

# Innovative Supply Chain Integration Approach on the Dynamic Capability of Small and Medium Industries (SMIS)

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## ABSTRACT

The main objective of this study is designed to investigate and develop innovative supply chain integration approaches so as to improve the performance and competitiveness of manufacturing industries in general Small and Medium Industries (SMIS) in particular. Mainly this study is conducted through primary data from industry field visit and secondary data from literature review on research articles, books, manuals, company report and electronic-sources which are related to the concepts, strategies and issue on supply chain and innovative supply chain capabilities. The survey data were analyzed qualitatively in descriptive and quantitatively through Analytical Hierarchy Process (AHP) tools. This study shows that manufacturing industries are under stresses to find new innovative methods to improve and gain competitive advantages and increasing their performance at regional and global levels. These stresses are found due to product demand-supply uncertainty, the complexity of new products, unstable world, unbalanced technological change, manufacturing firm needs for emphasis for single companies moving the competition in supply chain networks. Whereas the developed innovative and integrated supply chain approaches provides to use as a weapon to tackle manufacturing industry challenges in various scenario and segments within manufacturing and business process. This innovative approach also provides to enhance innovation capitalists on the firm through strong collaboration manufacturer with the customer in new product development, innovations in distribution, transforming raw ideas to technology transfer and commercialization. As well to attain an effective and efficient cooperation, coordination and relationship, supply chain partners within SMIs. Thus, these innovative supply chain integration strategies fully considered the integration of firm through sustainable and green economic and competitive advantages.

**Keywords:** Dynamic capability; Innovative supply chain; Integration approach; Performances

## INTRODUCTION

In current business process firms hampered in various constraints including increasing competition, increasing demand and supply uncertainty, higher complexity of new products, unstable world and technological change needs for emphasis for single companies moving the competition in supply chain networks [1]. As a result manufacturing firm are stresses companies to find new innovative methods to gain competitive advantages and increasing their performances [2]. Since firms are searching a solution to tackle such problems provides to enhance competitive advantage from the global markets. Innovative products and services to their customers. Since innovation capitalists create market-ready concepts by building on and transforming raw ideas that are sold to customer companies in order to be industrialized and commercialized. Also create an effective relationship, client companies should provide innovation capitalists with direction and guidance about their product gaps, innovation priorities, and business goals by sharing information based on a trusted and long-term relationship. Though innovation is an idea, concepts, practice, or object that is perceived as new by

an individual or other unit of adoption. Innovation is also seen as a process of idea creation, a development of an invention and the beginning of a new product, process, technology, systems or service to the market so as to solve problems to the community. Currently innovation is an essential element for economic progress of a country and competitiveness of manufacturing industry. According to Sidek, et al. argues that innovation is one of the most important competitive weapons and generally it seen as a firm's core value capability [3]. In addition innovation describes as an effective way to improve firm's productivity due to the resource constraint issue facing a firm.

Although a firm's capability to successfully leverage the distinctive competencies of firms in their supply chain is critical to sustaining the competitive advantage of the firm itself. This supported by Rhey, et al. as innovation within supply chains pertains to how firms leverage suppliers to develop more effective ways to serve either existing or new markets, whether by harnessing existing knowledge or by creating new knowledge [4]. While innovation that leverages distinctive competencies in a firm's supply chain is a

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potential source of competitive advantage. Though, firms develop their capabilities to use supply chains to knock innovations that sustain their competitive improvement.

Even though the innovation practice of developing countries are infant. According to Forum, 2013-14 classified Ethiopia among low income countries, as factor driven countries, ranking 127 out of 147 countries. Companies in these factor driven economies are characterized by low competitiveness with low technological readiness and innovativeness [5]. This calls for effort to be driven towards analyzing this low competitiveness of firms in sectors selected as strategic development sectors of Ethiopia. In addition key question is whether the practice of innovation and supply chain can make an impact on metal industry efficiency and performance. In this paper we intend to fill this gap, by discover the impacts and role of technological innovation for sustainable supply chain integration of metal industries on the development of competitive advantage throughout the supply chain. Though using data collected from literature review on significant value in innovation, supply chain integration and practices is applied. Since this study is intended to study the impacts of technological innovation and then to develop conceptual framework for enhancing sustainable supply chain integration on basic metal industries performance and global competitiveness.

### Statement of the problems

Nowadays, supply chain integration, innovation and technology transfer has become the most important source of economic growth and development. However Ethiopian economy, is characterized by lowest level of industrialization and technological capability being core manufacturing sectors, such as steel manufacturing industries, are least developed in many aspects such as, technology employed, technology commercialization, technology adoption, production volume, product quality, labor skills, and export capacity [6]. In addition the technological capability of local industries to adopt, modify and improve a given technology is infant and very weak [7]. Due to this Ethiopia basic metal industry are infant for Growth Transformation Program (GTP) economic contribution and poor competitive advantages. Since to tackle the above problems this research was designed.

### Objective of the study

**General objectives:** The main objective of this study is to develop innovative supply chain integration strategy on the dynamic capability of SMIS for improving productivity and firm performances.

#### Specific objectives:

- Assessed the current trends of technological innovation on manufacturing industries.
- Investigate the challenges and opportunities of supply chain innovation in the context of developing nations.
- Study relation on innovation with supply chain integration and sustainability.
- Analysis the gaps and strength of previous researches on technological innovation.
- To develop optimum technological innovation frameworks on sustainability of supply chain integration and improving competitive advantage on basic metal industries.

## LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENTS

Firm performance is a picture of how big the success of organizations can achieve it's their intended goals with the level of efficiency and effectiveness of the manufacturing company and the expectation of customer with time, money, quality, flexibility and cost. Meanwhile,

according to Abdulah Rakhman, et al. performance is how companies can improve productivity and reduce inventory and cycle time to increase market share and profits for all members of the supply chain [8]. However, firm performance is achieved by different system and methods. Although the previous study indicates that Kwak, et al. and Dametew, et al. for frequent collaboration firms in the supply chain compete with each other using innovative technologies such as web-based orders and integrated communication systems for knowledge and network formation [9,10]. This provides the appropriate degree of integration and collaboration and a core catalyst for better performance in the supply systems. However, the process of innovation, knowledge is an essential element and in the present competitive environment innovations help gain an advantage over other organizations. Since innovations are and will surely continue to be a means for organizations to survive in today's turbulent and highly competitive environment [11]. Since, innovation is the fundamental basis for creating firm specific asset that enable a firm to achieve sustainable advantage and improve its corporate performance. However innovations are a key source of a competitive advantage that determines the economic success of each organization. Organizations wish to survive and grow in today's turbulent environment, they have to make every effort to introduce an innovative approach and creativity; therefore top management's support is essential. Thus, innovation is concerned with the process of commercializing or extracting value from ideas. From this perspective, innovation would be expected to be closely linked to firm performance. Indeed there is widespread support for the assertion that firms must be innovative to survive and prosper in a competitive economy. From the research study by Lahovnik M, et al. the study identifies that technological innovation capability is a dominant source of competitive advantage and thus underpins performance of a firm [12]. Their study conducted in such a way that introduced the core ideas of the perspective of dynamic capabilities as the latest approach in the theory of strategic management, and presented the relevance of continuous innovation in today's environment.

Then they extended the importance of deploying technological innovation capability as a dynamic capability in a global dynamic environment such as the home appliance industry. Also the study examines the relationships and interactions of the dynamic capabilities, for example, marketing capability, and their influences on performance, technological capability with firm performance. We observe that there is a good approach conducting the study within that level but they miss other crucial concepts like, the relation technological innovation, with sustainability, technological innovation with environmental impact and technological innovation with product capability. As a result emphasis for this missed concepts of the previous work in addition to the included. Thus, based on the argument from previous research, the following hypothesis is proposed here that technological innovation plays important role competitiveness and firm performance.

### H1

The capability and performance on innovation will have positive impact on sustainable supply chain integration. Since, the previous study from Lahovnik M investigates the key technological innovation capabilities for production or design, and technological innovation capabilities key potential tools for production management [12]. As recognized, the previous study technological innovation capability has great impact on production capacity and product improvement. As a result we can propose the next hypothesis.

### H2

Sustainable innovation in technology has direct and positive impact on dynamic and sustainable supply chain integration. Although, firms develop their capabilities to use supply chain systems to knock innovations that sustain their competitive improvement. Likewise,

innovation is important to assist address global challenges, such as climate change and sustainable development of nations. Equally, sustainable innovation has been reinforced both by globalization and by rapid advances in new technologies, notably information communication technologies, which have enabled new forms of competition, cooperation and opened new markets for the creation, production and delivery of innovative process, products and services. Similarly in today development, sustainable innovation practice is a crucial determinant of competitiveness and national progress of developed and developing countries manufacturing industries. From this elaboration we can proposed the next hypothesis.

### H3

The adaptability of innovative supply chain strategy has highly impact sustainable supply chain integration. Sustainability of supply chain has positive relation with technological innovation adaptability. Because technological innovation adaptability plays a great role in performance improvement. Integrating suppliers, customers, and competitors and the illumination new product launch success are highly influenced by technological and competitive knowledge developments. Given that the impacts of technological adaptability on sustainable supply chain integration should be tested and investigated.

### H4

Flexibility innovation has an impact on sustainable supply chain integration. Flexibility is provides to the company change their product type, quality, quantity and systems based on the customer needs and requirements. The past empirical study shows that flexibility have an impact on the performance and competitive advantage of the firms [13]. Since the impacts of technological innovation flexibility should investigated and tested in this study.

## RESEARCH METHODOLOGY

The study was conducted through field observation, literature review of research articles, books, magazines, manuals, company report and electronic-sources which are discuss related to basic metal industries innovation and technological innovation (trends, challenges, growth, opportunities), the impacts of technological innovation on supply chain integration were assessed. The literature review focus on basic metal industry innovation competitiveness, the principles and systems of technological innovation, the current trend of technological innovation on developing nation basic metal industries assessed, the gaps of the current research on developing industries are studied, investigate and analysis in detail. Followed by model development based on the literature survey and field study analysis is done. Finally the conclusion and recommendation of the study was done. Since for analysis of the problems, the researcher mainly, for theoretical uses descriptive analyses and are empirically by AHP are used and apply to this study.

## RESULTS AND DISCUSSION

### Sustainable development

Sustainability is ensures the needs of the present without compromising the ability of future generation to achieve their own expectations. Since, sustainability includes programs of environment, economic development, suitable places from local to global, and institutions of government, continuous civil society, business, and industry to each project their interests, hopes, and aspirations onto the banner of sustainable development [14]. On the other hand, sustainable development, concept concern the substitutability of resources and economic growth. This includes capital: Social, natural, and man-made. As well as sustainable development elaborates by different researchers and scholars

[15-17]. Since, the ultimate aim of sustainability is to accomplish the long-term stability of the economic development, resources utilization, environmental friendly, through the integration of knowledge, technology, resource, infrastructures, throughout the organizational manufacturing process.

### Supply chain integration

Integration provides to manufacturing products and services are produced and delivered to the customer the right quantity, required quality without defect and at a competitive price. The previous study by Banomyong shows that integrated system is to assist in the production, consumption and distribution, or the 'supply chain', of goods and services [18]. Supply Chain Integration (SCI) is, to a great extent, concerned with the development of more integrated approaches that hold out the prospect of eliminating many of the inefficiencies directly attributable to supply chain fragmentation [19]. In addition, from the study by Uzuka, et al. has been conducted a research on the significance of integrating suppliers, manufacturers, distributors, retailers, and customers in a supply chain [20]. Accordingly the previous finding shows that, supply chain integration provides the co-operation between various functions in the supply chain for improving firm performance and effective flow of resources between firm organizations and enhances competitive environment to manufacturing industries. Although sustainable competitive advantage on supply chain firms achieved by through successful coordination and integration of supply chains activities, like all the activities associated with moving goods from the raw materials stage, process and to the end user with supply chains processes. Consequently, effective and efficient supply chain integration provides, confined flows of products, services and decisions in order to provide maximum value to the customer at low cost and high speed [13].

### Challenges and opportunities of technological innovation

The lurching innovative products, information technologies rural energy, the progress of new development, capacity building programs are some of the opportunity and benefits of technological innovation systems. The expansions, transformation, growth of these opportunities, have highly impact the growth, the improvement of nations. This also shows by Bisma, et al. technological innovation gives effective chances to create technological innovative product and services, helps in development and capacity building in developing countries [21]. This implies technological innovation and competitiveness have a dynamic, shared relationship. Innovation flourishes in a focused domain and thus, assumes a key part in the accomplishment of competitive environment. Since to handle this opportunities individuals and industries should work in quality, quickly and consistence conclusively to assemble our future, improvements of nations to the present resource. On the other hand, for the accomplishing needs and comprehensive improvement numerous, numerous challenges were facing on developing. The most common challenges that faced in developing nations manufacturing industry technological innovation systems are related to political, economic, social, and environmental factors. But all the challenges have that were faced, the effects are not always negative, and out of the challenges there arise opportunities. Even though, developing nations are commonly adducted by negative challenges than the positive possessions. The father of challenges in manufacturing industries is globalization. Subsequently exploration is at the very root of globalization. Since challenges of technological innovation on the developing manufacturing industries are related to, quality, time, utilization and adoption of technology, on long time taken for innovations to achieve market, capital escalation of innovation. Since improving the survival and competitiveness of developing nation basic metal industries, needs to furnish proper technological innovation systems [22].

## Sustainability of technology and supply chain integration

Supply chain integration compressively defiled by the previous researcher Nazzal in a way that the coordinated collaboration between the organization and its partners of suppliers and customers depending on an effective management of incoming material, services, information and money [23]. This provides to add extra value to product by delivering cost-effective quality product to final consumers timely. On the other sustainability provides to promotes economic prosperity, increased social welfare and environmental protection, provide the best ways to improve the lives of people everywhere and conservation within the right of future generations to those resources and environmental conservation. To think futurity in supply chain systems within a firm, sustainability is used as a vehicle to achieve that. Although, it is possible to integrate and think over the widespread of the issues on environmental awareness, resource conservation, resource sustainability, into supply chain integration process and activities. Thus developed and developing world basic metal industries imperative the efficiency, they should integrate their systems in line to cooperate in solving the environmental, social, economic problems, achieve sustainable growth, enhancing mutual benefits from the common world. However the relationship between technological sustainability and supply chain integration has positive relationships, this confirms H2.

Thus sustainability of technology and supply chain integrations has direct relation one to the other.

## Innovation and dynamic capabilities

Dynamic capabilities is define dynamic capabilities as the organization's ability to integrate, build, and reconfigure technologies, resources, and functions inside and outside the organization in order to adapt to continuously changing environments. While an innovation is defined as, an idea, practice, or object that is perceived as new by an individual or other unit of adoption [21,24]. As such, nearly any contemporary idea, practice, or product that an organization wishes to adopt and employ for the purpose of obtaining gains in performance can be thought of as an innovation. Since innovation capacity both in firms and in supply chains is also integral to responding to dynamic markets and customer need. Thus, innovative and dynamic capabilities consisting of strategic and organizational processes that create value for organizations in changing business environments.

## The performances of innovation impacts sustainable supply chain

The development strategists of manufacturing industries have to think for the creation of knowledge, innovation and invention; R and D also attend to the details of its acquisition, adaptation, dissemination, and use in diversified local settings. Given that innovations should be considered broadly as improved systems and products, processes, and business or organizational models. since, it is useful to review what is involved the systems and strategies of innovation that will help structure the analysis of the most appropriate policies, institutions and capabilities necessary to increase innovation in manufacturing industries. But innovation is contextual, because innovation in the context of developing countries is not so much a matter of pushing back the frontier of global knowledge, but more the challenge of facilitating the first use of new technology in the domestic context. On the other hand for countries behind the technological frontier, acquisition of existing knowledge may be expected to yield higher increases in productivity than would flow from a similar scale investment in R and D or other efforts to push back the technological frontier. According to Dahlman the previous work, direct foreign investment, licensing,

technical assistance, importation of technology as embodied in capital goods, components or products, copying and reverse engineering, and foreign study are the key channels are the means of technology transfer for private goods [15]. Since innovation is accomplished when a new product or process is made available on the market that affordable and useful to the customers. Innovation process considers the diffusion (or dissemination) is the process that sees a successful innovation gradually coming to be widely available for use in relevant applications through adoption by firms or individuals. Also inventions may result from different economic and social environments; innovations are mainly a result of the firm's activity. Since technology is part of the innovation system as it enables and constrains the activities of actors in the innovation system. The performance improvement to be capable, it moves in such a way that, utilize an invention and turn it into innovation, the firm should efficiently combine information, human, knowledge, financial, technological and material resources and existence of a functional distribution system is needed. Although technological innovation is not only the technical change and a linear process that simply goes from invention to innovation to diffusion. In reality, it is more a cyclical process; the feedback between market experience, accessibility, affordability by the customer, the capacity to simplify the lifestyle of the community and incorporating further technical development are especially important. Therefore technological innovations comprise new or significantly modified technological products and processes, wherever technological novelty emerges, unlike improvements, from their performance characteristics [25]. Also, technological innovation capabilities make it possible for firms to response to changes rapidly and to acquire technological innovation strategies and innovative outputs [26]. On the other hand the performance of technology and standards could prove an effective tool to spread effective and environmentally friendly technologies. Although technological performance could confirm important in promoting efficient end-use technologies at the end-user level, their application is much more controversial from the industry perspective. These concerns happen from clear, technological innovation systems, proper knowledge and technology transfers, apparent economic principles, standards are usually considered more costly than market-based solutions. Since from the above we understand that innovation directly linked to invention and technology, while technological innovation also likely connected to the level of innovation process and the utilization of resource and the effectiveness of potentials. Also technological innovation highly influence for the cooperation, collaboration, information shearing and improvement of firm performance. But cooperation, collaboration and proper information sharing furnished by proper supply chain integration [18,27]. As result capable and dynamic technological innovation have a direct impact on supply chain integration. The analysis indicated that sustainable supply chain integration is positively associated with the performance of technological innovations. Hence this supporting H1. Since, basic metal and engineering industry sector is central the birth and development of technological innovation to enhancing socio-economic development and transformation in a nation [28]. However, in Eastern Africa, basic metal and engineering sector unfortunately plays a rather limited role in promoting technological innovation, knowledge transfer and contribution of GDP growth compared with other regions. Since it is necessary to follow proper technological innovation systems and process so as to implement proper supply chain integrations in the regions.

## The impacts of innovation adaptability on sustainable supply chain

Technologies involve the techno-economic workings of such artifacts, including costs, safety, and reliability. These features

are crucial for understanding the feedback mechanisms between technological change and institutional change [29]. Technology consists technological trajectory and accumulation of knowledge. Since technological trajectory refers to a single branch in the evolution of a technological design of a product/service. As such, a technological trajectory is a set of technologies that consistently develop over time in certain direction [19]. However, innovation refers to a tradable application of an invention, as a result of invention integration into economic and social practice. Innovation is regarded, therefore, being a result of a process that starts with an idea genesis and continues with its materialization [25]. Thus the idea of the innovation process stresses that the flow of technology and information among people, organizations, regions, enterprises and institutions is key to an innovative process. These processes consists the interaction between actors who are needed in order to turn an idea into a successful process, product or service in the marketplace. However, study Marko, et al. shows that, many innovation systems are characterized by some flaws that greatly hamper the development and diffusion of innovations [29]. Since these flaws are often labeled as system failures or system problems. But Intelligent and evidence based innovation policy therefore evaluates how innovation systems are functioning, tries to create insight in the system problems and develops policies accordingly. Although an actors, institutions, networks and technology are the common and the basic building blocks or components of proper innovation systems [19]. Even if the Eastern Africa basic metal industries are infant stage of innovation, but they should use and adopt the building blocks of proper innovation system and procedures. Because technological adaptability results for adapt the process or systems continuously its technological systems according to different changing conditions. Since elegant results are increasingly integrated in manufacturing and production process, involving a leading-edge-technology with an aim to preserve, yet enhance the environmental quality. In this circumstance technological adaptability plays a major role to improve the production sustainable attributes. Since technological adaptability could be impact supply chain sustainability with, accessibility, affordability, healthy production and performance of manufacturing industries. Therefore, the analysis of this study extremely supported hypothesis H3. Thus East Africa basic metal and engineering industries takes a general approach to adopt and use, trying to identify the proper systems and the developments of adaptable technological innovation that could be apply to in the regional basic metal industry as a whole. Also individual companies should investigate these trends with a focus on their specific product range and organizational aims.

### Flexibility of innovation on sustainable supply chain

Flexibility provides to give the organization more room and ability to respond quickly to unpredicted changes. Technology flexibility refers to the ease of modifying a new technology system for some special application environments. The previous study of the effects of new technology flexibility on innovation performance in the post implementation age, 2015 indicates that, novel technology flexibility could impact the standardization, and encourage the information sharing, which is a most important factor influencing innovation system [30]. We hypothesize that the higher flexibility of technological innovation level has impact on sustainable supply chain and the firm performance. Flexible technology on capability dimensions for product modification, versatility of manufacturing process, production volume, mix, physical distribution, demand management and strategy development is positively related to sustainable supply chain integration [31]. Inanition industrial innovation includes the technical design, manufacturing, management and commercial activities involved in the marketing of a new (or improved) product or first commercial use of a new (or improved) process or equipment. Since innovation is the specific

tool of entrepreneurs, the means by which they exploit change and opportunity for a different business or service. It is capable of being presented as a discipline, capable of being learned, capable of being practiced. Although flexibility, technology and innovation are some of the strategies that enhance supply chain integration in manufacturing industries [32,33]. Since currently, changes in the environment (socio-political, changing demand etc.) are the cause for increasing uncertainty in the market place. In order to deal with this, flexibility, innovation in the supply chain becomes more and more important. As a result of this flexible technological innovation system is positively influence the sustainability of supply chain integrations. However in the current globe due to the domination of information technology manufacturing equipment and machines have become so complicated that each are made up of different technologies. This complexity results improved technological innovation apply and used in the developed. Since to be globally competitive, developing nation (including Eastern Africa) basic metal industries integrates their systems in technology and flexible technological innovation.

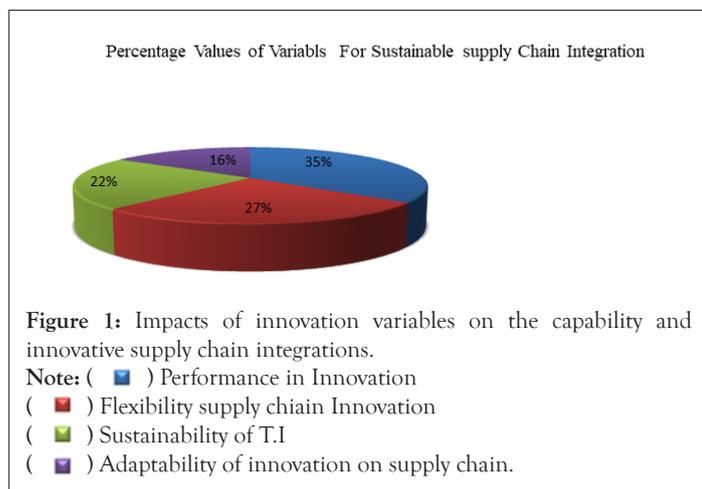
### Innovation and supply chain integration

Regardless of the significance of innovation, many developing country metal manufacturing industries have seen little attention for innovation and sustainable supply chain improvement in technological and productivity performance in recent years despite the new opportunities offered by globalization and new technologies, process, and system. However it is request to development of advances in technology, in conjunction with entrepreneurship and innovative approaches to the creation and delivery of goods and services, which translates manufacturing industries into scientific and technological advances, more productive economic activity as well. Since, supply chain integration provided evidence for their potential joint positive impact on competitiveness, efficiency and performance improvement on manufacturing industries [34]. Likewise innovation so as to leverages distinctive competencies in a manufacturing industry supply chain systems as a potential source of competitive advantage [4]. Also technological system for the industry provides to the technology itself, process and workflow, information exchange, job coordination and relationships, task configuration and relationships, rules and job feedback. This concept is the functions of proper supply chain managements. Directly or indirectly supply chain systems change and work with technological and technological changes in of the firms. However indicates that supply chain integration highly influenced by technological innovation and new technology commercialization.

From this theoretical study we found that, researchers widely studied the impact of supply chain integration with firm performance [23,31,35]. But limited study Kwak, et al. is conducted on the relation between supply chain integration with technological innovations [9]. Since the investigations on this study shows as a positive relationship between technological innovations with sustainable supply chain integrations have their own contributions to fill the previous research gaps. Accordingly to improve the firm performance and sustainability of manufacturing industries, in complex systems of supply chains, it should be technologically integrated. Since these technological integration is vital in order to achieve sustainable supply chain systems and enhancing firm performance.

### Analytical Hierarchy Process (AHP) analysis

Under this section, the impacts of technological innovation capability, sustainability of technological innovation, adaptability of technological innovation and flexibility of technological innovation on the dynamic and sustainable supply chain integration was investigated using AHP analysis (Figure 1).



The above graphical result shows that, the performance, flexibility, sustainability and adaptability of technological innovation is directly and positively influences on capable and sustainable supply chain integration on manufacturing firms.

This confirms by the previous study Kwak, et al. in a such a way that organizations with high innovative capacity might be likely to exchange more knowledge as a facilitator for supply chain integration by adopting integrated information systems so that other supply chain partners are satisfied, which may in turn enhance interdependence [9]. Even though the level and capacity of those technological innovation variables that impact supply chain integrations are different one to other. Since our theoretical findings supports by these empirical results, displayed in the figure above. However our findings provides to insights developing effective approaches for technological innovations with relation to supply chain integrations systems in manufacturers. Since the significant finding is that sustainable supply chain integrations is influenced by the level and type of technological innovativeness in supply chains firms. This study assures that effective and technological innovation systems have as a potential vehicle for supply chain integration on manufacturing industries. Thus basic metal industries should stimulate technological innovation in their supply chains systems, to provide as a self-indicative progress tool for enhancing the sustainability of supply chain integrations. Additionally to improve the competitiveness (in terms of innovation, technology, resource utilization, sustainability, health, education level etc.) and enhancing the performance of firms, manufacturing industries apply numerous improvements systems and techniques [36]. Given that, most of the time the performance improvement is achieved by implementing appropriate improvement tools for manufacturing industries.

## Key elements on conceptual framework development

### Statement of the problems

A conceptual framework is defined as a network or a "plane" of linked concepts. Conceptual framework analysis offers a procedure of theorization for building conceptual frameworks based on grounded theory method. Although the advantages of conceptual framework analysis are its flexibility, its capacity for modification, and its emphasis on understanding instead of prediction [37]. However, the drivers of supply chain innovation are the factors that motivate and in some cases force companies toward adopting innovations in the supply chain. According to the previous study Vallack, et al. shows that, the main drivers identified in the following three groups [28].

**Sustainable market domain:** The globalization of markets. This implies competition that is no longer limited to local or regional environments, but instead takes place in global markets with global competitors.

**Business domain:** The product variety of the company. It serves as a proxy for the level of complexity and for a crisis related to business policies rather than external factors-which the company must be able to handle to be competitive in the marketplace.

**External domain:** The impact from external factors. This includes governmental support and stakeholder pressures. Innovation is achieved through financial incentives, financial resources, or training program since, some authors address the importance of the external context of the company's competitive situation and its competition, as this context can influence the new investments and efforts necessary for a specific supply chain innovation [38]. The discussion shown in the previous study Dametew, et al. improvement model development is follows the following approaches [36].

Implemented/adopted the existing tools and models to manufacturing or business sectors. For example apply from one of the following, business model and innovation, technology adoption cycle, technology push, they used by the firms to improve the systems.

Sequence implemented or used the existing models in such a way, first to use one model as improvement programs and used as aids companies to achieve fruitful improvement results [39]. If this tool do not achieve the whole improvements, we can be implemented additional to one or more approaches, systems or model so as to improve the business performances. Since in one manufacturing industry use two improvement tools sequentially in order. For example, first they use technology adoption cycle, and then apply technology push models.

By integrating two or more continuous improvement approaches or tool to use in the industry as a means of improvement systems or models. In addition to this in research work, we are incorporates the next concepts. For example, integrating the phase gate model with technology push. Since there are feedback loops and time variations between steps, and establishes readiness criteria for moving between major phases of innovation development are enhancing by the phase gate model. Afterward technology push provides small change from the linear model where marketing and sales is added after production. Thus to integrating this together we developed power full models for technological innovations.

A model is developed based on the existing facts and context to chive the firm goals. Since facts-based Practice usually represents a decision-making process centered on justifications of relevant information's. Whereas context allows filtering out more useful information. Although the uses the filtering of contextual information to support evidence-based decision making in the area of crime prevention is presented to validate the framework. As a result in this study it is possible to follow the fourth option and to develop technological innovation models to achieve sustainable supply chain integrations. Although the technological innovation system is provides a concept developed within the scientific field of innovation cram which serves to explain the nature, the subsistence, progress and rate of technological change. As a consequence the technological innovation used as weapons for supply chain integration framework should concerns in points and ideas. Since based on field study, literature reviews, assed technological innovation conceptual framework development should consists the following points.

**Technology:** (Level, innovation, integration, cooperation and collaboration) process in a supply chain firms either in the internal or external level. As we know that the technology encompasses fundamentally, tools and instruments to enhance human ability to shape nature and solve problems (such as an airplane, lathe machine and nail), knowledge of how to create things or how to solve problems (such as how to make planes, how to constructs ships, to make an atomic bomb), and culture (our understanding

of the world, our value systems) [40]. These concepts directly or indirectly related to environment and sustainability. Since the level of technology strongly influence the development of sustainable supply chain integrations with technological innovations. Since level of technology and innovation having been recognized as the means for creating and sustaining competitive advantage within an increasingly complex and changing environment, it has become essential for organizations to proactively strive towards consistent, and persistent, innovation.

**Benchmarking and environment:** Either innovation, or the technology itself or the supply chain process, should be considered healthy environments. The integration process and technological improvement should be in line with sustainable and mutual benefits from the present to the coming generations for constraining resources. Hence the integration process controls natural and manmade disasters as controllable ranges. While benchmarking also a critical tool to, when to develop a new models either considering the performance of the bench-marked one's or incorporating the missed points for the existing conditions. This means that the establishment of an innovative business or services, or the improvement of accessible ones can be viewed as a continuing process improvement rather than a fixed fact. By focusing on the gap between where your company is and where it needs to be, priorities are set for making improvements. Since benchmarking provides for model performance improvement systems by analyze and improve your processes, enhance performance, gather the information we needs to assess our present and plan our future, identify some better approaches to accomplish our mission, vision, and goals. Thus benchmarking can be part of the initial stages of planning, as you assess current performance and set goals for improvement. This can also be part of the accomplishment of strategies, as you study outstanding organizations for alternative approaches to how your unit does its work.

**Firm type and strategy:** The business area provide to serve their and sensing customer needs, engaging with those needs, delivering satisfaction, be competitive to the market, improve their performance through proper modes, contribute to the GDP. Since this achieve by using proper technology and enhancing technological innovation in the sector. Thus technological innovation process and activities should be linked with the goal and mission of business sectors (industries). There for technology and innovation should be used as a vehicle to solves the problem of customer needs, improving the quality of the product, enhance mutual benefits between the firms, environmental friend, improve competitiveness of the firms. This concept is supported by the previous study Charles Baden-Fuller et al. technology development can facilitate new business approach's the most obvious historical example is way the invention and development of steam power facilitated the mass production business model [41]. Also in a highly competitive environment, technological innovation is the essential key to a firm obtaining a dominant position and gaining higher profits [42-45]. Consequently, to meet the strategies of the country, it is crucial to know which technological innovation systems and practices lead to success is very important. Since this conceptual framework establishes innovation and dynamic capability systems on basic metal industries to enhancing sustainable supply chain integration and firm performances [46-50]. Because this conceptual framework is a coherent system to enhance technological innovation between firm organizations [51-54]. As the framework indicates that, the application and adoption of technological innovation in lies with competitiveness of the firm, globalization, customer, ecological point of views [55]. Because the suitability or competitiveness of the organization always under this concepts, as a result this model mainly considered these. Although the driving gear of manufacturing industries to reach sustainable supply chain integration consists on technologic, benchmarking and environment issue, and firm type and strategy (firm, country) [56-

60]. Since, to accomplished the ultimate goal of any manufacturing industries, the above three points are the main things and power full ingredients to make outputs. Since this framework used as vehicle for the manufacturing industries to begin achieve sustainable supply chains gradually rather than drastically [61-65]. Thus in the performance evaluation ion stage, the contribution of the improvement system should be evaluated whether the companies are improve their competitive advantage, recover their performance, improve sustainability and attain their expectation or not. If the evaluation is in a good condition, manufacturing industry approaches to overall organizational performance and business Success, sustainability. Doing so, depending on the industry standpoint they apply different performance evaluation/measurement systems (Figure 2) [66-72].

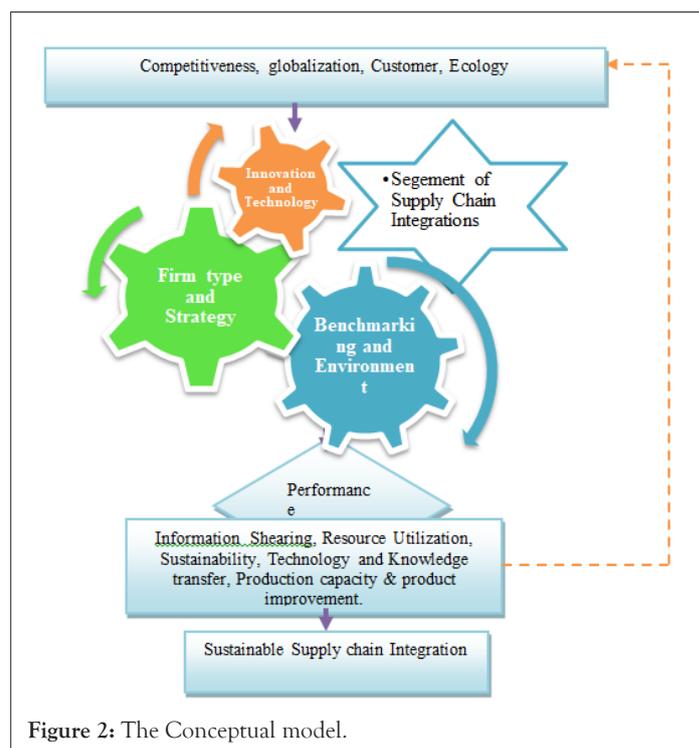


Figure 2: The Conceptual model.

## CONCLUSION

This investigation indicates that, there was a considerable positive relationship between sustainable supply chain integration with technological innovation, sustainability, performance and flexibility of technological innovations of basic metal industry. Improving the extent and the level of technological innovation in different context is to ensure sustainable supply chain integration on basic metal industries. Since to secure sustainability, individuals, organizations, firms, and nations should be work to mutual benefits. As the study indicates that, developed and developing world basic metal industries imperative the efficiency, they integrate their systems in line to cooperate in solving the environmental, social, economic problems, achieve sustainable growth, enhancing mutual benefits from the common world. This sustainable benefit is assured by sustainable technological innovation systems. Subsequently, this study has contributed to a new model which spread out sustainable supply chain integrations contexts, whereby shows the direct and positive relationships between sustainable supplies chain integration with technological innovations. Since this model contributes the improvements long-term cooperation and competitiveness on the supply chain firms. In conclusion, this results propose that strong innovative and technological integration is highly improve the performance of supply chains integration sustainability and firm performance but it is requires high cooperation and collaboration from individual level to firm and country wide.

## RECOMMENDATIONS

A detail study of technological innovation impacts on sustainable supply chain integrations were investigated and this have potentials approach for further investigations of other optimization and improvement tools. Since, is recommended to study the relation between on technological innovation with quality in specific, how integrate these two concepts to improve manufacturing industry performance? needs for further research.

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