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ENHANCING COMPETITIVENESS THROUGH INNOVATIVE LEAN MANUFACTURING (IN CASES OF ETHIOPIAN METAL AND STEEL INDUSTRIES)

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Keywords:

Innovation; Competitiveness; Lean manufacturing; Innovative Lean Manufacturing; Steel Industries.

A B S T R A C T

This paper examines the drivers and barriers that influence the implementation of lean manufacturing. Before direct investigation on the field, selected lean elements are identified from the literature using keywords related to lean production and implementation techniques. From literature, Lean manufacturing and innovation practices can bring continuous improvement. However, holistic approach studies and implementing lean production in continuous based process industries has found as a limitation. In addition to that, under this research investigation, the lean production system appears to be unknown and misinterpreted in selected sectors. Skill shortage, adoption of new technology, the linkage between upstream and downstream activities, product diversification and development, labor productivity and product quality, technological capability, and management problems are raised as problems. The most four critical problems have selected and conceptual frameworks and suggestions proposed for further improvement. On the leanness assessment, the necessity of having a contextualized and systematic approach to solving continuous improvement related problems facing metal and steel industries have given emphasis based on data analysis findings. So, that innovative leanness strategy is contextualized as an Ethiopian farming system.

1. INTRODUCTION

Continuous improvement refers to a set of management practice which facilitates and support incremental and experience-based improvements to existing products or processes (Demeester, 1995). The improvements made on products and process is an innovation which has a really significant impact on the new global competition (Schaufeld, 2015). In addition, Innovations create a competitive advantage by perceiving and entirely new market opportunity (Porter, 1990). Pablo (2013) recognized that to survive in such an increasingly competitive world, there is a need for continuous improvement in every type of industry. Meanwhile, According to Josef Greitemann (2013), the competitive environment gives the capability to react to changing conditions then, manufacturing companies have to identify and preselect potentially useable technologies in

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order to stay competitive. With this in concern, Lean manufacturing and innovation practices can bring continuous improvement (Ferro, 2013; Kováč & DrSc., 2013). While that practice is measured in terms of producing things better, faster, and cheaper and being more agile (Nicholas, 1998b).

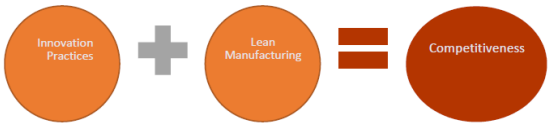

Figure 1. Conceptual Framework of a research

Lean and Innovation are not odds (Matthew, 2013). But they can be used together to manage knowledge value streams which are essential for systematic problem solving (Allen, 2007) and systematic innovation ideas generated to give solutions (Bart, 2004). According to Nordin et al. (2010), the main barriers to implementing lean manufacturing systems are the lack of understanding of lean concepts. Due to that, this research clarifies how to implement lean concepts with innovative and systematic approaches.

2. METHOD

Investigations from government documents, and a vast amount of literature exposed that, Ethiopian Basic Metal and Steel sector is not competitive because of philosophies coming to it is bounced back due to its nature of a continuous production system. So again, problems faced this sector is collected from documents investigated by government bodies and lean production elements which could be applied for the neglected continuous process industry has been nominated from researches done in similar cases especially researches focused on steel production in an innovative way. The questionnaire is prepared based on Likert scale with lean production elements which are appropriate for the case and it is investigated to check the magnitude of availability, the extent of scope, the form of their existence in the industry, and the level of understanding. after that, the returned questionnaire is investigated using Microsoft Excel, and information's inferred from the result is organized for further intensive interpretation and an integrated model of those elements applicable to the company is proposed.

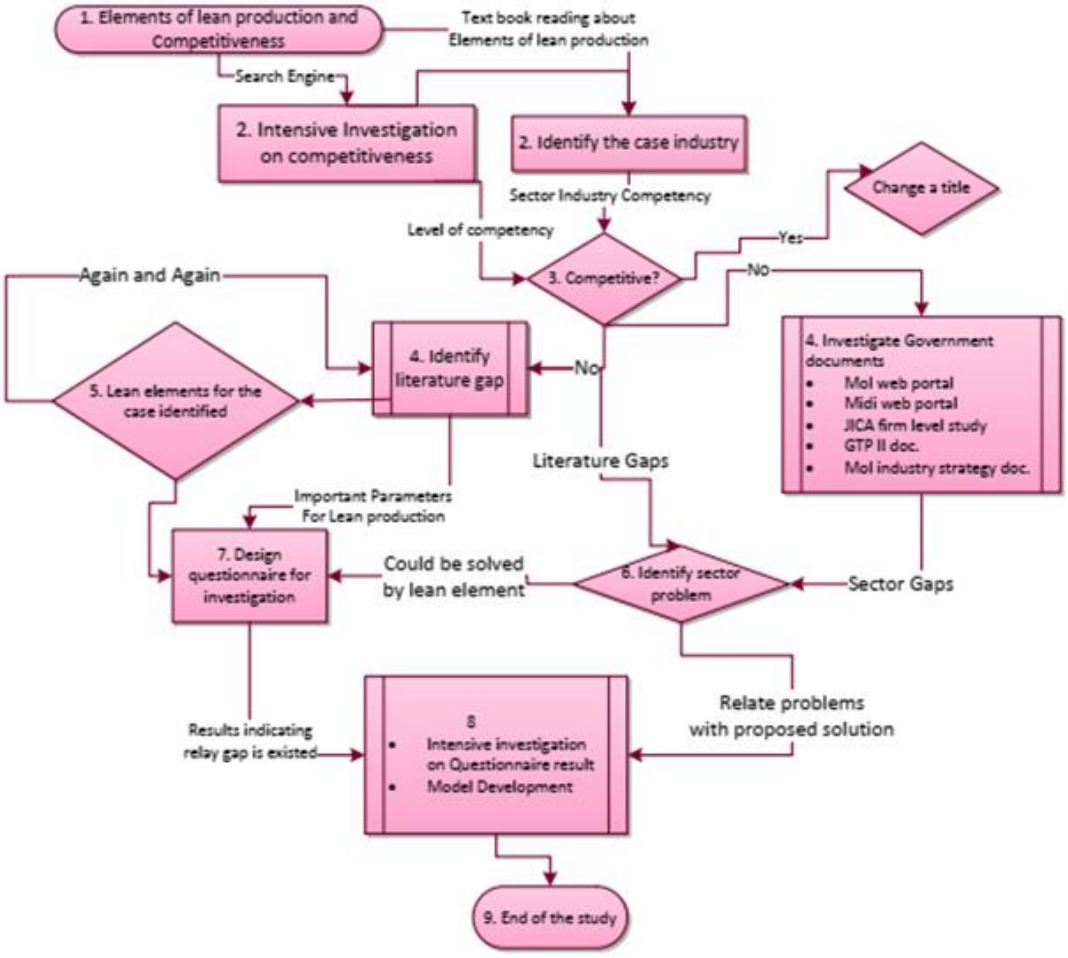

Figure 2. Research Methodology

3. LITERATURE REVIEW

3.1 Introduction to innovative lean manufacturing

According to Nicholas (1998a) one challenge facing modern day production is to meet growing demand for ever more diversified products. Longer production lead time due to high work in process, high rework, unnecessary transportation and repetitive changeovers (Tizita, 2013) are also problems seen in most of manufacturing industries. While lean thinking focuses on reducing costs, innovations create new business value by transforming original ideas to products or services that satisfy customers' certain needs, and thus enlarge the market size and strengthen a company's overall competitiveness. An organization that effectively accommodates both lean and Innovation will benefit the most and be competitive in the long term (Kováč & DrSc., 2013). But Lean and Innovation are not odds(Matthew, 2013). In other ways, Managing the knowledge value stream, systematic problem solving with analysis of the trade-offs between various design option(Allen, 2007)and solutions generated from ideas filtered by systematic innovation method (Bart, 2004) are viewed as methods within the lean design process. From those literatures it is true to conclude that, innovation (Macmillan, 2007) is a new idea, method, or the latest technological innovations and lean innovation value system is a mapping system that defines values for an innovation project based on to the R&D facilities to generate product differentiation with reduced resources and waste (Kováč & DrSc., 2013). So that, Lean manufacturing dominates innovation because of their concern is subjected with continues improvement philosophies. However, it's application is hindered due to , the misconception of the lean philosophy (Tourki, 2010). This is a literature gap that, lean philosophy seems solely implemented and applicable only discrete based processes rather than continuous based process industries. But now few articles are trying to evaluate the implementation of lean philosophy on continuous process industries. Based on Tourki (2010) lean philosophy was driven by some main ideas as: customer values. While Porter (1985) defined value as the amount buyers willing to afford. According to Allingham (1983); Erlach (2013); Velamuri (2013) the term is related with production of goods, which are useful for the consumer. However, according Laselle (2016) the traditional manufacturing approaches will no longer pace with a current dynamic new consumer-driven age. Thus, a manifestation new smart thinking approach is required for competitiveness (Bartodziej, 2017). In this line there is a value network which value is co-created by a combination of players in the network (Peppard & Rylander, 2006).

3.2 Lean manufacturing in steel production industries

Investments in R&D activity and innovation could help the steel industry to lower its future capital requirements and operating costs, while also increasing yields and reducing resource and energy use. These investments would ultimately help the industry become more efficient and economically viable(Silva & Paris, 2016). Just-in-time production system is one of these initiatives that focus on cost reduction by eliminating non-value added activities (Temesgen, 2004). Various Survey demonstrate that most of the researcher focus on one or two elements for finding out the existence of wastes and suggest their views on implementing these elements (R.Sundar, 2014). According to AVCI (2016), Benefits of Lean Manufacturing in Steel Industry are Optimal Inventory, Low rejections, Negligible machine down time, Reduced rejections, Quick Changeover, Spares Management, High OEE, high MTBF and reduced MTTR, and Highly Organized and Visual Plant.

All lean techniques may not be easy to apply to all industries due to that lean tools such as JIT, setup reduction, TPM, and 5s(Abdullah, 2003; AVCI, 2016; Deepak Kumar, 2014; El-Sharief, 2013; Hamed, May 2014; Moghaddam, November 2008; Tourki, 2010) are mostly applied in steel production industries. JIT is related with Small lot Production, Work cells and Cellular manufacturing, Pull production system(Nicholas, 1998a). Set up reduction leads to JIT, Pull production system, Pokayoke, TQM. Appropriate concept for Maintaining and improving equipment is TPM whereas 5s is implemented related with standard operations, and kaizen philosophy which stands for continuous improvement on the process.

4. DATA INTERPRETATION AND ANALYSIS

4.1 General overview Lean Production the selected sector

From the survey result it's easy to understand that, metal and steel industries are affected by continuous improvement infectious diseases, they understand they have tightened with a lot of problems which they can easily mention but they are not ready to be cured by philosophical treatments coming from external sources. For long time, they have tried to medicate themselves by enforcing management teams into extreme control mechanisms of the shop floor workers but still they are in problem. Those industries are still tightened with, low productivity, low quality, and related production and human resource problems which contained them from becoming worldwide competitive industry.

They may have a lot of reasons why they are not accepting very important and improvement ideologies, but as Daniel (2016) suggested in his book in titled with እንሆ መንገድ ለኢየጵያ meaning "Here is a road to Ethiopia" a limited attitude for paradigm shift is a main problem for change.

Industries run with traditional practices with a limited commitment for new ideology. For instance, Industries feared that the coming new ideology of improvement may damage their entire profit. In the other side, they also forecast the coming new ideology will be grounded as the forefather philosophies which was once a slogan. So, diagnosing the cause of those company's sickness is a responsibility whom claimed to be devoted in philosophies.

It is clear that Ethiopian kaizen institute has put its effort for companies serving for change and willing to accept their sermon. But in reality, the institute effort is not still coming out from its apartment and change the way of life that the "philosophy" kaizen demands to bring. Starting from its time of creation by a former prime minister Melese Zenawi, till now it is on the 5s stage of making ready industries for further step of its implementation even if the 5s principles are also mostly implemented on workshops. Industries are also still working on identifying the muda's that the philosophy claimed to remove while improving their process, product development and diversified production required have given limited attention so that now industries are in the way of even forgetting the trainings and efforts done by kaizen institute. A paradigm management and technical philosophies, like TPS (Lean Production), TPM, TQM, JIT, and has been rarely known in respected companies which are parts of this survey. Mostly Initiatives for change are coming from top management or front line department heads. The shop floor employees at the downstream don't want or, had a chance to think about continues process improvement, or on understanding the benefits on continuous process Improvement and implement themselves independently without management support. This had a significant implication on the productivity of companies who wants to change their competency at the pick of any local competitive company and beyond at the globe. According to this study, even if companies accept that it is very essential to strive for perfection, and there is a need for implementing a reward and incentive system for successful continuous improvement projects.

Under this study on the selected sector, lean production system appears to be unknown or misinterpreted. According to this survey there are a lot of cases for it. Lack of visible leadership at the senior management level, lack of understanding the fundamental change process, lack of alignment of management practice with continuous improvement philosophies, lack of system thinking mentality, lack of coordination, lack of commitment, and lack of qualified experts in the field are factors prioritized as causes for visible improvements didn't come as rate of it is required.

4.2 Challenges of Innovative Lean manufacturing for its existence and associated gaps

In the literature survey developed nations lean production system is reached on its ultimate pick and produced extra ordinary changes on industries. For instance, Toyota Automotive production, Motorola electronic company and others could be mentioned as pioneer in this philosophy which flourished the idea of eliminating waste in production system and become worldwide competitor company. Besides, lean production philosophy is originated from automotive industries and flourished in electronics and other kind of discrete production systems, it's was not applied more in continuous based industries is mentioned as a literature gap. As it is explained in the literature review, some literatures come out to show lean production benefit in cement (El-Sharief, 2013; Tourki, 2010) and steel(Abdullah, 2003; AVCI, 2016; Deepak Kumar, 2014), which they tried to magnified the application of lean production in continuous production system. According to those literatures lean production has been mostly implemented on discrete production systems. This gap is existed not because of lean production philosophy cannot be implemented, but it is misinterpreted with kaizen philosophy so that it is forced to be buried in the ground and companies are still breathes with their thousands of challenges and bulky wastes which dangling industries to life and death. Due to that skill shortage, adoption of new technology, linkage b/n upstream and downstream activities, product diversification and development, labour productivity and product quality, technological capability, and management problems are raised as a gap due to the above critical factors which are flourished in every metal and steel industry. The most four critical gaps have selected and suggestions proposed for further improvement in the following sections.

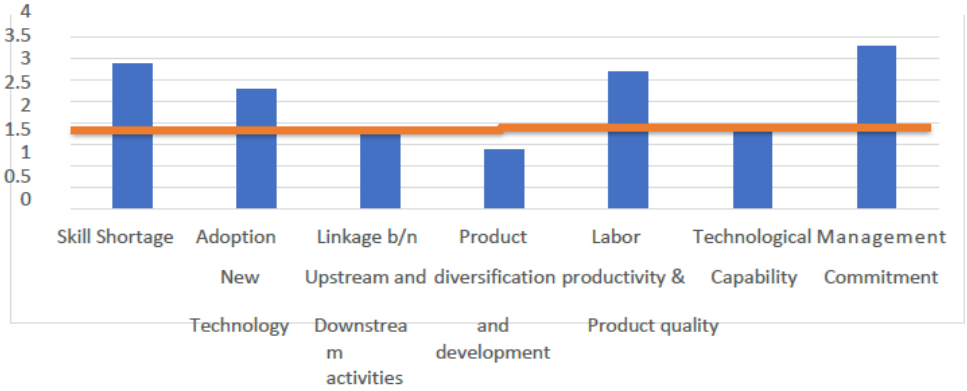

Figure 3. Gaps that critically forced for industries not to test changes from CI philosophies

Skill gap

All nation and people within it demands improvement in their way of life and business they perform for survive. The question is how this improvement originates and become real in their day today activity. Regarding to improvement there are Far East and western ideologies and sticking with one give the impression for practitioners on the field. The former ideology demands gradual and infinite process improvement while the later one requires rapid change which may require totally changing the way the business is performed. Such kind of ideologies was tried in developing countries and remained as an old fashion for change since it is not very cost effective to implement. Due to that, those nations especially in Africa continent they tried to bring philosophy for continuous process improvement like kaizen which requires less amount of effort with less investment cost while compared with the previous and now it is on loom process of its implementation stage.

According to this survey, having kaizen philosophy is a good start for improvement because it changes the world. The problem is, a gap from stakeholders implementing this philosophy as it demands to change. The survey indicates that, from the nominated lists of gaps 19% is accounted for skills limitations related to tools and techniques on implementation process. This gap is created since there is no sustainable follow ups from institutes and industries are not willing enough to take it as their business seriously because of previous failing experiences.

Identifying tools and techniques directly belonging into the particular cases is an indication that, skill gap is really existed. Improvement philosophies tried to be squeezed and emerged into one cup of tea and industries are forced to take it whether they are in need or not. A feasibility study suited for a particular industry doesn't seem to be implemented during this survey. Kaizen implementation is an example. Their implementation is remained on the corner of workshops and limited on few companies while it is still on the shining stage of 5s. This shows that, the theoretical aspects that changed originator japan didn't seem conceptualized (or, contextualized) unless industries were not still on the shining stage for this long period of time since the philosophy bring into Ethiopia.

To enhance this sector competitiveness the above skill development process should be followed strictly. First there should be a policy and regulation which is targeted to skill development on sectors regarding to continuous improvement. Institutions should have a synchronized development program on continuous improvement and they should be a controlled strong chained on their performance. In this case institutions refers to, educational and training institutions (both private and gov't), gov't institutions directly related to this sector (MIDI), Kaizen institution, Government and Non-government organizations who are concerned for a change in this sector and have a cumulative knowledge on the process.

When government policy and regulation is so strong and committed to bring change by creating those integrated institutions which may have a common goal in the skill development of the particular philosophy then it is obvious that there will be committed company managers working for the particular philosophy which can convey their development problem into trash. If managers are committed to change, the way employees motivated in changing their old habit and having a new cloth of development skill will be easy since managers have an ability to enhance employee's perspective in any direction when they become a true leader. Leaders in the industry can inspire employees under their league and they can make their industry a competency center. But committed industry manager should have been supported with consistent trainings and supports from institutions and from industry R&D Department. In this case to get a fully transformed skill R&D department should be installed in each sector industry and it should have a full responsibility on issues the company needs to overcome.

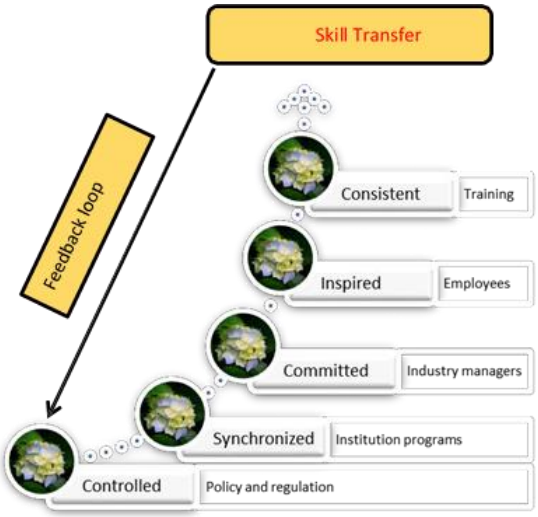

Figure 4. Skill development process for innovative lean manufacturing

The skill development is a never end process. It should be done again and again by solving gaps existed in each and every dime activity and each activity should have a feedback loop to gain the check and balance advantage on the process. Government policy also should be updated and fill a gap created during a skill development process using free and accountable feedback loop. When this process loop keeps, then the existed skill gap in those sectors could be resolved with a matter of time.

Adoption of new technology gap

Working with old fashion machineries, old fashion working procedures and principles, and trying to create a new system and broking the old habit is the strongest challenge facing most humanity. Change starts with replacing deep-rooted conditions with new and refreshed one. If somebody could not break bondages but wishes to change a system will remain within it how mush powerful it is or how much potential it has. So, changing starts with broking bondages which limits for it.

Most industries included in this survey are not willing enough to come out from their oldies activities they are experienced. Whether philosophies coming from east or west it looks doesn't work in their condition. But it does. The problem is they are not willing to accept it. Since the initiation is not from industries themselves, process improvement philosophies couldn't get a chance to be accepted. Nobody can be salvaged if someone not need to be saved.

Industry without active R&D department means a man without a leg. A man without a leg can try to run but it needs a lot of support and mechanism similarly committed manager without a dedicated R&D department cannot go further an inch either to inspire employees or even further to keep constant its motivational feeling.

For making the above skill development process practical industries should have R&D department installed in their organizational structure with full responsibilities so that it can help to keep motivation of managers for constant skill development process. In this case, we can say that there is a fertile ground for adoption of new technologies.

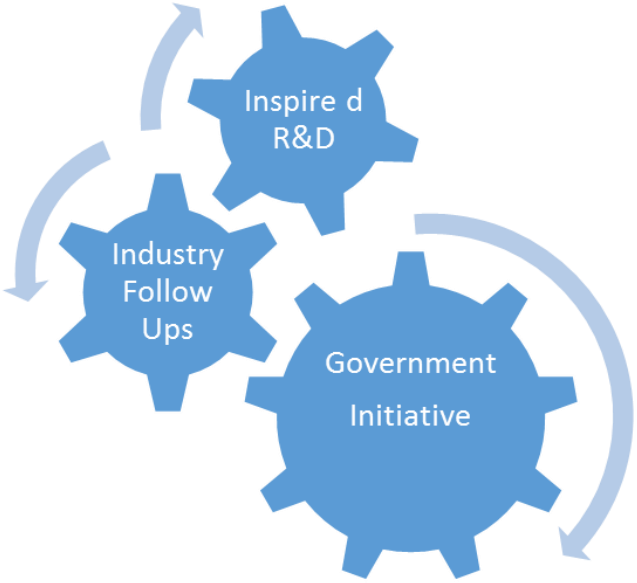

Figure 5. New technology adoption process for innovative lean manufacturing

The initiation for change in industries could be started by installing active R&D department in their structure and when this department starts to work strongly they can identify gaps existed in in day one of their duty. At this moment, it is expected to spark the light of change attitude and transform it to managers which is already ignited by the skill development process initiated by the government policy and regulation start-ups are is the point, the skill development process started to brighten the managers mind to show away of change but it doesn't have a capacity to transform their condition into a new environment. It is in humanity nature trusting a person belonging only for himself. In this case industry managers trust more their R&D department rather than government imitated process. But if the R&D finding and the government initiated program find similar gaps and reach on the same consciousness on the solution it will be very easy to implement any new innovation, philosophy, and what so ever the government policy wants to implement in the sector will come true.

Finally, it can be concluded that as humans have soul to live, mind to think, legs to run similarly industries need motivated manager as a soul, inspired employee as mind and consistent R&D performance for run on the process of development.

Management commitment gap

Manager could be very reluctant for change with different reasons. At this survey especially reported from kaizen institution the main challenge they did faced right now is lack of commitment from the manager's side. Managers don't need kaizen programs as their own and they don't want to concern on the progress the institute wants to bring. Eventually this gap can be filled by integrating the skill development process and new technology adoption process together referring figure 2 and 3 respectively.

4.3 Waste management practices

In this survey, is has been found that wastes have been labeled only for defects. Those defects which are related to frequent errors, product quality problems and poor delivery performance are understood as critical wastes. According to the interview result this covers 26% among other kind of problems occurred in the process. This signifies that, companies only considered defected products as critical waste. The second critical waste identified in this survey is inappropriate processing which is claimed to be the cause of defect related wastes. This waste account 24% of the total wastes available with respect to using wrong set of tools, using wrong procedures, having a wrong production system.

Unnecessary motion also take the lion share which is 21% with regard to the other kind of wastes available and it is accounted with, poor workplace organization, poor ergonomics, and related to this excessive bending or stretching and frequently lost items are the most visible causes for this kind of waste. Whereas, waiting is also account 11% with respect to long period of inactive due to machine breakdown and other related downtimes, power fluctuations, and waiting for information and goods coming downstream and upstream value chain. Excessive motion, overproduction, and unnecessary inventory accounted to 18% in total while compared to others. According to this survey result, company managers of metal and steel production industries have a huge problem of raw materials supply. Most of steel producers import scrap materials from abroad and Martials arrive without the company control. Banks, government officials and port related issues affected their supply chain and this kind of problems make them don't think about overproduction. Companies tried to produce a product as soon as they get a row material. They don't care whether there is demand or not. Since there is a vast amount of construction activity in Ethiopian, losing their customer is a least of their problem. So, over production is a success not a waste for such kind of particular case sector.

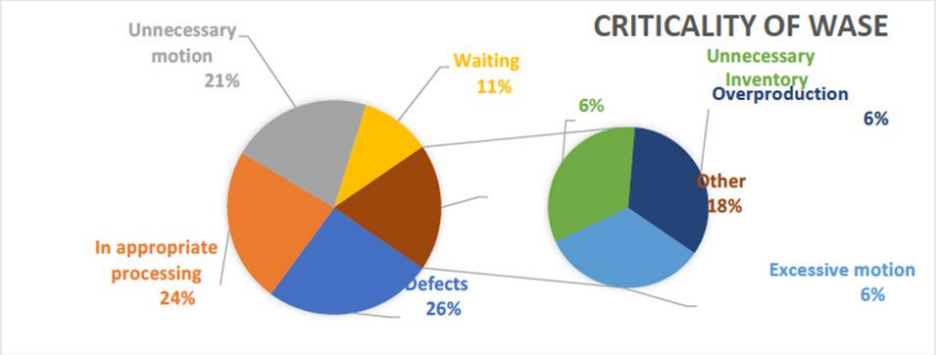

Figure 6. Pie of Pie diagram for criticality in the seven muda

In general, Defect related wastes, in appropriate processing related wastes and unnecessary motion related wastes should be given a priority. Overproduction, unnecessary inventory, and excessive motion are wastes which is not currently concern the selected sector. But waiting related wastes is expected to be solved immediately after the elimination of the first three prioritized wastes. Overproduction, unnecessary inventory, and excessive motion is not considered as a waste in the selected case industries not because they had a continues steel production system but they had ignored such kind of wastes due to their raw material related problems and an increased demand which will take any produced inventory at any time in any capacity. Despite, they had an outdated steel production technology which limits their production capacity, unnecessary inventory is steel a waste that they had denied to accept its existence due to the reasons explained above.

4.4 Leanness assessment

Taking all philosophies as a tool will have a problem in implementing very diverse techniques form each philosophy. Ethiopian kaizen institute is tried to implement kaizen using diverse philosophies as toolkit for it. As philosophy, it may not have any problem. But in real implementation stage, tools and broad philosophies will be mixed up and confused even expertise involved in the implementation process. In addition to that it will be very difficult to grasp the main concept of each tool and implementation procedure unless there is a strategy to follow up to reach at the desired stage. Leanness of the case company is tested by evaluating their rate of using lean tools in in their company by comparing it with kaizen institute whom responsible for the implementation of kaizen philosophy.

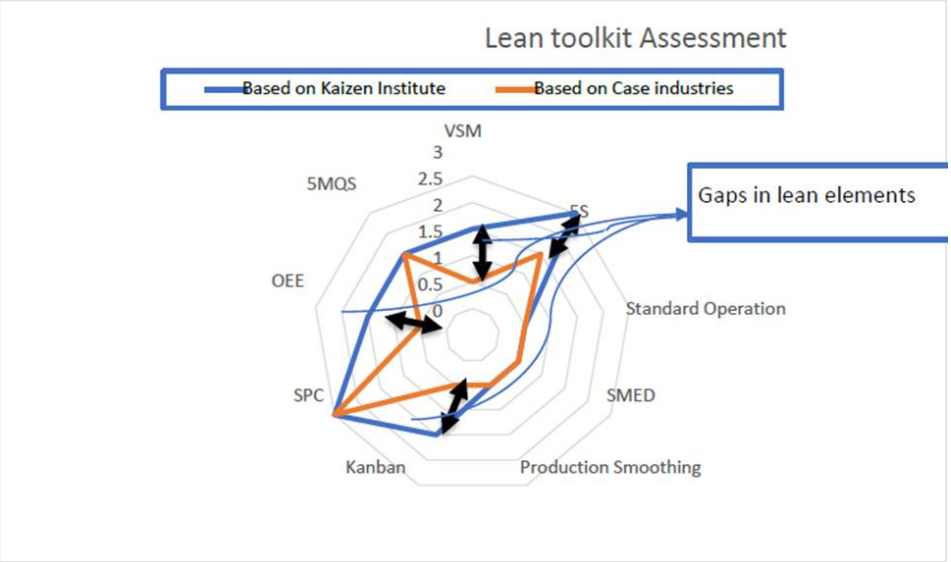

Figure 7. Lean toolkit assessment

SPC tools tried to be used by quality department even if they are on the stage of QC (Quality control). Management committee is responsible 5MQS. Man, material, method, machine and management related wastes have tried to be identified through routed reports from shop floor till top management. Quality and safety issues are also included in the report. VSM (Value stream mapping), SMED (Single minute exchange of dies), production smoothing, Kanban, Total productive maintenance techniques such as OEE (Over all equipment effectiveness), and operation standardization techniques are rarely known in the surveyed industry. As it is showed in the figure above there is a huge gap in implementation of tools which are belonging to lean production. Those voids are created due to limited understanding leanness for sustainable development purpose. It is a responsibility of government to close a gap by providing indirect and direct support to have a complete three-way collaboration between industry, government itself, and institutes. The following leanness strategy is composed with three stakeholders Institutes, Government, and Industry. These stakeholders are good players which decides on the fate of country with all their responsibilities and rights they have. If it is required to have a lean manufacturing philosophy implemented in industries the three stakeholders should work as hand a glove. All these elements could create a board of directors to sustain the implementation of leanness and this board should have all representatives from each element. Any initiative or response coming from those elements should get an approval to have an agreement and believe on the implementation process. Board of directors should create a bond between the three elements and work for the prosperity and success of manufacturing industries by solving problems by the continuous Plan_Do_Check_Act (PDCA) Deming's principles.

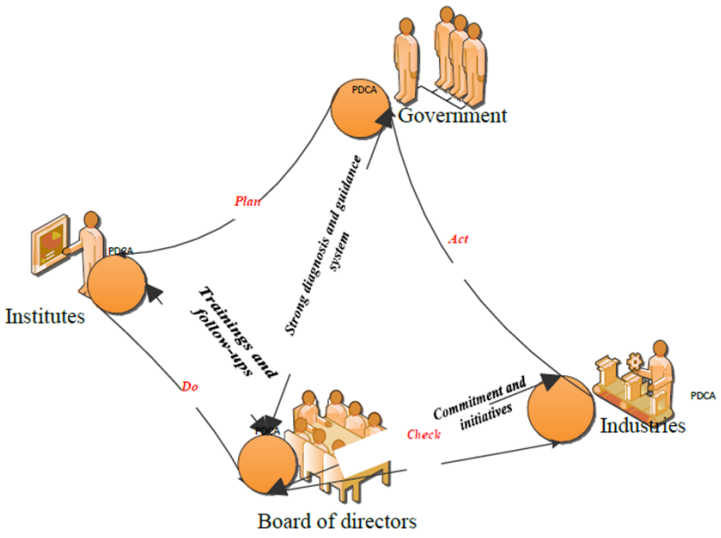

Figure 8. Innovative Leanness strategy

The bond between elements also should be strengthen by the three fundamental enacts called Strong diagnosis and guidance system, commitment and initiatives, and Trainings and follow-ups. In addition to each elements Plan_Do_Check_Act process a general Plan_Do_Check_Act (PDCA) Deming's principles is also a part of this strategy. All the enacts are discussed as follows.

A. Commitment and initiatives

As it is investigated in the previous sections lack of management commitment is huge problem for implementation of continuous improvement philosophies. One indication for this case is kaizen implementation. Kaizen is a kind of philosophy which requires a bottom _top decision process which solutions for detailed problems are proposed by the lower workers and top managers put their only approval and budget for implementation. This kind of process is not usual in Ethiopia since the attitude of industrial managers seems to follow a monarchical approach. A monarchical attitude will not accept the lower-class ideology without his/her willingness even if an idea is key for success. So, that for the achievement of this leanness strategy managers attitude should be shifted automatically into icebreaker to accept every dime idea of improvement for the company and approve based on its effect and play a good leadership act to motivate them as a payment of their pure idea and concern for the industry. In this study, it is also known that, skill gap is a very huge void in lower class workers. Most of shop floor workers have a limited capacity to understand every detailed and scientific techniques of lean manufacturing tools so that it may take a lot of time and effort and even replacing human resource with skilled and experienced ones is a price that could be paid for change. This is not the only commitment that should be taken by industrial managers, initiatives for change should be generated from lower class workers as it is depicted above but also initiatives for improvement, initiative for getting trainings, initiatives for consultations, initiatives for new projects, and initiatives of research for development thematic areas should be taken by industries then institutes will take the responsibility to payback their reason for existence to enhance companies way of life and development. All those actions should be balanced within the company Plan_Do_Check_Act (PDCA) of Deming's principle to keep industries on the track of change and improvement that seek by different stakeholder. All industries act should be checked and get approval by the board of directors.

B. Training and follow-ups

Institutes may refer to, Academic, Technical and Vocational Education Training (TVET), Ministry of Industry (MoI), Metal Industry Development Institute (MIDI), and Governmental and Non-Governmental Organizations (NGO's). Those different institutes have their own objectives and reasons for existence, enhancing the life conditions by transforming enterprise performances is the common factor for them. Institutions are expected to generate knowledge, experience, and explore new way of doing business for enterprises. This is an act which should be implemented on sustainable way through panel discussions, conference meetings, projects and research programs, feasible trainings, and tangible consultations about lean manufacturing. The process of all this activates should be supported by check and balance of PDCA Deming's principle.

C. Strong diagnosis and guidance system.

Institutions may fail before their act of objectives, industries may become reluctant and loss hope in those institutions when they ruin their plan of improvement. At this moment government, should intervene and play a leading role of supporting those elements in every dimension and reason of failure. Due to that a strong diagnosis and guidance system is required for the sustainable development and implementation of those lean production principles.

Diagnosis is a process to examine industries based on symptoms of failure to utilize ideologies emerged from institutes and in another side when institutes couldn't harmonize implementation of lean production ideology. The guidance system instructs about what institutes and industries should do or how should they behave and control the process of lean production system. A diagnosis and a guidance process should be controlled by the Plan_Do_Check_Act cycle within the government to create a sustainable diagnosis and guidance system.

D. Over-all Plan_Do_Check_Act cycle.

Independent government, institutes, and industries activities will not have an effect on lean production implementation if their actions could be integrated by the same plan of action related to leanness, the same implementation procedure or strategy, the same check and balance system, and the same consciousness on improvement and remedy action on voids found in implementation time.

4.5 An approach for leanness strategy

Contextualizing lean production philosophy should be the first step before implementing on unfertile ground. As it is explained above, during this survey industries have limited on implementing lean production due to the following major problems. Un skill labour which have limited capacity to understand and actively integrated with new philosophies and strategic approaches. Limited capacity to adopt new technology due to initiatives coming from outside and companies doesn't take measurements to invest on R&D department which can pledge philosophies and strategic approaches suits with their production system and technology.

Limited management commitment results have a very huge consequence on continues improvement. However, on this survey it is found that management is not still ready to let go some of their responsibilities into ground level and restructure the improvement system into down top approach. Productivity and quality related problems are created as a result of skill and management gaps. Labors reject a new technology proposed to them since most of shop floor workers is not capable fitting with those philosophical approaches and change themselves to create a promising output as it is expected. Unavailability of leanness strategy is also anther limitation and it leads stakeholders go through endless roads without a light. This condition worse than ever but it is a life that industries manage to survive by losing hope and satisfaction on implementing improvement philosophies. So, that a strategy is needed at list by having the following key criteria's: -

- Commitment and Initiatives from industries
- Training and Follow ups from institutes
- Strong diagnosis and guidance system from government and
- Overall Plan_Do_Check_Act (PDCA) approach to keep check and balance

As strategy, those selected elements should work as a farming system[1] . The following figure shows how the active leanness looks in the farming system.

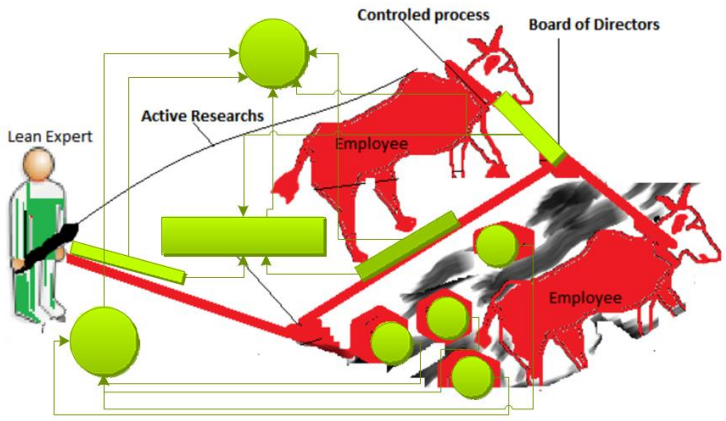

Figure 9. Representation of Innovative leanness with Farming system

5. CONCLUSION

Lean production philosophy is originated from automotive industries and flourished in electronics and other kind of discrete production systems, it's was not applied more in continuous based industries is a literature gap. As it is explained in the literature review, some literatures come out to show lean production benefit in cement (El-Sharief, 2013; Tourki, 2010) and steel (Abdullah, 2003; AVCI, 2016; Deepak Kumar, 2014), which they tried to magnified the application of lean production in continuous production system. This gap is existed not because of lean production philosophy cannot be implemented, but it is misinterpreted with kaizen philosophy so that it is forced to be buried in the ground and companies are still breathes with their thousands of challenges and bulky wastes which dangling industries to life and death. From the survey result it's easy to understand that, metal and steel industries are affected by continuous improvement infectious diseases, they understand they have tightened with a lot of problems which they can easily mention but they are not ready to be cured by philosophical treatments coming from external sources. For long time, they have tried to medicate themselves by enforcing management teams into extreme control mechanisms of the shop floor workers but still they are in problem. It is clear that Ethiopian kaizen institute has put its effort for companies serving for change and willing to accept their sermon. but in reality, the institute effort is not still coming out from its apartment and change the way of life that the "philosophy" kaizen demands to bring. A paradigm management and technical philosophies, like TPS (Lean Production), TPM, TQM, JIT, and has been rarely known in respected companies which are parts of this survey. Mostly Initiatives for change are coming from top management or front line department heads. The shop floor employees at the downstream don't want or, had a chance to think about continues process improvement, or on understanding the benefits on continuous process Improvement and implement themselves independently without management support.

[1] A farming system taken from Ethiopian traditional farming system. ገበሬ፡ Farmer, ሞፈር፡ Beam of plough, ቀንበር፡ Yoke, ጅራፍ፡ Lash, ዕርፍ፡ Beam of plow, እርሻ፡ Barnyard, ማረሻ፡ Plow, በሬዎች: oxen, ሞፈር ቀንበር እና እርፍ ሞፈር መቀርቀሪያ፡ Fastener, ልጓም፡ rein are the contexts taken from the Ethiopian traditional farming system.

Based on the leanness assessment in the above portion it has found the necessity of having contextualized and systematic approach on solving continuous improvement related problems facing metal and steel industries.

6. RECOMMENDATION

Contextualizing lean production philosophy should be the first step before implementing on unfertile ground. a strategy on leanness should be evaluated using; Commitment and initiatives from industries, Training and Follow ups from institutes, Strong diagnosis and guidance system from government, and Overall Plan_Do_Check_Act (PDCA) approach to keep check and balance.

Ethiopian industries should have a common hall to meet and pass decisions regarding to their experts' effort of implementation on the improvement philosophies. This common hall could be a common group of representatives, common associations (Like associations of Engineers from all institutions, association of lean expertise, or any association which can lift up leanness and create common sense of understanding).
Government has a power to solve problems beyond institutes and industries. Government can connect industries and institutes by solving, financial, legal, and logistic problems.

For perfect results industries, should be work integrally with government and institutes bonding with the board of directors.

Employees should carry the burden of improvement and lead a company into the future. Industry managers should only play as guidance and supportive action for the efforts made by employees.

Where ever the research idea originates if it is related to lean production and leanness strategy the lean expert should be responsible to take active researches and bring solutions which can touch a ground and elevate problems during the implementation process.

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