400 m (1,312 ft) length. These pipes are available in pressure ratings from 30 to 90 bar (3 to 9 MPa; 435 to 1,305 psi). Over the last few years this type of pipe has been acknowledged as a standard alternative solution to steel for oilfield flow line applications by certain oil companies and operators. An advantage of this pipe is also its very fast installation time compared to steel pipe when considering the welding time as average speeds up to 1,000 m (3,281 ft) /day have been reached installing RTP in ground surface. Primarily, the pipe provides benefit to applications where steel may rupture due to corrosion and installation time is an issue.

Polyethylene (PE) Plastic Pipes

Polyethylene (PE) is a thermoplastic material produced from the polymerization of ethylene (Clark, 2020). PE plastic pipe is manufactured by extrusion in sizes ranging from ½" to 63". PE is available in rolled coils of various lengths or in straight lengths up to 40 feet. Generally small diameters are coiled and large diameters (>6" OD) are in straight lengths. PE pipe is available in many varieties of wall thicknesses, based on three distinct dimensioning systems.

Polyethylene can be used in low temperatures without risk of brittle failure Henderson & Clark, 2019). Thus, a major application for certain PE piping formulations is for low-temperature heat transfer applications such as radiant floor heating, snow melting, ice rinks, and geothermal ground source heat pump piping A PE piping material consists of a polyethylene polymer (commonly designated as the resin) to which has been added small quantities of colorants, stabilizers, antioxidants and other ingredients that enhance the properties of the material and that protect it during the manufacturing process, storage and service (Henderson & Clark, 2019). PE piping materials are classified as thermoplastics because they soften and melt when sufficiently heated and harden when cooled, a process that is totally reversible and may be repeated. In contrast, thermosetting plastics become permanently hard when heat is applied. Because PE is a thermoplastic, PE pipe and fittings can be fabricated by the simultaneous application of heat and pressure.

In addition in the field PE piping can be joined by means of thermal fusion processes by which matching surfaces are permanently fused when they are brought together at a temperature above their melting point. PE is also classified as a semi-crystalline polymer (Henderson & Clark, 2019). Such polymers (e. g., nylon, polypropylene, polytetrafluoroethylene), in contrast to those that are essentially amorphous (e.g., polystyrene, polyvinylchloride), have a sufficiently ordered structure so that substantial portions of their molecular chains are able to align closely to portions of adjoining molecular chains (Procto, 2019). In these regions of close molecular alignment crystallites are formed which are held together by secondary bonds. Outside these regions, the molecular alignment is much more random resulting in a less orderly state, labeled as amorphous. In essence, semi-crystalline polymers are a blend of a two phases, crystalline and amorphous, in which the crystalline phase is substantial in population (Procto, 2019).

Methodology

The qualitative study purposively selected 15 participants from five manufacturing companies in Harare Metropolitan Province who have been in operation for the past ten years. The sample frame constituted managing directors, senior engineers and senior marketing executives. Interview guide were used to solicit data which was analysed and presented thematically. The researcher observed ethics at each and every stage of conducting this study. Therefore, the researcher observed the following ethical principles: upholding honesty, truthfulness and accuracy during the conduct of study by seeking authority from relevant Ministries and stakeholders before carrying the study.

Results and Discussion

Data saturation was reached at 8th respondent and the researcher stopped. However, the response rate was 53 percent which was moderately high to justify the significance of the study results. Conversely several themes were generated from the study results on the major implications of manufacturing different type of plastic pipes on growth of plastic pipe manufacturing companies. However, the following responses were generated from selected participants.

Participant 1 had this to say:

> …as an organisation we are gaining a lot of revenue in the manufacturing of different types of pipes. Currently a lot of revenue stream is being generated by high demand of our multilayer plastics pipes from our stakeholders as they offer remarkable mechanical properties, effectively withstanding high

> pressures and high operating temperatures-ideal for the construction of sanitary facilities…multilayer pipes are also the ideal solution for conducting water in distribution, heating, and cooling systems and as such are in high need from customers.

Participant 2 avers that:

> …we specialize in the production of PVC pipes. In terms of revenue generated, PVC is one of the most valuable products of the chemical industry. Globally, over 50% of PVC manufactured is used in construction. As a building material, PVC is cheap and easy to assemble. In recent years, PVC has been replacing traditional building materials such as wood, concrete and clay in many areas. Despite claims that PVC production negatively affects the natural environment and human health, it is still widely used.

Participant 3 added that:

> …in our company we do manufacture all plastic pipes but we focus on those on current demand. Currently we are focusing on Vinyl polymers and Thermoplastic polyesters. Vinyl polymers and ABS does not show difficult to melt, having properties superior to the pipe material when proper bonding procedure are used. HDPE is used in various applications, such as pressurized gas and water pipelines that require high mechanical strength Polyethylene requires operation at the lowest possible melt temperatures while maintaining a high level of thermal-mechanical homogeneity in the melt. Thermoplastic polyesters can provide toughness, flexibility, and low temperature properties to the pipes. The control of the melt temperature is important; if too high it can reduce the melt strength significantly, the result will be a irregular wall thickness.

Participant 4 alluded that:

> …we do produce PVC pipes. Specialization gives a niche in the market and allows our organisation to be innovative and show a lot of improvement in the same pipe materials. This has generated a lot of revenue for our organisation. Thu most used plastic for application in extrusion is PVC. PVC dry blends allow the processor to take advantages of using their own compounding formulations that should provide costs advantages. Polyvinyl chloride is widely used for producing pipes. In the water distribution market it accounts for 66 percent of the market, and in sanitary sewer pipe applications it accounts for 75 percent hence we dwell on that gap to continue specializing so as to get more markets…

Participant 5 also added that:
Our organisation rapidly bend to market demands on its production of plastics pipes. The structure of the industry has thus been subject to considerable change and upheaval in recent years. Because of the nature of the building industry, demand for pipe products tends to be cyclical, with reflections in the economy. Rapidly fluctuating polymer prices and pressure on

prices from the consumer end have led to an unstable environment with producer margins being eroded…

Participant 6 confirm that:

> In our company we do both plastic and steel pipes manufacturing, thus diversity as each bears different advantage and disadvantage over others. Plastic pipe is being recycled on a relatively large scale because of the high value of polymer used in the manufacturing process. Although ductile iron and steel pipes can also be recycled, the energy cost to do so is makes the process considerably more expensive than with plastics. Basic calculations show that the power consumption to recycle plastic pipe is approximately R0.09/kg compared to R0,23– R0,45 for steel, bearing in mind that many steel pipelines are internally lined with material that first needs to be stripped from the steel… more with less two "Plastic pipe is not wasted and therefore does not contribute to environmental pollution. One hundred per cent (100%) of recycled pipe can be re-used although strict quality requirements set allow most of it to only be used in non-critical application.

Participant 7 asserted that:

> Plastic pipe systems have revolutionized the plumbing industry, providing numerous advantages over traditional metal pipes. Their adaptability, durability, corrosion resistance, low thermal conductivity, non-reactive properties, and sustainability make them a top choice for residential and commercial plumbing projects. Professionals can rely on plastic pipe systems to ensure efficient, long-lasting, and environmentally friendly plumbing solutions.

Participant 8 alluded that:

> We are focusing on manufacturing multilayer pipes as they increases our Return On Investment. The multilayer pipes market boast a competitive landscape with several key players vying for market share. As an organisation we are investing in research and development to enhance the performance characteristics of multilayer pipes, focusing on aspects such as thermal resistance, flexibility and ease of installation, strategic partnership in the dynamic business environment.

The study results were in line with literature. Due to high demand and manufacturing different plastic pipes organisations have witnessed a rapid increase in revenue streams (Wahab et al., 2020). Accordingly literature has noted that Plastic Pipe Market size was over USD 59.84 billion in 2024 and is anticipated to cross USD 137.35 billion by 2037, witnessing more than 6.6% CAGR during the forecast period i.e., between 2025-2037. In the year 2025, the industry size of plastic pipe is estimated at USD 63 billion (European Business Report, 2024). According to industry analyses from 2022, top-tier PVC pipe manufacturers can see annual gross profits range significantly based on several influencing factors, including scale of operation and market reach. For high-performing companies, gross

margins have been reported to hover around 25-30%.Furthermore, due to rising demand, the PVC pipe market is poised to increase at a lucrative CAGR of 6.1%, during the forecast period 2019-2025 (World Bank, 2024)

Conclusions and Recommendations

Conversely, major findings of the study demonstrated that diverse manufacturing of plastic pipes significantly improves Return On Asset, Return On Investment, Return On Equity of the companies for sustainable development allowing businesses to align their marketing strategies more closely with financial performance goals. Based on the study result, conclusions drawn were that integrating business reengineering focusing on product orientation is essential for business growth. However, it is recommended that plastic pipe manufacturing need to embrace business strategic orientation taking into cognizance innovative mantra to harness performance in the volatile competitive landscape. Therefore, longitudinal study need to be done for all SMEs as they contribute significantly to the global economy

Citation: Jongwe, T; Dumbu, E; Chimwai, L. & Kajongwe, C. (2025). Plastic Pipe Manufacturing and Implications for Business Growth in Zimbabwe. *Journal of African Interdisciplinary Studies*, 9(3), 33 – 46.

References

Al-Debei, M. M. & Avison, D. (2019). Developing a Unified Framework of the Business Model Concept. *European Journal of Information Systems*.19, 359 – 376.

Alt, R. & Zimmerman, H. (2018). Introduction to Special Section – Business Models. Electronic Markets. 11(1), 3 – 9.

Andersson B, Bergholtz M, Edirisuriya A, Ilayperuma I, Johanneson P, Gre´goire B, Schmitt M, Dubois E, Abels S, Hahn A, Gordijn J,Weigand H and Wangler B (2016). Towards a reference ontology for business models. In Proceedings of the 25th International Conference on Conceptual Modeling (ER2006) 6–9 November, Tucson, AZ, USA, pp 1–16.

Arend, R. J. (2019). The Business Model: Present and Future – Beyond a Skeumorph. Strategic Organization, 11, 4, 390-402.

Baden-Fuller, C. & Morgan, M. S. (2019). Business Models as Models. Longe Range Planning, 43, 156 – 171.

Baker, S. E. & Edwards, R. (2022). How many qualitative interviews is enough? National Centre for Research Methods Review Paper.

Beer, M., & Eisenstat, R. A. (2014). How to have an honest conversation about your business strategy. *Harvard Business Review*, 82(2), 82-89.

Betz, F. (2002). Strategic Business Models. Engineering Management Journal. Vol. 14, No. 1, pp. 21 – 34. Blank, S. (2023). Spotlight on Entrepreneurship: Why the Lean Start-Up Changes Everything. *Harvard Business Review*.

Carter, C., Clegg, S. R. & Kornberger, M. (2018). Strategy as Practice?. *Strategic Organization*, Vol. 6(1), 83–99.

Casadesus-Masanell, R. & Ricart, J. E. (2019). From Strategies to Business Models and to Tactics. *Harvard Business School*.

Cassel, C. & Symon, G. (2018). *Essential Guide to Qualitative Methods in Organizational Research*. Thousand Oaks, California: Sage.

Chesbrough, H. & Rosenbloom R. S. (2022). The Role of the Business Model in Capturing Value from Innovation: Evidence from Xerox Corporation's Technology Spin-off Companies. Industrial and Corporate Change. 11(3), 529-555.

Chesbrough, H & Schwartz, K. (2017). Innovating Business Models with Co-development Partnerships. *Research Technology Management*, 50, 1, 55-59.

Chesbrough, H. (2019). Business Model Innovation: Opportunities and Barriers. Long Range Planning 43, 354 – 363.

Collier, N., Fishwick, F., & Floyd, S. W. (2018). Managerial Involvement and Perceptions of Strategy Process. *Long Range Planning*, 37(1), 67-83.

DaSilva, C., M. & Trkman, P. (2019). Business Model: What It Is and What It Is Not. *Long Range Planning* 47, 379–389.

Demil, B., & Lecocq, X. (2019). Business Model Evolution: In Search of Dynamic Consistency. *Long Range Planning*, 43(2-3), 227-246.

Everaert, H. & Peet, van A. (2016). Kwalitatief en Kwantitatief Onderzoek. Hogeschool Utrecht. Eyring, M., J., Johnson, M., W. & Nair, W. (2011). New Business Models In Emerging Markets. Harvard Business Review.

Fielt, E. (2019). Conceptualising Business Models: Definitions, Frameworks and Classifications. Journal of Business Models, Vol. 1, No. 1 pp. 85-105.

Francis, J. J., Johnston, M., Robertson, C., Glidewell, L., Entwistle, V., Eccles, M. P. & Grimshaw, M. (2019). What is an adequate sample size? Operationalising data

saturation for theory-based interview studies, Psychology & Health, 25, 10, 1229-1245.

Freeman, R., E. (2020). Strategic Management: A Stakeholder Approach. Boston: Pitman Publishing Inc. Freeman, R., E. (2011). Stakeholder Theory of the Modern Corporation. Business Ethics: The Controversy.

Freeman, R., E. & McVea, J. (2011). A Stakeholder Approach to Strategic Management. Handbook of Strategic Management. University of Virginia. Oxford: Blackwell Publishing. Galper, J. (2017). Three Business Models for the Stock Exchange Industry. *Journal of Investing* 10(1), 70-78.

Gassmann, O., Frankenberger, K. & Csik, M. (2018). The St. Gallen Business Model Navigator. Working Paper, University of St. Gallen.

Gebauer, J. & Ginsburg, M. (2003). The US Wine Industry and the Internet: An Analysis of Success factors for Online Business models. *Electronic Markets* 13(1), 59-66.

Gordijn, J. & Akkermans, J. M. (2013). Value-based requirements engineering: exploring innovative e-commerce ideas. *Requirements Eng. Journal.* 8(2), 114 – 134.

Gordijn, J., Osterwalder, A., & Pigneur, Y. (2015). Comparing two business model ontologies for designing e-business models and value constellations.

Groysberg, B., & Slind, M. (2017). Leadership is a conversation. *Harvard Business Review*, 90(6), 75-84.

Guest, G., Bunce, A. & Johnson, L. (2016). How Many Interviews Are Enough? An Experiment with Data Saturation and Variability. *Field Methods*, Vol. 18, No. 1, 59-82.

Hamel, G. (2020). Leading the Revolution. Harvard Business School Press.

Harrell, M. C. & Bradley, M. A. (2019). Data Collection Methods Semi-Structured Interviews and Focus Groups. Rand Corporation.

Hedman, J. & Kalling T. (2020). The business model concept: theoretical underpinnings and empirical illustrations. *European Journal of Information Systems*, 12, 49 – 59.

Hoffmann, F. E. G. (2022). Visual Business Model Ideation. University of St. Gallen, School of Management, Economics, Law, Social Sciences and International Affairs.

IBM Global Business Services (2019). Path to Success: Three Ways to Innovate your Business Model.

Jarzabkowski, P. (2018). Strategy as Practice: Recursiveness, Adaptation and Practices-in-use. *Organization Studies*, 25.4, 529-560.