

# **The impact of culture and Organization culture in Lean manufacturing initiatives in Lean Manufacturing (LM) companies South Africa**

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## **Abstract**

Organization culture and the culture of the working class influences the productivity of a manufacturing company. The culture of the people differs from one geographic region to another depending on the different past experiences that bind the working class together on the basis of cultural values and beliefs. One can suggest the Japanese are bound together by their culture, the second world war and its outcomes. What they can do successfully in Japan may find resistance and many challenges in another part of the world. The manufacturing culture in South Africa (SA) is not an exception. The study reviews the different manufacturing cultures in other parts of the world and compares it with that of Japanese companies in SA mainly suppliers of TOYOTA SOUTH AFRICA (TSAM) and other motor industries.

## **Key words:**

Lean culture, collaborate, create, control and compete.

## **1. Introduction**

To introduce and implement Lean in an organization, the culture of the workers come first in order to remove the uncertainty, insecurity and resistance to buy in the Lean Culture. The will of the people is critical in getting all workers on board. Culture defines the assumptions, values, norms and the way an organization and its people behave. It is the social, moral and behavioural norms that a group of people in this case workers of a particular organisation believe in to share common attitudes and behaviour. Culture is like a wind whose effects we can feel but we do not see it. A progressive management accept, adopt and drive a culture of continuous learning, buy in it, live by it and improvement. The Organizational culture and change management have been found in many studies to be critical success factors when one wants to introduce Lean Manufacturing (LM) principles for the first time at an organization. The paper seeks to establish the effect of culture to the success of LM in manufacturing industries in South Africa (SA) by first studying the literature of organization culture in other continents then compares it with that of SA.

## **2. Literature survey**

The study explores the literature first to be able to compile a question schedule that can be used in the interviews and questionnaire to collect the data required for the study. The literature of different cultures will be used to obtain the barriers that need to be eliminated with respect to the working and social culture of the employees. (Hines, 2010) identified the seven skills in Lean should be embraced, these are:

- i. Customer consciousness
- ii. Adaptability
- iii. Initiatives
- iv. Enterprising
- v. Influence
- vi. Collaboration
- vii. Innovativeness

The worker should respect the customer and strive to meet the customer needs. Whatever product is being manufactured, the value added should meet the customer needs. If overvalued the customer will not pay for the extra value and when it's undervalued it will not compete in the market. When Lean is being introduced into the organization, each worker embrace change and accept the shift in mind-set and behaviour. A sense of ownership

of the company start to develop. During adoption the team's continuous improvement initiatives motivate the workers to innovative and use their talents. The improvements succeed when collaboration between supplier and customer is healthy. TSAM leads the innovation initiatives and influences its suppliers and customers on every car model which they make.

(Briody, Pester and Trotter, 2012) made an investigation at manufacturing organizations in Syria to establish the influence of organization culture and individual readiness for change. The study established four groups of culture that are essential at an organisation. Group or Organisation culture focus on teamwork, member participation, worker empowerment and sharing of ideas on the subject concerned. Group culture performance outcomes depend on the flexibility and control of activities within and outside the organization. The group is held together by faith and respect of senior management who are all seen as mentors. Teamwork and participation is used to make decisions by consensus.

Then comes Developmental culture which influence the organization and its stake holders to always develop. It has high flexibility and allows creativity and innovation among the workers in the organisation. The company's development culture is flexible and accommodative to allow workers in creativity and innovation. Unique and new products are produced by such an organisation to gain a big market share because of less controls that hinder the execution of innovation initiatives.

The Hierarchical culture which has a centralized worker control mechanism that focus on stability and prediction of outcomes characteristic of mass production. Its control is more effective within the organisation structure and will only control stake customers when it has competitive promotions and backup programs. This is formalized and managers have powers to make decisions without consulting the rest of the workers "manager's special offers in supermarkets".

Lastly is the Rational culture that is focused on the task with respect to performance, efficiency, and clarity. Managers focus on achieving the market goals in order to obtain customers. Workers in this case should perform efficiently to meet the clear customer requirements. In Lean manufacturing Group and Developmental culture fit very well as opposed to the Rational and Hierarchical which are inclined to mass production. This framework was successfully used in the Syrian manufacturing industries especially SMEs.

A survey done in India by (Kumar and Kumar, 2012) showed that lack of a long term vision, support, communication, innovativeness, time, training, labour resources and capital from management hinders the progress in adopting LM for continuous improvement. If management does not engage with workers consistently, the employees risk getting change-exhaustion, and become sceptical or even hostile to continuing change. Senior management has to create a sense of urgency in understanding Lean, and acquire knowledge and understanding of LM before the workers are trained. The organization should guard against mediocre consultants who contribute much to the failure at the early stage of implementation. It is a challenge to foster collaboration between multiple stakeholders unless the company provide training to its suppliers like TSAM. Many stakeholders need to be engaged in continuous improvement in a highly regulated industry. During each regular training for TSAM employees, the suppliers' staff members participate, a sign excellent collaboration.

(Kumar and Kumar, 2012) also showed some challenges in copying with variability of products, this requires the use of single minute die exchange and ability to level production as per client requirements. The application of Group Technology skills would set up contingency methods to alleviate the levelling and waiting problems to reduce the lead times. Social factors and unwillingness to learn plays a role in hindering LM implementation. The company trains the workers on Hiejunka so that they understand the modalities in the production of similar not identical products for different customers.

Communities are bound together by social and cultural factors derived more than a century ago. Some of these social and cultural practices are surrounded by the unwillingness to learn new skills and resistance to change. Any new ideology is seen as a way of removing their tradition and placing an alien tradition. These challenges are considered by some communities as a way of retrenching the indigenous manpower and replacing them with exotic manpower. TSAM derives its workforce Africans, Indian, coloured and white communities in the south coast of Durban. Each of these communities is bound by their traditional culture that identifies them as one community that owns TSAM thus eliminating the servant/boss barrier of the Zulu culture.

(Nordin et al., 2012) developed a framework where communication culture formed the basis of success in Lean implementing at an organization. He stressed that effective communication elaborates and makes workers understand the need for change to Lean manufacturing. This helps to make workers get ready for change instead of taking them by storm. The vision and strategy is clearly understood by all workers before the change agent system is developed. Teams are then built using proper team building techniques that empowers the workers to implement the changes.

(Sarhan and Fox, 2013) studied the UK construction industry and identified the barriers in LM. First was sub contraction of special services from specialist whose working culture and social norms and values were not aligned to the LM philosophy where the seven steps are incompatible. The methods of procurement and supply of resources were traditional and often had problems in meeting customer requirements and timely supply of products. Some specialist and suppliers were not familiar with Lean principles, hence the culture and attitudes of the teams that deliver resources is different among the contractors and suppliers. This caused delays resulting in waiting, rework, rejects and inventory wastes. Among the sub-contracted specialist were some with poor customer focus because of inadequate lean awareness and understanding. If senior management of the company and its suppliers is not committed to support the lean awareness and understanding, the design and financial issues to support Lean education is found wanting.

The success of Japanese companies has made the world to think of applying the Kaizen at their manufacturing plants in order to win the global market. (Rahmanian and Rahmatinejad, 2013) highlighted that the astonishing success in applying Kaizen is due to the hardworking culture of the Japanese. The Japanese philosophy develops manufacturing industry into mini Universities where research and development is vibrant to allow continuous improvement. The flexible development culture makes the employee prepare psychologically for developing new projects that the company roll out. On the other hand, rigid and hierarchical cultures prohibit any fundamental changes to occur especially when a rigid national culture is dominating.

(Dombrowski and Mielke, 2013) highlights that traditional white and blue collar employees has been brought to extinction by LM. LM redistribute the tasks according to the employee knowledge and skill. In the LM, operators are the first to notice a defect before it becomes too big to be corrected. All improvements in mass production comes from senior management, but in LM the operators point out the required improvements. The philosophy of senior managers if rigid and does not value the contribution of workers becomes a stumbling block. The team leader is a coach who builds the team from worker inputs without giving blame. He/she does not add any value for the customer, it is the employee or operator that adds value to the product. As the Manufacturing culture is changing to zero inventories and zero wastes, the attitudes and behaviour of workers also changes.

(Mapfaira et al., 2014) concluded that in Botswana most manufacturing companies are unfamiliar with productivity improvement tools or lack the technical know-how of implementing the tools hence that knowledge barrier exist. The study noted that lean adoption and implementation barriers are associated with lack of adequate resources. These are inability to cope with change, lack of skilled employees, employee resistance to change, inadequate financial resources as the major challenges.

(Parhizkar et al., 2014) also revealed that employees' disregard of LM procedures and standards of eliminating wastes. The Poka Yoke principle was found difficult to implement because workers were used to fool proofing instead of error proofing. The application of Sigma 6 shows the competence of a manufacturing centre by singling out non-conforming items or defects. The study highlighted that errors are caused by many factors in manufacturing and for that reason the blame game only demotivates the worker. Failure to observe proper standards and procedures in the design process may cause an error which is not a baby of the production team but design. Due to high usage, components and tools deform and loose shape resulting in producing defects in the production unit and the production team cannot be blamed for that. Some materials from supplies are non-uniform or faulty whilst threaded fasteners, hoses get exhausted.

(Pakdil and Leonard, 2015) recommended that before the organisation implement LM it should study first the organization that have been successful in implementing Lean. Some organizations institutionalize particular organisation cultures. Learning and understanding how Lean processes have implemented by other companies would be very helpful but time is required to measure the success.

A study by (Zimmermann and Bollbach, 2015) in China at a German Automotive components Manufacturer looked at the impact of culture in the Chinese community and established the following barriers:

- i. Lack of Lean knowledge in the staff of different nationality
- ii. Lack of systematic problem-solving procedures in the company culture
- iii. High employee turnover due to LM initiatives perceived as employee retrenchment approaches.
- iv. Disregard of LM procedures and standards of eliminating wastes.
- v. Difficulties and challenges in Intercultural and religious communication.
- vi. Weak supplier performance, resulting from certain cognitive dispositions and behaviours of local suppliers.

Insufficient knowledge on lean from employees had a negative impact to productivity improvement through LM principles at the Chinese Automotive company. Some employees disregarded procedures and standards in problem solving, they would omit some steps in assembly tasks intentionally knowing that the chance of getting caught by management is low and after all the car would meet some user performance standards. When the defect is detected

by the quality department or user accountability is not directed to the station that skipped the step. The industrialisation saw workers migrating from farms to industrial cities. These had very little experience and were less law abiding because of their rural background where law enforcers were compromised. The same in SA where there is a migration of workers not only from farms but from different countries in Africa and Asia. The introduction of LM drove part of the work force to leave the organisation instead of learning and adapting to LM principles. They visualized LM as a way of giving blame to staff who do not follow procedures after which retrenchment will follow yet LM is culture that never retrenches but expands its recruitment to meet customer demands. Most NLM companies have a policy where if an employee makes a mistake the first time he is reprimanded, the second mistake he will be warned and punished and the third time he will be dismissed. The labour procedure forces employees to start looking for alternative employment elsewhere. Workers in NLM countries work for high salaries and are found migrating from one company to another in search of greener pastures. This discouraged the company from training the workforce who would leave and use the training elsewhere.

(Zimmermann and Bollbach, 2015) recorded 80% of workers resigned at an Automotive company in China after training and acquiring experience making it difficult to replace the skilled workers. The lack of experience of newly recruited operators caused quality deviations and frequent stoppages of machines. They also lacked knowledge to solve systematic problems and required further training. LM initiatives embraces training and rotation from one manufacturing centre to the other.

Some organizations face intercultural communication challenges in terms of interpersonal skills among team members. The lean training required some Basic English language skills, for supervisors to get input from operator's suggestions as part of continuous improvement and acceptance by employees at all levels. (Zimmermann and Bollbach, 2015) identified the disparity between the Chinese indirect communication style and the very direct German communication style which lead to misunderstandings. Germans were perceived to be rude and inapprehensive of the important facts which Chinese colleagues wanted to make. Germans were annoyed by Chinese communication because it was not clear whether they have understood the instruction or not. The indirect communication style by workers was long winding and inhibited the rapid problem-solving required for one-piece flow production.

(Kapanowski, 2015) also made survey in China and established that the no blame environment is effective in continuous improvement. A mistake or a problem in lean is visualised as a good opportunity to do better instead of blaming the employee. When the team solves the first problem, straight away their "Lean Eyes" sees the next step to be taken to further improve the process. The team environment is used for problem solving planning, development and metrics. Team leadership is consistent and its collective agenda is articulated in lean projects and individual assignments. It has cultural change elements and standalone strategic priorities initiated and tracked against the traditional manufacturing philosophy.

(Alkhoraf and McLaughlin, 2016) argued that organisation culture plays a big role in making a company especially SMES implement the appropriate Lean culture that enhances company growth and competitiveness. The framework developed by the two identified four elements of organisation culture that feed in Lean success as an entity where the new members drive the organisation success. A new member at an organisation should make a difference. The second culture, values and beliefs are shared by employees to foster a certain behaviour. The third is the strategy where culture is viewed as a phenomenon that encompasses cultural activity and change. The last is mental programming culture which is adapted to over period of time. The study also compared the effect of Lean enablers under the generic inhibitors.

In the study by (Lodgaard et al., 2016), lack of capturing and sharing of knowledge by management was sighted as a major hindrance to implementing LM by senior and middle managers. Without a Gemba walk by managers and active support of Kaizen initiatives by management implementation of lean is unlikely to succeed. Improvement initiatives will suffer where there is little support from management. If Management does not prioritize lean practice in their sections and fail to define roles and responsibilities of team members it becomes difficult to spearhead LM. For any achievements rewards are used as a form of motivation in implementing LM is destructive.

In the 2<sup>nd</sup> study (Lodgaard et al., 2016) revealed that most senior managers attributes the limited success to barriers linked to the practices done by specifically workers. On the other hand, workers primarily pointed to management related challenges. LM is not a blame finding game as such people from different functions and hierarchical levels in the organizations have different backgrounds, and cultures, hence different world views. Questions and opinions are perceived differently depending on the individual's hierarchical position. Surprisingly the study showed that Middle managers identified a wide range of barriers in which roles and responsibilities were not clear so that best practice tools would be chosen.

(Ahmad, 2017) indicated that instead of focusing on culture some organisations focus on technology which is less important in the success of Lean implementation. By neglecting the human factor and concentrating on Lean tools and techniques, the company fails to build a positive cultural role among the employees. Ahmad developed the framework for lean culture that would improve the lean implementation. He stressed that before an organisation can start implementing Lean it is imperative for all staff to understand the Toyota culture first. This contribute in motivating the national culture, organisation culture, work culture, lean culture, people and continuous improvement strategies determine the success of Lean.

Setting guidelines for implementing lean principles such as cell manufacturing, pull system, Kanban systems, and one-piece flow and poke-yoke methodologies in factory layout design stage. Tools such as 5S, value stream mapping, quality circle, work place ergonomic and health and safety can be applied once the company is about to start the production. Creating a Lean environment by setting up cross function teams that meet regularly to discuss improvements and give feedback. Ideal teams have a Project Manager, team leader, members each of which have special responsibilities per given time.

To this effect (Sarhan et al., 2018) concluded that the flow of the manufacturing processes reveals the interdependency of tasks across the whole product flow. It brings in the element of waste reduction whilst generating value for the customer. When the company roll-out a change, all the employees will be affected and need to adopt new ways of working by abandoning some elements of the old culture. Many organisations have fostered a sustained commitment using the bottom-up engagements taking and using inputs from the workers. Employee engagement is essential to exploit the workers' emotional attachment to the company enterprise.

NLM organizations have less tolerance to errors and mistakes but the LM philosophy uses errors and mistakes as the starting point to learn and improve productivity. A mistakes that is noticed can be corrected quickly to improve productivity. The Poka Yoke principle aims to eliminate all mistakes by noticing them on the onset. (Mohd and Mohd, 2018) analyses work study data from observation, interviews, questionnaires and experiments in the application of Kaizen to reduce mistakes.

(Haron, Muhamad and Ghani, 2018) and (Jasiulewicz-Kaczmarek, 2014) recommended the application of mistake proofing techniques in TPM in conjunction with 5S, SMED, bench marking, bottleneck analysis, reliability and recognition and reward programs to solve the process and machine problems. The approach reinforced and improved efficiency in the building of a zero defects and green manufacturing culture in TPM.

A study by (Perera and Samaraweera, 2019) in Saudi Arabia and United Arab Emirates revealed that organisational culture is a major barrier in implementing lean in the construction industry and its suppliers. The construction industry has many suppliers and manufacturers of construction materials and equipment to assembly and use in the structures being built. Collaborating with all the suppliers and influencing them to apply LM principles was found to be difficult. This emerged to be the cause of delays in finishing the projects in time because of waiting for materials and equipment. A Lean culture is not adopted radically, but requires small improvements time after time, till it's well-built. If a task is done repeatedly several times, new ideas are born to improve and perfect the process through innovation initiatives spearheaded by the company culture and the workers' social culture. Failure to change the mind-set of all workers was a barrier that slows down the full implementation of Lean in order to eliminate waste.

### **3 Methodology**

The literature survey is used to formulate the questions in for the interviews conducted to six manufacturing organisations that supply Toyota SA (TSAM) with parts for motor car models. These companies also supply other Automobile companies in SA. Questionnaires were submitted first and interviews were a follow up to responses in the questionnaires to validate the data gathered.

### **4 Findings**

The study found that the organisation and top management requires to establish an atmosphere where all workers know what is happening. The working culture in SA is to recruit trainees and workers from the local community and train them with operational skills. Many employees lack the skills, expertise and a systematic problem-solving techniques and procedures in the company culture. The recruits are trained by TSAM at their academy to understand many LM tools such 5S, Poka Yoke, JIT, Jidoka to mention a few. At first, knowledge on the 8 wastes is imparted then comes the 5S for housekeeping before the other tools. Knowledge on the rest of the tools is specific and imparted to staff after allocation of departments based on the individual talent and when the need arises.

Any changes in the working culture has to be communicated to all parties and employees so that they get ready for the change. An effective communication culture between all parties in the partnership and integrated teams was found to enhance the success of Lean. A poor communication culture impedes the progress in adopting LM.

A multinational and language workforce in SA is found to cause some challenges in communication. Some nationals communicate in a short and direct way whilst others have an indirect communication style that waste time. We also have employees who are conversant with English in a factory English is the language of communication.

In cases where the project is fragmented to contractors, some contractors use the bottom up communication whilst others apply the top down. This mix of communication cultures on the same project breaks down communication. Fragmentation and subcontracting in manufacturing has a negative impact on cooperation and learning together when multi company projects (Building power stations) are undertaken. TSAM collaborates with all its suppliers and goes to the extent of providing training to the supplier workforce when the need arises. This has reduced the waiting time and changed the culture to JIT. When continuous improvement is being introduced it can be done across all companies but the cultures may be different such that one company may delay to realise the benefits. Each company will be using its own manufacturing philosophy to meet the set targets. Some Contractors allow one party to impose power over another and create adversarial relations. TSAM managed to create collaborative relationship with all its suppliers leading to gradual implementation of LM.

The training provided by TSAM eliminates the inability to work as a team which is a big challenge in many industries where there is no proper team building exercise done before teams are formed and trained. Team work, brainstorming and group discussions solve the culture problem and build confidence among the professionals at different levels. Each member in the team has a specific role for the success of each task. If the member is not effective the other members assist until he meets the expected targets. A member is only moved to another section if it is found that the talent is underutilized.

In SA the citizens have many social responsibilities in the family clans, religion and cultural or traditional initiatives which bind them together in their daily life. Communities are bound together by social and cultural factors derived more than a century ago. Some of these social and cultural practices are surrounded by the unwillingness to learn new skills and resistance to change. The culture where royal members are not supposed to be criticized openly or supervised by subjects impedes brainstorming and utilization of talent in the SA context. Amongst women those from the royal family want to be treated with respect as queens and consultants everywhere irrespective of their knowledge and capabilities. However, they have the blame culture which conflicts with the LM philosophy. The “no blame culture” is a challenge to established NLM organisations that are accustomed to blaming and punishing a manufacturing defect as a corrective action in South Africa and Africa at large. LM manufacturing culture recommends that we learn from mistakes and a mistake is the first step to improve productivity.

The influence and culture of “injure one injure all” used by the Labour Unions in some cases hinders the change of mind set (paradigm shift) of workers. SA workers feel united when they go for industrial action to support workers from other companies who belong to the same Union even if their manufacturing philosophy is different. (Bhat and Shetty, 2013) reported that Lean cannot work in Unionised environment. TSAM and its suppliers have a common Union that air their demands as one through proper channels. In LM the workers own the company and before they take industrial action they first meet the customer supply needs by manufacturing a buffer safe stock for 4-10 days.

Another cultural misconception is that “Lean is stressful and mean” TSAM and its suppliers use the two shift work per day instead of the three shifts which many companies use. Each shift has eight (8) normal working hours and four (4) hours overtime per day. Workers do not create overtime hours but it is always there when the demand is normal. Overtime hours are also used to deliberate on productivity improvement and document and display achievements. Some subcontractors have adopted the twelve-hour shift approach at Thermal Power stations and mines. This saves an hour everyday of waiting and motion whilst exploiting the talent in brainstorming.

African tradition workers strongly believe that housekeeping of the workplace is done by women and cleaners. As such they resist or apply sparingly the 5S housekeeping fundamental tool reduce waste in motion and waiting in order to improve productivity. Many are not comfortable with the SMED, Poka Yoke, Gemba and Heijunka tools to meet customer requirements.

In Africa there is a culture that imposes lack of commitment to the work because of the meagre salaries the workers get from foreign companies. They have a misconception that Lean is for Japanese and only suitable for Japanese car industries and their suppliers. Some workers feel that the beneficiary or owner of the business is sitting somewhere in developed countries in enjoying income from the poor workers’ effort, hard work on adding value on African resources. Inappropriate job placement and unemployment also causes a problem; you find an artisan welder working as a truck driver due to unemployment challenges. The training of engineering skills can be based on demand and supply to avoid flooding the market and lowering salaries. Where we have many unemployed artisans the salaries are pegged at the minimum by many companies which forces the skilled and experienced personnel to take menial jobs on contract because the salaries will for skilled artisans will be low.

## 5 Discussions

A framework is developed from the data gathered from TSAM and its suppliers to validate the effect of culture to the success of Lean manufacturing in SA. Learning and understanding the Toyota way before you train and educate the workers helps the employees to buy in the LM philosophy. The use of bottom-up engagements gives brilliant ideas from the workers of both the manufacturing company and its suppliers through continuous collaborations. The human factor and their culture should not be neglected for communication. Use easy to interpret signs marked on boards, floors, walls, roads, walkways and notice boards. Cameras are installed to record the human behaviour when crossing intersections in the plant where we have vehicles.

Create a Lean environment by setting up cross function teams that meet regularly to discuss improvements, give feedback and display the improvements on notice boards. LM companies have noticeboards for every worker to see improvements done and in progress. Teams have coherency and work as a unit. The errors in production pushes the team to learn and improve productivity by reducing mistakes using intelligent sound and light signals to reveal the mistake at the onset.

Align employees to organizational goals to guide them in their individual roles and responsibilities. Employees are trained to develop expert skills and knowledge that empower staff to make decisions that eliminate rejects and rework. Appropriate incentives are used to motivate team members for good achievements. The incentives are the team and group. Most incentives come after the improvements have been used several times usually after a year when users give feedback. Mistakes are for the team not the individual and mistake initiate improvements and innovations.

Individualism in achievements and rewards is popular in Africa than group achievements. This rewarding process lead to wrong attitudes such as concealing the defect by many workers so that the mistake is not recorded under their staff number. Some operators reject the responsibility to do minor maintenance and run the machine even if the signs of producing defects show. Reflections on improvements from Continuous Improvement Project Log sheet are displayed on notice boards so that all employees can see.

LM applies team work where communication and transparency among the team members in the production line has to be effective. If a mistake is repeated by the same operator because the operator is not talented then he can be transferred to the right place where his passion and talent is great. In the case of salaries LM companies have benefits that are commensurate with the improvements in productivity which the team has achieved.

A company that manufactures and supplies windscreen wipers to 4 automotive manufacturers say Nissan, GM, TSAM and VW and the work centre is the same then Hiejunka levelling method is used so that none of the customers will run short of bearings and wipers in them assemble stations. The same applies to other parts manufactured by the same companies for the same demand.

Conducive parameters for a cultural change to take place include the personality, motivation, sustainability and innovation. The workers who share values and beliefs can accept or reject the LM principles in total if the motivation is not convincing. This group will resist change and innovation until other means of motivation have been put in place. If the group accept the LM philosophy success is inevitable. Such a group will be highly innovative and many improvements in productivity will emerge. The 8 waste will be minimised and the benefits LM tools like 5S will quickly show whilst continuous improvements projects will prevail.

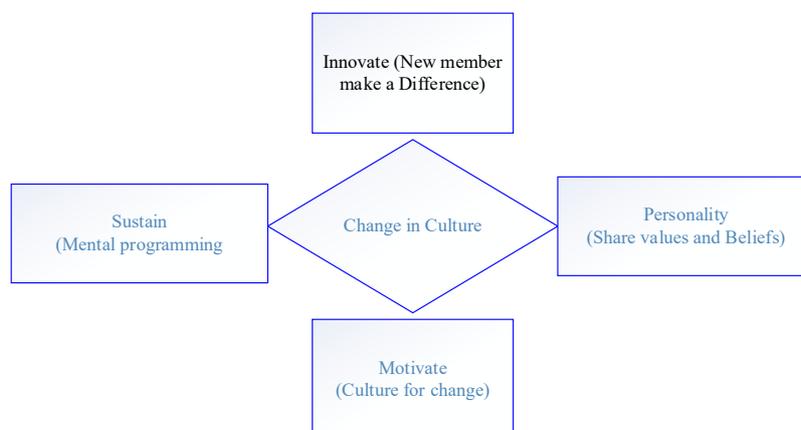


Figure 1 Framework of manufacturing culture change.

## 6 Conclusions

The success of LM depends on the current organisation culture and cultures of the workers. These play a fundamental role to change the manufacturing philosophy. It is critical for the organisation to study and understand the Toyota way before they do the awareness campaign to employees. Neglecting the employee culture often have a negative impact. The worker input should come first so that they are trained and skilled and empowered to make decisions. Collaboration with suppliers on the change in culture helps suppliers in making the product development process successful. Collaborate, create, control and compete. A LM model shown below is used with success with most companies.

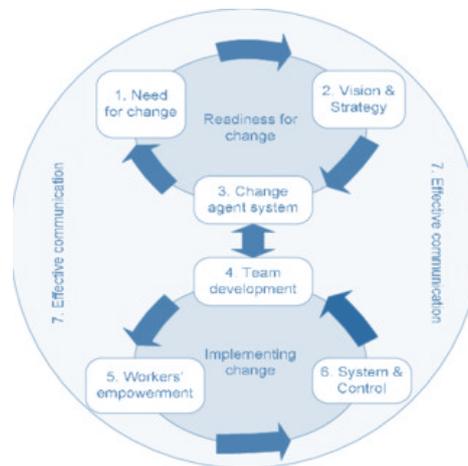


Figure 2 Lean manufacturing model

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