

ASHESI UNIVERSITY COLLEGE

FEASIBILITY OF JUST-IN-TIME (JIT) IN GHANA

By

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DECLARATION

I hereby declare that this dissertation is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere.

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I hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by Ashesi University College.

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Date: 20th April, 2009

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At every crossroad in this short performance, we call life, we turn back look at what we have left behind and make a personal evaluation. Mine is simple- I have come far. I have come very far in a short time and truthfully, it was through no feat of mine. Great men and women have helped me push my coracle far beyond the limits of my strength.

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ABSTRACT

Just-in-Time, a system of production that calls for the elimination of inventory has taken many parts of the world by storm. Many producers and even suppliers are engaging the statutes of this new production system and are seen to be clearly reaping the benefits associated with it. Ghanaian firms seem to be tarrying with respect to the use of this system thus this paper seeks to discover how beneficial this system of production will be to producers in Ghana and how feasibly its implementation will be. In attaining the objectives of this study, both qualitative and quantitative data were collected with the main data source being Magvlyn Ind Limited. Published journals and articles were some of the other data sources used. A regression analyses served as the tool for the determination of the strength of the relationship between sales and inventory. Also a qualitative analysis was used in the analysis of the questionnaires and other secondary data collected.

In conclusion, it was determined that there is a very strong relationship between inventory levels and sales and that inventory levels have a positive impact on sales. Also it was realized that Just-in-Time would not be the most feasible of production options for producers because of the current economic and infrastructural difficulties and also because of Ghanaians attitudes towards change.

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Chapter One: Introduction

1.1 Background to the Study

The world is always facing a shift in ideologies and thought dimensions.

There has been an abandonment of old practices as new and better ones are embraced. The manufacturing world is no different in its quest to enhance its production methods and processes. For instance, the current world economic system of free trade that has broken down borders and geographic barriers is a change from the old Keynesian ideology of controlled markets. Free trade has led to the world becoming a large market place where there is an increased interaction between the forces of demand and supply. Communication and easy transportation have intensified competition and this has led to serious technological advancements with the attendant problem of products with short life spans (Mowen & Hansen 2006, pp. 518). Hence, business process in their design must be structured to cope with the rapidly changing business life cycle and environment.

Moreover, a major challenge for businesses in this changing business environment is the scarcity of resources needed to meet the demands of economies. This underlying rationale behind economics – the fact that man's wants are greater than the available resources – implies that organisations look into avenues that will yield the best results despite the presence of the scarcity. Consequently, firms and countries face the task of arriving at set targets using the most optimum of processes and thus, institutions face a similar task of using practices that will yield the best results.

Several industries and disciplines have created systems designed to yield the most desired results. However, are these systems effective in the current

global business environment? The realization that old manufacturing processes, are not likely to lead to companies gaining the utmost benefit from the free market trade, has led to the creation of new management tools. In this regard, companies in developed economies have developed and adopted several modern costing methods, management tools and business processes such as the Just-in-Time (JIT) system of keeping inventory, throughput accounting, target accounting, back flush accounting etc. These modern methods of business processes seem to have improved the efficiency and effectiveness of operations in organisations in developed countries. Despite the performance of JIT in developed countries, will its use be viable in organisations stationed in developing countries considering the different environments of operations.

Inventory constitutes a large portion of any organisations assets (i.e. merchandise or manufacturing) due to its transaction, precautionary, and speculative purposes. However, there is cost associated with keeping inventory and if inventory keeping is not practised, there is the possibility of a stock-out. There is therefore the need to balance between the financial influence and operational influence of inventory through proper inventory management. One method of inventory management that has evolved over the years and formed the basis for throughput accounting is the Just-in-Time production system (JIT).

JIT system of inventory management aims at increasing invested return through the reduction of inventory and its contingent carrying costs (Brandon & Drtine 1997, pp. 374). The JIT ideology propounds the argument that

inventory is waste (Mowen & Hansen 2006, pp. 518). Thus, firms only keep stock when necessary. The key principle of JIT is that goods moved through a system should be because of present demand and not projected demand (Mowen & Hansen 2006, pp. 518). Therefore, firms will only be producing to satisfy current demand and not to meet some expected future demand. Inventory (raw materials, work in process and finished goods) found within a JIT system is always at the barest minimum. This principle goes against the traditional views on manufacturing or inventory.

Traditionally, carrying inventory is seen as more advantageous than detrimental. It is argued that the bulk purchase of inventory helps hedge against price fluctuations and keeping inventory means that firms can quickly meet the increased demands of consumers (Brandon & Drtine 1997, pp. 375). Purchasing inventory in large quantities also gives the benefit of trade discounts and inventory prevents halts in production that occur when there are late deliveries of raw materials (Brandon & Drtine 1997, pp. 374). Although the traditional ideas on inventory are strong, JIT offers alternatives to all the issues raised by the traditionalists. For instance, instead of buying in bulk to hedge against price fluctuations, firms can enter into long-term contracts with suppliers so that they have a guaranteed supply of products with minimal changes in price. In addition, firms will combat the increases in demand by reducing their setup times. JIT has become the hallmark of the world's system of production in recent times and it has been recognised as system that when well implemented, encourages growth and increases

performance. One can therefore safely assert that developing countries will make great developmental leaps if JIT is implemented.

The benefits of JIT are said to go beyond the advantages derived from the usage of the traditional manufacturing methods. JIT is a system that calls for a total change in every aspect of a firm's practices and equipments; inventory, management, machinery, skill level of workers etc (Brandon & Drtine 1997, pp. 518). These changes also include the creation of stronger relationships with suppliers (Brandon & Drtine 1997, pp. 518). Companies' whose business practices are an enactment of JIT postulates, may initially be seen as suffering the risks associated with ordering raw material only when needed, but these companies overtime draw on their supplier relationship and are thus always assured of cheaper, high quality and readily available raw material on time. Another advantage that companies stem to derive from practicing JIT methods is the ability to reduce their lead times (Weygandt et al., 1999). This is because of the relationship companies have with their suppliers and the layout of their machinery (production line) reduces the time that products spend within the production system. Majors costs associated with the traditional manufacturing systems are also eliminated when companies are involved in JIT. Whilst the streamlining of operations and production removes the extra cost associated with a traditional operation system, JIT also removes the attendant costs of inventory storage ((Weygandt et al. 1999, pp. 143).

Ghana, a developing country, has many manufacturing industries including; the food and beverages industries, mining sector, paper, plastics, clothing,

and textiles industry. The activities of all these industries have been affected by international trends and occurrences due the opening up of the Ghanaian market to the rest of the world. How well do these domestic industries compete with their foreign competitors locally and internationally? If these Ghanaian industries are faced with costs that put them at a disadvantage with respect to price how will they survive in their own market? For example, the wax print manufacturing industry made up of companies like Akosombo Textile Limited and the Ghana Textiles Prints is faced with stiff competition from Chinese competitors who have flooded the Ghanaian market with cheaper products (Ryan, 2006). JIT offers producers the chance to reduce carrying costs and increase productivity thereby increasing profitability.

Faced with an environment that is subject to the elements of a developing economy, Ghanaian companies are exposed to the disadvantages associated with an underdeveloped or developing economy; high levels of inflation, balance of trade problems. To rise out of the effects of such straits Ghanaian manufacturers have to do something extra to be efficient and successful in their local and the international markets. Considering the benefits of JIT system, will the Ghanaian environment support the implementation and practice of JIT system of production? The goal of this study is to test the feasibility of Ghanaian manufacturing companies shifting from traditional manufacturing ideas to modern methods of business operations specifically, the JIT system keeping in mind the stated benefits of this system. It also seeks to discover the benefits or otherwise that Ghana as a whole might derive from the change. The research, therefore, seeks to access the

feasibility of JIT system of production in developing countries, specifically, Ghana.

1.2 About Magvlyn Ind. Limited

The company used as the platform for uncovering how feasible or otherwise a JIT system will be in Ghana was Magvlyn Ind. Limited. This company employs over four-hundred employees and is the sole producer of the mobile range of products. These products include mobile water (sachets, 500ml bottles, 1.5l bottles, 20l bottles and 300ml bottles), mobile garrigbix, mobile chocomix and mobile pineafresh. Established in 1996, Magvlyn Ind. Limited services Ghana and parts of Togo with its products especially the mobile water range. Though it is primarily engaged in the production of food products, it is involved in service deliveries, such as the rental and sale of water dispensers and the free servicing of these dispensers. Currently operating in the Tema light industrial area Magvlyn Ind. Limited has won several international awards including the Frankfurt Arch of Europe Gold Quality Award, 2001, and the Dr. Kwame Nkrumah Excellence in Enterprise Award 2007.

1.3 Problem Definition

Developing countries have shown good growth possibilities over the last few years with the implementation of policies and practices that will encourage growth and development in various sectors of their economy. For companies in these economies to be sustainable in this competitive business environment and to ensure economic growth and development, they must utilise modern systems business operations. However, it appears that most businesses in Ghana are still using the traditional system of business

operations. The questions for which answers were sought through this study are; how do Ghanaian companies remain competitive with their old ways of operations? Can Ghanaian companies integrate modern systems of business processes (i.e. JIT) in their operations? Does Ghana have the right systems to support and develop JIT? For these questions to be answered there is the need for research into these subject areas hence, the motivation for this study.

1.4 Research Objectives

The purpose of this research is not just to find out whether JIT will find footing in Ghana but also to discover whether it is healthy for Ghana's manufacturing companies to embark on such a change. Explicitly this research sought to:

1. Examine the current business processes and operations of manufacturing firms.
2. Assess whether the asset base of Ghanaian manufacturing companies will support the JIT system.

1.5 Significance of Study

Hopefully the results of this thesis would act as a data source that provides information to manufacturing firms and even service providers' as to how their activities and subsequent returns will be affected if they choose to maintain or switch from whatever system they are currently practising.

Though the production practices of the Magvlyn Ind. Limited may not necessarily be a representation of what other manufacturing companies and enterprises use, companies will be able to draw from the findings of this paper, data that is relevant to their own industries and situations. This act

will be made possible because this paper assesses the Ghanaian environment (economic, infrastructure, societal attitudes) in relation to JIT statutes.

For firms already using variants or the full JIT requirements, the results of this paper can act as a tool of performance and growth measurement. Practising companies who may seek to evaluate their JIT engineered performance just need to compare their situation with the findings of this paper. Members of the group of manufacturers that believe in the use of the old traditional methods of production will also be afforded the chance to reassess the methods currently used and weigh the merits of joining the JIT bandwagon as against maintaining their old production ways.

On the economic level, this paper sought to highlight the bottlenecks in the Ghanaian environment that may hinder the sustainability of this system. Though bottlenecks may be identified, the state and manufacturing companies can pinpoint penetrable points within these constraints through which they may equitably implement a variant of JIT suitable to the developing economy atmosphere.

1.6 Methodology

This study employs the case study method of research with Magvlyn Ind. Limited being the company under study. Magvlyn Ind. Limited was used for this research because it is a medium scale manufacturing company whose brand and products are well recognised and patronised within the Ghanaian market. Apart from the fact that this research is geared at discovering the feasibility of JIT in Ghana, this paper seeks to find out how JIT can help change the economic background of this country through improved production methods. There are considerably more small-medium scale

manufacturers in Ghana than there are large ones, therefore the collective changes made by the small-medium scale producers may have a greater influence than any changes made by large producers, hence the choice of Magvlyn Ind Limited.

Even though the case study method was employed, convenience and systematic sampling methods were used in the determination of the elements of the sample. Since, the sample size for this research is fifty (because of time constraint) systematic sampling was used to randomly select respondents. Convenience sampling was also used since not all employees are exposed to the same levels of data. For instance, factory hands are not privy to the market and supplier information available to production and supply chain managers. Thus, convenience sampling was used for the members of management especially the production manager, supply chain manager, and head of quality management department. Since JIT is a system that emphasises on inventory management, the main variable for this research is the levels of inventory kept by Magvlyn Ind. Limited for the last five years (i.e. 2004-2009). Inventory here refers to the raw material (fruits, gari, milk, milo, water etc); work in process (fruit during juice production, instant gari during production etc) and the finished goods inventory (Mobile Products). Data on the costs of keeping inventory were also gathered. The data collected through the administration of questionnaires served as the primary data, whilst the information on inventory and sales served as the secondary data. Other secondary data included statistics (State published documents and other published journals)

on the economy and infrastructure of Ghana and the societal behaviour of its citizens. In the analyses of the data collected, data analysis tools like regression, scatter graphs, pie, and bar charts were used. These tools are part of the many tools that Excel and SPSS offer for easy data analysis.

1.7 Organization of the Study

This report on the study carried out on the feasibility of JIT, comprises of five chapters. Chapter One serves as the introduction to the research and it gives a synopsis of the rationale for the study, its objectives, significance and specifies the problem statement. Chapter Two on the other hand is a review of literature pertaining to the subject area under study. The third chapter is a detailed account of the methodology used in arriving at the conclusions. The methodology comprises of the data type and the methods used in analysing collected data. Furthermore, in this chapter the justification of the choice of analysis tools are stated and explained. It also contains the sampling techniques used, the sample size, and the data source. Chapter Four examines the results of the study in relation to the stated objectives. It refers to the analysis of the survey and other data collected. The final chapter is dedicated to conclusions, recommendations, and further research topics emanating from this research.

Chapter Two: Literature Review

2.1 Introduction

In this chapter, a discussion of other literary works on the Just-In-Time (JIT) system is carried out. This review is important because existing thought and views on the questions this research seeks to answer are discussed. Thus through this review of existing literature there will be an attempt to evaluate the JIT system with respect to Ghana; whether or not Ghana can adopt modern systems of production, whether or not Ghana has the right systems (economic, infrastructural and social) to support JIT? The performance of JIT in other economies is evaluated through this review. The discussion of existing data better defines this research because it helps identify past achievements in this field of study and at the same time magnifies the gaps that are yet to be touched.

Although the JIT system of production can be described as one of the newest additions to the existing production practices, it has gained widespread recognition and use. Despite this widespread use of the JIT system across many industries all over the world, almost all literature on this subject cover fields that exclude developing nations.

2.2 Review of Literary Works

2.2.1 Definition of JIT

In the book Management Accounting: *Information for Decisions*, by Ingram et al (1997), JIT is described as the manufacturing philosophy that attempts to eliminate activities that do not add value by reducing inventory levels. The authors further explain this definition by stating that; "Under JIT, no product or component is manufactured until it is needed". Brandon and Drtina (1997) also concur with this definition and explanation by arguing that

under the JIT system goods should be pulled through the system rather than pushed through. The JIT Method of production is described by Sugimori et al (1977) as being “only the necessary products, at the necessary time in the necessary quantity”. By this definition, the JIT system of production is seen as a measure of control over inventory and time. This control over the variables time and inventory in the JIT system is the waste annihilating factor that businesses are set to derive performance and competitive benefits from. Also J. E. Beasley (n.d.) describes JIT as a lean production method that does not only eliminate waste in its many forms, but it encompasses the belief that ordering costs of companies can be reduced. Apart from these stated aims of this system, Beasley (n.d.) further describes it as the system that continuously pushes firms to improve.

2.2.2 History of JIT

Though it had not been structured as a main science of manufacturing in the early 1900's, Henry Ford's can be described as one of the pioneers of the JIT philosophy though manufacturers before him had considered some constituents of JIT. Starting in 1910, Ford's assembly line project streamlined all his processes and helped produce cheaper products. (Lean Manufacturing, n.d). Between 1949 and 1975, the leadership of Japan's car manufacturing company Toyota, began introducing some Ford's processes into their production cycle due to the benefits it offered; this increase spread to other Japanese industries and the later to the rest of the world (Lean Manufacturing, n.d.). As the benefits of JIT became more recognized and appreciated, companies' worldwide implemented elements of JIT and are seen to be benefitting immensely from the returns JIT offers. Dell

Computers, a JIT practitioner, has changed most of its business process and designs to suit that of JIT. According to Broyles et al (2005), apart from the cost savings on storage that are experienced by Dell, its market position has been solidified by its strategic focus to reduce inventory and streamline their distribution channels. Dell's system of production has ensured its ability to deliver eighty-five days faster than its closest competitor HP (Broyles et al, 2005). After an extensive use of JIT, Dell is now in the position where it is able to provide suppliers with more information, has a customer base with superior satisfaction and has process that yield limited waste (Broyles et al, 2005).

2.2.3 Merits and Demerits of JIT

After a successful implementation and use of the JIT system, every company depending on the economic and infrastructural environment is likely to experience any or all of the benefits that arise from JIT usage. Frazier (2004) in JIT Manufacturing "Just-in-Time" (Lean Manufacturing and Stockless Production) highlights several benefits of JIT. Though he identifies several advantages he also stresses that these benefits accruing to practicing manufacturers will differ from company to company. Some of Frazier's stated benefits of JIT include; possible increase in profits stemming from storage and other cost savings, quality products that are generated as a result of the zero-defect attitude that JIT demands, quicker setup time leading to faster product turnout, high versatile and flexible employees, strong relationships with suppliers, the elimination of waste that usually occurs with highly perishable inventory. In the book Management Accounting, Lucey (2003), also identifies lower investments in inventory, space savings from eliminated

inventory and redesigned layout, greater customer satisfaction due to the high quality and the ability to produce and supply in small batches as some of the advantages of JIT.

Despite the many stated benefits of JIT, there are some costs that companies or manufacturers may experience from practicing this system of production. One of the costs of JIT as identified by Frazier is that JIT is a long term commitment that carries huge initial startup costs with minimal or no short term returns. Also when companies have a damaged or bad relationship with its suppliers, a firm may lose a lot of money since its output depends on the timely and effective delivery of input. There is also the risk of never being able to successfully implement a full JIT system because of the political, infrastructural; and socio-economic environment a company may find itself operating in.

The inhibiting factors that may stop most firms from changing from the traditional methods of production to JIT are the costs or demerits that are likely to be experienced. Although these costs, huge initial startup costs, negative producer-supplier relationship and product quality issues, can easily cripple a firm's productivity the bad effects of the change are usually felt within in the early days of implementation. If JIT is a system of continued improvement, then careful practice through observation and change will steer practicing firms clear of the stated costs. JIT relies on a strong relationship with suppliers, total quality management by all employees and a host of many other statutes that in the long run eliminate all demerits that firms may experience when they first make the change.

2.2.4 Elements of the JIT System

In the article *Just in Time (JIT) Production* (n.d.), the author describes JIT as the production approach that has the objective of “producing the right part in the right place at the right time.” The article then goes on to give an overview on the necessary elements that are necessary for the effective and efficient implementation and sustenance of JIT as; the reduction or elimination of setup times, reduction of lot sizes, reduction of lead times, preventive maintenance, the presence of a flexible work force, a high supplier quality assurance practice and a small-lot conveyance.

Setup time is defined by the dictionary.bnet.com as the time it takes to prepare, calibrate and test a piece of equipment to produce a required output. According to the article *Just in Time (JIT) Production*, setup times can be reduced through the redesigning of process and product and better planning. A lot size which can be described as the total quantity per batch, and its reduction in terms of quantity per lot produced will be possible if there is a fall in setup time and an increased relationship with suppliers. This increased cordial relationship with suppliers will be able to engineer the reduction in lot sizes or purchased raw materials. These suppliers in effect will be making frequent deliveries but with reduced quantities per delivery. Also another element of a successful JIT system is the ability to reduce lead times, which can also be described as the period between when an order is made for a product to when it is delivered by the manufacturer. Lead times as explained by *Just in Time (JIT) Production*, can be reduced by redesigning the work space so that work stations are closer together. Other forms of reducing lead times stated in *Just in Time (JIT) Production* include the

reduction of job waiting queues by cutting down the times that each production job has to wait to be processed. When it comes to delivery from both the company's end and that of the supplier, *Just in Time (JIT) Production* suggests that the company redesign its delivery methods and also have a closer relationship with suppliers. Another of the various elements that are geared towards the effective usage of JIT statutes is the ability to practice preventive maintenance ethics. The idle time that comes about as a result of the lulls between customer orders should be used to maintain all equipments and prevent machine breakdowns. The next JIT element is the presence of a flexible workforce. All workers in a JIT system must be well trained and equipped to man several machines and oversee several manufacturing processes. Not only should there be well trained employees, on every JIT platform there should be managers who understand the nature and characteristic of JIT and as a result are well prepared to man not only the facilities but their subordinate human capital. Most of the elements require that a strong relationship be maintained between suppliers and the JIT practitioner. This relationship will help the company meet the next element of JIT that *Just in Time (JIT) Production* propounds. JIT companies must require of their suppliers a high level of quality and zero defect products. Since JIT does not encourage the tradition of inventory keeping, products delivered by suppliers must be of zero defects and of high quality since there are no stores of excess parts of raw materials. This element requires that workers be held responsible for the quality work they produce.

2.2.5 JIT and the Traditional Method

Though the traditional method of production and JIT are all directed at producing enough to meet a market's demand in the most optimum of methods, these systems differ in the manner in which they arrive at this objective. While the traditional method is more inventories focused, JIT is concerned with the elimination of inventory and the changing of manufacturing systems into a more fluid and highly connected production system. Brandon and Drtine (1997) in *Management Accounting: Strategy and Control* describe JIT as having the theme of inventory being waste while the traditional method values inventory because it serves as an available stock for meeting increased (expected) demand and also serves as a buffer for defective parts or products. This implies that JIT has firms keeping only necessary levels of inventory to meet present demand while the traditional method has companies keeping much higher levels of inventory to meet expected demand. Though the JIT method may suffer mishaps of late deliveries because of late supplies, the traditional method incurs higher costs because of storage and bears a higher risk especially when the goods are perishables, because the goods produced may never be purchased (Brandon, H. C. and Drtine, R. E). Brandon and Drtine also describe the traditionalists as manufacturers who derive better relationships with their suppliers through bulk purchases from which trade discounts may be negotiated. On the other hand, the JIT companies build relationships with suppliers through the negotiation of long-term contracts to hedge against price fluctuations and to ensure timely and high quality deliveries.

2.2.6 Environment and structures that support JIT

The aims of this new method of production, though easy to understand, thrive on the implementation of a complex series of requirements. Sugimori et al (1977) outline the requirements needed for the effective implementation of JIT: There must always be an encouragement of human employee participation, also worker safety must be ensured, and worker capability must be encouraged through the entrusting of employees with responsibilities.

Also in the research article, Impact of JIT Manufacturing and its Infrastructure on Manufacturing Performance, Sakakibara et al (1997), try to find out if there is an existing relationship between the infrastructural practices of companies and JIT practices and if these two have an effect on manufacturing performance. These researchers at the end of their study conclude that the “effectiveness of JIT is dependent on the overall strength of a company” (Sakakibara, 1997). In their conclusion, they also state “Just in Time practices have value only when they are used to build infrastructure and are built on the right infrastructural framework. What is the strength of a company if the effectiveness of JIT is contingent on the overall strength of a company? This company strength can then be safely described as being the things that enhance and support a company’s production and operation activities; machinery, facilities, management, and the benefits that firms derive from the environment in which they operate. Thus, JIT will only be effective when firms have their internal strengths in place as well as an enhanced ability to take advantage of the opportunities that the external environment offers.

JIT will therefore survive in places that have the right infrastructural environment, where the environment is not only characterized by production machinery, but state provided infrastructure like roads, defence, communication, and transportation lines, and education. The overall strength of a company is dependent on the climate in which it plies its trade.

Weak infrastructural loopholes in countries affect the strength of companies. In a research carried out by Lawrence and Hottenstein (1995), it was discovered that the implementation of the new production methods were positively correlated with plant size and production processes affected by relationships between JIT and performance. Thus, investments in infrastructure that will push companies closer to JIT systems lead to increases in performance. Apart from the influence of economies over the manufacturing practices of companies, the general culture of the population, industry, and company will also affect the implementation of certain practices. In Lawrence and Lewis's study on the obstacles that will affect the implementation of JIT in Mexico, three broad spheres of obstacles were identified. These are:

- Employee Participation
- Supplier Participation
- Managerial Integration of JIT Components

The participation levels of employees, suppliers and management are all dependent on the cultivated behaviour of a population. Employees, suppliers and managers arising from a nation whose general characteristics lie

opposite to those needed for the efficient implementation of JIT methods may display attitudes that are detrimental to JIT implementation.

In addition, while suppliers may exhibit lackadaisical attitudes that will hamper raw material delivery periods and total lead times, employees will have no regard for the need to curb wastage especially with respect to time and managers will find it difficult to oversee and control the attitudes of employees and the production processes. Chikan and Whybark in 1990 highlight in their article, *A Cross-national Comparison of Production-Inventory Management Practices*, importance of the role played by economic environments in the use of manufacturing management practices by companies (Chikan 1990).

2.2.7 The Ghanaian Environment

The Ghanaian economy has undergone many different epochs of structural adjustment programs because it has suffered many financial and economic woes. The nation was and still is indebted to many creditor nations and organizations and suffers a perennial balance of trade problem (Aryeetey 2000). The political atmosphere was also riddled with a series of coups that also contributed to the economic problems of Ghana (Konadu-Agyemang 2001, pp. 444). Implementation of reforms in the financial and agricultural sectors was minimal or non-existent in the formative years of the countries independent economy (IMF n.d.). The International Monetary Fund in 1998 foresaw Ghana crossing the poverty line in thirty years if it maintained its current growth rate and methods (IMF n.d.). In addition, the liberalization of trade in Ghana has led to a gigantic increase in imports and trade deficits (Amoako-Gyampah 2001). This saw to the demobilization of certain

manufacturing industries because they could not effectively compete with the foreign industries that had better production methods and systems than those of Ghanaian origin (Amoako-Gyampah 2001). Thus, Ghana at all levels of production depends on imported goods and machinery. Most final goods on the local market such as rice, matches, and shoes are imported. (Agyeman-Duah 2007) Most Ghanaian companies also depend on raw materials from foreign sources.

Though Ghana did not suffer the many of the untold woes that befell most developed countries with the inception of the global financial crises, its economy still showed signs of stalled growth as the general fall in demand in the developed countries narrowed the growth prospects of most Ghanaian companies. Some companies even lost their foreign and local market shares due to the fall in demand and the quest of companies established in developed countries to seek out new lucrative markets. The woes suffered by the Ghanaian economy due to the long reaching effects of the credit crunch was compounded by the ever rising oil prices in 2008, and the general uncertainty that came after the election of a new government in December 2008. In 2009, inflation and exchange rates were fluctuated with the nation witnessing some of the highest rates recorded in recent years.

Africa is the least developed continent in the world; the infrastructure base of the continent is near deplorable, and Ghana finding itself on this continent has not escaped from the present fate of its host. The transportation and communication network in Ghana is scanty with a majority of this infrastructure located in the south of the country (Ghana Statistical Service,

2005). The distribution, of other growth determining resources like educational and health facilities is also skewed towards the south of Ghana. Though the infrastructural base of the country is weak, inroads in the form of free basic school education, free meals for primary students, the national health insurance, and the free maternal healthcare have been introduced to improve Ghana's resources and infrastructural base.

2.2.8 Ghana and JIT Today

In Amoako-Gyampah and Gargeya's research article on Just in Time Manufacturing in Ghana, the production processes of forty-eight companies were analyzed. Twenty-four of these companies were identified as JIT companies because they had identified the benefits of this manufacturing process and had implemented some of its statutes. These JIT Ghanaian firms, had made efforts at employee training, setup time reduction, supplier partnership and continuous quality improvement, though these Ghanaian firms do not boast of a total JIT influenced production system. One commonality between the Ghanaian JIT practitioners and non-practitioners is the lack of a difference between the existing measurement systems of these two groups. Inventory levels, inventory record accuracy, shop floor routing accuracy and raw material accuracy are some of the measurement areas in which both classes of Ghanaian firms exhibit the same capacity. The presence of similar measurement abilities of both classes shows that Ghanaian companies may lack the ability to fully benefit from the advantages JIT offers because they may be miscalculating the variables they need to improve, reduce, or enhance. The improper management of JIT in practicing companies can lead to the inability of firms to properly predict demand levels

as occurred in 1999, when Internet Corp. underestimated demand levels. The lapse in demand measurement saw Internet Corp. experiencing high labour turnover, and increased plant breakdown. This research also counters the disbelief in the capacity of manufacturing firms in developing countries to understand the essence of JIT. Amoako-Gyampah and Gargeya state that "firms in Ghana have the same fundamental understanding of JIT as one would expect from more developed countries. This should be reassuring to companies in developed countries that might be interested in joint manufacturing activities with forms in Ghana."

2.2.9 Ghana and JIT: Future Prospects

The lack of extensive literature on the viability or nature of JIT system of production in developing countries especially Ghana, shows the need for more research developments in that field. Most developing countries especially African, complain about the negative impact trade liberalization has had on the local manufacturing industries. Can JIT be the change causing factor that prepares local industries more for the overwhelming impact of foreign industries? However, in answering this question one first has to confirm the feasibility and viability of a total JIT system in developing nations. As shown in the examined literature, the requirements of this new system are just not infrastructural based, but changes in human attitudes and skill level are needed. Even when infrastructure is solely considered, the success of JIT is dependent on both internal and external infrastructure. Internal being the firm's own facilities and plants and external is concerned with those facilities and systems that the state and other stakeholders provide to support the activities of local firms. From this review, it is realized

that Ghana outwardly may not be a feasibly ground for the implementation of JIT. This is due to the weak external infrastructural base, price fluctuations or inflation caused by global oil hikes, exchange rate risk, and general market perceptions. The lack of proper facilities in the form of education and healthcare will also impede the production and sustenance of labour with the proper skill sets to manage the complex JIT vision. Amoako-Gyampah and Gargeya's research on the other hand point out that there are some existing Ghanaian companies practising variants of JIT. This study will thus be centred on discovering reasons that will confirm the feasibility or otherwise of JIT in Ghana considering both the internal and external platforms that encourage or disallow it.

Chapter Three

3.1 Introduction

In the quest to discover whether Ghana possesses the proper environment to support the statutes and practices of JIT, there is the need to find suitable data which upon analysis will inform whatever conclusions and recommendations that are made. This study focuses on the manufacturing industry of Ghana, but uses Magvlyn Ind. Limited as the platform for analysis because as reiterated in earlier chapters, this thesis seeks to discover how changes in the operations of the many small to medium production enterprises can affect economic growth, although this is not the underlying reason for the carrying out of this research.

The previous chapter served as a platform for discussing and reviewing existing literary works on the Ghanaian environment and JIT. It also looked at how both will relate together. This chapter moves a step further by showing the ways in which the relevant data and its collection was carried. The process of data collection from Magvlyn Ind. Limited, other secondary sources are elaborated upon, and the rationale behind each choice explained. Briefly, this chapter discusses research tools employed and methods that are used in the data collection process. This discussion covers the types of data to be collected, the sources, sample sizes and questionnaire design. This chapter also highlights the limitations that arose during the data collection and analysis process.

This research process; data collection and analysis, sought to show the correlation between the Ghanaian economy, manufacturing firms and JIT, through the answering of the following questions:

- How the state of Ghana's economy will affect the survival of JIT?
- How the current practices of manufacturing firms and their asset base will support a JIT Platform?

3.2 Research Methodology

Although the data collected was mainly primary, secondary data was also used. Questionnaires were used primarily in the collection of data from the selected company. The respondents to the issued questionnaires were staff of Magvlyn Ind Limited in both management and subordinated positions, to ensure accuracy of data. The secondary data collected from Magvlyn Ind. Limited spanned a period of five years; from 1st January 2005 to 31st December 2009 and is information on their sales revenue and inventory operations. Other secondary data sources were published articles on the economy, development, infrastructure, and the societal receptiveness to change of Ghana.

3.3 Selection of Company

The primary data source Magvlyn Ind. Limited, was chosen on a convenient basis owing to the limitation of time. Other primary data sources considered were the Tema Oil Refinery, Blue Skies Ghana, and Nestle Ghana Ltd. These were dropped because the refinery was gutted by fire and the streams of processes that had to be undergone to get permission at Nestle and Blue Skies pushed against the boundary of time.

3.4 Sampling Method

Since each staff member of Magvlyn Ind. Limited is randomly distributed with respect to duties and tasks, systematic sampling was used for the lower level employees. Convenient sampling was used in the collection of data from

managers since some managers were more directly involved with JIT (and traditional method) implementation and functions than others. This convenient sampling on the part of managers was done to control the information received and to ensure relevance.

3.2 Population and Sample Size

Fifty respondents were chosen because Magvlyn Ind. Limited is a medium scale manufacturer and as reiterated the constraint of time would not allow the consideration of a large sample size. JIT involves all aspects of the firm thus a sample size of forty-five respondents were selected from the employee pool on a systematic basis to ensure that the data is not skewed. Five members of management were also chosen on a convenient basis depending on their positions and how their duties may be directly affected by JIT. Due to the sampling method used, each employee (especially from the lower level) had an equal chance of being chosen and that the most relevant information was collected.

3.3 Data Collection

3.3.1 Questionnaire

The questionnaire included four sections; knowledge of JIT, employee information, company practices, and company and external environment. These sections contained both open and closed ended questions whose answers were to provide relevant information for the data analysis process. The issued questionnaires were to help in the collection of data needed for the qualitative analyses.

3.4 Data Analysis Tools

Microsoft Office Excel and SPSS were the primary data analysis tools used in analyzing the data collected. The responses provided in the questionnaire

were graphically displayed for easy analyses in the form of pie charts, bar graphs and cross tabulation tables. The Excel regression function was used to determine the relationship existing between sales and inventory and this was the main quantitative analysis tool used.

Limitations of the Study

The limitations of the study included but were not limited to:

- The presence of constraints like time, money, and bureaucracy
- The presence of an inadequate or non-existent data on the social and economic variables of Ghana. Present data was also not always current information.
- Restricted access to certain vital information that may be declared sensitive or that could give competitors an upper hand.
- Unwillingness of some of the respondents to answer some of the questions.
- The distribution and filling of the questionnaires occurred during working hours and this hampered the quality of information received from respondents as they were focused on carrying out their corporate activities.

Chapter Four: Summary Analysis and Broad Discussion of Results

4.1 Data Analysis

The analysis of the data collected for the purposes of this research, is in two parts. The first part looks at the qualitative data analysis while the second is an analysis of the quantitative data.

4.2 JIT Knowledge and Company Practices

For Just-in-Time (JIT) to gain grounds there needs to be some existing knowledge of it. Managers and workers must know and understand the system, its risks and technicalities. As clearly seen in figure 1, twenty percent of the total employees sampled have some knowledge of JIT that they mostly garnered from their time in educational institutions (see Appendix C). The employees who had JIT knowledge were evenly split between the junior and senior employees (see Table 1). The junior workers include supervisors, factory hands and delivery personnel while senior workers include managers and their assistants.

Figure 1: Just-in-Time Knowledge

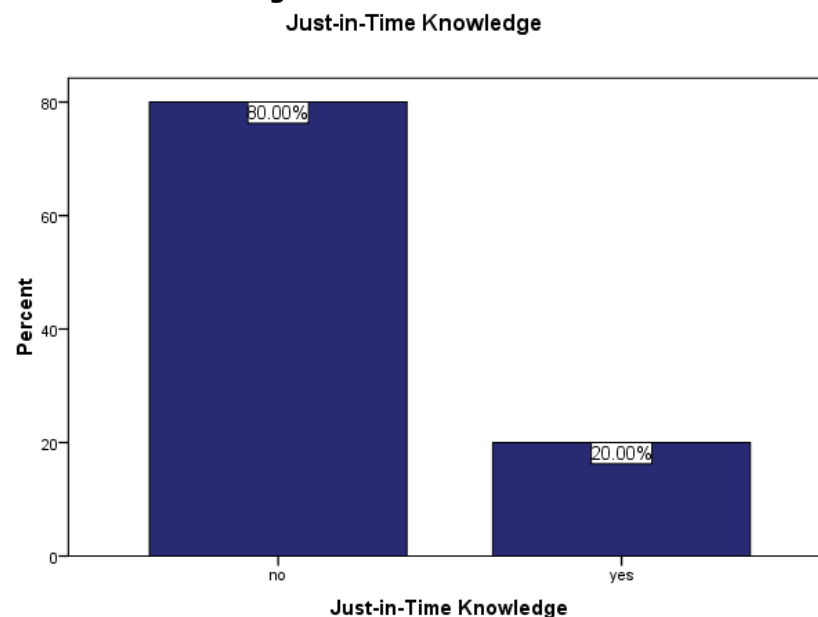


Table 1: Just-in-Time Knowledge*Employee Category Cross tabulation

Just-in-Time Knowledge * Employee Category Cross tabulation				
		Employee Category		Total
		junior employee	senior employee	
Just-in-Time Knowledge	No	65.0%	15.0%	80.0%
	Yes	10.0%	10.0%	20.0%
Total		75.0%	25.0%	100.0%

The prior understanding of JIT also clearly influences how the employees of Magvlyn Ind. Limited view their production practices. Table 2 shows that all of the respondents who had no knowledge of JIT stated that their company was engaged in the traditional method of production where high levels of inventory are kept. Five percent of the sample elements that declared some JIT knowledge were of the view that their company was engaged in the JIT activity of ordering as and when the need arose.

Table 2: Just-in-Time Knowledge*Inventory Management and Production Methods Cross tabulation

Just-in-Time Knowledge * Inventory Management and production methods Cross tabulation					
		Inventory Management and production methods			Total
		storage of large quantities of stock to meeting production demands	ordering of raw materials as and when needed	no response	
Just-in-Time Knowledge	no	75.0%	.0%	5.0%	80.0%
	yes	15.0%	5.0%	.0%	20.0%
Total		90.0%	5.0%	5.0%	100.0%

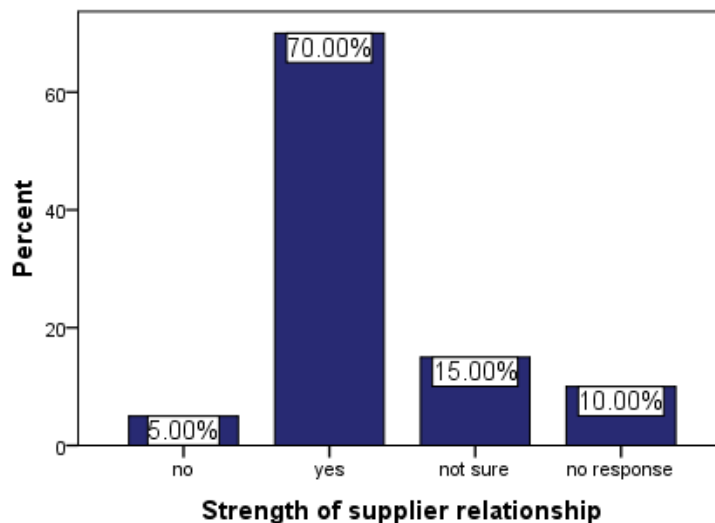
4.3 JIT Elements

4.3.1 Supplier Relationship

JIT demands a high level of quality that is contingent on the relationship that producer companies have with suppliers. JIT does not encourage the

keeping of inventory hence there is a lack of buffer stocks to replace defective raw materials. A strong relationship with suppliers is what every JIT system thrives on to curtail the lack of buffer stocks. The requirements that JIT needs to succeed in developing countries does not differ from what JIT requires in other (developed) countries. Hence for JIT to work in Ghana there needs to be an existing culture of producer-supplier relationship that will enhance and support a JIT system. From Figure 2, Magvlyn Ind. Limited's employees and management believe that the company has a strong relationship with its suppliers. While seventy percent of the Magvlyn employees sampled believe that their company has a good relationship with its suppliers only five percent responded otherwise. Fifteen percent were not sure what the nature of their company's relationship with its suppliers and ten percent of the respondents did not answer the question.

Figure 2: Strength of Supplier Relationship
Strength of supplier relationship



4.3.2 Change

Though no article on the general attitude Ghanaians exhibit towards change was found during the period this research was carried out, certain articles on different issues have captured some elements of the general Ghanaian response to change. Otchere and Okantah (n.d.), found that introducing supplements into the feeding patterns of cows will increase milk yields, improve calve growth and decrease calving intervals. Although these benefits of supplements were identified and made known to cattle herders and their employers, none of the parties were inclined to adopt this strategy because of the cost element involved (Otchere and Okantah, n.d.). In addition, Opoku and Akorli (2009), highlight the refusal of most Ghanaians (even low-income earners) to purchase locally manufactured products because of their perceived superiority and because foreign goods confer a certain social status upon the user. Thus, Ghanaians are unwilling to change their consumption habits because of the image that society may confer upon them. Lastly, Kudadjie (2000) uses the proverbs of the Ga and Adangbe to show how culture influences societies change attitudes. With 30 proverbs, he illustrates how proverbs, which serve as moral codes, have instilled in the Ga and Adangbe the trait of maintaining the status quo and refusing change.

The data collated from Magvlyn Ind. Limited shows that the seventy-five percent of the total respondents will welcome a change in production methods (see Table 3). Although most of the workers were prepared to accept a production change, sixty percent of the respondents who would welcome any change had no knowledge of JIT and thus could not make an informed decision as to what exactly they were accepting (see Table 3). Also

from Table 3, fifteen of the twenty percent who had some JIT knowledge were happy to accept a change in production towards a JIT oriented system. From Table 4, one can deduce from the general responses garnered that 47% of the people who answered yes, did not really care whether there was a change, they were just there to earn a living. Only twenty percent of the total respondents understood the relationship between the change and its effects on production. Since some factory, hands were paid according to output ten percent of this number refused a change because they envisioned themselves earning less than they do now.

Table 3: Just-in-Time Knowledge and Production System Change Cross Tabulation

Just-in-Time Knowledge * Production System Change Cross Tabulation

		Production System Change		Total
		no	Yes	
Just-in-Time Knowledge	No	20.0%	60.0%	80.0%
	Yes	5.0%	15.0%	20.0%
Total		25.0%	75.0%	100.0%

Table 4: Reasons for Accepting or Refusing Production Change

Reasons for Accepting or Refusing Production Change			
Response	Reasons	Percentage of total	Percentage of Yes or No
Yes Category	Nonchalant: What the bosses want the bosses must get	35%	47%
	So that theft will be controlled	5%	7%
	To reduce pressure that builds up during the afternoon shift	5%	7%
	It will lead to effective, efficient and high production,	20%	27%
	other reasons	10%	13%
No Category	Because there is a higher affinity for the prevailing system	5%	20%
	A change may affect wages pegged on output	10%	40%
	other reasons	10%	40%

4.3.3 Internal Production System

JIT does not only survive on a change in inventory practices, but it also relies on a well established and organized production floor and distribution channels. The production floor must be structured such that there is easy movement from one machine to another or the processes of the implementing firm may require a total change in machinery that can produce a better quality product in less time and with less cost.

Table 5 shows a breakdown of the different times that the various category of factory hands who produce the various Mobile products use per production session. While the sachet water packers work within an eight hour session, the bottled water and other product lines are more targets oriented; each group or person has a set target they are supposed to meet during their sessions. The table clearly shows that despite each category, there is a general consensus among the Magvlyn workers that raw materials are stored on site and used as and when needed.

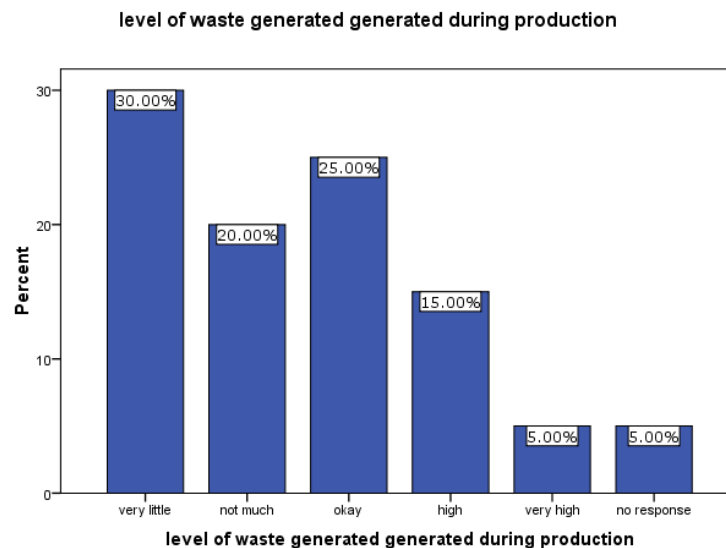
Table 5: Duration of production batches*Inventory Management and production methods Cross tabulation

		Inventory Management and production methods			Total
		storage of large quantities of stock to meeting production demands	ordering of raw materials as and when needed	no response	
Duration of production batches	less than an hour	15.0%	5.0%	.0%	20.0%
	1 - 3 hours	10.0%	.0%	.0%	10.0%
	4 - 6 hours	10.0%	.0%	.0%	10.0%
	more than 6 hours	50.0%	.0%	.0%	50.0%
	no response	5.0%	.0%	5.0%	10.0%

Duration of production batches * Inventory Management and production methods Cross tabulation

		Inventory Management and production methods			Total
		storage of large quantities of stock to meeting production demands	ordering of raw materials as and when needed	no response	
Duration of production batches	less than an hour	15.0%	5.0%	.0%	20.0%
	1 - 3 hours	10.0%	.0%	.0%	10.0%
	4 - 6 hours	10.0%	.0%	.0%	10.0%
	more than 6 hours	50.0%	.0%	.0%	50.0%
	no response	5.0%	.0%	5.0%	10.0%
Total		90.0%	5.0%	5.0%	100.0%

Figure 3: Level of waste generated during production



JIT encourages the reduction of waste especially in the face of reduced or non-existent buffer stock; hence an attempt was made to get a general idea of the waste level generated by Magvlyn Ind. Limited through the use of the questionnaire. The level of waste generated by the producers of the various mobile products is clearly seen by most of its workers to be very little as shown in Figure 3. Thirty percent of the respondents were certain that their

production methods yielded very little waste as compared to the five percent who concurred that their activities yielded high waste levels.

Table 6: Plant layout and efficient production*Handling more than one machinery Cross tabulation

plant layout aids efficient production * Handling more than one machinery Cross tabulation

		Handling more than one machinery		Total
		no	Yes	
plant layout aids efficient production	No	.0%	15.0%	15.0%
	Yes	15.0%	65.0%	80.0%
	n/a	.0%	5.0%	5.0%
Total		15.0%	85.0%	100.0%

Two of JIT statutes are that the plant layout must be such that it is the most optimum with respect to time and that workers must be able to work on more than one machine. From table 6, eighty-five percent of the employees of Magvlyn can comfortably work on more than one machine and sixty-five percent of the eighty-five percent also believe that their work space is designed in a manner that aids efficient production.

Table 7: Plant layout and efficient production*Quickly meeting orders of customers Cross Tabulation

plant layout and efficient production * Quickly meeting orders of customers Cross tabulation

		Quickly meeting orders of customers				Total
		Immediately	1 day - 1 week	2 - 4 weeks	No response	
plant layout aids efficient production	no	5.0%	5.0%	5.0%	.0%	15.0%
	yes	70.0%	10.0%	.0%	.0%	80.0%
	n/a	.0%	.0%	.0%	5.0%	5.0%
Total		75.0%	15.0%	5.0%	5.0%	100.0%

From the cross tabulation analysis that is shown in table 7, a relationship between plant layout and the prompt production of customer's orders can be seen. Seventy percent of the respondents are of the view that the plant layout aids in efficient production and that the company's meeting of customers' orders is prompt. While five percent of the respondents who have problems with the current production floor layout meet customer's orders within a week, ten percent have no problems with the layout but also meet customer orders within the same period.

4.3.4 Work Place Culture

The standards that are required to ensure a smooth and efficient JIT system cut across every department, practice and operation of a company. Thus there also needs to be a culture that supports or can easily be changed to support a JIT system. JIT calls for periodic training that affords each employee the chance to be well equipped to handle more than one process or machine. Table 8 shows the relationship between the training history and the frequency of training at Magvlyn Ind. Limited. It is clear that ten percent of the employees do not have a clear understanding of the term training since they denied being given any form of training but admitted to receiving training at the time of employment. Sixty percent of the sample elements said they had received training and of this twenty-five percent was at the time of employment. Fifteen percent of the respondents who had received training said they had received training once a year.

Table 8: Training History and Culture*Frequency of Training Cross tabulation

		Frequency of Training							Total
		once a year	at the time of employment	monthly	twice a year	quarterly	Daily	No response	
Training History and Culture	No	.0%	10.0%	.0%	.0%	.0%	5.0%	10.0%	25.0%
	Yes	15%	25.0%	5.0%	5.0%	5.0%	5.0%	.0%	60.0%
	No response	.0%	15.0%	.0%	.0%	.0%	.0%	.0%	15.0%
Total		15.0 %	50.0%	5.0%	5.0%	5.0%	10.0%	10.0%	100.0%

In addition, a strong platform that allows workers to air their views on the company's practices bodes well for the implementation of changes and the reviewing of company practices. Seventy-five percent of the sampled workers of Magvlyn Ind. Limited felt that their company had a platform that encouraged the airing of personal views on the firm's practices. Twenty percent of the workers felt they had no given opportunities to do that. Also from figure 5, fifty percent of the respondents stated the medium of periodic meetings as the main platform for airing concerns and suggestions. Twenty-seven percent also chose individual reports as the means of channelling concerns and contributions. Six percent felt that suggestion boxes were the only mode of communication and seventeen percent did not respond. Forty percent of the respondents that said their company had a platform for airing concerns and suggestions chose both periodic meetings and individual reports as the medium of communication. Five percent stated that periodic meetings and suggestion boxes were the modes of communication and sixty-

five percent chose either individual reports, periodic meetings or suggestion boxes as the mode of transmitting suggestions and concerns.

Figure 4: Platform for suggestions and Contribution

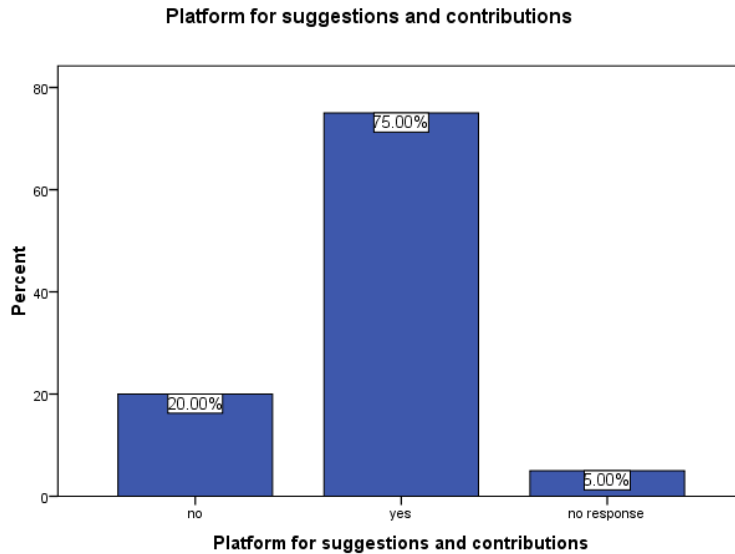


Figure 5: Nature of Contribution Platform

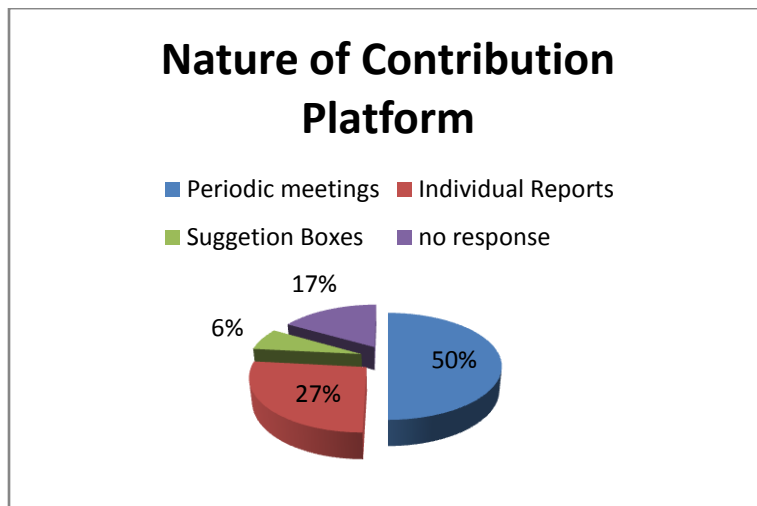
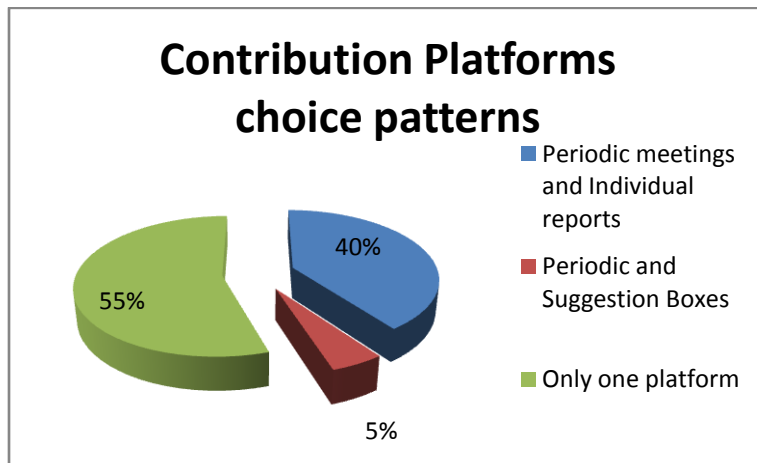


Figure 6: Contribution Platforms Choice Patterns



4.3.5 Infrastructure

Although, every manufacturing system needs the presence of infrastructure to thrive with respect to the education and health of skilled workers and the amenities that support delivery and operations, JIT is heavily affected by the presence of a good and well maintained infrastructure or the lack of it.

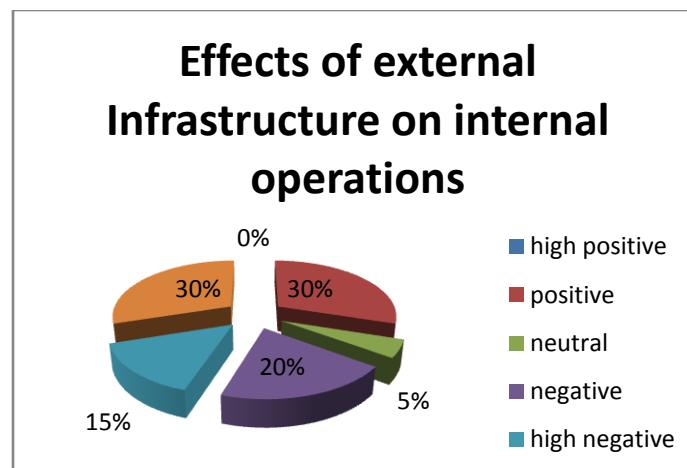
The distribution of health facilities in the country is skewed towards the south with more than half of the country's health resources located in the south of the country especially the Greater Accra Region (Ghana Statistical Service, 2005). Like the distribution of health facilities, the distribution of educational facilities in Ghana is also skewed towards the south with most of the private institutions possessing the necessary tools needed for proper and efficient education. For a population of seventeen million Ghanaians within the school going age, there is available 5450 junior schools, 503 senior secondary schools, 21 training colleges, 18 technical institutions, two diploma awarding institutions, seven public universities (Education in Ghana, n.d.) and 87 private universities (List of Universities in Ghana, 2010). Thus for every junior school there are 3119 people willing and able to use the inadequate

facilities. Also the ratio between a senior secondary school and the Ghanaian population is 33,797 Ghanaians to one school. It is also obvious that the quantity of educational facilities fall as the level of education rises, thus from junior school to senior school the number of educational facilities fell by 4947 and the number of available schools fell by 368 when there is a movement from senior secondary school to the tertiary institutions. The quantity and quality of educational and health facilities in Ghana means that the general standards of labor that is to be produced in the country is neither highly skilled or of good health, thus increasing the cost to the employer who spends extra time and cost to reeducate and train and cater for the health needs of the workforce.

If a company has its production floor well organized but cannot manage its delivery patterns the whole system fails since the purpose of getting the final product to the consumer in the shortest possible time is defeated. This distribution aspect hold valid for firms who mostly do distributions rather than having the consumer come for the finished product. Some of the elements of distribution in for companies are; transportation and communication lines. With the inception of mobile technology there has been a massive improvement in the communications industry primarily fueled by competition. Unfortunately the transportation network especially rail, sea and road transports leave a lot to be desired. The rail network for instance freighted over two million tons of goods and eight million passengers in the early nineteen sixties while in 2003, only 1.8 million tons of goods and 2.3 million passengers were lifted (Ghana Railway Corporation, 2009).

An attempt was made to gain an understanding of how the employees and management of Magvlyn Ind. Limited perceive the effects of the external infrastructure on their internal operations through the use of the questionnaire. Though thirty percent of the respondents did not respond to the question, twenty percent of the sample felt that the external infrastructure had a negative effect on operations and thirty percent also felt that the existing infrastructure supported internal operations positively. Another five percent were of the view that the existing infrastructure had no effect on the company's internal activities and fifteen percent saw the current infrastructural capacity as having an adverse effect on internal operations. For the people who stated that they had a problem with the current infrastructural setup the most reoccurring problem was the incessant power outages that affected internal and supplier production and that the infrastructural level of Ghana has resulted in a less optimal worker productivity rate.

Figure 7: Effects of external infrastructure on company operations

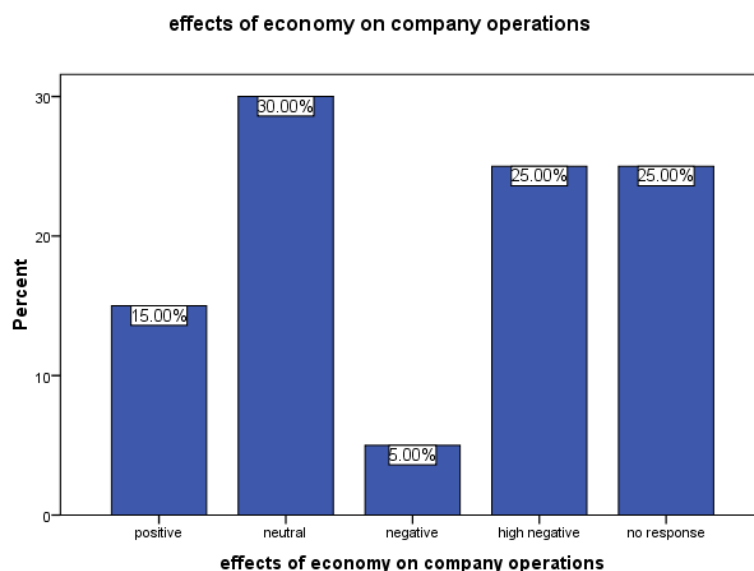


4.3.6 Economy

The economy is the broad environment in which every company functions, it influences the decisions and operations of every company. Certain economic indicators like inflation, the interbank exchange rate, and the cedi per dollar rate and risk free rate all influence investment and growth decisions of firms. Ghana's inflation fell from a peak of 20.74% in June 2009 to 15.79% by the year's end (Bank of Ghana, n.d.). Also the interbank exchange rate which influences the lending rate of banks was recorded to be 1.43% in December 2009 as compared to the January figure of 1.34% (Bank of Ghana, n.d.). Since most Ghanaian companies import all or some of their raw materials and the international trading currency is the dollar the exchange rate risk is also very important. The cedi per dollar rate in December 2009 was 2.31% as compared to the lower figure of 1.94% in January of the same year (Bank of Ghana, n.d.), meaning that it cost more to change a cedi into a dollar hence increasing import costs even though the dollar value remains the same. The risk free rate which is the Treasury bill rate (91 day) shows the least return investors can make on investments (since treasury bills are perceived to risk free). At the start of 2009, the risk free rate was 24.70% and by the year's end it had fallen to 22.50% (Bank of Ghana, n.d.) implying that the return on riskier investments may also have fallen (all other things being equal) since market risk (RM) of a financial instrument (share, debenture, bond) is equal to the risk free rate (RF) plus the risk premium (RP- the return for engaging in that investment), $RM = RF + RP$.

From the analysis of the questionnaires, thirty percent of the respondents felt the economy had no bearing on their internal operations and some were of the view that whatever costs they incurred could be passed on to the final consumer. Fifteen percent thought the economy had a positive effect on internal operations, five percent thought the effect was negative and twenty-five percent thought the effect was a high-negative one. Twenty-five percent of the respondents did not respond. By this, the assertion that an increase in inventory levels will lead to an increase in sales can be made.

Figure 8: Effects of the economy on company operations



4.4 Quantitative Analyses

A regression analysis was carried out to show if there was a relationship between sales and inventory costs. From Table 9, there was an R^2 value of 98%, implying that there is a strong relationship between sales and inventory. Also this means that 98% of the variation in sales can be explained by the regression model.

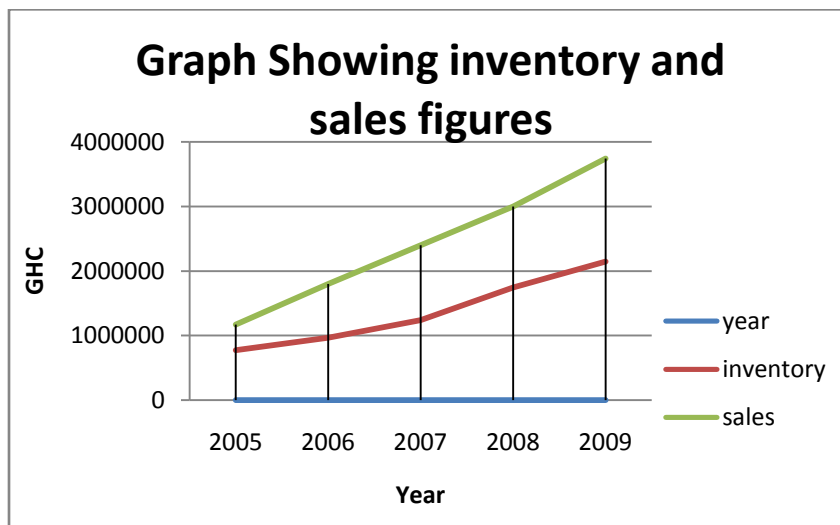
The positive p-value of 0.00167 (less than 0.05) means that the value obtained for the slope is significant thereby confirming the relationship between sales and inventory, the f-significance, 0.00166, (see appendix A) also confirms this. This implies that a rise in inventory levels will lead to a significant rise in sales as seen in figure 9 and under table 9 where sales = 11868.17 + (1.75 x inventory cost). Thus an increase in the inventory cost value of Magvlyn Ind Limited to GHC 30000 will lead to a Sales figure of GHC 64368.17.

Table 9: Summary of Regression Analysis of Sales and Inventory Costs

R square (R2)	Coefficients	Standard Error	T stat	P-value	Lower 95%	Upper 95%
0.975202199	1.751308918	0.161235764	10.86179	0.00167	1.238185	2.26443308

$$\text{Sales} = 11868.17401 + (1.7513089 \times \text{inventory cost})$$

Figure 9: Graph Showing inventory and sales figures



Chapter Five: Conclusion

5.1 Introduction

This chapter is a presentation of the conclusions drawn from the analysis made in the previous chapter. JIT is a production system that is mainly characterised by the removal of inventory from production processes. This system calls for certain changes in operations and internal culture like the restructuring of production floors, retraining of workers, new and increased worker responsibilities.

JIT has several benefits that can enhance a firm's production cycle. JIT can also generate costs or setbacks especially if ill applied. Some of the benefits of JIT include high quality and cheaper goods, reduction in waste levels and increased supplier relationship. The demerits also comprise of a possible halts in production during times of natural disasters, the risk of delayed products to consumers due to defective parts and the cost of paying salaries and wages during periods of low or no production.

Though several articles have been written on this system, very few exist on the system in developing countries (especially Ghana). The only article on Just-in-Time in Ghana by Amoako-Gyampah and Gargeya (2001) uncovered that, variants of the JIT system is what most Ghanaian companies are practicing. Other articles highlighted some of the necessary tools or elements for a good JIT implementation as, a good infrastructure, good supplier relationship, and a vibrant and dynamic economy.

5.2 Findings

A regression analysis was carried out to show if there was a relationship between sales and inventory costs. From Table 9, there was an R^2 value of 98%, implying that there is a strong relationship between sales and inventory. Also this means that 98% of the variation in sales can be explained by the regression model. The positive p-value of 0.00167 (less than 0.05) means that the value obtained for the slope is significant thereby confirming the relationship between sales and inventory. This analysis shows that inventory has a strong and positive influence on sales.

From the sampled elements there seems to be an existing knowledge of JIT within the upper management and the junior workers in the positions of supervisors and operation assistants. The knowledge of JIT also affected the manner in which the workers viewed their operational activities, where seventy-five percent of the workers who had no JIT knowledge saw their activities as purely traditional and as did fifteen percent who had some JIT knowledge. Only five percent of the workers who were mostly based in the pure water division that kept no finished goods inventory saw any JIT practices in their operations.

Most of Magvlyn's workers were willing to change their operational activities because they were just in the business of producing for their employers so they can also earn an income. Only twenty-seven percent of the people who were willing to accept a change attributed their desire to the need for a more efficient production system. According to other published data analysed, Ghanaians are generally not willing to accept change due to traditional

teachings, society's value placement system and the cost the change may bring.

Some other elements like the perception the employees have of the strength of supplier relationship was seen to high as seventy percent of the respondents said that their company had a strong relationship with its suppliers. Most of the respondents stated that there was generally a good relationship between workers of all spheres. There is a consensus that all workers can easily report problems and air their views on certain production practices to high-ranking staff members and management. Magvlyn on the other hand does not have a well-grounded training system for its staff as most of the employees are trained as and when they are employed and receive no other form of training.

With respect to infrastructure most of the workers concur that the general Ghanaian infrastructural base has an adverse effect on their production. The data collated and analysed on the educational, health, transportation and communication facilities show that the nation's current infrastructural level hampers production. Ghana's infrastructural base hampers the distribution and receipt of goods to consumers and from suppliers respectively. The nature of Ghana's infrastructure also affects the productivity of workers since the human resource products of this system are of under educated and trained. There is also the factor of low productivity due to ill health rising out of the nation's inability to increase the capacity and number of health facilities. The economy is also seen to have a neutral influence on the operations of Magvlyn by the sampled elements since all costs will be passed

on to the final consumer. Twenty-five percent saw the economy as having a negative effect on operations. The economic indicators like inflation, Treasury bill rate, interbank exchange rate and the cedi to dollar rate in 2009 showed that the economy declined. Most of the indicators increased in values showing that the costs of loans and operations had increased. The fall in the Treasury bill rate showed a drop in the return on investments.

5.3 Conclusions

The research showed that there is a strong relationship between inventory and sales implying that companies will be less willing to scrap inventory, because of its incremental and positive ties with sales. The economic situation in the country has led to the unpredictability of demand and supply. According Nanor (2009), fuel price increases for instance have a positive effect on the general price levels in the country. As a result, any increases in fuel prices lead to a fall in demand. JIT is demand based and any incessant and frequent falls will hamper the smooth running of the system. Though the studied company has some practices that will support JIT introduction and implementation, the current economic situation in Ghana will not support a full JIT system. JIT thrives on a good infrastructural system, which Ghana clearly lacks. There are inadequate and ill-maintained transportation and communication lines, health facilities, educational institutions and the providers of utilities like power and water are infrequent with their deliveries. Lastly, Ghanaians are shown to be negatively correlated to change and JIT asks for a total overhaul of existing production systems.

5.4 Recommendations

- For JIT to be feasible in Ghana there needs to be an upgrade of Ghana's infrastructural assets. There needs to be more of everything; schools, hospitals, power lines, water pipes and roads. Infrastructure helps generate income to grow and develop an economy. Hence, a good infrastructural base will help fix the current economic problems of Ghana. The culture of maintenance also needs to be adopted, maintained and upheld by all Ghanaians.
- Companies who hope to change into a JIT system must improve upon their internal culture of training, employee contribution, and suggestions. This does not only hold true for a JIT system since internal operations of traditionally producing companies will be heavily enhanced when this is implemented.

5.5 Further Research Topics

- The Ghanaian's attitude to change and its effects on JIT
- Can Just-in-Time, move Ghana forward economically?
- The ability of training and education to change the Ghanaian's attitude towards change
- Can JIT force workers to give off their fullest willingly rather than work for the end product; salary?
- Inventory and Sales in Ghana; can the bond be broken through the adoption of JIT.

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Appendixes

Appendix A – Regression Analysis

SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.987523265
R Square	0.975202199
Adjusted R Square	0.966936265
Standard Error	182602.1572
Observations	5

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	3.93382E+12	3.93E+12	117.9785	0.001669824
Residual	3	1.00031E+11	3.33E+10		
Total	4	4.03385E+12			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	11868.17401	236344.0067	0.050216	0.963107	-740283.937	764020.2847	-740283.9367	764020.2847
Inventory	1.751308918	0.161235764	10.86179	0.00167	1.238184756	2.26443308	1.238184756	2.26443308

Appendix B: Questionnaire

Thesis Topic: The Feasibility of Just-in-Time Manufacturing in Ghana

Just-in-Time is a system of production where the practice of inventory keeping is discouraged because inventory is seen as waste and an added cost factor.

This questionnaire is geared at seeking information on your organisation's practices, and your opinion on alternative production methods; infrastructure and management.

Knowledge of Just –In Time

1. Do you know about the Just-in-Time System of Production?

☐ Yes

☐ No

(If no, move to question 3)

2. How or where did you hear about this system?

☐ Past Place of Employment

☐ Colleagues

☐ School

☐ Current Place of Employment

Other: _____

Employee Information

3. How long have you worked for your company?

☐ Less than 5 years

☐ 5-10 years

☐ 11- 15 years

☐ 16 – 20 years

☐ over 20 years

4. How old are you?

☐ Less than 20 years

☐ 20-30 years

☐ 31 – 40 years

☐ 41 – 50 years

☐ Over 60 years

5. What category of employees do you belong to in your current place of work?

☐ Junior Employee

☐ Senior Employee

Company Practices (Corporate Environment)

6. Are you capable of handling more than one unit of production or equipment?

☐ Yes

☐ No

7. Have you ever received training on the duties and tasks you are required to carry out?

☐ Yes

☐ No

(If no, move to question 9)

8. How often are you given training on or off the job site?

☐ At the time of employment

☐ Twice a year

☐ Quarterly

☐ Every other

month

☐ Monthly

☐ Weekly

☐ Daily

9. Will a production system change be acceptable to you? (This system change involves a total change in production methods, redesigning of work space and production floor, and change in worker duties).

☐ Yes

☐ No

10. Please give reasons for your answer in question 9.

11. How would you rate the inter-worker relationship existing at your organisation?

☐ Terrible ☐ Bad ☐ Okay ☐ Good ☐ Excellent

12. Is there a platform or program where employees can easily make suggestions and contributions concerning production methods and organisational behaviour?

☐ Yes ☐ No

(If yes, move on to next question, if no please move to question 14)

13. What is the nature of this suggestion and contribution platform?

☐ Individual reports to upper management or company owner (s) ☐ Suggestion Boxes
☐ Periodic meetings for such purposes other: _____

14. Assessing the production methods, which of these methods describes the production methods and stock management practices of your company?

☐ The storage of large quantities of inventory to meet production requirement at any point in time

☐ The ordering of raw materials as and when needed

☐ Other

15. How long does it take your department or company to process a production batch?

☐ Less than an hour ☐ 3 hours ☐ 4 – 6 hours ☐ More than 6 hours

16. Who checks for product quality (raw material, work in process and finished goods)

(Please check all that apply)

☐ Employees in charge of quality assurance ☐ The supplier
☐ Workers in charge of delivery receipts ☐ All workers
☐ State agencies such as the Food and Drugs Board

17. Does the layout of the various units of production aid efficient and easy production and movement of products on the production floor?

☐ Yes ☐ No

18. How quickly does your company meet orders for products as and when they arrive?

☐ Immediately ☐ 1 day – 1 week ☐ 2 – 4 weeks ☐ more than a month

19. What is the level of waste generated by each production method?

☐ Very Little ☐ Not much ☐ Okay ☐ High ☐ Very High

Company and External Environment

20. How quickly are your orders delivered by your company's suppliers?

☐ Less than 1 day ☐ 1 day - 3 days ☐ 4 days – 7days ☐ 7 days – 14 days

☐ 15 days – 28 days ☐ More than 28 days

21. Does your company have a strong relationship with suppliers?

☐ Yes ☐ No ☐ Not Sure

22. What is the effect of the following elements of the Ghanaian environment on your company's internal operations? (please check the appropriate box)

	High-Positive	Positive	Neutral	Negative	High Negative
Economy					
Infrastructure					
General Societal Attitudes					
State Policies					

23. Please explain briefly how these environmental elements affect internal operations of your company.

Economy	
Infrastructure	
General Societal Attitudes	
State Policies	

24. What changes can be made to the stated environmental elements to make your company's operations better?

Economy	
Infrastructure	
General Societal Attitudes	
State Policies	

25. What are those elements existing in the external environment that make your firm's operations more effective and efficient?

Appendix C: Figure Showing Source of JIT Knowledge

