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The Impact of manufacturing environment on the Performance of the Egyptian Automotive Industry

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Abstract: Egyptian manufacturing companies in the ex-public industrial sector have suffered from relatively various obstacles, with problems in production planning and control in particular. These impediments were responsible for negative effects on costs and caused low profitability for these companies in most years. Cost accounting systems were basically established for the purpose of preparing financial statements not for operational control. The literature was reviewed to explore the recent developments in cost accounting systems such as open book accounting. To examine this research phenomenon empirically, a case study was conducted in an Egyptian El-Nasr automotive manufacturing company. Data were collected from published and unpublished reports and by semi-structured interviews within the case company. The major findings of this study were that manufacturing environment played a significant role in designing cost accounting systems. It concluded that planning capabilities of the company and suppliers play a significant role in the process of cost reduction and improve the competitive position.

Key words: manufacturing environment-cost accounting-performance.

Introduction

The competitiveness and manufacturing environment of companies has changed. For example: A comparison of a US company with a Japanese competitor in the manufacture of a particular automotive suspension component illustrates the nature and extent of the Japanese advantage. The US Company bases its strategy on scale and focus: it produces 10 million units per year - making it the world's largest producer - and offers only 11 types of finished parts. The Japanese company's strategy, on the other hand, is to exploit flexibility. It is both smaller and less focused: it manufactures only 3.5 million units per year but has 38 types of finished parts (Stalk, 1988, P. 44). It culminated a decade in which stiff competition from the Japanese and European auto industry had squeezed profits for all three US auto makers. The quality was catching up to its competition's but the years of bad publicity had taken their toll, and the market did not share the perception of increased quality. The competition had kept adding new features and new technology (Ansari et al., 1997, P.1).

There are several characteristics of this contemporary environment that focus on promoting quality, reducing inventories, creating flexible production flows, automating manufacturing technologies, and using information technology to control facilities. Faced with strong competition and the challenge to increase efficiency, effectiveness and productivity, many companies seek to implement innovative managerial philosophies and new technologies which cover a wide spectrum of manufacturing activities. To do that, they have to operate in a suitable economic climate. Therefore, many developing countries have started to change their economic philosophies and the ownership structure of their enterprises.

The global competition has forced companies to pursue strategies consistent with just-in-time which aims to elimination all aspects of waste. Consistent with these changes, a paradigm shift is occurring in strategic management. In an effort to enact competitive manufacturing strategies, organisations are converging into informationally integrated systems. The primary

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shift in the current manufacturing trends is twofold: overall organisational structures are changing and simultaneously new information to manage them is being demanded. Management, faced with extraordinary levels of complexity and interdependency in the current information environment, has been forced to adopt new flexible strategies and structures (Kanter, 1989). Thus, the recent manufacturing trends, in response to the need for more rapid exchange of information in the design, development, supply, production and marketing of products, have changed to a new aspect of an integrated information network. Additionally, the current trends in manufacturing are increasingly information-based; information flows from the customer to the design, purchasing, manufacture of a product and storing. The constantly expanding capabilities springing from information technology improvements and innovations are responsible for this transformation. Though these effects are being felt in all organisations, manufacturing in particular is being forced (via strenuous off-shore competition) to undergo a veritable renaissance. Providing useful and relevant information to support strategic management decisions is the primary purpose of an internal accounting system (Shank, 1989).

Often decisions must be made regarding the following types of issues: which products to manufacture and in what quantities; outsourcing; price setting; cost control; and production process changes. Because managers must make these types of decisions in line with organisational strategy, structure and environment, the information provided by the internal accounting system must be useful and relevant for each organisation's unique situation. From a normative perspective, the accounting systems should be subservient to corporate strategy; not independent or in conflict with it. The system's design elements should capture the underlying technology, be consistent with the corporate commitment to total quality, JIT, and increased automation, and promote its efforts to compete on the basis of cost, quality and lead time. Therefore, one expects that the corporate efforts, particularly in the developing countries, to be leading-edge companies and to compete effectively in world markets should be redesigned their cost accounting systems. Organisations must understand the cost of each component of their value chain from product design and purchase of materials, through production and shipment, if they are to be able to effectively compete with other companies by eliminating wasteful efforts and lowering costs. Knowledge of internal costs becomes critical for competitive action and building of shareholder wealth in the current globally competitive economy. This study holds that without adequate product cost; cost control and strategic cost reduction information, knowledge is only partial and therefore, organisational chances for success in the current environment are diminished. Performance measurement systems have been criticised for not being designed for fitness in the new environment, in which the thinking about such systems has changed. Traditional performance measurement systems tend not to provide relevant, timely and useful information for the managers who are faced with operational and strategic business decisions on a timely basis. The main goal of this research is to investigate the effect of the development of a manufacturing environment on manufacturing performance in the Egyptian automotive industry. Also, it examines the changes in the manufacturing environments of this Case Company and their current and potential impacts on the manufacturing performance

This study would assist management to evaluate the effectiveness of the actual manufacturing system in a specific case. The emphasis of the case study is on the management of manufacturing resources. The study allows the company to identify the essentials of manufacturing problems such as the fluctuation of procurement and manufacturing lead times and the existence of multi-sourced parts. These difficulties seem frequently to confront manufacturers in developing countries as Egypt. One of the key aspects in this study, therefore, is to consider the relationship between the company and its environment from some significant aspects such as financial constraints on the purchase of material and default in negotiations with suppliers due to bureaucracy and strict decision patterns. This approach would aid management to explore the real cost drivers of the overrun costs caused by not only un-necessary activities inside the company but also outside. Therefore, this study provides insights regarding performance measurement, cost control and decision making, which could be apply to similar cases. Thus, the contribution of this study is to provide guidelines to managers in this company and others, which may help them when developing their performance measurement systems. Also, this study intends to help contribute to the development of the existing theory by adding to the growing knowledge rule in this area by analysis of the company's experience.

The study is organised as follows: Section 2 presents literature review and hypothesis development. Section 3 provides background on the case study and research methodology. Section 4 presents empirical results and analysis. Finally, conclusions and future research are provided in Section 5.

2. Literature review and Hypothesis Development

Caglio, A., & Ditillo, A. (2012) indicates that to improve the manufacturing performance, the collaboration between companies has revealed as an important business attitude. One important theme related to the functioning of these collaborative relationships is the need for "information sharing". Carlsson-Wall, M., et al. (2015) indicates the sharing of cost information between customer and supplier which would traditionally have been kept hidden by each partner in a supply chain for negotiations. Pietro R. & Marco F. (2012) explains that a strategy in which information exchange leads towards co-operation between companies in a supply chain. This information is used to influence the flow of products and services between the companies in question. Information, which previously was kept hidden, is now disclosed. Information sharing allows all partners in a supply chain for cost management as inputs into a planning phase. This requires a highly trust between the parties involved, and it presupposes a system by which information is actively shared. Hoffjan and Kruse (2006) indicates one aspect of the extensive area of information sharing, which comprises all data transfers, i.e., all forms of disclosure of valuable information between business partners. Ariela C &. Angelo D. (2012) states that it is not enough to consider firm-level variables. Instead, it is necessary to open the black box to collect detailed information about the specific tasks and activities and the exact relationships taking place between the interacting individuals of the collaborating companies. Companies can combine different forms of management accounting information exchanges at one level to achieve information flows that are unique at a higher level. The disclosure of roduct/activity/process cost information in a customer-supplier relationship, as one of the most recognized IOCM technologies which identify areas of improvement within the supply chain and collectively estimate the feasibility of these potential changes (Carr and Ng, 1995, Kaju¨ ter and Kulmala, 2005) hence increasing collaboration within the supply network (Mouritsen et al., 2001).

3. Case study

3.1 Background of the Study

A number of changes have taken place in the companies' environment as a result of increased global competition and the accelerated pace of technological change. In addition to rapid changes in management and manufacturing practices there are also a number of other important developments that have contributed to changing the competitive environment of companies. These include world-wide trends towards the removal of trade exchange barriers through international agreements, the reorganisation of industry and the trend among governments, including Egypt, to change the ownership structures of government trading organisations by incorporation as State-owned Enterprises or by privatisation (e.g. Peng, 2000). These changes have resulted in many pressures and strains on the companies and their management as well as their cost accounting systems. Whether and how cost accounting systems should be redesigned in response to these changes is now of considerable interest to both managers and management. The rapidly changing market demand characteristics, the increased pace of technological developments and fiercer competition have forced almost any industrial company to fundamentally rethink its manufacturing strategy (Hayes and Wheelwright, 1984).

The application of such international agreements as GATT has made the world more accessible. The competition has moved from local to global markets and the goal is to capture a market share. The world competition of the 1990s has driven companies to pursue strategies consistent with JIT and TQM to eliminate waste. Quality, flexibility and speed of innovation have become more important as sources of competitive advantage. These changes have affected industrial companies almost everywhere: in logistics (e.g. MRPI, MRPII) , marketing and product development as well as in operations on the shop-floor itself, by the introduction of CNC machining centres and, finally, of Flexible Manufacturing Systems (FMS) and Flexible Assembly Systems (FAS). It is realised that automation by itself does not solve manufacturing problems. The inherent versatility of flexible equipment leads to complex new problems related to the justification, to the design and layout, as well as to the planning, scheduling and control of such systems (Zijm 1988).

The amount of reported research on planning and control problems in the engineering manufacturing is much more limited, despite the very high degree of automation in this area. Indeed, the problems arising in engineering manufacturing often differ substantially (and are perhaps less familiar) than those experienced in other applications.

Egypt is an environment highly relevant for this study because it is a developing country with large ex-public sector companies that were established by the state with comprehensive development plans. Egypt is and has been for a long period faced with significant economic changes with the characteristics shown in table (3-1).

Table (3-1): Characteristics of Industrial Sector in Egypt

Population	66.0 Million
Gross Domestic Product (GDP)	82.7 Billion US $
Consumer Price Index (1990=100)	223
Manufacturing Value Added (MVA)	17.8 Billion US $
Constant MVA (at 1990 prices)	15.9 Billion US $
MVA per capita	275.0 current US $
Share of MVA in GDP	23.5% at current prices
Manufactured Exports	2,978.0 Million US $
Share of Manufactures in Total Exports	76.2 %
Manufactured Imports	10,862.0 Million US $
Share of Manufactures in Total Imports	82.9 %

(UNIDO National Accounts Statistics Database. 1997/98).

Egyptian industrialisation has tended to be inward-looking and since 1930 the governing strategy of industrial development has been import substitution. This strategy of industrialisation prevailed in Egypt under a variety of economic policies, which ranged from a free private enterprise economy which was revived under tariff protection in the 1930s, and gathered momentum during the Second World War, and where the state played a minimum role in economic development; to a controlled planned, centrally economy with a dominant public sector which was established after the 1952 Revolution. The policy of state control over the economy began in 1954 and was completed by the early 1960s, especially after the extensive wave of nationalisation in 1961. It was only with the liberalisation procedures of 1974 and the opening-up of the economy to foreign investment, that the Government, especially during the 1980s, attempted to change the industrial strategy from import substitution to export promotion. The emphasis was put on export - led growth with the encouragement of inflows of foreign private capital and technology and the development of the Egyptian private sector.

During the first industrial plan in the late - 1950s, the Government planned for heavy industrial projects. The state involved itself during that period in mobilising capital and constituting mega-corporations. Thus, many industries including the automotive industry were established or expanded under the control of the Government. By the mid-1980s, the Egyptian automotive industry (in particular passenger car assembly operations) was in a state of flux. Given the very low volumes of production and the continuous demands made by the industry on foreign exchange to import semi-knocked down (SKD) and completely knock down (CKD) kits, parts and components needed for local assembly, Egypt's automotive industry has been cited by the Government as an instance of inefficiency.

Thus, industrialisation is a major development strategy in Egypt, like in many other developing countries, but is confronted with a variety of obstacles and problems of an economic, organisational and technical nature and efforts are continually being made to improve the situation. In the attempts to improve industrial efficiency, computer support has been adopted for specific key functions, such as material requirements planning, capacity planning, product costing etc. It is therefore of interest to determine whether and to what extent the use of computers has contributed to improve the process of planning and controlling production and cost systems.

3.2 Research Methodology

This study employed a case study method. Selection processes of the research site and data collection methods are discussed in this section.

3.2.1 Selection Process of the Research Site

The purpose of this empirical research is to explore and investigate the changes in the cost accounting practices in Egyptian manufacturing industry. Assembly and engineering industries of the ex-public sector have been selected in this study due to the fact that private sector companies have been established only recently, by individuals, so their environment has not changed remarkably, and is unlikely to have had major impact on changing their CASs. Moreover, it was not possible to get access to all of them to collect the data necessary to carry out this research.

El-Nasr Automotive Manufacturing Company which produces and assembles automotive vehicles constitutes the field study site for this research. The researcher contacted the president of the Egyptian Holding Company of Engineering Industries who informed him that the studied affiliated company had undergone some changes in their manufacturing, information technology and cost accounting practices. However, the researcher also visited three ex-public television manufacturing companies and found that they were just in charge of assembling and that their cost accounting systems had not undergone any changes. Undoubtedly, selecting the right kind of industry for testing the viability of the substantial hypotheses of this research is very important. The following reasons explain why assembly and engineering industries have been selected in order to conduct this empirical study:

(1) Assembly and engineering industries are relatively more development than other types of industries in

Egypt. The progress that Egypt has achieved in these industries is significant and therefore they are of great scientific research value.

(2) They are complex industries because their products usually consist of many components and parts. Consequently, they create an environment in which sophisticated management techniques such as MRPI and MRPII can be applied. Therefore, both industries are worth researching.

(3) Egyptian ex-public sector manufacturing companies in general and engineering industries in particular suffer from relatively low inventory-turnover rates, and very low added-value inventory-turnover rates. Low inventory turnovers were responsible for low companies' profitability in most years. For example, in the study of Mady of five types of Egyptian ex-public industries (textiles, food, chemicals, engineering, and metal), he concluded that:

Manufacturing companies were turning their inventories in an overall average of 2.119 times a year with an average growth rate only 6.61 per cent every year. After an average growth rate of 8.77 per cent in the year 1981/82, the whole industry suffered setbacks bringing the inventory turnover rate (ITR) growth rate down to about 2.08 per cent in 1982/83 These growth rate figures might be misleading when compared with similar measures in other industrial nations. This is due to the fact that ITR is relatively very low in industry in Egypt. The 6.61 per cent growth rate is equivalent to an increase of only 0.094 turns every year. When compared with some industrial nations, the situation in Egyptian industry seems discouraging. It was reported that the inventory turnover rate averaged about 5.41, 6.75 and 7.86 times in Western Germany, USA, and Japan, respectively, during a period of 15 years starting in 1966. He indicates that the average growth rate during the same period was 5.45 per cent in Western Germany and 6.80 per cent in the USA. Japan was at the top with an average growth rate of 8.11 per cent every year. The recent statistics show an improvement in the overall manufacturing sector in the USA, where inventory turns increased to 7.7 times in 1988 (Mady, 1990, PP. 24,25).

However, the significance of inventory in this type of industries is relatively higher than in the other groups. In another study, he indicates that among all inventory categories the raw materials and purchased components category deserves most attention in these industries. This creates a real need for more effective production planning and control systems. He also concluded that material-intensive companies tend to achieve a relatively low ITR. While it is hard to generalise, a close look at the distribution of inventory categories indicates that poor material requirements planning might be the reason behind the relatively low ITR in Egypt. Raw materials inventory accounted for about 62.75 per cent of the total inventory investments in the whole sample. Raw materials to total inventory ratio (RMR) was always more than 50 per cent in all industry groups (Mady, 1991).

In the engineering industry group, he claimed the situation is even worse; averaging only about two inventories turns a year, although this type of industry was the one which achieved really remarkable progress of inventory performance development in most industrial nations during the last two decades.

In the automotive industry, while the average is about eight turns per year, most Japanese producers are doing above average with a considerable margin (Sodahl, 1983). Toyota achieved remarkable progress, with turnover rates reaching 38 times in 1985 and 1986 (Cusumano, 1988). These findings suggest that inventory and materials cost management might have a positive effect on profitability and productivity in the Egyptian industrial ex-public sector companies.

(4) The products manufactured by these industries are subject to development innovation and continuing modification to their designs and models. These products, especially automotive, face strong competition in the local and international markets, particularly after the privatisation of these Egyptian industries in the light of market economy restructuring. While the products' environment is changing continuously, companies apparently use both advanced products and process technology, such as NC, CNC, CIM, FMC, and FMS in order to compete in the world markets.

(5) Any assembly and engineering industry depends on several other supplier industries. Therefore, the importance of this industry lies in the establishment of other supply chain industries. As a result, organising the material, parts and components flow is very important and requires a high degree of information flow in every part of the organisation.

(6) There are differences in profitability and cost, not only for each of the different types of finished products, but also for every kind of manufactured part or component. Due to the fact that there a lot of parts and components, companies need to know immediately the profitability and cost of each manufactured part for decision making purposes.

(7) These industries play a major role in the economic development of any state. They support development plans in Egypt through sparing foreign currencies which would be used to pay for importing alternative goods. On the other hand, the state gains revenue through foreign currencies by exporting the surplus of these products. In order to determine the relevant case for this study, the researcher conducted a pilot study based on some Egyptian manufacturing companies in June 1997. Then, the researcher visited the research site for three months starting in June 1998. The formal permissions were issued by the Egyptian Education Bureau through the Egyptian Embassy in London.

3.2.2 Data Collection

This case study used the following resources for field data collection: (1) Semi-structured interviews, (2) field tours in the company's factories; the manufacturing processes in the factories were observed and understood through plants tours, (3) organisational charts of the company and factories layouts, (4) technical manual and conceptual design manual of the old-established cost accounting systems, (5) magazines issued by the company, (6) annual balance sheets and financial statements, (7) performance reports prepared for the Board of Directors and the Holding companies, (8) production and selling reports, capacity and cost reports, diagrams, statistics tables, brochures, bulletins and leaflets issued by the information centres at the companies.

The study was conducted in two phases. The first phase involved semi-structured interviews by using a questionnaire. The purpose of this phase was to pre-test the study's assumptions and to get feedback from Egyptian manufacturing companies visited, to select a case for detailed study. The results of the first phase were used to revise the questionnaire for use in the second phase. The case was selected in the Assembly and Engineering industries with different activities. The semi-structured interviews of the second phase were carried out for two purposes. First, they afford insight into actual company practices. This insight is often invaluable in the interpretation, conclusion and recommendation portions of research. Second, the semi structured interviews can be used as validation, or pilot test, taking into account the feedback and experience from the first phase. All interviews were recorded in writing and subjected to in-depth analysis. Several meetings and interviews were held at the case company during the field visit. These included the directors and the managers in different departments, with an emphasis on the General Administration of Supply and Planning, Factories Management and the General Administration of Accounts including the Cost Accounting Dept. Those interviewees were able to provide extensive information about the different systems that needed to examine.

The interview questions contain exploratory questions. The spent time, in meetings with different interviewees, to discuss the interview questions, varied. The time was about six hours at one visit a day and repeated visits. The interview questions were discussed with all interviewees in the case study organisation during the field visitation. The questions were used to collect background data about the company and data of manufacturing environment, including data on characteristics of the manufacturing environment, for example assembly methods, engineering or manufacturing factories, products, layout type, production lines, production planning and control systems, and problems facing production. Also the semi-structured interview questions were used to collect data about cost accounting practices, including the current cost accounting system features: cost structure of the product, product costing methods, cost allocation methods and bases, the role of cost data for pricing and make or buy decision making and cost control systems, the relationship between the CAS and the other sub-systems in the company and is the relevance of the system in the new environment. Semi-structured interview questions were used to collect data about the new system including its components, subsystems, the conceptual framework, the new cost concepts, methods and the preparations preceding implementation, like using the computerised communication network. It is worth mentioning that unstructured and informal talk with various individuals, inside as well as outside the company, elicited information of great significance, helping to develop the researcher's awareness and understanding of phenomena related to the study.

4. Empirical Results and Analysis

4.1 Background about the Company

El-Nasr Co. is one of the biggest automotive companies in the Engineering industry sector not just in Egypt but also in the Middle East and Africa. It occupies 1,660,000 square metres, out of which 378,816 square metres is covered. It has selected the current location because of nearby major local supplier industries and availability of transportation. The company has performed a vital role by supplying transport vehicles to the different classes of the Egyptian society. The company manufactures, assembles, and sells various types of vehicles including passenger cars, trucks, buses, tractors and trailers. It also makes engines, necessary

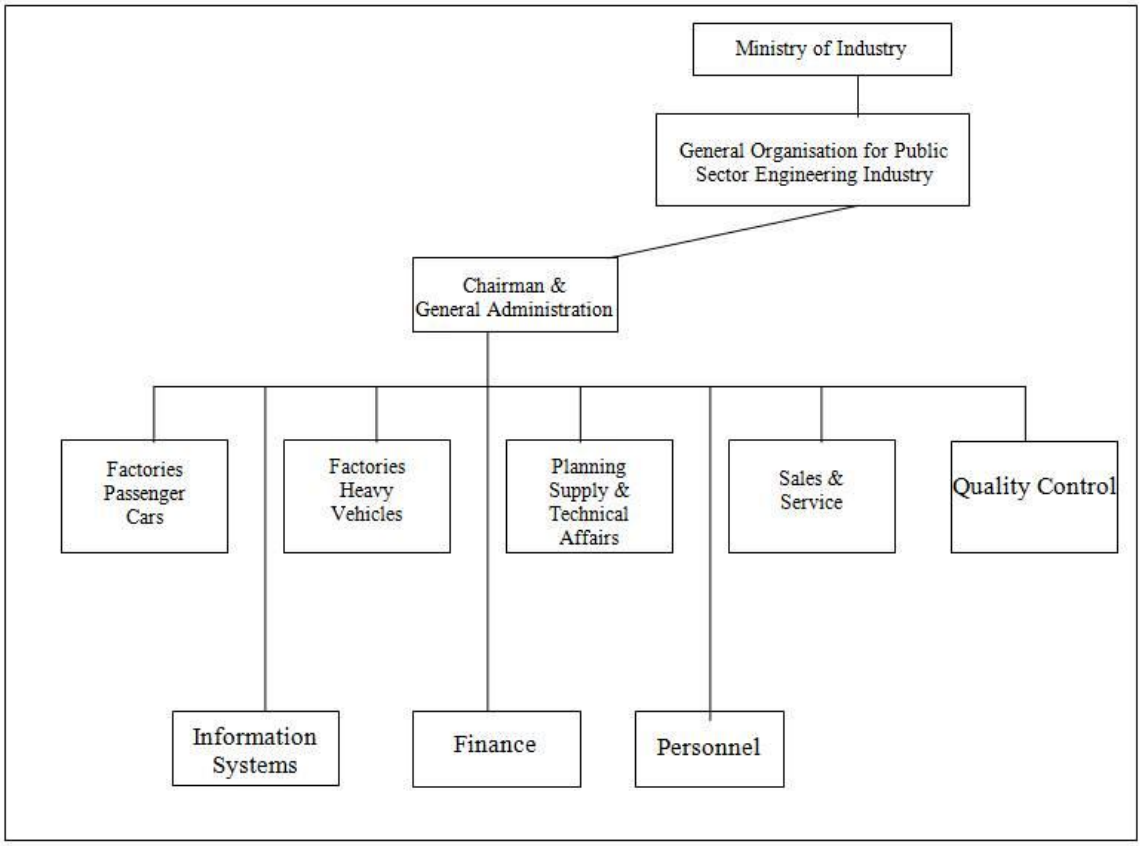
components for production, and spare parts for its products and manufactures for others (El-Nasr Bulletin, 1997). It has been in business for 40 years and has experienced a very high growth rate, with revenues of over LE 778.50 million and total assets of over LE 1.50 billion. Vehicles sell in the markets in a built-up (complete) or in parts state. All are processed in seven fabrication and assembly plants before release to the market place. The company's sales during its years of production, total, according to the Company magazine (1998): Passenger cars 340,000; Lorries & Tractors 118,000; and Buses & Min-Buses 22,000.

4.1.1 The Organisation Structure of the Company

The public enterprises were considered the `private` property of the state, and they were managed by individuals who more often than not had no experience in the field, while the organisation of the public sector failed to provide enough checks and control against illicit practices by the management of the public enterprises (Interview with vice-president, July 1998). Public organisations were therefore abolished by a law that concentrated power in the hands of the Board of Directors of the individual public companies. This power gives the Board responsibility for following up the implementation of projects and meeting deadlines, achieving financial targets, developing resources, recruiting and training manpower and implementing quality and quantity control.

The Government's need to plan and control the manufacturing industry in the ex-public sector has, however, recently resulted in a new umbrella organisation, intended to overcome the old policy of concentration of the power and management in the central government. The General Organisation of Public Sector with subdivisions for individual branches (engineering industry, chemical industry etc.) is thus the newly formed intermediate body between the Ministry and the individual company (see figure 4-1).

Figure (4-1)
Organisation structure of the company



The company is organised in six sectors, each sector having a number of divisions. The dotted line indicates the indirect supervision of the Ministry of Industry as a representative of the Egyptian Government. This means that although the Government has abandoned its direct control of the ex-public sector companies, political objectives cannot be ignored as an influence on organisations. Further changes in the present organisational structure of the company can be anticipated if agreement is reached in present negotiations between the company and `Daewoo` (Korean Co.) about a joint venture, DMCC (Daewoo Misr Car Company) for the production of Buses and Trucks.

With reference to the company's organisation structure in figure (4-1), the present study was carried out within four sectors: the two Factories sector; the Planning, Supply and Technical Affairs sector; and the Finance sector. Thus, viewpoints have come primarily from these sectors rather than, for instance, from the Sales and Service sector.

4.1.2 Company Strategy

Government policies are important in determining the way in which the company's strategy is formulated, since the company's strategy is developed and promoted as a part of the industrial development strategy of the country. At the time of the company's establishment, the dominant strategy was for the local manufacturing content to achieve a hundred percent import substitution, as will be explained in more detail below. The tendency in this company was for large-scale manufacturing enterprise to be highly vertically integrated.

During the 1980s, the Government tried to change the industrial strategy from import substitution to export promotion. Increased competition has led the company to seek to develop a sustainable competitive advantage by adopting not only a low-cost strategy but also a product differentiation strategy. The company has achieved recognition of quality programmes. In 1996, it obtained an International Quality Certificate of ISO 9002 in the field of passenger car products. It is planning to integrate new technology with a substantial base of existing equipment. Joint venture is a part of the company's strategy at present and for the future.

4.2 Manufacturing Environment of the Company

The manufacturing environment of the company has changed over time. It is affected by the prevalent conditions of competition, the extent of government ownership and control, and changes in customers' tastes. The company has started to adopt new advances in production technology. In this section, a brief outline of the company's production systems, shop-floor organisation, engineering and assembly processes, and production organisation is given.

4.2.1 Production Systems

The company uses a batch production system to produce groups of similar units in a certain order to meet the continuous demand. When a set quantity of an item has been produced, the factory sets up machines for making the next group of items. Then, after the required quantity of the other items has been made, the factory returns to producing the earlier items, and so on. The batch production system, in this case, combines both continuous and intermittent production systems. Thus, the company's plants have the characteristics of both systems. The continuous production is characterised by standardisation and repetition because materials and components flow from one workstation to another, regularly and in sequence. Each process in the series is related to the proceeding and subsequent processes. It is desirable that production should pass through these processes smoothly, without bottlenecks.

Also, the production system is intermittent because the company produces according to customers' different tastes and requirements. The plants' facilities are characterised by a flexibility that allows the output of various types and volumes of products. The design is such as to allow changing the product from time to time.

This system is very complicated and needs sophisticated information flow. For example, in the assembly plant of the passenger cars, where a single product is made continuously, an assembly line is designed to perform specific operations. All parts and components which flow through the line pass the same operations. Nevertheless, the cars that appear at the end of the line are not necessarily similar. For example, some cars have two doors, others have four doors. Some might be green, others black. Some are fitted with standard tyres and others with special tyres. As a result, layouts of the company's plants take these differences into account. Under the batch production system that applies in the company, production may be one of such aspects as: a 'one off' batch; a batch as required; a batch to meet a continuous demand (Factories' tours, Observations, and Interviews with the production engineers and the operators at the company, June, 1998).

4.2.2 Shop-Floor Organisation

As discussed above, parts production at El-Nasr Co. is (batch-) flow-oriented, where material and components in process are transferred among operations in machine

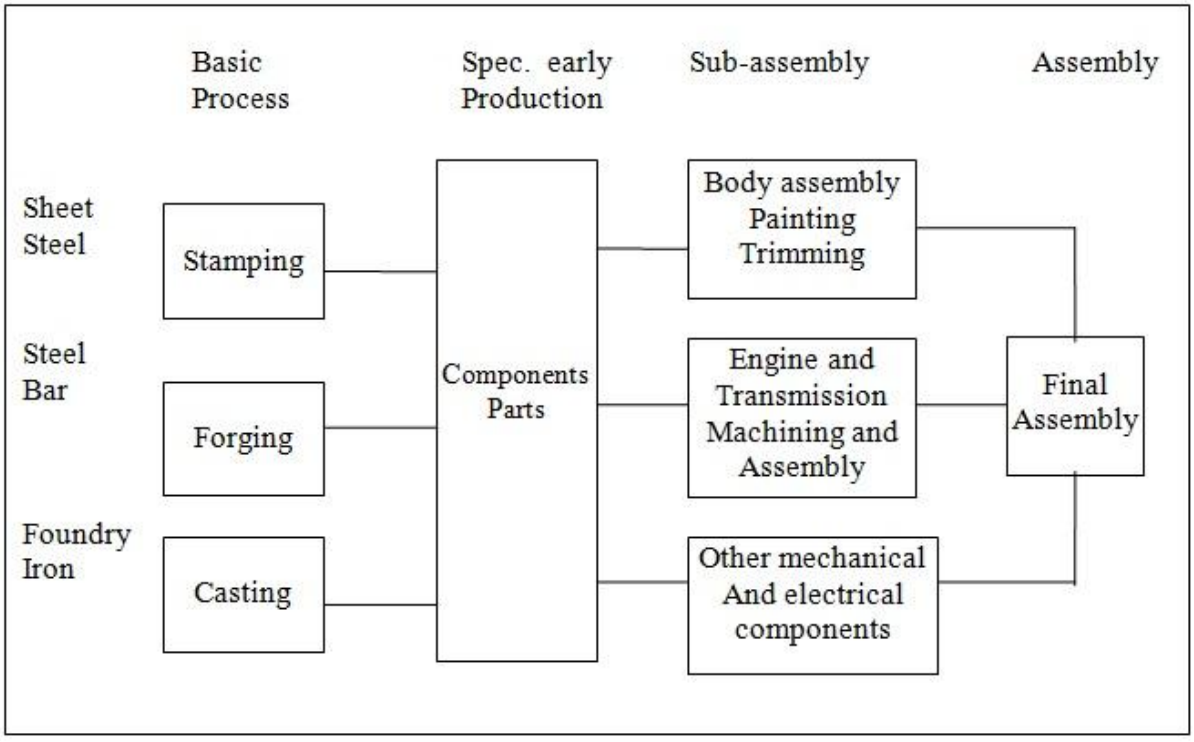
centres. A number of machine centres belong organisationally to an operations room within a plant, and each centre is equipped with a group of homogeneous machines and skills based on the functions to be performed. The operations room is the operational conjunction between the planning department and the shop floor.

Works orders are either for single units or batches of identical units, e.g. a customer may order a car, or a Governmental institution such as "the Corporate Institution of Transportation" order a batch of buses. The sizes of orders are determined according to economic rules (economic order quantities). Each order specifies the required operations that are to be processed in certain machine centres. Associated with each operation is an operation time, i.e. the sum of transportation time, machine set-up time, process time, and machine tear-down time.

The sequence of operations is usually constrained by technological requirements and thus determines the routing of the order across machine centres. The planning of job shop activities is based on assumptions about availability of resources and standard times for machine work. The accuracy of these assumptions and the applicability of the standard times are important for the capacity planning. As we will see below, this results in a serious problem at the company.

However, the making of any type of motor vehicle involves in general three basic phases: design, fabricating of parts and the assembly of components, first into sub-assemblies and then into the finished vehicle. A characteristic of production under license, as with El-Nasr Co., is that design is subject to engineering changes imposed by local requirements.

Figure (4-2)
The motor vehicle production process



Stamping of sheet steel into body shells (see figure 4-2) is the only basic process done by the company. Forging and casting of, for example, engine blocks and gear box housings is done outside, partly at `El-Nasr Company for Forging`, another public industry in Egypt. For basic parts production, as well as for sub-assembly steps, there are thus different sources of supply: from foreign subcontractors, from other Egyptian local supplier companies and from in-house production.

4.2.3 Engineering and Assembly Processes

4.2.3.1 Engineering Process

It is worth mentioning that metals are the basis of the engineering process, but there are other industries' products which are also necessary, for example, plastic, glass, rubber, etc. The engineering process supplies manufactured parts and components to the assembly process, to be assembled into the form of finished commodities. Consequently, the purpose of an engineering process is to convert and form the metal and non-metal products -through an assembly- into products with specific features which are ready to be used by consumers. Therefore, an engineering process depends, firstly, upon other industries which provide the production requirements. Assembly is the last process in the production system in the company. This engineering process needs highly skilled labour, continuous training and advanced manufacturing technology as well. Engineering products' consumers are either final consumer, as when a motor is used to assemble a car, or intermediate ones, such as when a motor is used to operate a machine, to produce other goods (Interview with the Director of the Fabricating parts' factories).

4.2.3.2 Assembly Process

The assembly process at the company is in charge of assembling products which consist of several parts and components. These processes are accomplished in a chain of operations and performed by either a single group or many sub-groups, proceeding to the final assembly. The parts which a worker (or workstation) is responsible for assembling are also required to be determined in advance. The output of this assembly process is always a completed product which is different in form and characteristics from its contents, i.e. parts and components. The assembly process can be either as simple as assembling a chassis or as complicated as assembling a car. This company uses assembly lines to assemble parts and components in order to obtain a finished product. To ensure the continuity of production, materials and parts have to be available regularly, and the production lines are balanced or reconfigured as well. It is necessary to maintain good planning, control and follow up of the production throughout the assembly process. Also, efficient and effective systems of purchasing, storing, material handling and transport are important to guarantee a continuously production flow.

In the following we will restrict the study of El-Nasr Co. to the flow of material for final assembly. This view will, however, include not only material but also in-house manufacturing of parts and sub-assembly of components. Before the material flow is described in more detail, partly below but primarily in chapter seven, an overview of the production organisation is presented.

4.2.4 The Production Organisation

The company is organised in six sectors, each one with a number of divisions. Figure (4-3) shows the company's production organisation.

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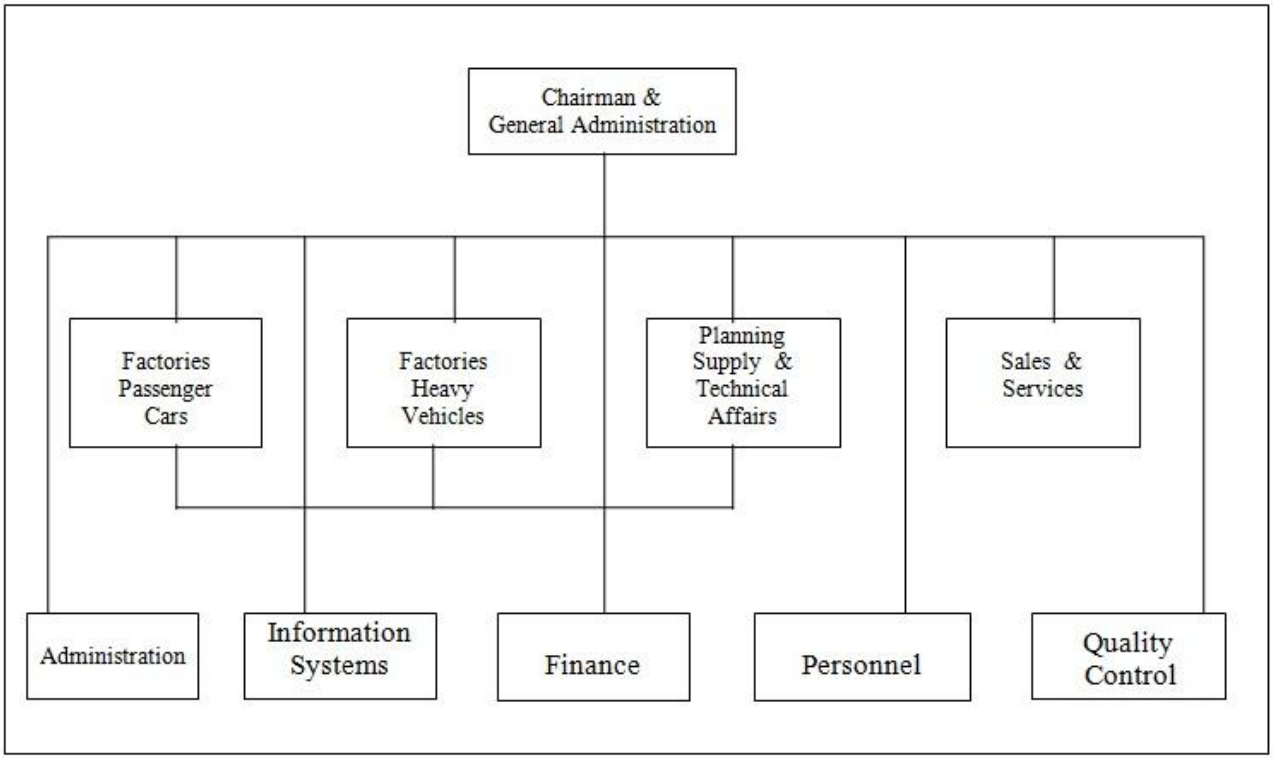
Figure (4-3)
The production organisation at the company



4.2.4.1 The Manufacturing Plants

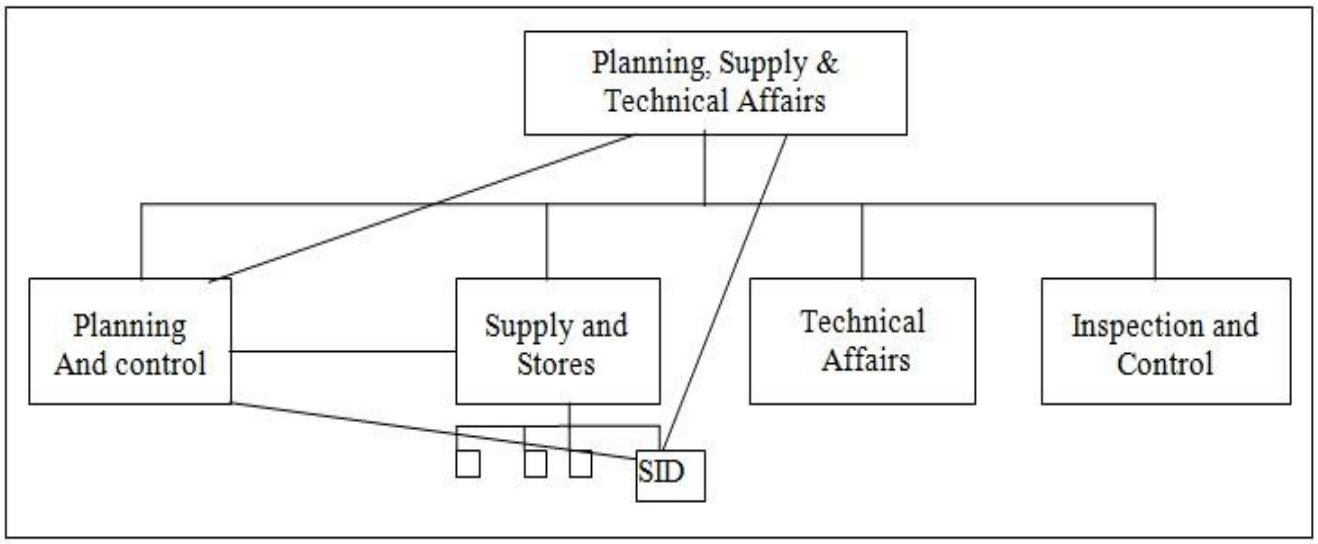
Engineering factories at the company include diesel engines factory, petrol engines factory, miscellaneous machines, gears and heat treatment factory, press factory and tool shop room. Assembly factories at the company include a factory for trucks, tractors, trailers & buses and a factory for passenger cars. In house-manufacturing takes place in Hangars 2, 5, 6 and 7. Hangar 2 is the Diesel Engine Factory where items such as cylinder blocks, crankshafts, connecting rods, oil pans etc., are manufactured out of components that are supplied in incomplete condition. The factory has lines for assembly, testing and run-in of diesel engines. In Hangars 5 and 6, various mechanical components for heavy vehicles are manufactured in four different sections. In section one are production lines for components of differential rear and front axis. In section two are machine groups for various machining operations, e.g. lathes and boring drilling and broaching machines. Section three is dedicated to gear cutting and there are machine centres for cutting pinion gears, different gears, gears for gear boxes etc. Section four is for heat treatment.

Hangar 7 is the press shop, performing the only basic process done within the company. Here, parts for heavy vehicles are formed, welded and machined. Items manufactured in the press shop are, for instance, doors, bumpers, bus body parts, axle housings, brake shoes and tractor fenders.

4.2.4.2 Planning

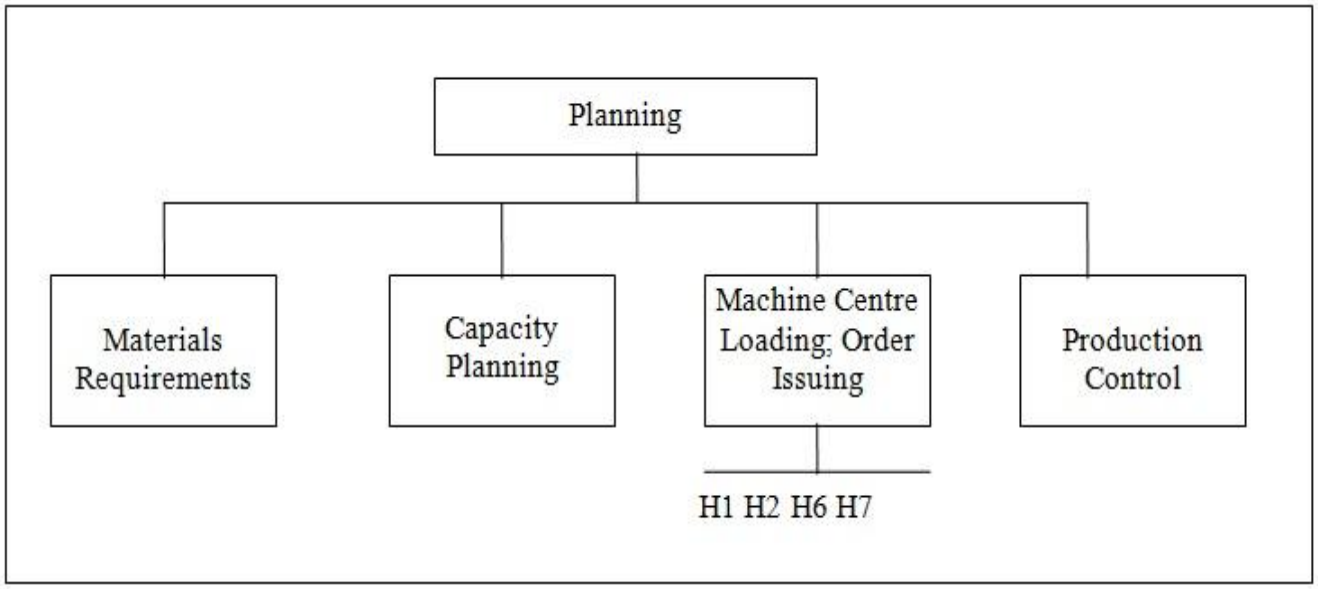
The Planning, Supply & Technical Affairs sector, having the operational responsibility for the planning of production and for materials supply, is of particular interest throughout this study. A more detailed organisational chart of this sector may therefore be useful:

Figure (4-4)
The planning, supply and technical affairs sector



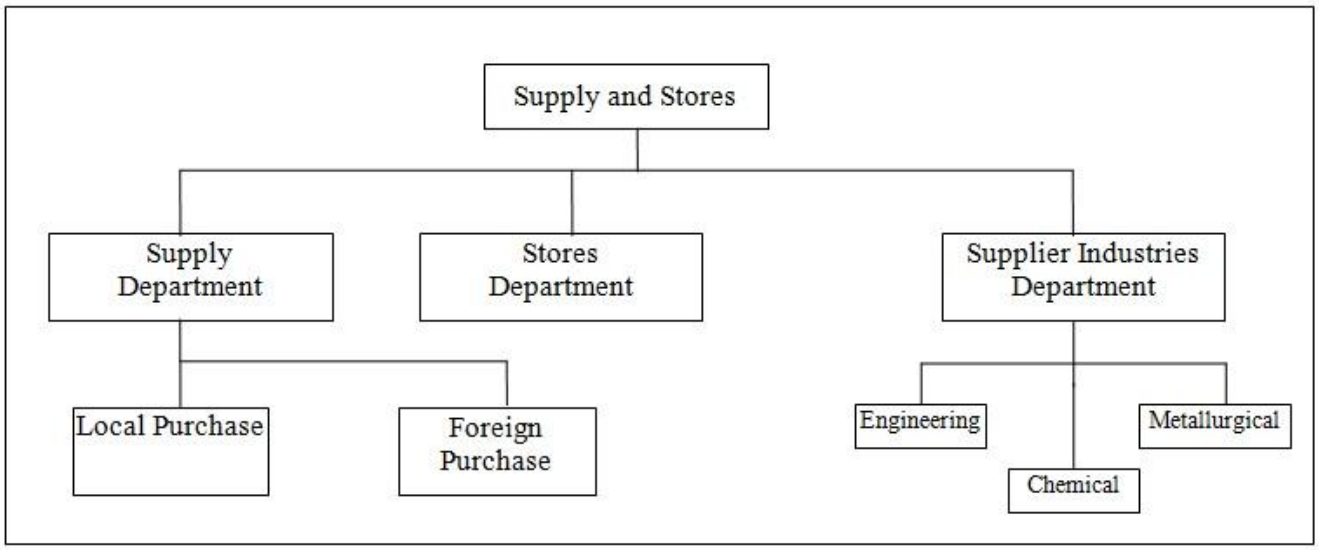
The planning and Supply and Stores divisions are organised as follows:

Figure (4-5)
The departmental organisation of the planning division



H: Hangar

Figure (4-6)
The departmental organisation of the supply and stores division



4.2.4.3 Stores

There are three different kinds of stores: the Principal Store, common for the heavy vehicle production, and organised under the Supply and Stores division (Figure 4-6).

Control Storage, belonging to the Planning division, which serves as a materials buffer, and third buffer, is found in each Hangar Store. It should be noted, however, that a not insignificant volume of material in various shapes and conditions is found outside the three official stores, i.e. in the surrounding alleys and open places within the factory area. This material represents work-in-process or products for storing.

4.2.5 Local Manufacturing Strategy at the Company

Since the establishment of the company, the strategic target has been to promote and enhance domestic production by encouraging local enterprises. There are two main reasons for this: to build an indigenous skill in industrial production and to reduce the outflow of capital for the import of material and parts. The company has a role in the establishment of local industries, both through its Supplier Industry Department and in a few joint projects, and there is a long-term plan to exploit any available potential to increase domestic content in the final products. Though the company has made efforts to buy-out most of its requirements from local suppliers, it still chooses to internalise production of some parts and components whenever there is available capacity, especially with the general bias against private industries which appears to have been carried over from the days when the private sector was not politically favoured.

As a matter of fact, this domestic production strategy is still determined in the light of the political objectives of the Government. An effect of this is that the government may establish rules that are intended to benefit the country but are not necessarily in the interest of the company. For example, the transfer of purchase of certain components from a foreign to a local supplier may be regarded as important from the government's point of view (import substitution) whereas for the company the result may be quality problems or delivery delays. This is further discussed below.

However, it is not easy to reach the target because of the fact that the automotive industry requires huge capital investments, advanced technology, availability of the raw material, labour skills, technical, engineers, and very large space for the hangars, stores and other administrative departments.

The establishment of the Fabricating factories at the company is clear evidence of the intention for the company to produce a complete locally manufactured and assembled product. During 1960 and 1961, three agreements for three new projects were signed. The domestic needs for the products of each project, as well as their importance to the national economy, were borne in mind in determining priorities. Hence, top priority was given to the manufacture of trucks and buses, followed by agricultural tractors, third were assigned to trailers. The passenger cars project occupied the fourth

priority. Despite the efforts made by the company in order to achieve the targeted percentage of local manufacturing content, the company, by 1991 had achieved various levels of local manufacturing content for different products, as follows:

Table (4-1)
The local manufacturing content of the company's products in 1991.

Product	Local Content Percent
Engines	90 %
Mini Bus	74 %
Modification Bus	84 %
Heavy Bus	60 %
Lorry &Tractors	35 %
Developed Lorry	76 %
Saturn Lorry	85 %
Military Lorry	70 %
Passenger cars	20 %

General administration of factories at the company, Performance assessment reports, 1990/91

(Local content includes both in-house production parts and local purchases including customs duty. It also excludes the assembly operations and imports).

Table (4-2) shows the progressing of local manufacturing content of products at the factories level in 1997. It can be seen that the percentage of local content is higher in buses, tractors and engines than in passenger cars.

Table (4-2)
The local manufacturing (content of the company's products in 1997)

Product	Local Content Percent
Lorries:	
-Saturn Nasr Lorry 125/ 13	
Engine 125 H. P. Chassis /Box 8.6 ton	91.49%
-Modification Nasr Lorry 190	
Engine 190 H. P. Chassis /Rear Tipper	
/Tractor head/ Fire Engine 10. 2 ton.	83.37%
-Military Nasr Lorry 4*4	
Engine 125 H.P. Chassis/ Box	87.33%
Heavy Nasr Lorry 2*4 /4*6 /6*6	
Engine 256 H.P. Different Loads.	50.90%
-Daily Nasr Lorry/ Light Truck	
Preparations/ Double Cabin	52.90%
Buses	
-Modification Nasr Bus/ 924	93.07%
-Bien El Mudun Nasr/ 923 Standard/	86.93%
Air Condition	79.74%
-Heavy Nasr Bus 871	
Engine 256 H. P. Load 110 Passenger	75.72%
-Tourist Coach Nasr "High Deck"	75.72%
-Nasr Mini Bus 941 /Engine 88 H. P.	
Load 26 Passenger Standard/ Air	
Condition	74.33%
Tractors	
Nasr Tractor 651/ Engine 65 H. P.	
Agriculture & Transport	40.72%
Passenger Cars	
-Nasr Dogan 1600 Tempra	44.00%
-Nasr Sahin 1300	46.00%

General administration of factories at the company, Performance assessment reports, 1997.

(Local content includes both in-house production parts and local purchases including customs duty. It also excludes the assembly operations and imports).

This strategy has a direct impact on the computerisation process of the company, since the goal of increasing local content also applies to the company's own production, where the share of manufacturing

increases relative to assembly. This creates a demand for improved co-ordination of production and material supply and, hence, for efficient production planning and control methods.

4.3 Changing the Manufacturing Environment and Seeking to Competitive Advantage

The monopoly position of the company enabled it to enjoy most of the characteristics of scale economies of the automotive industry in Egypt. A higher volume of output was achieved, particularly, in the commercial vehicles rather than in the passenger cars, with a relatively unskilled labour force backed by heavy investment in machine tools and long model run. In recent years, particularly, as the competition has become very strong, Egyptian markets are more accessible to foreign auto makers; and customers' tastes have changed as well. Achievement of a competitive advantage in the automotive industry in Egypt depends not only on production volume but also on the number of models produced and the length of life of these models. This factor is especially important in the production of passenger cars, due to the continuous change of models. The normal pattern has been for cars to get a major model change every two or three years. However, with rising costs of tooling, the cycle has slowed down to changes every four years, with face-lifting minor changes in exterior sheet metal, front grills, and chrome adornments in the interim years. This pattern is known as the style cycle. It is worth mentioning that the initial expenditure incurred by the company when changing a model used to be high, especially when most equipment used in car manufacturing was specific to a particular model. Obviously, the longer a model stays in the market the more it is possible to spread the costs of specialised machinery and tools.

In order to satisfy the diverse customers' needs, the company produces different versions of vehicle models. As a result, vehicle models change over time, particularly with technological progress and changes in product characteristics. The company has started to adopt a more flexible production technology, which has dramatically changed the production method. Flexible automation involves the use of numerical control machine tools (NC) and computerised numerical control machine tools (CNC) which can cope with different models in the different processes of motor vehicle production, e.g. stamping, welding, painting and machining operations, and testing.

Although the developments in production technology in the company have increased the flexibility of production facilities in responding to customers' rapidly changing demands, they have also led to even more capital intensive techniques, so that unit fixed costs have become even more responsive to volume and the financial burdens of under-utilisation of capital and production capacity have become more severe, as explained in Chapter Eight. For example, under-utilisation of capacity in the 1990s resulted in very heavy operating losses because of the increasing competition.

4.4 Production Problems Facing the Company

This section deals with manufacturing production problems from which the company suffers and explores the essential factors causing them. Some factors are connected with the internal affairs of the company and the others are non-controllable factors caused by external influences. Some of these problems have already been solved by the company, by installation of new developed systems, while others still need improvement. These problems are interacting and complicated and some of them are reflections of others. The problems and challenges that face the company vary and cover technological, suppliers, production planning and costing dimensions.

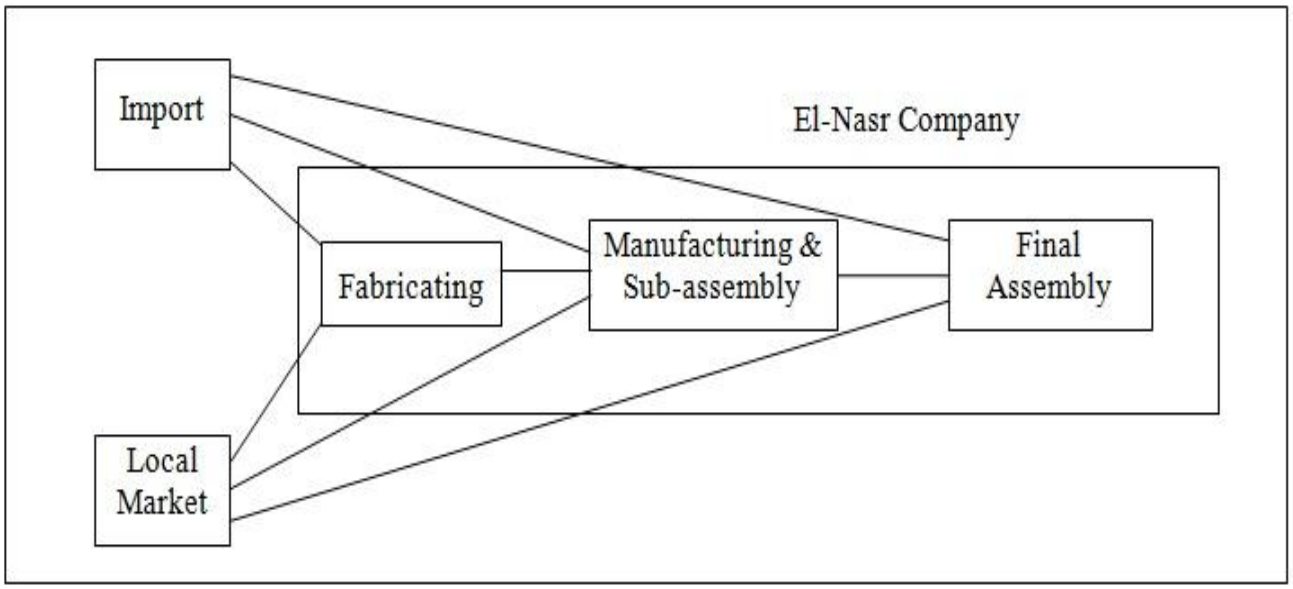
4.4.1 Production Control

At El-Nasr Co., the term production control is applied to both manufacturing and assembly as well as for materials supply, in accordance with general practice. Manufacturing and sub-assembly together with external procurement constitute the three sources of material supply for final assembly. It is also the task of materials management to ensure the supply of materials for in-house manufacturing. The focus of materials management is on the material flow, within as well as outside the company; through the study of the material flow it is expected to gain insight into the company's materials management

We can state that materials management at the company involves the following areas: the forecast of material needs; the acquisition of material; and the supply of material.

The problems addressed by materials management at the company can be illustrated as follows.

Figure (4-7)
Multi-sourced supply of material for final assembly



4.4.2 Supplying Shortage of Materials and Parts on the Production Lines

Poor planning of raw materials and components, limited capabilities of the small package production planning system and its narrow applications at the company, led to emergence of a serious problem of missing parts or materials on some production lines. This phenomenon caused many stops in the production lines and failure to achieve the production plan. The shortage of imported components was only in the passenger cars factory because some products are assembled and licensed by the licence companies, so operating the factory depend on some imported parts. Shortage of imported parts occurred because hard currency was not available.

From Table (4-3), we can find out that this problem is gradually disappearing; it decreased from 408 h. in 1984/85 to 199 h. in 1987/88. Table (4-3) shows the greatest proportion of production stops caused by shortage of the local material and parts on the production lines, was in the Special parts' factory. It decreased from 61812 h. in 1984/85 to 57718 h. in 19987/88. These shortages were due to the production processes being planned and controlled badly and to lack of communication to handle data rapidly and precisely, moreover the computer facilities were still in the infancy stage. The shortage of local materials and parts in the other factories was not big and decreased gradually during the period from 1984/85/ until 1987/88, except for the tractors factory. Table (4-3) shows the trend of shortage at the seven factories during the periods from 1984/85 until 1987/88 before the introduction of a new sophisticated system.

Table (4-3)
Shortages of materials and parts at the company's plants "Hours of stoppage"

	* Shortage of Local Components & Materials				** Shortage of Imported Component			
	85	86	87	88	85	86	87	88
Lorries	173	192	-	-	-	-	-	-
Buses	305	205	199	190	-	-	-	-
Tractors	42	110	131	286	-	-	-	-
Passenger	164	158	302	87	408	494	499	199
Diesel Eng.	-	-	37	-	-	-	-	-
Special. parts	61812	57666	49157	57718	-	-	-	-
Petrol Eng.	-	112	50	-	-	-	-	-

Production control department, Performance Assessment Reports and financial statements for the finished years in 1984, 1985, 1986, and 1988.

In order to avoid the risks of shortage of materials and components and to ensure fulfilment of the production plans, the company needs to hold a certain level of inventory of raw materials and parts at all times. The true reasons for this problem are explained below.

4.4.3 Problems with Local Suppliers

Generally, as claimed by interviewees, reliability levels of Egyptian domestic suppliers are extremely variable. However, this may be result from import substitution policies in general, rather than relying on local suppliers to produce the required parts and components. Some may allege that reliance on external vendors by El-Nasr Company may lead to more hazards with increased probabilities of stoppage and may cause it some degree of discomfort, but this does not necessarily mean that in-house production of such parts and components would be less risky or more efficient.

Although the Egyptian Government's policies still have a significant influence on the company's decisions, the company has some autonomy in selecting of local suppliers, with the exception of a few public sector suppliers which monopolise some industries and from which El-Nasr Co. has to purchase its requirements for certain parts and components.

The best approach, from El-Nasr Co. viewpoint, is to have a limited tender with suppliers, to avoid the risk of supply. However, some public sector suppliers which are allowed by the state to have a monopolistic position in contrast to El-Nasr Co. can set certain conditions which El-Nasr Co. cannot negotiate. In fact, the interviewees claimed that for private sector suppliers, there are around 52 per cent of orders are finite tenders and the rest direct orders. In contrast, around 89 per cent of purchases from public sector suppliers are through direct orders, and only 11 percent are limited tenders.

It is preferred from the company's standpoint to rely on several suppliers and to induce and encourage efficiency in the local producers. Generally, the selection of suppliers by El-Nasr Co. depends on their efficiency, in conjunction with such determinants as prices, quality of products, time of delivery, according to the Department of Supplying Industry at the company. It was stressed that quality is the most important thing to be considered in relation to subcontracting.

4.4.3.1 High Prices

The most important problems mentioned by the interviewees concerned in high prices. Prices of some local parts and components might be higher than those imported items, leading to higher costs of production. As stated by the interviewees it is better to have finite tenders to get the best prices. However, some ex-public suppliers that are permitted to have a monopolistic place can impose high prices that are not negotiable. It was also argued by the interviewees that private sector suppliers do not require down-Payments to start producing parts and components for them, while the public sector suppliers claim at least a third of the price of an item.

4.4.3.2 Poor Quality of Local Suppliers

The other major problem facing the El-Nasr Co. is poor quality of parts and components made by some domestic suppliers and the incapability of some to adhere to specifications, leading to a high rate of rejection. Table (4-4) shows the proportions of the production accepted by El-Nasr Co.

Table (4-4)
Percentage of the quality approved commodities by the El-Nasr Co. from Some of its suppliers

Suppliers	Percentage of the quality approved commodities
Ex-public sector suppliers	
Nassr Co. of rubber	65.7
El Nasr Co. of forging	67.9
industries	72.5
El Yayat Co.	79.7
Iron and steel Co.	
Private sector suppliers	
Giza Co. of rubber	91.1
Iamco Co.	85.4
Dessouki Co.	85.0

(Interview with the director of Material Supply Division at the company, August, 1998).

From Table (4-4) we can see that the rate of rejection varies remarkably among ex-public and private suppliers. It is higher in the ex-public suppliers than the private ones. This may be attributable to the traditional close relationship between the case company and other ex-public sector companies. For example, El-Nasr Co. may tolerate a level of quality from other large ex-public sector suppliers which it might not accept from private suppliers. Large ex-public suppliers are not, in most cases, worried about meeting El-Nasr Co.'s specifications exactly, since they are confident that El-Nasr Co. is satisfied to buy some of its requirements from them. Also, the ex-public suppliers are large size companies, and the purchases of El-Nasr Co. represent a relatively small proportion of their total output. In contrast, private suppliers are usually small-size ones, which cannot afford to lose El-Nasr's customer by failure to conform to its specifications. It seems, from the viewpoint of El-Nasr Co. that ex-public suppliers are more secure than the private ones and some of them still have a monopolistic position. This behaviour would not be permitted for the private suppliers. However, this situation is affected by the old policy of the state that induced and encouraged public ownership and tried to support the role of ex-public sector at that time. It would be preferable, as argued by the interviewees, for the company to depend on several suppliers as this would encourage efficiency, whereas a monopoly position may lead to complacency.

It is worth mentioning that production of some items requires special facilities which may only be available with the large size suppliers. Therefore, El-Nasr Co. relies on the private suppliers to make some items that do not need high capabilities. For example, most of the medium and light pressed metal works needed for assembly of buses and trucks are provided by those small suppliers.

However, poor quality of components from local suppliers is often due to poor quality of local and imported materials. It was mentioned by the interviewees that some materials are imported to the Egyptian market are based upon low prices, irrespective of quality. This leads to lower quality and bad specifications of products produced.

4.4.3.3 Delays in Delivery Schedules

Recent figures from El-Nasr Co. indicate that parts and subassemblies from own fabrication account for 31 percent of all delays in material supply. Locally supplied materials account for 54 percent, whereas imported materials account for 15 percent of all delays. Delays refer to the time difference between planned and actual events. Figure (4-5) shows a sample of lead times of some imported parts. The causes of delay are an important issue in the further analysis of materials management at the company. Locally supplied material accounts for the majority of all delays in material supply to El-Nasr Co., and most of the shortages (delays and partial deliveries etc.) occur with semi-finished parts. There is, however, a considerable variation among suppliers with regard to delivery on time. While no delays were stated in deliveries of a few suppliers during the period considered, other public suppliers, for example the El-Nasr Co. for Forging industry, a major supplier to the company, accounted for a significant share of all delays.

Figure (4-5)
The lead times of some imported parts

Part	Order date	Issuing of order	Opening of credit	Freight start	Arrival of ship	Arrival of goods	Issuing of delivery
Rubber bushing 33-54-109	15-03-96 until 20-04-96	25-8-96	14-12-96	18-05-97	02-08-97	23-09-97	30-10-97
		"	"	30-06-97 (3 stages)	03-09-97 (3 stages)	07-10-97 (3 stages)	
Rubber bushing 5555-34-10-06	15-03-96 until 20-04-96	25-10-96	30-12-96				
		"	"	16-05-97	13-06-97	14-07-97	25-09-97
Roller bearing 30215DIN 720	15-04-96	24-05-96	20-06-96	11-01-97 Until 27-2-97 (3 stages)	21-03-97 23-04-97 (3 stages)	29-04-97 15-05-97 (3 stages)	27-5-97 12-07-97 (3 stages)
Connecting rod 0141-06-07-OIR	06-03-96	28-06-96	10-11-.96	30-04-97 Until 01-06-97 (4 stages)	08-06-97 Until 01-09-97 (4 stages)	15-09-97 until 30-10-97 (4 stages)	07-11-97 until 10-12-97 (3 stages)

As an explanation of varying lead times, a number of parts from the company's parts list, randomly selected, were followed during the different material flow phases. It must be emphasised that the selected parts represent only a fraction of the total parts list and that different time periods manifest different cases; for instance, new suppliers become involved, transportation capacity deviates, and use is made of new production facilities. These restrictions notwithstanding, the lead time facts accurately characterise an average for the company. It should also be emphasised that these illustrations do not essentially concentrate on the long lead times, nor the significant time difference observed between planned and actual observations. What is however remarkable, and what will be stressed as serious in the study, is the great variation in lead times. This means that El-Nasr Co. is at times encountered with uncertainty that does not give the company an adequate basis for cost and production control.

For imported material we can explore a variety of factors causing delays, e.g. when bank accounts are opened for payment to suppliers; when items have arrived and technical inspection is made; when material is carried from supplier to the company; and when purchase orders are prepared.

For in-house production, it looks as if there is no direct connection between the planned request date for materials availability and the actual production situation, i.e. between the date of demand according to the optimistic plan and the actual implementation of the work order in the factory (release date). It was noted by the interviewees that in 90 observations out of 100, actual order start was later than that planned by the planning department, and these delays ranged from two to nine months. Table (4-6) shows the lead times for some selected work orders.

Table (4-6)
The lead times for some selected in-house work orders.

Part name	Material used	Issuing work order	1st operation	
			planned	actual
Exhaust Manifold	Assembly Parts	04-05-96	20-09-96	19-01-97
Bracket for Alternator	"	02-04-96	07-05-96	15-08-96
Intake Manifold	"	08-05-96	19-10-96	30-12-96
Differential pinion cpl	"	11-10-96	01-11-96	25-11-96
Space ring	Semi-finished	27-02-96	11-03-96	15-04-96
Pinion shaft	"	07-04-96	27-04-96	25-07-96
Bushing	original mat	12-12-96	02-01-97	07-6-97
Sphericalset	"	11-12-96	05-01-97	10-8-97

(Material Supply Department at the company, Performance assessment reports, 1997).

As a consequence of delays in delivery schedules by most suppliers, El-Nasr Co. has to engage in ad hoc month-to-month scheduling, suffering persistent disruptions of assembly operations to parts manufacturing schedules. These delays may cause production at lower capacity, forcing the company to charge unnecessary costs, including higher inventory costs to avert stoppages. The importance of on-time delivery for automotive assemblers is reflected in a recent development in automotive manufacturing, the adoption of the Just-In-Time philosophy, mainly in order to be able to reduce inventory costs. This point will be elaborated in Chapter Nine.

In this regard there are also some differences between public and private sector suppliers. From the interviews, El-Nasr Co. staff believed it is better to dealing with private sector suppliers. They pointed out that they faced many difficulties with public sector suppliers, which they assured were due mainly to their carelessness. One of the most serious issues by the interviewees was the delays in delivery by the public sector suppliers, which were affirmed to be very costly to the company, because of delays in their production schedule. Private sector suppliers were said to be more reliable regarding adherence to promised delivery times. Table (4-7) shows the delivery rates of some suppliers dealing with El-Nasr Co.

Table (4-7)
Delivery rates of some local suppliers dealing with El-Nasr Co.

Supplier	Delivery Rate as to total contracted quantities
Private sector suppliers	
Giza Co. of rubber	95.3
Iamco Co.	83.8
Dessouki Co.	79.1
Abu Yussef Co.	90.0
Technical Co. for plastics	80.0
Arabic Co. for aluminium	78.3
Gahbour Co.	89.0
Al helal Co. for engineering works	87.6
El -Nigma Co.	68.4
Ex-public sector suppliers	
Nassr Co. of rubber	78.0
El Nasr Co. of forging industries	83.1
El Yayat Co.	45.3
Iron and steel Co.	61.0
Helwan Co. for diesel engine	73.0
National plastics Co	40.0
Egyptian Co. of plastic and electricity	-

(Material Supply Department at the company, Performance assessment reports, 1997).

4.4.3.4 Irregularity of the Source of Supply

Another obstacle faced by El-Nasr Co., particularly with small size private suppliers, is that they are based on individual ownership, which generates no trust. This means when something suddenly occurs such as closure or activity being stopped for any reason, legal or illegal, that can affect the regularity of supplies to El-Nasr Co. In addition, some private supplying firms are not striving to achieve a national goal, in contrast to the ex-public ones. All these events contribute to create an atmosphere of insecurity of some private suppliers, which threatens the regularity of supplies. Moreover, despite the difficulties faced in relation to public sector suppliers (basically caused by obstacles encountering the public sector in Egypt in general, e.g. over employment, poor management, shortage of foreign currency required to import raw materials), it must not be overlooked that public sector suppliers have capabilities to produce some parts and components which the private sector cannot produce because of limited technological facilities and financial resources.

However, the new reform laws and regulations made by the Egyptian government under the privatisation programme in recent years may help to improve the situation. The new economic policy aims to encourage the activities of the private sector and support its significant role in the new industrial programme. Although these changes carried out by the government provide a basis to build the infrastructure, the assemblers must reform and reconsider their relationships with their suppliers. However, to deal with all the above problems with local suppliers, the company needs to reformulate its priorities and to reorganise its assistance to local suppliers. It may be interesting to explore (given the government objective of increasing local content of automotive production in Egypt) how far El-Nasr Co. is ready or able to encourage and aid local suppliers, given the fact that in the short-term, at least, there is a conflict between the goal of raising the local content of vehicles manufactured in Egypt and that of efficiency. For instance, in several cases, the requirements of lower prices for parts and components and increasing local content conflict (given the fact that at present El-Nasr Co. allows local purchase of parts and components to be up to 10 per cent over the price of imports) and also, while quality is non-negotiable, there is always a price that El-Nasr Co. has to pay to guarantee quality from local suppliers.

In some cases, El-Nasr Co. policies have, according to interviewees, led to some difficulties for the local suppliers. For example, it often has ordered a very low volume each time, which could not justify the high costs of dies and moulds required to produce some parts and components, particularly in view of the continuous changes of models. However, it was interesting to find that El-Nasr Co., shared some of these costs with some (but not all) of the public sector suppliers. For example, El-Nasr Co. Pays fully for the costs of pattern plates needed to produce some malleable cast iron parts at El-Nasr steel pipes and Fitting Co. This type of assistance is rarely given to private sector suppliers. However, suppliers, as stated by the interviewees, still suffer from other obstacles with El-Nasr Co. For instance, suppliers do not receive their payments until long after delivery, because first, inspection is carried out by El-Nasr Co., which may take a few months (ranging from 1-4 months and in rare cases, six months). This is due to the complicated routine procedures, which take a long time.

4.4.4 The Lack of Long- and Medium-Term Planning

The lack of long- and medium-term planning is a major difficulty caused by El-Nasr Co., not to mention short-term planning and the continuous changing of plans and orders, e.g. orders may be deleted or replaced while they are in progress, which results in confusion to suppliers and may cause disruptions. Some managers

explain this situation as follows: In one case the company asked a supplier to supply certain items, and then deleted the order because it found an alternative cheaper source of supply, but when the company procured the items from this new supplier, they detected them to be of an lower quality and had to deal again with their first supplier (Interview with the cost manager, July, 1998).

This continuous changing of plans and orders is detrimental to the relationship between the company and its suppliers. There must be a continuity of connections with technical and managerial support by the assembler to maintain constant good business relationships with its suppliers. This point will be elaborated in Chapter Nine. This can cause severe problems to suppliers. There are no reserved items to be outsourced by El-Nasr Co. but if the company has idle capacity, it starts producing parts which were previously outsourced, without realising the consequences, and dismisses their local suppliers. This problem is particularly serious for private sector suppliers. This is because the public sector suppliers are large companies where El-Nasr Co.'s orders represent a very small percentage of their total production. Any disruptions to their plans by El-Nasr Co. do not affect them to any great extent. In contrast, small scale private sector suppliers may depend heavily on orders from El-Nasr. The interviewees argued that there is no long term central planning for the company, which affects automotive supplier industries' efficiency and their capability to plan their own production, leading sometimes to high storage costs of both raw materials and final product. This specific problem, as argued by the interviewees, prevented suppliers from trying to rely much on El-Nasr Co.'s orders, with their very short-term plans, sudden decisions and persistent changes of orders (both quantities and/or time schedules). As one manager stated:

The company has not long-term plans for its production, because of the continues changes in the designs and customers preferences so how can it convey to suppliers any future schemes (Interview with the Planning Manager, July, 1998).

The company does not give its suppliers any warning about any expected disruption of its production plans. There is also no co-ordination between the company and its suppliers about future market programmes. Thus the lack of trust between the company and its suppliers is due mainly to inadequacy of information exchange between them. Undoubtedly, suppliers require having long-term programmes in order to reduce risks and uncertainty. They need to plan their requirements of raw materials to avoid bottlenecks (particularly when most of them are imported and take a long time). Also, they need to arrange a more accurate production schedule, and even to be able to plan future investments. If a supplier has already imported the required materials for producing the order issued by El-Nasr Co., then the company cancels it for any reason it will leave bad consequences for this supplier. The following is an example:

This problem happened with a supplier called Helwan Co. for casting that was established to supply El-Nasr Co. with its needs of parts. According to the original programmes this supplier should have been supplying El-Nasr Co. with at least 86 per cent of its total output. Today El-Nasr Co.'s orders do not represent more than 12 per cent of its total output. This is because there is no long term central planning for the transport equipment industry in general, which is reflected in the manner of automotive assemblers in Egypt. This manner affects automotive suppliers and their capability to plan their own production, leading sometimes to high storage costs (Interview with the director of Planning & Supply Division, August 1998). Thus, solving this planning problem will assist suppliers to reduce their costs of production considerably and at the end it will be reflected in reduced prices for items supplied to El-Nasr Co. and its production costs will fall in consequence.

4.4.4.1 Other Problems related to the Lack of Planning.

The first problem is unrealistic delivery orders. The interviewees stated that there are sometimes unrealistic delivery orders by El-Nasr Co. with the pressure to accelerate delivery (e.g. 45 days), even though a supplier may need at least 90 days in order to produce the required item to the appropriate standard. They then go out of their way to claim compensation for late deliveries. However, this is very much related to the lack of planning at El-Nasr Co. Another related problem is high storage costs. This problem is also related to the lack of planning by El-Nasr Co. and non-reliability of the suppliers In order to avoid the hazard of late deliveries and to ensure accomplishment of the production plans, the company needs to hold a certain level of inventory of components and raw materials constantly. For instance, inventory increased in 1991/92 by about 16% in compared to the previous year, because of materials arriving late at the end of the year. Appendices (B and E) show the various categories of inventories. This raises costs unnecessarily and may place the company in a critical financial condition. For example, in 1991/92 the company was charged interest on bank overdrafts of 123 Million LE. because of there was not enough liquidity to finance a full operating cycle. The company had to borrow around 873 Million LE from banks. This amount

represents the most important cost element following materials cost. Obviously, this situation caused bad consequences for out-cash flow and liquidity at the company (see appendices B and C). Although the situation improved in 1996/97, the company still suffers from the same problem.

An excessive inventory is not invested funds, which negatively affects the liquidity of the company and causes disruption to its operations. Not only is the inventory as opportunity cost to the company, but it may jeopardise its familiar risks.

El-Nasr Co. does not any care to share its suppliers' inventory costs, leaving them to face all resulting costs and risks. This problem seems to be very clear in recent years, particularly when the El-Nasr Co. adopted a new policy of rationalising storage to reduce its inventory costs. This policy forces suppliers to store any item produced for El-Nasr Co., thereby increasing their own inventory costs. This fact was confirmed by the manager of Suppliers Division at El-Nasr Co., he said:

Giza Co. is a supplier making rubber parts for the company. The company's orders are continuous all year round and over several years. For example, the company may order 3,000 parts of which 500 units have to be supplied every four months. El-Nasr Co.'s aware that this supplier produces the entire order i.e. 3,000 parts required because the materials required to make these parts are not available all the time or take a long time to import. Then the supplier stores them, pending El-Nasr Co. requisition. This policy leads to raising the supplier's own storage costs accordingly (The manager of Suppliers Division, August, 1998). The interviewees highlighted shortcomings in planning the production programmes, by considering only monthly programmes according to market requirements. This is due to continuous development in product designs; changes in customers' orders at short notice; inaccuracy in estimating requirements of raw materials; and fluctuation in raw materials ratios all the year round, particularly with high raw materials imported on account of the complexity of importing procedures; as well as increased rates of currency exchange.

Suppliers, as asserted by the interviewees, could not cope with or spend a lot of money to be able to adapt to these continuous changes. The persistent modifications in design of parts increased their costs, particularly as a result of the need to modify some parts, which are very costly and often imported. This problem is increased by the small batches required by El-Nasr Co. each time.

Poor planning of production has had bad consequences for the company. In one case, when the company faces a rise in demand, poor planning and changing production volumes of the plants leave it short of available capacity. The required capacity can be provided by having additional machines and equipment, additional people (perhaps temporary employees), the use of overtime and additional shifts, variable production rates on the machines, or a combination of all these. In contrast, the other case is when the company encounters slacking in demand, the poor planning capabilities of the company lead to An Idle Productive Capacity. The reduction of available productive capacity exploitation ratios is one of the chronic phenomena at the company, as explained in detail in Chapter Eight. Particularly since Egypt began its privatisation programme and transferred to a market economy, automotive competitors have increased. The company has faced difficulties in marketing its products locally and abroad. For example, finished goods inventory increased by 250% compared to the previous year. This is due to controllable factors such as decreased quality of some products which do not satisfy customers' requirements and are not consistent with world specifications for export. The non-controllable factors are, for example, wars, political interruption and cancelling of exporting contracts with some countries, as well as public economic conditions that led to spiralling inflation.

In fact, accompanying the poor planning, there is another type of obstacles, as the interviewees argued, which interrupt the efficient usage of the productive capacity at the company and lead to high selling prices because of increasing production costs. For example, the company size is not suitable with its marketing capabilities. It neglects marketing activities and has not established an effective market strategies. Some equipment is obsolescent; there are no planned maintenance programmes; electrical cuts are common; and productive capacity is not balanced along the production lines, so production does not go smoothly. Non-efficient lease transport is used to move raw materials and bought parts from suppliers to the company's sites. Some equipment is not installed because the required buildings are not ready on time.

4.4.4.2 Shortage the Foreign Currency

Shortage of foreign currency is another obstacle which causes idle capacity at the company. It was argued by the interviewees that the changes in the Egyptian finance market were one of the most important factors behind the production problems faced by the company. The company used to obtain its requirements of the hard currency at a low exchange rate. The government allocated enough funds to finance the purchasing of necessary materials, parts, components,

spare parts and equipment. Also, when the company was a monopolist, it enjoyed the protection from foreign competition imposed by the state. Nowadays, the recent changes to reform the Egyptian economy have led to liberation in the finance market. The company no longer enjoys subsidies from the state. It must get its requirements of hard currency by itself from the free finance market, at the real exchange rate. Thus, the company is caught in the vicious circle of being unable to get enough hard currency to import a sufficient volume of raw materials and components necessary to utilise available capacity, and/or equipment and machinery to upgrade capacity, either to achieve profit sustaining volume levels or to satisfy the local market demand for new vehicles.

The interviewees assert that idle productive capacity has had adverse consequences, for example, decreased productive capability and thus a drop in the yield in some plants and slow growth rates in others. Faulty production, spoilage, and waste of raw materials have increased. Consequently, the cost of some products has increased as a result of increased costs of fixed productive capacity, causing a rise in the selling prices and weakening the competitive position of the company in the market. Undoubtedly, dealing with the problem of unemployed capacity at the company will improve the company's condition. By increasing production and decreasing costs, there is a possibility of reducing selling prices and getting better quality.

4.4.4.3 Decreasing the Productive Efficiency

Finally, the company has faced the problem of decreasing productive efficiency (see the appendices) associated with labourers; wages; production planning and control; and obstacles connected with maintenance and quality control. In fact, decreased productive efficiency at the company is due to decreased available productive capacity exploitation ratios and rising unemployed capacities; decreased productivity of labourers; increased inventory; decreased efficiency of materials usage and decreased quality of some products. Figure (4-8) summarises cause and effect relationships of the main problems at the company.

Figure (4-8)
Analysis of the company's chain linkages (the production and cost systems)

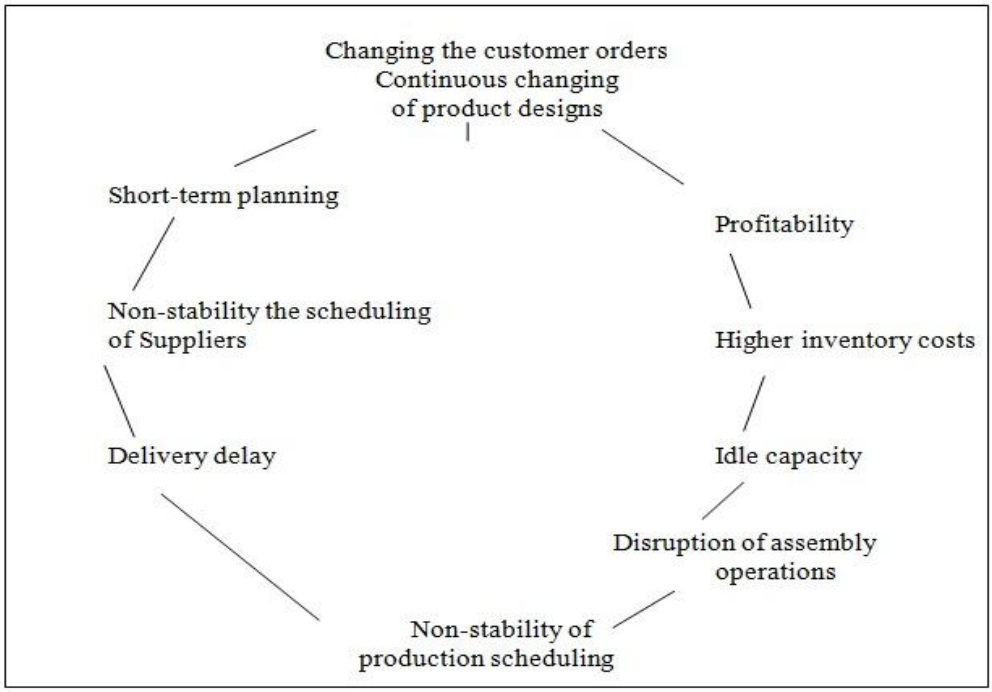


Table (4-8)
Summary of production problems facing El-Nasr Co.

Source	Problem
Un-reliability in local suppliers	A. high prices of materials and parts B. poor quality of materials and parts C. delays in delivery schedules D. Irregularity in source of supply
In-stability in production planning	A. unrealistic delivery orders B. high storage costs C. shortage in foreign exchange
Un-reliability in the technical system	A. using traditional machines B. using extra and non-skilled labour C. irregularity in maintenance D. long lead time E. idle productive capacity F. decreasing the productive efficiency

Thus, if the company wants to prosper in a new competitive environment, an integrated computerised-aided manufacturing planning and control system is required in this environment. A key objective of the improvements made to the production planning and control processes is to ensure material availability and reduced inventories.

5. Conclusions and Future Research

Since the late 1980s the company has encountered serious problems in production planning and control. These problems and challenges that face the company vary and include technological; suppliers; production planning and costing dimensions. Problems due to the need for timely supply of materials lead back to the material requirements planning. Poor planning of raw materials and components, limited capabilities of the small package production planning system and its narrow applications at the company, led to a serious problem of missing parts or materials on some production lines. This phenomenon caused many stops in the production lines and consequent failure to achieve the production plan.

Problems with suppliers include high prices. The higher of some parts and components, the higher costs of production. The other most significant problems are poor quality of parts and components made by some domestic suppliers, and the incapability of some to adhere to specifications, resulting in a high rate of rejection, and delays in delivery schedules. As a consequence, El-Nasr Co. may resort to ad hoc month-to-month scheduling, experiencing frequent stoppages of assembly operations to parts manufacturing schedules. These delays may cause production at lower capacity, leaving the company to charge unnecessary costs, including higher inventory costs to avoid disruptions. Insufficient responsiveness to customer needs has led to weakness the competitive position of the company, especially with the increased competition brought by the contemporary economic policy in Egypt, which has allowed local automotive competitors to enter the market.

One solution available to this case Company is to apply open book accounting (OBA), referring to the disclosure of product/activity/process cost information in a customer-supplier relationship, as one of the most recognized IOCM instruments. Predominantly, OBA is portrayed as means to identify areas of improvement within the supply chain and collectively estimate the feasibility of these potential changes.

Cost information sharing is required in engineering and product development and coordination or development of supply chain activities.

External validity does not exist in this study, because the results of the study cannot be statistically generalised. The goal is not to make statistically valid generalisation about the population. Although a given companies' situations may be unique, some of the findings may be generalisable to other companies in similar conditions. This study was at the company level with a comprehensive survey in the different departments and plants inside the company. Data were gathered through interview with the key individuals in the different departments and plants at the company. Data were also collected formally from published and unpublished sources. Personal relationships played a significant role to overcome some difficulties that faced the researcher during the process of collecting from un-published sources.

References

Agndal, H. and Nilsson, U. (2009) 'Interorganizational cost management in the exchange process', *Management Accounting Research*, Vol. 20, No. 2, pp. 85-101.

Ansari, S. L. et al. (1997), Target costing, IRWIN.

Anthony, R. N. and Govindarajan, V. (1998) 'Management control systems', Ninth Edition, The McGraw-Hill Co. Inc.

Ariela C. Angelo D. (2012) 'Opening the black box of management accounting information exchanges in buyer–supplier relationships', *Management Accounting Research* Vol 30, No.23, pp.61– 78.

Caglio, A., & Ditillo, A. (2012) 'Opening the black box of management accounting information exchanges in buyer–supplier relationships.' *Management Accounting Research*, Vol 30, No.23, pp. 61–78.

Ca¨ker, M. (2008) 'Intertwined coordination mechanisms in interorganizational relationships with dominated suppliers', *Management Accounting Research*, Vol. 19 No. 3, pp. 231-51.

Carlsson-Wall, M., Kraus, K., & Lind, J. (2015) 'Strategic management accounting in close inter-organisational relationships.' *Accounting and Business Research*, Vol.45, No. 11, pp. 27–54.

Carr, C. and Ng, J. (1995) 'Total cost control: Nissan and its UK supplier partnerships', *Management Accounting Research*, Vol. 6 No. 4, pp. 347-65.

Cusumano, M. A. (1988) 'manufacturing innovation: lessons from the Japanese Auto industry', *Sloan Management Review*, Vol. 30, No. 1.

Dekker, H.C. (2003) 'Value chain analysis in interfirm relationships: a field study', *Management Accounting Research*, Vol. 14 No. 1, pp. 1-23.

Hayes, R. H. and Wheelwright, S. C. (1984) 'Restoring our competitive edge: competing through manufacturing', New York, John Wiley.

Kanter, R. M. (1989), 'The new managerial work', *Harvard Business Review*, November-December, Vol. 10, No. 2, pp. 65-78

Kaplan R. S (1995), 'Quantitative models for management accounting in today's production environment', Chapter 7, PP. 103-115. In Ashton, D. et. al., Issues in management accounting, second edition.

Mady, M. T. (1990) 'Inventory performance in Egyptian industry: analysis and insights', *Industrial Management & Data Systems*, Vol. 90, No. 3.

Mady, M. T. (1991), 'The effect of type of industry on inventory investments and structure: The Egyptian case', *International Journal of Operations and Production Management*, Vol. 11, No. 6.

McIvor, R. (2001) 'Lean supply: the design and cost reduction dimensions', European *Journal of Purchasing & Supply Management*, Vol. 7, pp. 227-42.

Mouritsen, J., Hansen, A. and Hansen, C. (2001) 'Inter-organizational controls and organizational competencies: episodes around target cost management/functional analysis and open book accounting', *Management Accounting Research*, Vol. 12 No. 2, pp. 221-44.

Munday, M. (1992) 'Accounting cost data disclosure and buyer-supplier partnerships –a research note', *Management Accounting Research*, Vol. 3 No. 2, pp. 245-50.

Peng, M. W. (2000) 'Business strategies in transition economies', Sage Publications, Inc.

Shank, J. K. (1989) 'Strategic cost management: New wine or just new bottles', *Journal of Management Accounting Research*, Fall.

Stalk, JR. G. (1988) 'Time - the next source of competitive advantage', *Harvard Business Review*, July-August.

Sodahl, L. O. (1983) 'Improving the productivity of inventory capital: A challenge to top management', *Proceedings of the 26th Annual International Conference of APICS, New Orleans, LA*, 1-4 November.

Pietro R. and Marco F. (2012) 'Designing and implementing open book accounting in buyer–supplier dyads: A framework for supplier selection and motivation' *International Journal Production Economics*, No. 137, PP. 68-83

Thrane, S. and Hald, K. (2006) 'The emergence of boundaries and accounting in supply fields: the dynamics of integration and fragmentation', *Management Accounting Research*, Vol. 17 No. 3, pp. 288-314.

Thrane, S., Nielsen, H. and Bautrup, T. (2008), 'Opening the books – black boxing risk, profit and opportunism', *Proceedings of the New Directions in Management Accounting – Innovations in Research and Practice Conference, Brussels, 15-17 December.*

UNIDO (1998) 'Characteristics of industrial sector in Egypt' National Accounts Statistical Data Base, UNIDO.