



Production Planning and Control Strategies Used as a Gear Train for The Death and Birth of Manufacturing Industries

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Abstract

This study is conducted to develop innovative production planning and control strategies to manufacturing industries so as to improve production performance and competitiveness of basic metal sectors. Though the study was conducted through field observation and questioner used as primary data and literature review on research articles, books, and electronic-sources which used as secondary data. While the questioner and field observation data collection were done from two selected Ethiopian basic metal industries. Since the collected data were employed by both using descriptive and empirical analysis. Waste in the production process, poor plant layout systems, defective products, improper material requirement planning, deficiency on control and monitoring systems, insufficient inventory control, poor workflow strategies, null warehouse management systems, problems in information systems and information management strategies were investigated as the main challenges of developing the nation basic metal industries. As a result of these challenges, the performance and global competitiveness of local basic metal industries are poor and weak. As well the literature's finding endorse that production planning and controls have gradual advancement in developed manufacturing industries but it is found to be at its infant stage in developing manufacturing industries. Due to these challenges and weak performances on the developing firms, the entire production process on the industries was declining, and then they approach to die. Though the new production planning and controlling strategies can bridge the gap and birth will begin within proper implementations of the model to basic metal industries.

Keywords: Production Planning and Control; Death and Birth; Manufacturing Industries, Basic Metal Industry; Implementation; Innovative Conceptual Model.

1. Introduction and Back Ground of the Study

Manufacturing industries wish to satisfy customer demands expressed in terms of real or estimate need and expectations. Moreover, due to the current technological developments, manufacturing companies need to perform engineering changes in manufacturing systems to adapt their manufacturing program and enhance the products, while reducing manufacturing costs. These needs various facilities are complex, dynamic, stochastic systems. Starting at the beginning of organized manufacturing, workers, supervisors, engineers, and managers have developed many clever and practical methods for controlling production process and activities (Denkena & Winter, 2015). Consequently manufacturing industries have recognizing the importance of numerous manufacturing strategy in their businesses performance and efficiency (Bonney, 2000). From those strategies, production planning and controls have an important role in organizations to achieve firm performance and a competitive advantage. Since this strategy provides to meet customer expectation, reduce production difficulties and enhance the birth of manufacturing industries at higher extent. Moreover, in a complex manufacturing environment, a comprehensive production planning and controlling process are adopted in order to ensure the best utilization of resources, improve production capacity and

metal manufacturing investment in various nations were increased because of the sharp importance of a skilled workforce, technological exchanges, supply-chain logistics, and emphasis on scale economies (Dametew & Ebinger, 2017). Also, the higher extent that technological innovation and information technologies drive productivity growth, many other sectors are now at the advantage with respect to attracting metal manufacturing investment. Though production and controlling system provide used as a gear train on to basic metal industries' performance on the production system and make the sector more competitive. In this range production planning and control (PPC) systems are crucial for Basic metal industries (BMIs) firm to meet the increasingly high customer demands and expectations and the performance and comparative advantage of the firm (AW, D, & F, 2017). Though production planning and control system that leverages distinctive competencies in a firm's process is a potential source of competitive advantage. As well the approach involves system and resource planning, capacity and resource allocation, setting up and control framework. Also, the technique is used for foreseeing every step in a long series of separate operations, each step to be taken and control at the right time and in the right place and each operation is to be performed in a maximum efficiency (Alie, Dametew, & Kitaw, 2017). This ensures entrepreneurs to work out the quantity of material,

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manpower, machine, and money required for the pre-determined level of output in a given period of time. Thus, it is necessary to explore the effect of production planning and control on Basic metal and engineering industries (BMIE) performance and competitiveness. As a result, this study is intended to investigate and assess the practices, the impact of production planning and control on Ethiopian Basic metal industries and Way forward for improving the firm performance and global competitiveness was done.

1.1. Statement of the problems

Basic metal and engineering industries considered as the backbone and the most important source of economic growth and development (Dametew & Ebinger, 2017). Nevertheless, the Ethiopian basic metal and engineering industries are characterized by the lowest level of industrialization and technological capability. This is due to poor decision-making, problems procurement, production, in transportation and distribution, the technology employed, technology commercialization, technology adoption (Dametew & Ebinger, 2017), production volume, product quality, labor skills and export capacity, in information processing and communication in the sector (Alie et al., 2017), (Homma & Ababa, 2010). In addition, the high cost of imported raw materials, infrastructure problems (including power fluctuations, ports, logistics facility), labor-intensive production systems, are the main challenges that have been seen in Ethiopian basic metal and engineering industries (AW et al., 2017), (Kitaw Y. L., 2014). Due to this constraints the performance and global competitions of basic metal and engineering industries are weak and poor. Thus, to tackle the above problems this research was designed.

1.2. General objectives

The main objective of this study is to investigate the roles of production planning and control systems on the birth and death of basic metal industries, so as to achieve global competitions through developing innovative improvement strategies.

1.3. Specific objectives

- Assessed the current trends of production planning and control systems on manufacturing industries.
- Investigate the challenges and opportunities of production planning and control in the context of developing nations including Ethiopia.
- Study relation of production planning and control with the birth and death of basic metal and engineering industries.
- Analysis the gaps and strength of previous researches on of production planning and controlling strategies.

To develop optimum production planning and controlling strategies in improving the performance and competitive advantage of basic metal industries.

1.4. Research methodology

The study was conducted through field observation, a literature review of research articles, books, magazines, manuals, company report and electronic-sources which are discussed related to basic metal industries the roles of production planning and controlling on the death and birth basic metal industries, the trends, challenges, growth, opportunities the impacts of production planning and controlling on basic metal and engineering industries performance and global computation were assessed. Go after by model development based on the literature survey and case study analysis is done. Finally, the conclusion and recommendation of the study are done. Since for analysis of the problems, the researcher mainly uses the Analytical hierarchy process (AHP) empirical and descriptive analyses were employed.

2. Literature Reviews

2.1. Introduction

In this section from the previous research work a total of 67 articles were found to be assessed and reviewed in related to the concept and roles of production planning and control on manufacturing industries. Though initially the definition, concept, theory of production planning and control role in manufacturing industries were employed. Then we expressed the components, principles, functions and strategies and roles used in production planning and controls to manufacturing industries also incorporated. Accordingly the previous research gaps and miss concepts were investigated.

2.2. Definition of terms and concepts production planning

Planning is the process of selecting and sequencing activities such that they achieve one or more goals and satisfy a set of domain constraints. IT looks ahead, anticipates possible difficulties and decides in advance as to how the production, best, be carried out.

Control: phase makes sure that the programmed production is constantly maintained.

System: isa function is to convert a set of inputs into a set of desired outputs.

2.3. Production scheduling

Scheduling deals with the efficient allocation of tasks over resources. The general scheduling problem is, given a number of tasks and a number of resources, set the dates when each task should be accomplished on each resource. Since production scheduling is a decision-making process that is used in manufacturing and service industries to achieve efficiency and minimize production cost. Production schedule framework should be designed to meet company goals filling customer requirements with minimum total cost (Opoku, 2013).

2.4. Production control

Production control (PC) is the function of management which plans, directs and controls the material supply and processing activities in an enterprise (Fernandes & Godinho Filho, 2011). Since PC concerned with, determining whether the necessary resources to implement the production plan have been provided. If not, it attempts to take corrective action to address the deficiencies (shortages). Also, Shop floor control, Inventory control are the main activities of production control.

2.5. Production planning

is the planning of production and manufacturing processes in a company or industry. Planning is also the primary managerial function for enterprises, which is the direction and instruction to coordinate and cooperate the enterprise's overall operation (Wang & Liu, 2013). While this is one of the most important activities in manufacturing enterprises. Since production planning, utilizes the resource allocation of activities of employees, materials and production capacity, in order to serve the customers. However, production planning and control (PPC) plays a fundamental role in any manufacturing unities. This provides making a routine for proper plant layout, raw materials requirement, utilizing resources, and maintenance of machinery are done. This results in a positive way by the improvement of productivity, quality, customer satisfaction, profit, and global competitiveness. In the meantime, PPC concerned with implementing the plans, i.e. the detailed scheduling of jobs, assigning of workloads to machines (and people), and the actual flow of work through the system (Yang, Arndt, & Lanza, 2016). Also coordinate with different departments: such as production, marketing, logistics, warehouse and other departments depending upon the nature of organization. The other point is there are different types of production methods are found in a manufacturing firms, such as single item manufacturing, batch production, mass production, continuous production etc. have their own type of production planning. Production planning can be combined with production control into production planning and control, or it can be combined and or integrated into enterprise resource planning. Since currently, the framework that is most commonly applied to the deconstruction of planning activities is the use of three hierarchical levels that range from strategic to operational planning are strategic planning ,tactical planning and operational planning focuses. Since typically, these activities include the detailed production scheduling, inventory control, and lot sizing. Since mainly production planning concerned with deciding which products to make, how many of each, and when they should be completed, scheduling the delivery and/or production of the parts and products, planning the man power and equipment resources needed to accomplish the production plan and major activities like MRP,MPS(MPP),CP,APP are emphasis by production

planning. Besides production planning system through master planning have to covers that part of the continuum that takes the business plan and converts it into a matching sales and operation plan. Since mainly master planning provides to enhance, forecasting and demand management, production planning (sales and operations planning), resource planning and master production scheduling.

2.6. The Master production schedule (MPS)

The master production planning/ master production schedule (MPS) sets the quantity of each end item to be completed in each week of a short-range planning horizon. The MPS sets its production schedules based on forecast, orders and lot size of the customer order (Kitaw A. M., 2014). It uses information from both forecasts and orders on hand, and it is a major control (driver) of all production activities. In fact, the MPS begins as a trial schedule. If these schedules are feasible, the schedule becomes input for the MRP system. MRP sees this schedule as given: the system cannot check if a schedule is correct or incorrect, for example if a schedule goes beyond production capacity or not. The MPS can be updated or modified anytime a production-manager wants. As a result of these changes the MRP-input changes, as does the production output. Thus the MPS is in reality the mother of all schedules, and it is a plan for future production of end items, set by market forecasts, customer orders, inventory levels, and other information necessary to make correct schedules. Hence, an effective master production schedule provides the basis for , Making customer delivery promises , exploit the capacity of the plant effectively, Attaining the strategic objectives of the firm as reflected in the production plan and Resolving tradeoffs between manufacturing and marketing .

2.7. Aggregate production planning

Aggregate production planning (APP) is the process of determining output levels of product groups over the coming six to eighteen months on a weekly or monthly basis; the plan identifies the overall level of outputs in support of the business plan. The APP is a medium-term capacity planning that determines minimum cost of workforce and production plans to meet customer demands. Main inputs of aggregate production planning are resources, demand forecast, and employment policies. Since APP aim is to determine the production quantity and inventory level in an aggregate term. However, The Company starts its plan by stating its business plan. A business plan is a statement of an organization's overall level of business activity for the coming six to eighteen months, usually expressed in terms of monetary values of sales for its various product groups.

2.8. Material requirements planning (MRP)

After preparing the master production schedule, we need to think of availing all the necessary materials to manufacture the planned items. Materials requirements planning (MRP) is a means for determining the number of parts, components, and materials needed to produce a product. MRP provides time to schedule information specifying when each of the materials, parts, and components should be ordered or produced. In a comprehensive definition, MRP is a time-phased priority-planning technique that calculates material requirements and schedules supply to meet demand across all products and parts in one or more plants. This is a material control system that attempts to keep adequate inventory levels to assure that required materials are available when needed. Although Materials Requirement Planning (MRP) is based on the philosophy that each raw material, part, and assembly needed in production should arrive simultaneously at the right time to produce the end items in Master Production Schedule (MPS). So inventory levels could be reduced, production capacity could increase as well as the profits. However, an MRP package takes into consideration: Customer Orders, Forecasts, and Shop Orders, Parent part requirements, Inventory Management, Bills of Materials (BOMs), Purchasing, Receiving, Stockroom Control, Accounting, and Invoicing. In addition, the above different production and scheduling strategies are used by many companies around the world. Some of these most commonly used strategies are Chase strategy, Make-to-Stock, Assemble to Order and Make to Order(Saharidis, Dallery, & Karaesmen, 2006),(Kitaw A. M., 2014) (Shivam Bansal, 2015).. These strategies allow manufacturers to produce goods in long

production runs, taking advantage of production efficiencies, the company continuously produces goods equal to the average demand for the goods, produce goods after receiving an order from the customer and assembled products from a stock selection of ingredients. This improves the competitiveness of the firms and enhances comparative advantage.

3. The Progress and Advancement of PPC Subsystems on Business Environments

In manufacturing industry the amount of information available to manufacturers and their suppliers for decision-making has become an important factor in improving manufacturing productivity. Manufacturing firms have always sought ways to improve their competitiveness. During the first half of the twentieth century, internal manufacturing efficiency on the shop floor was largely sufficient for successful operations. Though, with growing struggle, companies have been forced to find new ways to improve their operations and to look beyond the walls of the factory. Currently, manufacturing firms need to be competitive in different aspects, such as quality, delivery, cost efficiency, and flexibility, and must therefore plan and control their operations accordingly (Kitaw Y. L., 2014). Since for achieving sustainable and competitive production environment planning and control task has become more critical for improving complex systems ; lead times are shorter, improve product life cycles, reduce bottlenecks more effective and efficiently.

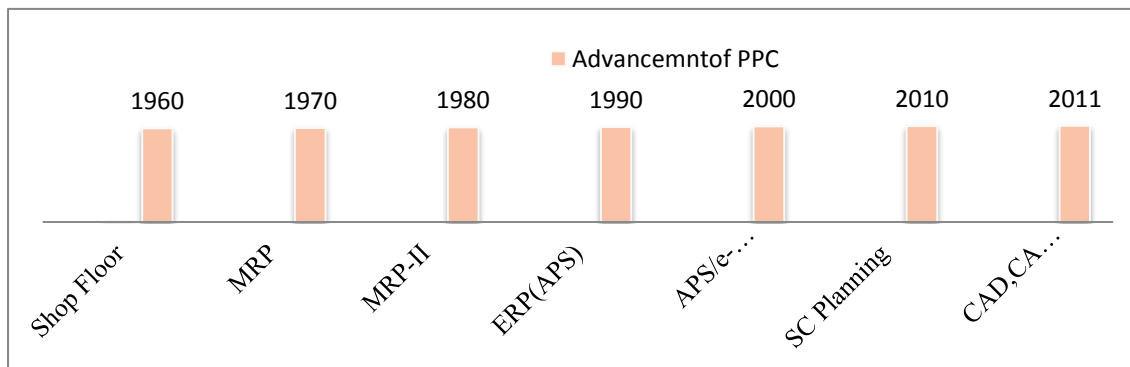


Fig. 1. The growth of Production planning and control Systems, Source: (Kitaw Y. L., 2014)

The above figure illustrates how the important point of production planning and control has shifted over the last 50 years. The perspective has successively evolved from lower (shop floor) to higher planning and control stages. The figure clearly show that the developments in information and communication technologies (ICT) have assist the gradual improvement of computer based systems for PPC. Thus, current advanced PPC systems significantly utilize advanced computerized systems and programs. This is highly interlinked with the fact that manufacturing has been simplified with Computer Aided

Manufacturing (CIM) systems (Kitaw A. M., 2014). In addition to this Computer-aided design (CAD) is provides any design activity that involves the effective use of a computer to create, modify, analyze, or document an engineering design. CAM/CIM mainly concerns for Flexible manufacturing systems can react quickly to product and design changes. A FMS includes a number of workstations, an automated material handling system, and system supervisory computer control. Since due to the global competition and fast change customer requirements, implementing CAM/ CIM systems in

manufacturing industries is beneficial. Because CIM program could provide products with better quality, lower costs, better support, and in a short lead-time. But Implementing CIM requires organizational and technical Thus Ethiopian Basic metal industries should considered Computer-integrated manufacturing (CIM) for blend recent developments in manufacturing with information technology to achieve competitive advantage. In manufacturing system production planning and control systems have great impact for the overall performance of the firm. Though humans, machines, systems, strategies and equipment are combination of manufacturing systems that are bounded by a common material and information flow (Academy, 2007). Though in these various manufacturing systems or for any production unit production planning and control (PPC) plays a crucial role in production facilitator, for quality improvement, firm efficiency and have to deliver the product within

understanding and strategic approach. As a result any organization should know the way of implanting CIM approach for program improvement and global competitiveness.

schedule time and product performance. While for business environment, the manufacturing systems on planning and decisions hierarchy have three main stages and components (Academy, 2007). This consists of strategic (i.e., choice of a general goal), tactical (i.e., choice of an approach to reach the goal) and operational (i.e., application of this approach and control of the result). As well the organizational level on which the decisions are taken (strategic decisions should be made at the highest decision level, operational decisions at the lowest). In the third the horizon of the decision making (long horizons at high levels, short horizons at low levels).

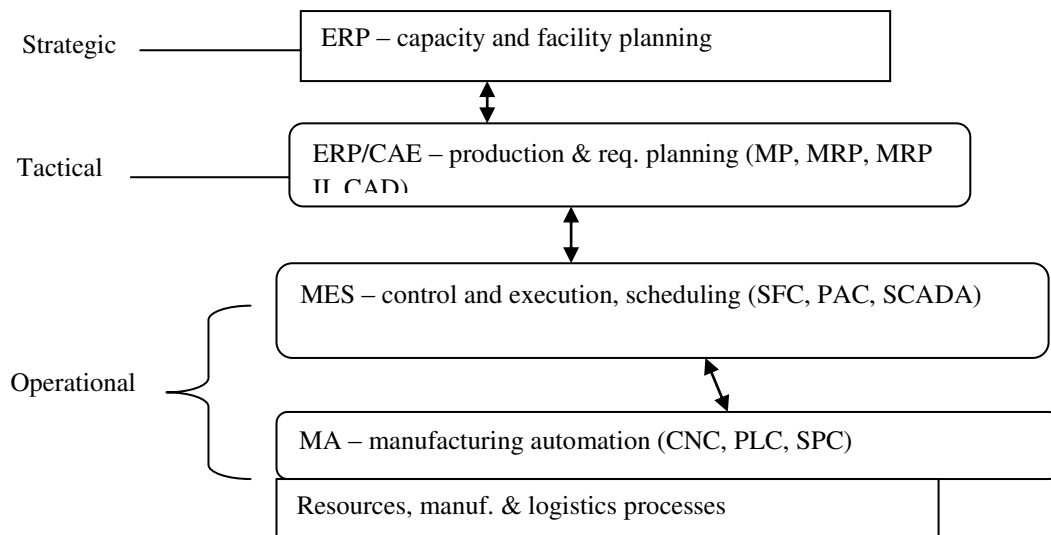


Fig. 2. Planning and decisions hierarchy, as well as related manufacturing information systems (source(Pfeiffer, 2007))

Though production planning and control is an important tool in a manufacturing industries due to it consists of four main steps like- routing, scheduling, dispatching and follow up. In these extent the application of production planning and controls in manufacturing firm provides to reduce the idle time of the worker and optimum utilization of inventory while doing the production in the industries.

3.1. Births of manufacturing industries

The birth of manufacturing industry mainly starts from the new businesses go through different phases. A new manufacturing industry often starts with an idea in the mind of an entrepreneur, then emerges in a home office setting with only the founder or founders as employees, and finally reaches the point at which it hires additional labor. Though the concept of manufacturing industry

counted as an establishment birth, a State-level firm birth, and a national-level firm birth. In the contradictors manufacturing industries reduce their performance time to

births seems self-explanatory, in practice, measuring business births and deaths raises a number of definitional issues that have to be resolved. Since lone important question is whether births should be identified and measured at the point at which employees are hired or sometime prior to that (Sadeghi, 2008).

While, Births at the firm level are referred to as entrepreneurial births; they measure strictly new business creation and the spread of entrepreneurship and innovative activities. This innovative activity consists of the application of improvement strategies, the performance improvement of manufacturing industries, lunning of resource utilization approaches, and higher extent customer satisfactions are considered as the symptoms of industry births. Accordingly when an establishment opens for business for the first time, it is

time, move below the expectations, poor customer's satisfactions crates the death of manufacturing industries. In most developing nation industries including Ethiopia

the production performance and global competitions are poor and weak. These is due to problems on raw materials, infrastructure problems (including power fluctuations, ports, and logistics facility), labor intensive production systems, problems in innovation and technology transfer(Dametew & Ebinger, 2017).However Ethiopian basic metal and engineering industries is characterize by lowest level of industrialization and technological capability, weak performance in quality, fiancé and global competitions (Kitaw A. M., 2014),(Alie et al., 2017),(Homma & Ababa, 2010). As a result of these constraints and a correction actions are not take in to account the sectors starts to death.

4. Analysis and Discussion

In the literature review sections was presented on variety of perspectives towards production planning and controlling concepts, theory, function, the practice, implementation strategies, the models that developed and practiced for manufacturing industries, so as to improve manufacturing firm performances and comparative advantages. Though, a general so far important issue is that many of the studied articles have hardly built on previous works. Most researcher seem to open a new window and develop their argument, models, factors, parameters, the potentials for considering the preview related works. While, most researches(Kia, Javadian, & Baboli, 2011),(Makarewich, Dwyer, & Cantu, 2015),(Clotet, 2015),(Farzam Rad & Shirouyehzad, 2014),(Nieminen, 2014),(Pochet, 2001),(A. Gunasekaran*, 1994)conducted and done using different types of models but they analysis and studied some aspects of production planning and control. Accordingly each of the papers has not any certain rationale for choosing the models they used. Although, the challenge for today's business companies is not only how to adapt to changing business environment but also how to draw competitive advantage from the way in which they choose to do so. Seeing that, a root to achieve competitive advantages, the companies have happening to seek to optimize production systems. Given that, traditional production planning, scheduling and control mechanisms were found insufficiently flexible to respond to this new paradigm. In the fact that, in the current competitive environment, effective and efficient production planning and control has become a necessity for endurance in the market place. Since, using PPC in the industry can have an advantage for customers, producers, employees and stake-holders, and also for the nation. Better planning leads to increased productivity in the firm, efficient deliveries of the products at proper time, more products available to the consumers at cheaper price, flexible manufacturing process and better quality. Another point we found that, inspiration the growing of production planning and control systems for manufacturing industries improvements. In this respective the systems was evolved from lower (shop floor) to higher planning and control

ICT support stages (Kitaw Y. L., 2014). However, this development is in a much earlier stage and by far not as widespread among the manufacturing systems as the quality and the customer satisfaction production initiative. However, the potential efficacy of improvements in manufacturing firms are evident. As main concerns of production planning and control systems are to balance from different aspects of the firms from supply of resources to demand, from the market, to allocate resources in the most effective way, from production to distribution, customer satisfaction to sustainability of the business and production to make recycling part is most promising in being effective and efficient in resource utilization and improve performance and competitiveness of manufacturing industries. On the other hand the preliminary miss point is that, in various production planning and scheduling models applied to discrete parts manufacturing industries and process industries. It is seen that models have been developed in single stage and multi-stage production environment. Most of the models in multi-stage production environment have focused on fabrication and assembly types of product structures. The production environment with recycling process and its associated complexities has not been addressed in the literature(Ezz, Steel, Ezdk, & Dekheila, 2012). But in manufacturing process recycling is an important issue in bringing down production costs. The review also indicates that, the existing models on production planning and control do not address the complexities of the production environment to improve firm competitiveness(Farzam Rad & Shirouyehzad, 2014). Since it needs to develop an integrated models to address production planning and controlling tasks, production planning and controlling decisions, inconsistency often occurs in capacity requirements of production planning decisions and controlling decisions. As well we discussed that in the above literature while the issue of developing country firm competitiveness relayed to production planning and controlling systems is not address. In addition to these most of the previous research work were done, using secondary day but to tackle the exact problems and improve the practical environment the study should supported by case studies. As a result, in this study we considered a case studies for improvement of manufacturing firms.

5. Result and Discussion

5.1. Theoretical results

Based on Field observation, Questioner and literature survey results the challenges, constraints and the performance of basic metal industries related to production planning and control systems were investigated. Though in this study observed and assessed that in Ethiopian basic metal industries, ination to their

potentials to begin to industrialization, there were a lot of problems were investigated related to production planning and control system and strategies. Based on this investigations, the sectors are hacked by various challenges including production quality, manufacturing waste, poor resource utilization, poor facility layout systems, insufficient production space, problems skill manpower, research, and development problems, lack of unity including poor coordination, low production capacity, and effectiveness and lack of smooth service and support delivery were investigated as the main challenges of the firms. As a result of this, the performance of basic metal industries are decline and the death of basic metal industries are approaches. However, successfully tackle and control the constraints of basic metal industries plays a great role in the competitiveness of sector at national and global levels. Moreover, these problem controlling systems results to the survival and the birth of the sectors.

A result from numerous manufacturing industry performance improvement systems alternative, production planning, and control has to be given the first priority. Since, improving production planning, controlling and related issue in the sector is a critical task for basic metals industries performance improvement and global

5.2. Analytical hierarchy process AHP results

Under this section, the impacts of variables could be analyzed and tested in the relations with production planning and controlling systems to basic metal industries. Since the impacts of manufacturing process performance, problems in facility lay-out, poor warehouse and resource utilization and manpower and management challenges on the performance and competitiveness of basic metal industries was investigated.

Table 1
Alternatives Variables (independent variable) Ranking

S.N	Name of Variables	Percentage Values	Result
1	Manufacturing process Performance	37.12%	Performance & Global Competitiveness
2	Problems in facility Lay-out	25.78%	
3	Poorwarehouse and Resource Utilization	23.10%	
4	Manpower and Management Challenges	15.87%	

The table above indicates that there were statistically significant differences the impacts' production planning and control on performance and competitiveness of basic metal industries. However, AHP analysis result was used to determine differences between specific variables on performance and competitiveness of basic metal industries. Though as a result, the higher value of the variables indicated in the above tables has a highly negative impact on performance and competitiveness of basic metal industries. This indicates that performance and competitiveness of basic metal industries are highly related to proper production planning and control strategies. This means that, if the performance of

production planning and control systems are poor and weak, the performance and competitiveness of basic metal industries declined. These lead to the death of manufacturing industries at higher extents. The reverse of this concept is true. That means good production planning and controlling practices improve the performance and competitiveness of basic metal industries. Due to good PPC implementation strategies, the survival and birth of basic metal industries will begin. Though the Ethiopian basic metal industries need to improved and proper production planning strategies so as to improve the performance and competitiveness of basic metal industries at regional and global levels

Table 2
Alternative-Main Criterion-Matrix That Impacts on Performance and Competitiveness of Firms

	Product quality	Resource Utilization	Integrated production	Performance & Competitiveness	Production capacity & product improvement
Manpower and Management Challenges	33.97%	28.94%	24.14%	27.61%	21.28%
Problems in facility Lay-out	14.04%	17.50%	15.34%	13.81%	16.45%
Poor Wear house and Resource Utilization	23.90%	24.63%	23.35%	19.53%	19.03%
Manufacturing process	28.08%	28.94%	37.18%	39.05%	43.24%

This empirical result is shown in the table above, the performance and competitiveness of basic metal industries at regional and global levels (such as product quality, resource utilization, integrated production, performance & competitiveness, production capacity

product improvement) highly affected by the performance of production planning and control strategies. Since good production planning and controlling systems have a positive impact on the performance and competitiveness of basic metal industries.

Table .3
The performance evaluation criteria

Strong relation	Product quality	Resource Utilization	Integrated production	Performance & Competitiveness
Manpower and Management Challenges	Consistency ratio:0.04			
Problems in facility Lay-out	Consistency ratio:0.02			
Poor Wear house and Resource Utilization	Consistency ratio:0.02			
Manufacturing process	Consistency ratio:0.04			

The above table shows that, the major variables of production planning and control strategies were affect the final performance of the performance and competitiveness of basic metal industries in terms of quality, resource utilization, integrated production systems, , production capacity & product improvement in the firms. Thus , this AHP result supports to field observation and literature review investigations.

6. Development of Improvement Strategies for Firm Performance

6.1. Birth of manufacturing industries with P(PPC)

Manufacturing including basic metal industries should have an effective and efficient production system to accomplish the goal and objective through integrated production systems. Because the integrated production systems consist of material, people, equipment, and procedure designed for the combination of materials and processes that turn the industries manufacturing process and operations. While these all activities could be control and guided by well-organized production planning and control systems. Because production consists on to the industry physical equipment, production equipment, manufacturing shop layout, the arrangement and sequence of the facility, material handling equipment systems, material resource planning, warehousing systems, and management information systems also considered under this production systems. Since the adoption and implementation of proper production planning and control systems have a great role in the performance and competitiveness of manufacturing industries as a whole. Specifically the birth and the survival of Ethiopian basic metal industries highly influenced and supported by production planning and control strategies. Thus, production planning and control strategies can be used as transmission gear for the death and birth of manufacturing industries.

6.2. Therelatives behind transmission gear with PPC

The Ethiopian basic metal industry produces two categories of products: long and flat products. Long products include reinforcement bars and tubular sections and wires, while flat products comprise LTZ profiles and various sheets: such as steel (lamera), corrugated, and EGA. The engineering sector consists of manufacturers of doors and windows, tankers, vehicle bodies, truck trailers, spare parts, and machinery like concrete mixers and vibrators (Agency (JICA), 2010). While, basic metal industries could have an effective and efficient production system to accomplish its production operations. These production systems consist of material, people, equipment, and procedure designed for the combination of materials and processes that turn the industries manufacturing process and operations. However, these all activities could be control and guided by production planning and control systems. But in the context of Ethiopian basic metal industries, not such practices the systems and the strategies.

As a result of such challenges during our filed observation web served that, the performance of basic metal sectors in terms of, production equipment arrangement, manufacturing shop layout, the arrangement and sequence of the facility, material handling equipment systems, material resource planning, warehousing systems, and management information systems are poor and weak. Though the flow, procedure, inspection, and evaluation and approval of the above activities in manufacturing industries can't be organized and controlled by the proper productions controlling systems. This semis to a miss aliment and disengagement of gears on the transmission systems. A gear is a wheel with teeth that mesh together with two or more other gears. Since this meshed gear provides to change the speed, torque (rotational force) and direction of rotating axles to product mechanical outputs. Given that, as result of this transmission gear, accelerate or decelerate the speed, rotation, direction of the mechanical machines (2017, Created by REV Robotics, 2017)

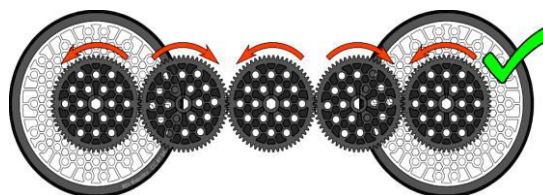


Fig. 4. A: correct arrangement of gear train

In the figure 4.A. above shows the simple gear train how works in properly to produce outputs. In this example, the gears on the end are linked to the drive wheels and one of the center gears would be driven by a motor power imputes. The bright arrows indicate the relative rotation of each of the gears showing that the two wheels are mechanically linked, mesh and will always rotate in the same direction. Since idler or change gears reverse the direction of rotation, it is important to pay attention to the number of gears in the drive train. This idler gears are a

good way to transmit power across distances in the given machine to produce mechanical outputs. From this analysis, we observe that with the engagement of two or more things have great powers to change the soundings. Also as we know our practical experience a small idler or change gear also have a great role either by changing the direction of machine rotation or by accelerating the speed, torque, and rotation of the machines to make products.

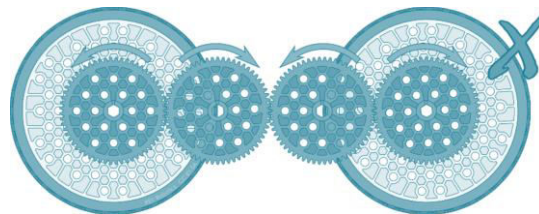


Fig. 4. B: incorrect arrangement gear train

On the other side in figure 4 BB. above indicates, because of improper arrangement and mismatched gear assembling, used on the gear train, always spin in opposite directions which is incorrect and will get that robot nowhere fast. This alignment results, damaging of the gear train, overheating of the machine, poor quality products, finally the entire machine not properly work as a whole. Since when to use a gear as transmission propose, engineers should select, and use the correct type, size, proper number of gears, the maximum transmission capacity of the gear as well as the machine. The working condition, type of mechanical devices, type of the In addition to this, production improvement easily achieved by coordinating and integrating the entire systems rather than individually. These results the birth and survival of manufacturing industries at various extents including proved quality, efficiency, resource utilization, the flexibility of the systems and provides to achieve customer satisfaction. Thu, proper adoption and implementation of PPC us as a proper mash gear train, that drives the entire systems in effective and efficient manners. Ultimately, the PPC as a mesh gear train creates the birth and survival of manufacturing industries. Because proper PPC adoption will be counted as a sector -

material that will process and used also considered during the selection and implementation of gear trains. Likewise, in manufacturing industry production planning and control systems work as transmission gear for the company. While using and implementing a single production planning and control systems have large impacts to change the situation of manufacturing industries. Because all the activities on the firms can be engaged and meshed together through production planning and control strategies, there have great potentials to accelerate the growth, productivity, and competitiveness of manufacturing industries. level firm birth. The sectorial births are more indicative of entrepreneurship than establishment-level births. Though births at the sector level are referred to as industrial births; they measure strictly new business creation and the spread of industries and innovative activities in various range and performances. Though Ethiopian basic metal industries should use and adopted an integrated PPC strategy throughout their systems, so as to improve the performance and competitiveness of the firms. From this investigation, we have to develop the following strategies and principles.

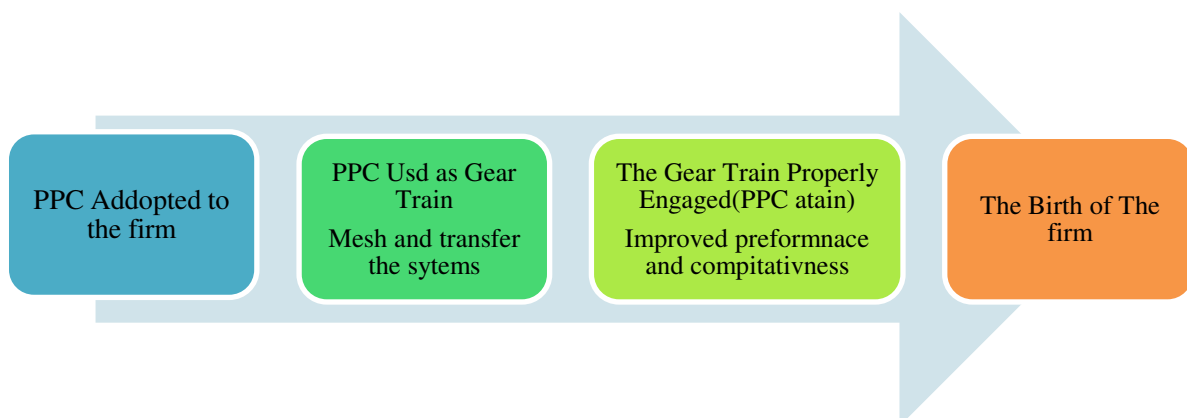


Fig. 5. Production planning and control strategies used as Firm Birth (Adopted by the author)

Bides, as we have seen from gear principle improper selection and application of gear trains results to the decline of the machine and manufacturing systems as a whole. From this principle, perceives that improper and non-implementation of PPC on manufacturing industries result for the decline of the firms and poor competitiveness. So to improve the production capacity, profit, performance, and global competitiveness, especially developing nation manufacturing could apply the correct gear train principles to use PPC in their firms.

6.3. The way forward for strategies implementing PPC to Basic metal Industries

Therefore, to attempt the above problems the production planning and control approaches should be applied to Ethiopia basic metal industries. Thus, for using implementing PPC to basic metal industries the following strategies are ways forward for sustainable basic metal industry development and contribute competitiveness in the country.

- While there are a variety of considerations that go into the development and implementation of an optimization model for manufacturing planning and control. Any planning problem starts with a specification of customer demand that is to be met by the production plan. In most contexts, future demand is at best only partially known, and often is not known at all. Consequently, one relies on a forecast for future demand. To the extent that any forecast is inevitably inaccurate, one must decide how to account for or react to this demand uncertainty.
- Even if, single PPC methods have limitations on performance and competitions of the firms. However, to overcome the limitation of standard individual PPC systems such as MRP, MPS, CP or other, it is possible to develop a hybrid system to combine two or more systems have an impact on changing the environment. This is done combining the advantages of PPC elements (like MPS, ERP, MRP) simple logic and theory of constraints (TOC) ability to synchronize all production and material flow in a manufacturing firm. Because TOC is a systematic management approach that focuses on actively managing those bottlenecks that impede a firm's progress toward its goal of maximizing profits and effectively using its resources.
- Manufacturing workshop should be both flexible and effective nature to improve the competitive performance of the industries. Both flexibility and efficiency through Product and Process Layouts. Basic metal industries should consider hybrid production/facility layout methods. Since the arrangement of the facility provides in such a way that, the systematic and functional arrangement of different departments, machines, equipment and services in a manufacturing establishment.

- The main objective of layout design, that is to minimize distance traveled, is not always suitable for all the manufacturing industries. Some congestion in a specific area may have to be tolerated while maintaining minimum separation between facilities. Instead of the criterion of minimizing total distance traveled, one may wish to minimize the maximum distance traveled. Since by considering this concept basic metal industries also should emphasis warehouse design and implementations.

7. Conclusion and Recommendations

7.1. Conclusion

This study indicates that there was a considerable positive relationship between performances of the performance and competitiveness of basic metal industries with PPC. Improving the extent and the level of production planning and controlling strategies highly impact on performances of the performance and competitiveness of basic metal industries. Though to secure performance, sustainability, individuals, organizations, firms, and nations should be applied and implemented on various strategies and systems. As well according to the investigations basic metal industries imperative the efficiency, the integrate their systems in line to cooperate in solving the environmental, resource, quality, social, economic problems achieve sustainable growth, enhancing mutual benefits from the common world. This sustainable benefit is assured by sustainable production planning and control system and strategies. Afterward, this study has contributed to a new model which spread out improve basic metal sectors of the performance and competitiveness contexts of quality, flexibility, effectiveness, whereby shows the direct and positive relationships between performances and competitiveness of basic metal industries with production planning and control strategies. Though this model contributes to the improvements long-term cooperation and competitiveness of basic metal industries at a global level. Moreover, the models provide to contribute the birth and survivable of basic metal industries at regional and global levels. In conclusion, these results propose that strong production planning and controlling strategies have highly improved the performance and competitiveness of basic metal industries but it requires high cooperation and collaboration from the individual level to firm and countrywide. In addition, under different circumstances specific production planning and controlling practices might be required for the skill, cooperation of various responsible. While to improve the deficiency that has seen in the sector, innovative production planning, and control improvement model has been proposed for implementation in Ethiopia basic metal industries for the firm performances improvement and global competitiveness.

7.2. Recommendation

- It will not totally be a question that the competitiveness of the basic metal sector in Ethiopia should increase this time. Nevertheless, the approach to attain better competitiveness situation is the challenging issue. As alternative means to sector improvement and growth, Ethiopian basic metal industries can implement production planning and control strategies as a better choice for sector performance and competitive advantages. Since, there has to be a strong commitment to responsible bodies towards implementation of the systems.
- Also Basic metal manufacturing process always supported by research and then every industry should have research and development center.
- Future research study , use this study as reference for developing integrated production planning and control frame work to basic metal industries.

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