

Literature Review: The Role of Organizational Factors in Maintenance Organizations Affecting Their Manufacturing Performance, From Sri Lankan Cultural Perspective

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Abstract: - Sri Lanka is still a developing/emerging country having an upper-middle income economy [87]. The vision of the entire country is expected to become a fully developed country in a short and reasonable time frame. In line with this vision, the level of maintenance of assets and facilities of the manufacturing and industrial establishments which contribute immensely to the national economy of the country must be enhanced and sustained. Manufacturing and maintenance industry performance today is inadequate, because of lack of standard policies and practices, mainly the absence of rich maintenance culture. The cultural deficiency mentioned above is one of the biggest contributors to this inefficiency. Thus, developing the maintenance culture is essential to increase the awareness about maintenance. Therefore, the objective of this paper is to critically review the existing literature of key organizational factors that affect the maintenance performance of manufacturing organizations, and consequently propose different approaches to resolve these issues and gaps identified from the perspective of research and practice.

The method of the study used is the electronic database and the recognized journal articles, conferences, seminars, books, symposium proceedings, theses, and synthesized literature [30]. Reviews provide a description, summary, and critical evaluation of these factors in relation to the research problem being investigated. Such research studies are in Sri Lankan context so rare and difficult to find even in other developing countries. Under these circumstances, this theoretical exploration is very significant. The determinant organizational factors revealed in this exercise are technology and innovation, communication in maintenance, training and education, problem solving, planned maintenance, maintenance policy and strategy, organizational structure and fund allocation. These findings indicate that these determinants have positive relationship with maintenance performance. This review paper will make significant contribution to existing body of knowledge and to the business performance.

Keywords: Maintenance Performance, Maintenance Culture, Organizational Factors, and Manufacturing.

I. INTRODUCTION

The industries of this century face a big challenging environment as never before in optimizing their production. With ever-changing technologies, global

competitiveness, environmental changes, emerging safety and security requirements, increasing trend of quality parallel to the technology changes while threatening human capability are the most accountable areas to be considered in focusing on the company's performance. In addition to increasing production capabilities, customers and stakeholders' expectations, this has led to increased pressure on manufacturers. Thus, with the flexibility of products and processes, today's companies need to meet exact customer demands in order to stay in the business [25]. In manufacturing industries, plant availability becomes a key issue in the manufacturing environment because possible maintenance breakdown is more likely to affect production and product quality simultaneously [1].

In general, maintenance activities should include restoring any kind of machinery and equipments or their components to a working order to prevent unnecessary failures or errors to happen, so as to perform their intended function, by ensuring the protection of environment, people involved and machinery or component itself [2]. Likewise, according to Ben-Daya and Duffuaa, [12] machine or equipment ought to be ideally maintained in an operating condition and should perform its expected functions effectively for efficient production, and machine availability. In order to succeed, the maintenance management activities should be integrated with the production and operational processes. But their role in the formulation and improvement of maintenance objectives and other management strategies has not been adequately identified. Maintenance and business strategies are rarely aligned [49]. Therefore, the maintenance function is identified to solve problems related to the technical condition of production equipment and facilities, and thus is closely affecting both the effectiveness and the efficiency of the manufacturing process. Thus, it is essential to develop a strong maintenance culture to increase awareness of machinery and asset maintenance in industrial establishments in countries like Sri Lanka. However, this prevailing situation, as pointed out by Tranfield et al [76], shows that the Sri Lankan manufacturing sector has not yet met its potential. We should emphasize with this statement that this study

contributes to the investigation of key factors affecting business performance with a special focus on manufacturing performance. Considering maintenance productivity, which is directly related to production efficiency in particular, can be interpreted as a special need. Further findings suggest that the intensification of demand for this research disclosure is due to the high impact of manufacturing on the Sri Lankan economy. It is significant to consider the evidence that the index of industrial production has decreased by 3.5% in the month of October 2020 compared to the same month in 2019 which is a significant aspect to consider [23]. Developing such an acceptable maintenance culture in manufacturing in Sri Lanka, by improving maintenance skills, stability and dynamics, and maintenance capability (maintainability) leading to productivity are the most important criterion that need the attention of Scholars and Industrialists.

1.1 Manufacturing Industry in Sri Lanka

Until the late 1970s, manufacturing sector in Sri Lanka was dominated by several large-scale enterprises developed and managed within the government sector, mainly goods such as cement, fabricated steel, ceramics, fuel and lubricant oils, paper, leather, tires, textiles, sugar, and liquor. Only a few factory-based industries were in hands of private sector, mostly producing light consumer goods. The liberalization policies of economy adopted in 1977 by the newly formed government, that brought significant changes. Some state-owned industrial enterprises were privatized. Mainly private investors were given financial and other concessions to attract foreign investment. This included an incentive package offered at several investment promotion zones. The investors in private sector were attracted to these relief incentives as well as to the low wage rates prevalent in the country. That was why an Export Processing Zone was set up to promote non-traditional exports [42]. New employment generated through this liberalization that meant introducing new business practices and products, tending to reduce poverty, reduce inflation and to avoid income inequality and address the balance of payment problem. Parallel to this process the small and medium enterprises have been recognized in view of their export potential, ability to provide raw materials and semi-finished items to the large manufacturing firms, capabilities to produce under the sub contraction system and the capacity to take the manufacturing process to rural areas of the country [17]. In this stance Sri Lanka had a number of strong points in entrepreneurship that focused more on technology and innovations as drivers of the economy in going forward. The process involved in converting inventions into viable goods and services is called innovation, as Schumpeter's theory of innovation [69] which these innovative methods of manufacturing transcend traditional practices. Except for the garment industry, which is the largest Labour intensive, other industries could not escape from technology and innovations. In the case of manufacturing following technologies and innovations are utilized or have been to conceptualize to use. Those are Internet of Things (IoT),

nanotechnology, robotic process automation, artificial intelligence, virtual reality and augmented reality, smart manufacturing and so on. In addition, there is a tendency to use innovative administrative tools, like Enterprise Resources Planning system, Material Resources Planning, ISO quality management tools, Total Quality Management tools, Lean Management Toyota Production concepts and Computerized maintenance Management System etc. In the manufacturing plant's as maintenance concerns, Total Productive Maintenance, Reliability Centered Maintenance, Autonomous Maintenance function as fundamental concepts used. Under these concepts, Condition Based Monitoring, Predictive Maintenance, Preventive maintenance, Proactive Maintenance are functioning currently with respect to technologies and concepts adopted.

According to another study, Sri Lanka is different from western and other entrepreneurs and their structure because Sri Lankans prefer to have high power distance and tough control through their informal traditional rules [34]. It is therefore clear that the cultural values of these Sri Lankan entrepreneurs and their followers and the modern management are incompatible. Therefore, entrepreneurs'-followers behaviour can be interpreted differently in dissimilar cultural contexts [8]. These inequalities have implications for entrepreneurs' and working peoples' creativity and innovative attitudes. This is how the human factor influences the other organizational factors of the organization. This impact on maintenance performance as well as other manufacturing and business performance is a certainty.

1.2 Maintenance and Manufacturing

Maintenance is not only ensuring the proper functioning of machinery and equipment but also plays a key role in achieving the company's objectives by improving productivity and profitability as well as overall performance efficiency. According to De Groot [24], maintenance is considered an essential and compulsory component of an organization's long-term profitability and is increasingly becoming part of an overall performance approach. Maintenance is considered as the activation of activities, ensuring that physical assets continue to provide what their users want [52]. Tsang et al. [77] refer to maintenance as the normal and repetitive process of keeping an asset or machine in normal operating condition. It can also provide the desired performance or service. In general, the perception and acceptance of society as a whole is that maintenance is seen by many executives or stakeholders as less important than just making money due to a vague understanding of the role and maintenance of achieving a company's goals and objectives [26]. Accordingly, its role is ensuring the maintenance impact on the business performance aspects, such as productivity, increased profitability indefinitely, improving machine availability, efficiency, product quality and faster delivery, including environmental and safety requirements. Growing of corporate perception of plant maintenance function, still needs to add a lot of positive conceptions of maintenance. Its relevance is particularly

justified in the production environment [1]. Many researchers and practitioners have emphasized on the total losses caused by maintenance omission or ineffectiveness in maintenance. Nonetheless, maintenance is still considered as a cost centred and is not much considered as a profit centred. Thus, it can be said that maintenance affects production by increasing production capacity while also controlling the output quantity and its quality [12]. Then, the integration of maintenance and production has to be done based on a clear understanding of their relationship. According to Kelly [37], the maintenance organization's need is to make continuous improvements or modification in order to respond to the changing needs of maintenance and to understand the evolving nature of the production system and its requirements.

Current practices of maintenance reliability, not only Sri Lanka, even in developing countries like, Vietnam, Nigeria, Tanzania, Malaysia, are not in an acceptable level. In most of these countries, manufacturing plants, and physical assets are frequently dilapidated resulting from a grossly inadequate maintenance culture. The said deficiencies emerge from, outdated strategies, poor planning, and the absence of a proactive nature. In Sri Lanka, undesirably prevailing low rates of capacity utilization, low machine availability (uptime) as reported currently is 78% in the industries, and the lowest availability was reported as 69%, in 2011 [19]. **Accordingly, maintenance discipline, strategy, way working, and maintenance performance (effectiveness) in Sri Lankan context is understood as inadequate in relation to industry and national productivity. This is mainly due to irregular poor maintenance accomplishment and poor maintenance culture already established.**

1.3 Justification to Literature Review

Maintenance as well as manufacturing performance in Sri Lankan context still being recorded in an inappropriate level. It has been resulting a bad impact on the industry effectiveness leading to country's economic stability. For instance, in Sri Lanka, there is an increasing concern that plant maintenance executions are being unprofessionally applied by managers and industrialists due to many reasons. The current practice in maintenance industry in Sri Lanka and similar countries still lack standard guidelines. It will be clear that this study helps to bridge the gap in literature on maintenance culture and its determinant organizational factors. The way forward of this research would be served as a reference on the critical success factors of organization towards increased maintenance efficiency in the industry.

1.4 Objective of this paper

Objectives of this paper are as follows:

1. To examine the determinant organizational factors, which influence maintenance culture towards their industry maintenance performance through reviewing the previous research studies.

2. To present the review findings as guidelines to contribute to the industry, and the academic endeavors for improving the maintenance culture and performance as well.

II. LITERATURE REVIEW

2.1 Identifiers of Culture

Organizational goals can be achieved by creating a strong cultural organization. A strong culture of management is also possible if every employee is able to create a work environment of their desire [59]. Corporate organizational culture is a fully-fledged social aspect that influences the behavior of employees' decisions. Organizational culture is an experience that binds people together and makes them feel that they are part of the organization. This feature is also important player in attracting new employees and keeping them up. Organizational culture also supports the process of interpretation and helps employees understand corporate events and make communication more effective and efficient. When a company's strong culture is not aligned with the company environment and desires, it cannot effectively serve the customers and other key stakeholders [50].

2.2 Maintenance Culture

Any culture may be discussed from an economic viewpoint; It means manipulating the competence or ability and success of the organization [21]. According to them culture could be identified as a backbone of an organization. Furthermore, a strong culture will stimulate organizational performance while having direct strong relationship. There is also a similar connection between the maintenance culture and its performance. Culture of maintenance is important to elevate maintenance performance which would directly enhance the manufacturing performance according to scope of this study. It is an alternative for improving maintenance commitment and maintenance awareness among all parties involved in maintenance. Therefore, acting and behaving are related to things to do and to achieve what we want for an organization. In regard to the maintenance concerns, these elements are almost adaptive to the expectations. The aim of improving maintenance culture is to build an awareness of importance of maintenance concerns in maintenance objectives. The maintenance culture has not been strongly described in the available rare literature, but there are similarities with cultural definitions in other fields. Market al., [51] and Suwaibatul, [72] stated that maintenance culture is way of working, thinking, sharing their ideas, beliefs, values, practices, norms to protect a system, equipment and structure pertaining to maintenance discipline. Florence [28], on the other hand, states that maintenance culture is not a universal nature and that it usually goes hand in hand with individual corporate culture. It is a natural daily exercise that can be learned from a person and followed by others. The person that influences is essentially the maintenance leader himself. It is clear that culture of maintenance is beginning with influence of main organization culture and behaviour [53].

2.3 Organizational Factors as Determinants of Maintenance Culture and Performance

It is revealed that there is no acceptable study in Sri Lanka of such factors affecting to maintenance performance. Similarly, there are very few and limited studies also found in other countries. According to the maintenance culture a study done at Universiti Teknologi Malaysia, by S.I.A. Sani, A.H. Mohammed, M.S. Misnan [53] the determinant factors have an impact on the developing of maintenance culture were identified from the previous researches. The organizational maintenance factors identified by them other than human and psychological are policy system, strategy, work planning, adequacy of organizing training and education, and organizational structure. In addition, in the search for human and psychological factors, according to Suwaibatul, et al. [72], maintenance culture is the core of any person, the group, or society that considers maintenance as their life. The values, thinking, behavior, and cognition are important factors and that they are applied to their performance. Likewise, according to Mark, et al. [51], concept maintenance culture is the internal environment between management and staff to ensure that management effectively maintains through the sharing of ideas, beliefs and values of each member of an organization. Even though the maintenance or production member has a high attitude with positive ideas, beliefs and values pertaining to the maintenance culture, the effort of maintenance work will not be successful without the relevant maintenance management tools or organizational factors in the maintenance subject. Else, the maintenance effort will not be efficient.

Odusami and Faremi [60] in a study of Nigerian perspective revealed following factors that affect maintenance performance. Most of them are of organizational nature. They are insufficient funds for maintenance, procurement difficulties of having good spare parts, total maintenance cultural effect of the country, inadequate training and development, using poor quality components and materials, quality of management, persistent breakdown through indiscipline and ignorance, absence of planned maintenance programmes, Most of them are appropriate and have relevance to this study, such as organizational staffing policy, productivity measures, training in management, training for planners, training for technical teams, budget and controls, work order functions and scheduling aspects, stores, material, tools, and their controls, how preventive is functioning, equipment history, record and their utilization, condition monitoring applications, work measurement of people and information systems. Good maintenance means maintaining maintenance goals and strategies without isolating them. Efficiency determination may vary according to company maintenance and production policy. Once the maintenance objectives are outlined, maintenance strategy formulation is necessary to help decide which type of maintenance needs to be followed, when to do it, and how often it can be done [70],[36],[71],[61]. Once the goals and strategies are

introduced, the success of the maintenance work depends on managing them properly. According to Campbell [20], the maintenance work management cycle consists of work identification, planning, scheduling, execution, and completion of work. Some authors have pointed out that when choosing these strategies, maintenance efficiency can be achieved by using more advanced technologies [70]. Therefore, the primary task of maintenance managers is to coordinate and direct maintenance efforts to achieve such corporate strategic objectives efficiently and effectively [1],[3]. It is therefore becoming more important than ever for these managers to receive formal educational training that covers various aspects of their organizational roles [73]. The maintenance in manufacturing organizations is estimated at twenty-five percent (25%) of the total operating costs. Therefore, monitoring and controlling the cost of allocating and maintaining funds is essential. This is also an essential factor to be considered.

Further the literature reviewed have shown that the computerized maintenance management systems (CMMS) include performance measurement systems that incorporate many of the components needed to support maintenance management [43]. In this position, the overall use of information exchange, quality of information, familiar use of information technology, time-related issues, process management, and integration of all information are considered as critical factors [78]. As highlighted by Simos et al. [74], the percentage of work orders (WO's) completed on time out of from all WOs received is also an important indicator of maintenance. This also falls under maintenance planning factor. Making the right maintenance decisions about maintenance is an important factor to consider as an important role in an organization. There is a potential link between machine maintenance and performance data and there are such accurate and up-to-date maintenance decisions among maintenance professionals in the Sri Lankan apparel industry Identified by Wijesinghe, and Mallawarachchi, [82] in a study on the Sri Lankan apparel industry. Accordingly, the training and development factor to improve the decision-making ability and knowledge of maintenance managers are relevant. From another Sri Lankan study, Wickramasinghe and Wickramasinghe [85] it was found that there is a high level of participation in decision making attribute reported in practice of lean manufacturing operations in apparel industry.

It was identified in another Sri Lankan study by Dilanthi, and Deegahawature [22] that four maintenance practices ensured the sustenance of the maintenance function in Sri Lankan manufacturing industry. They are leadership, communication and coordination, Training, employee involvement, and equipment failure responsiveness and team working. Maintenance efficiencies appear to vary due to differences in different organizational cultures and maintenance skills [83],[4]. One new approach to improving the performance of maintenance activities is the implementation and development of a TPM strategy [4]. The TPM is

concerned the employees' participation is valued and expected to improve production equipment's availability, performance, quality, reliability, and safety [4]. Study revealed in apparel industry, Implementing TPM maintenance system which is mostly an operator and technician involved autonomous practice increases cost efficiency, productivity, product quality, timely delivery and flexibility and have shown their validity reliability in the Sri Lankan context[84].

Normally maintenance cannot be blamed if things go wrong; nevertheless, maintenance management is able blamed (Idrus et al., 2009). As per this statement, therefore, an appropriate maintenance plan should be developed to ensure efficient maintenance [5]. As Myeda et al. [46] pointed out, if all the maintenance work to be successful, an organization must have a suitable planning. Adenuga [6] studied maintenance management practices in building maintenance concerns. The study found that low effectiveness is due to the fact that maintenance department was staffed with inexperienced workforce. Enshassi et al. [27], assessed the practices of maintenance management have been handled by unqualified maintenance staff and the lack of the inventory system were the reasons of the variation in responding to maintenance requests. Finally, they recommended that the maintenance staff should have the required experience and they should be well trained to do their jobs effectively. Baba and Buba [10] assessed the following factors that affect maintenance performance. Their study revealed that low standard material use, lack of preventive maintenance practice, insufficient workmanship and design appropriation factor are the most important factors influencing maintenance. They further noted that technological changes, non-availability of replacement parts and components, lack of communication between maintenance contractors and clients, and lack of understanding of maintenance benefits were the least important factors. Talib et al. [75] studied the factors influencing maintenance. Their profound findings were lack of preventive maintenance, inadequate funding for maintenance, poor quality of maintenance, lack of quick response to maintenance requests, and lack of replacement part and components were the most significant factors. Adenuga et al. [7] observed the factors affecting maintenance management. Their results showed that lack of adequate training, lack of clear maintenance culture, misuse of user attitudes and facilities, and reluctance of an organization to support innovation were the most important factors influencing maintenance management. When considering maintenance in a non-manufacturing field, it is feasible. The Sri Lankan study on factors affecting building related, maintenance and their costs, Perera et al. [62] emphasized that the following factors also play a considerable role. Poor maintenance accomplishments, poor budgetary control, poor quality of spare parts and materials usage, poor maintenance management tools, lack of maintenance strategy, failure in reporting procedures and failure to take corrective action timely.

Therefore, this literature review seeks to examine issues related to various aspects, such as maintenance practices, resource management, maintenance procedures, and evaluations of manufacturing organizations.

III. METHODOLOGY

The study has explored through the methodology of secondary data collection, and critically reviewing the literature from previous researches, revealed about maintenance organizational factors specified in maintenance culture perspective. The determinant factors, variables affecting maintenance culture including their performance and similar other organizational cultures were analyzed. Review of literature review includes from published data such as seminars, journals, books, theses and dissertations. The review includes in Sri Lankan and foreign reading materials. The following table 01, summarizes the most influential organizational factors, that involved in maintenance and organizational cultures investigated and analyzed. There have been over 260 research articles were adequately read and secondly, the identified organizational factors were critically evaluated and discussed.

Table: 01; Determinant factors identified related to organizational cultural construct in maintenance culture, by reviewing the previous research studies

Organizational Factors	Evidence (Researcher and the Year)
Planned Maintenance	Duffuaa et al.(1997); Bowers (2005); Wall (1993); Lukacs (2003); Shen Qiping (1997); Kundi et al.(2001); Mkilania, (2016); Labib (2004); Baltes, Dickson, Sherman, Bauer, and LaGanke, (2002); William, Cato and Mobley (2001); Peters (2006); Mather (2009); Mishra, (2007); Zairra Mat Jusoh, Narimah Kasim, (2017); Whybark and William, (1986); Evan et al.,(1987); Ramakrishna,(2005); Ogbadu,(2009); Ondiek, (2009); Windle(1993); Bamper et al.,(1999);Wireman,(2004); Duffuaa,(2012); Ben-Daya, Duffuaa, Raouf, Knezevic, and Ait-Kadi,(2009); Garg and Deshmukh,(2006); Ben-Daya, Duffuaa, and Raouf,(2000); Muchiri, Pintelon, Gelders, and Martin,(2011); Jonsson,(1997); Sarshar (2006), Letza (1996), Thomas (2011), Barret (1995).
Training and Education	Van Vugt, (2006); Polanyi, (1966); Bhargavaand Anbazhagan,(2014); Ilgen and Pulakos, (1999); Deming, (1982); Sahinidis and Bouris,(2008); Peach, Ellis and Visser,(2016); Cua et al(2001); Katila(2000); Windle(1993); Bamper et al.,(1999); Hannson and Backlund(2002); Seth and Tripathi (2005); Rodrigues and Hatakeyama(2006); Siong and Ahmed(2007); Ahuja and Khamba(2008); Badhi Shah(2012); Aspinwall and Elgharib, (2013); Ng et al., (2011); Chan, (2005); One et al., (2005); Blanchard, (1997); Davis, (1997); Fredendall et al., (1997); Swanson, (1997); Gupta (2000); Mjema and Munanu (2008); Taha et al. (2003); Tay and Goh (1995); Mann(1998);Nakajima (1988); Andrew,(2009); Fielder,(1970); McCall, Lombardo, and Morrison,(1988); Ilgen and Pulakos, (1999); Jaoko,(2014);(Partlow,(1996); Tihanyi et al.,(2000); Bo udreau et al., (2001) ; Flynn et al., (1995) ; Phillip seamen et al., 2005); Yasin (2010), Varcoe (1993), Alexander (1994), Carder (1995), Mc Lenna (2000), Puddy (2001), Sapri and Pitt (2005), Pathirage (2008), Wahid and Fernie (2009), Nutt (1999), Youssef and

	Zairi (1995), Ali (2013); Panayides, (2007); Park, and Kim, (2006); Sakalas, and Venskus, (2007); Walecka-Jankowska,(2015); Yecil, Buyukbese, and Koska, (2013); Zhou, and Li,(2012).
Communication	Misnán and Samlawi (2012); Mohammad Zadeh and Saghaei (2009); Andi et al. (2005); Khoiri (2010); Cristina et al. (2012); Zou (2010); Mohd Saidin (2009). Stephen, (2005); Cua et al(2001); Hannson and Backlund(2002); Seth and Tripathi(2005); Ng et al.,(2011); Park and Han,(2001); Yamashina,(2000); Fredendall et al.(1997); Wang, Chen, and Chen,(2009); Valente et al.,(2015); Shohet and Lavy(2004), Nat (2006), Yu et al. (1997), Waring and Wainwright (2002), Ada Scapulo (2012);
Technology and Innovation	Katila (2000); Camisón, and Villar-Lopez (2012); Carmeli, Gelbard, and Gefen (2010); Evangelista, and Vezzani(2010); Jacobsson, and Bergek,(2011); Jimenez-Jimenez, and Sanz-Valle,(2011); Sanidas,(2005); Vaccaro, Parente, and Veloso,(2010); Vincent, Bharadwaj, and Challagalla,(2004); Akguna, Keskin, Byrne, and Arena, (2007); Alegre, and Chivab, (2008); Calantone, Cavusgil, and Zhao,(2002); Correa, Morales, and Pozo,(2007); Davila, Epstein, and Shelton,(2006); Ezra, (2005); Fernandez, Mundet, Sallan, and Sune,(2004); Hult, Ferrell, and Hurley,(2002); Hyvarinen,(1990); Jansen, Bosch, and Volberda,(2006), Kuo, and Wu, (2007) ; Joe, John, and Keith, (2005); Lampela, (2009); Luecke, and Katz, (2003); Mercader, Cerdan, and Sanchez, (2006); Morales, Montes, and Jover, (2007); Therin, (2002); Wang, and Ahmed, (2004); Fischer, (2006), Davila et al., (2006); Yang et al.,(2009); Kasper et al. (2008); Ezra, (2005); Jansen et al., (2006); Weerawardena et al. (2006); Alegre and Chivab (2008); Olavarrieta and Friedmann, (2008); Akguna et al., (2007); Kuo and Wu, (2007); Therin (2002); Park and Kim, (2006); Henderson et al., (2008); Jimenez et al., (2007); Skerlavaj et al., (2007); Correa et al., (2007); Calantone et al.,(2002); Weerawardena and O’Cass, (2004); Rothaermel and Deeds, (2004); Drucker, (1985); Kacker,(2005); Bakir, (2016); Murphy, Perera, and Heaney (2015); Yasini, (2016); Murphy et al., (2015); Walecka-Jankowska,(2015); Valente, Dyal, Chu, Wipfli, and Fujimoto, (2015);
Policy and Strategy	Misnán and Samlawi (2012); Mohammad Zadeh and Saghaei (2009); Andi et al. (2005); Khoiri (2010); Cristina et al. (2012); Mohd Saidin (2009). Perumal and Abu Bakar(2011); Windle(1993); Bamper et al.,(1999); Katila(2000); Hannson and Backlund(2002); Seth and Tripathi(2005); Siang and Ahmed(2007); Ahuja and Khamba(2008); Chan, 2005; Hansson et al.,(2003); Park and Han,(2001); Fredendall et al., 1997; Swanson, 1997). Igal (2004), Irizarry (2014), Gupta (2000), Carmen Jaca (2013); Barrie and Peter, (2007); Wordsworth (2001); Salonen, (2009); Campbell and Reyes-Picknell, (2006); Waeyenbergh and Pintelon, 2002); Wireman, 2010); Chanter, (2005); Victor, (2003); Bavu et al., (1997);
Organizational Structure	Bamper et al., (1999); Panayides, (2007); Kosova et al., (2010); Leitao and Franco (2008) ; Panayides, 2007; Law and Ngai, (2008). Morales et al., (2007); Sakalas and Venskus, (2007); Miesing, (2006); Lotti et al., (2006); Koontz and Wehrich, (1990); Morales et al., (2007) ; Olavarrieta and Friedmann, (2008) ; Akguna et al., (2007); Kuo and Wu, (2007); Kasper et al. (2008) Fernandez et al., (2004); Aghion and Tirole (1997); Meijaard, Brand, and Mosselman,(2005); Nahm, Vonderembse, and Koufteros,(2003); Sakalas,

	and Venskus, (2007); Teixeira, Koufteros, Peng, and Schroeder,(2008); Zheng, (2003);
Problem Solving Culture	Ercole Belloni and Jaroslava Ficova, (2017); Frishammar et al. (2016); Baer et al. (2013); Schaafstal, Schraagen, and van Berlo (2000); Dörner (1987); MacDuffie (1997); Antoni and Albert, (2004); Mayer and Wittrock (2006); Rafique (2005); Canter (2004); Ketelhut, (2007); De Bono, (2006); (Paulus,(2000); Harris (2004); Brian, (1998); Sternberg (1995); Scott (2007); Richards (2003); Ransom(1990); Altier (1990); Nolan(1989); George(1970) ; George and Frank[1980]; Norton(1977) ; Pounds(1953); Filley(1975); House(1975); Dellecq (1975) ; Kolb(1974) Johnson(1970) ; Kast and Rosenzweig(1974) ; Newell and Simon(1972) ; Kepner and Tregoe (1965);
Fund allocation and Budgeting	Seth and Tripathi (2005); Bowers (2005); Jiang, and Li, (2008); Rydell, (1970); Shabha, (2003); Skinner, (1982); Slater, (1982);

IV. FINDING AND DISCUSSIONS

4.1 Planned Maintenance

The primary objective of planned maintenance is to maximize equipment performance by keeping equipment running safely for as long as possible, without deteriorating or having unplanned outages. The schedule for planned maintenance tasks can be based on equipment running hours, number of items produced, distance traveled, or other measurable factors. As per the direction of strategic maintenance approach, the implementation of maintenance planning practices and equipment condition assessment are done. Bowers [11] commented that maintenance planning should reflect and identify needs, establish goals, and allocate fund to meet goals, scheduling maintenance and allocating funds for implementation. In a manufacturing facility, it is essential that equipment runs at optimum performance, not only to maintain production but also ensure staff safety and product quality[65]. That is why the utility of maintenance planning is in high demand. In Sri Lankan maintenance cultures around 50 % of the places no standard work orders are used. Moreover, the findings reveal that, no equipment or plant register is in place. Additionally, risks assessments are not conducted effectively, backlog analysis system is not in place and lastly training and development plan for maintenance planners and schedulers is not in place as no maintenance planner is available in most of the public and private organizations. A similar practice is found in developing countries like Tanzanian industry perspective [47].

Maintenance planning is an advantageous mandatory factor in improving maintenance performance. Direct benefits of planned maintenance include; significantly reduced probability of catastrophic equipment failures and also reduced unplanned equipment downtime and improved overall equipment performance, and prevents costly, unscheduled repairs, more efficient use of manpower and other resources, preventing production interruptions, reducing overall maintenance costs, ensuring machinery runs at maximum efficiency and many more advantages.

4.2 Training and education

This is also identified as determinant to maintenance, which is defined as the planned systematic development of the knowledge, understanding, skills, attitudes and behavioural patterns required by an individual in order to perform adequately a given task or job. The training and development of company employees is essential for organizational operation and advancement. Companies are committed to improving the skills of the workforce. The approach involved is opportunistic as well as systematic. Generally, certain basic skills are required in the field of knowledge of all maintenance staff. For large Companies provide internships where there are apprentices and newcomers in training electrical, mechanical and hydraulic systems usually. Nowadays, the operators are trained not only to perform routine maintenance but also to assist the maintenance function and perform more difficult preventive maintenance jobs during shutdown days, including disassembling and simple repairs. This approach enables the maintenance staff to handle an ever-increasing amount of equipment with the same number of personnel. In other firms, most of the maintenance functions are performed when the production shifts are not working, so there is still a debate as to whether it is worthwhile to train operators and production personnel in minor maintenance and repairs. Further, training and education can improve employees' knowledge and skills as TPM, and maintenance literature review show the importance on their development and lead to an increased sense of belonging to the system [57]. TPM encourages education and training through autonomous maintenance (AM). As described by McKone et al., [48], operators learn to carry out important daily tasks that maintenance people rarely have time to perform their advance jobs. However, in order for training to be effective, the training system must be constantly reviewed and improved to suit changing needs [57]. It must be planned in a systematic and objective manner. Not only changes in technology but also quality training must be continuous.

4.3 Communication

Communication is a factor that affects culture as well. This process partially can be achieved through the communication factor. It is a channel used to transform any information or attitude or behaviour from one person to another as well as between groups, cultures or organizations. This process involves the exchange of facts, ideas, suggestions, emotions, among them. Additionally, it also involves the interaction of stimulus meaning when exchanging messages or information. It is definitely essential attribute of human life whether they are in organization or not. Despite recent developments and the rise of new technologies in maintenance, information management and communication within maintenance teams is still not significant. Often, poor maintenance results are not the result of technical incompetence but ending with poor communication and resource management. Communication is also essential part of the maintenance improvement efforts. To

focus on a few elements, planners need to be assigned, implement a computerized maintenance management system (CMMS) and manage the spare parts. Work management processes should be defined and maintained, preventive and predictive maintenance programs should be developed, and maintenance performance should be monitored. Training is also a key part of this process. Elevating maintenance indicators to the level of other corporate metrics will give them the importance they need and deserve. Weekly and monthly reporting of these statistics will keep and identify who are in a position to keep the effort on track. This is how communication affects the maintenance context.

4.4 Technology and Innovations

Technology and innovation are the key to enhancing organizations' competitive advantage in today's dynamic knowledge-based society. Manufacturing enterprises mostly in Sri Lanka have outdated technology compared to the large-scale businesses in the country. The usage of obsolete or inappropriate technology used by manufactures results in low productivity, low quality of products, and a high rate of rejection of products and equipment stoppages, resulting in higher costs to producers and a reduction in market competitiveness [18]. Manufacturing organizations need to develop and implement a technology and innovative strategy in addition to financial, marketing and operational strategies to make them innovative. There are number of institutions which support the manufacturers to have modern know how such as, Industrial Technology Institute (ITI) and Industrial Development Board (IDB)etc. Gamage [31] suggests that at present there are various governmental, non-governmental organizations and private sector institutions that support for the promotion of manufacturing enterprises. The services extended by these institutions include, arranging credit facilities, conducting entrepreneurship and small business trading programs and counseling services, dissemination of appropriate technology conducting research and development etc. However, these institutions do not have well spread network which provide extensions and assistance to manufacturers on continuous and regular basis. External Barriers Lack government support. Every government that ruled Sri Lanka has given a substantial support to this sector. However, it is not focused on developing innovativeness of such organizations. Even the large-scale businesses are also imitative rather than innovative. These facts show that there is no innovative production culture among Sri Lankan entrepreneurs. Countries like Japan, USA, UK, France and China are constantly undergoing a lot of innovations throughout the year. Businesses in such countries can see what is happening in terms of innovation. Successful results have been obtained. This situation gives entrepreneurs a chance to see how they are innovating their business.

Theories explain that the company's technological advancement leads to an increase in productivity. Unnikrishnan et al [79]state that the use of safe technology positively correlates with workers' productivity. Based on

empirical findings among small and medium-sized entrepreneurs in Ghana, during the economic crisis in Singapore in 1985, the discussions were decisive and their efforts to enhance the competitiveness and productivity of manufacturing and business enterprises are well known in the field of study. Adaptation to modern technology has been recognized as an important solution to increase the productivity of the enterprises and is considered to be the most competitive challenges facing companies in the 21st century economy. Large-scale companies, especially multinationals, had the opportunity to learn how to increase their productivity, and adaptation of technology was at the forefront of other improvement efforts. Entrepreneurial ability to adopt innovations in business technology is likely to decline, mainly due to limited resources such as financial capital, human capital and marketing knowledge or skills. However, technological innovations in this sector can accelerate economic growth in the future. Choi and Lim [15] examined a positive correlation between technological innovation capability and performance in companies. As another evidence, according to Chau and Deng's [16] research on small and medium enterprises in Vietnam, M-Commerce acknowledges the powerful technology to improve the efficiency and productivity of their small and medium enterprises. Unnikrishnan et al. [79] show that the importance of innovation-based product technology research can help sustainably to improve the productivity of small and medium-sized entrepreneurs.

4.5 Policy and strategy

There is no universally accepted definition on management strategies or strategic management tools. These strategic management tools are initially created from many varieties of disciplines such as management, accounting, engineering, and economics. The use of strategic management tools for planning and controlling purpose by Du Pont Company prior to World War I. Implementing the strategy requires strategic plans that can be executed [80]. Today, manufacturing strategies are being challenged by aggressive competition from emerging economies, putting intense pressure on the domestic manufacturing sectors in developing countries. For countries like Sri Lanka, this pressure is continuing.

If it is concerned with maintenance management, a maintenance strategy is a systematic way to maintain operations including identifying, researching, and implementing the repairs, replacements, and decision-making on equipment reliability. Maintenance strategy includes a set of policies and actions that are used to "retain" or "restore". Many authors have described maintenance strategies in different ways. Firstly, maintenance and repair, focused on all work, was the predominant period until World War II (1940). That is, the methodology of reactive maintenance. Secondly, prevention and maintenance have been defined as tasks based on planning and scheduling up to 1970s. Both generations are associated with the life cycle of the equipment and depend on the profile that describes the frequency of failure, known as

the "bathtub". The third generation, to date, has been involved in predicting and preventing activities as well as eliminating negative feedback and results from the famous strategy; "Reliability-Centered Maintenance" culture [52]. This third generation of maintenance strategy includes issues such as condition monitoring, safety and hazard identification, teamwork, equipment reliability and maintainability. Considered as the fourth maintenance generation, issues such as maintenance prevention, early failure detection, reliability and maintainability have been extensively researched over the past two decades. Competition in manufacturing organizations in the global market often depends largely on their average cost, flexibility, quality and their production process capabilities, as also as competing priorities. Therefore, the availability and reliability of production equipment is very important, crucial and maintenance becomes an integral part of the manufacturing management process. Maintenance management strategies, on the other hand, influence the competitive priorities, so it helps to achieve overall business strategies [61]. Awareness of corporate business strategies is essential for maintenance, because it is considered as fundamental to maintenance management strategy. As we understood that, the business strategy should drive the selected maintenance approach, models, and strategies to be utilized. As we know, there are many models, techniques, systems, and approaches to facilitate and support the management of activities, resources, and decision management [32]. There are several approaches to use as well as new strategies and techniques. They are autonomous maintenance under TPM, web-based online maintenance, predictive maintenance (PdM) based on intelligent condition monitoring results, computerized maintenance planning model (CMMS), reliability centered maintenance (RCM), preventive maintenance (PM). Therefore, it is essential to focus on maintenance management strategically and systematically to make the right selection, especially in capital intensive industries. The literature therefore highlights the strong linkage between business strategies and maintenance strategies in manufacturing [54],[61],[66].

Table 02 summarizes the focus on applied maintenance models and strategies, that identified in the literature, respect to the current contexts. The researcher has read over 135 publications applied to maintenance strategies and critically reviewed them adequately. According to the literature review, the summary table can be summarized as follows by reflecting the views expressed by different researchers on maintenance strategies from different dimensions.

Table: 02; Summarizes the focus on applied maintenance models and strategies that identified in the maintenance literature respect to the current contexts

Maintenance Strategy	Focus	Evidence (Researcher and year)
Corrective maintenance (CM), Breakdown (BDM), or Reactive Maintenance (RM). (Run-to-failure model)	Maintenance is carried out after a failure had occurred, and it is intended to restore an equipment to a state in which it can perform its original function (EN 13306: 2001).	Pintelon et al.,(2006); Stoneham,(1998); Ben-Daya, Kumar, and Murthy,(2016); Hauw, Wan, and Shahara,(2017); Jonge et al.,(2017); Salah, Osman, Hosny,(2018); Wang, Deng, Wu, and Xiong, (2014).
Preventive Maintenance (PM), Time Based Maintenance (TBM)	Maintenance frequency is measured by the time, production volume or asset condition. Basically, planning and scheduling based on optimal PM intervals.	Stromberg, (2000); Tsai et al.,(2001); Gupta et al.,(2001); Chen et al.,(2003); Chang, (2014); Bloch-Mercier,(2002); Sheu et al.,(2001); Juang and Anderson,(2004); Zhao,(2003); Bris et al.,(2003); Badia et al.,(2002); Gurler and Kaya,(2002); Motta et al.,(2002); Maleki and Yang, (2017); Ni, Gu, and Jin,(2015); Dohi et al., (2001); Lai et al., (2000); Ben-Daya and Alghamdi, (2000); Hsu, (1999); Gopalakrishnan et al., (1997); Luce, (1999); Gopalakrishnan et al.,(2001); Swanson, (2001); Jonge et al.,(2017); Pintelon et al., (2006); Sarker and Faiz,(2016); Sheu, Chang, Chen, and Zhang,(2015).
Predictive Maintenance (PdM), Condition-Based Maintenance (CBM)	Maintenance is carried out when necessary based on reliability and conditions by predictive planning scheduling frequency.	Grall et al.,(2002); Chen and Trivedi,(2002); Carnero,(2006); Marseguerra et al.,(2002); McKone and Weiss,(2002); Jamali et al.,(2005); Saranga and Knezevic, (2001); Do, Voisin, Levrat, and Lung, (2015); Ramirez, Muñoz, and Marquez, (2017) Engeler, Treyer, Zogg, Wegener, and Kunz,(2016) Barbera et al., (1999); Luce, (1999); Goyal et al.,(2017); Keizer, Flapper, and Teunter,(2017); Caesarendra et al., (2016); Carroll, May, McDonald, and McMillan,(2015); Chu et al.,(1998); Tsang et

		al.,(2006); Swanson (2001); Pintelon et al. (2006) Su, Nunez, Baldi, and Schutter,(2016); Moghaddass and Ertekin, (2018); Yan, Chen, and Mukhopadhyay,(2017).
Reliability-Centred Maintenance (RCM)	Corporate level maintenance strategy for optimization purposes.	Moubray,(1992); Smith, (1993); Guck, Spel, and Stoelinga, (2015); Balzer et al.,(2001); Piasson, Biscaro, Leao, and Mantovani, (2016); Bertling, (2002); Clement et al.,(1991); Gustavsen, (2002); Stillman et al.,(1995) Ruijters et al., (2016); Leite da Silva et al., (2001); Gabbar et al.,(2003); Wessels (2003); Eisinger and Rakowsky, (2001); Salah et al.,(2018); Hipkin and Cock (2000); Rausand (1998); Murthy et al., (2002); Pintelon et al.,(2006); Yssaad and Abene, (2015).
Total productive maintenance (TPM) / Autonomous Maintenance, Total Quality Maintenance (TQMain.)	An asset management philosophy of whole company that integrates all business aspects- operators, process, material, quality and equipments,	Salameh and Ghattas (2001); Al-Turki (1998);Hossen, and Ali, (2018); Wang and Lee, (2001); Modgil and Sharma, (2016); McKone et al., (2001); Yang, Tavner, Crabtree, Feng, and Qiu, (2014); Ireland and Dale,(2001); Magno, and Zucchi, (2017); Das, (2001); Gupta et al., (2001); Chen and Meng, (2011); Kodali and Chandra,(2001); and Kodali, (2001); Finlow-Bates et al.,(2000); Jain, Bhatti, and Singh, (2014); Cooke,(2000); McKone et al.,(1999); Shamsuddin et al.,(2005); Manjunatha, Srinivas, and Ramachandra, (2018); Hipkin and Cock,(2000); Murthy et al.,(2002); Swanson, (2001); Ljungberg,(1998); Jeong and Phillips,(2001); Bamber et al.,(2003); Poduval, Pramod,(2015); Al-Najjar and Algabroun,(2018); Peters (2003)
Computerized Maintenance Management System	Designed to store, retrieve and analyze information,	Fernandez et al.,(2003); Galan and Alfonso,(2016); Leger and Movel,(2001);

(CMMS) Maintenance planning and scheduling.	through computer applications.	Singer,(1999); Labib,(1998); Cedillo, Rodriguez, and Méndez,(2017); Swanson,(1997); Jones and Collis,(1996); Wickers, (1996); Gabbar et al., (2003); Artana and Ishida,(2002); McKone and Weiss,(2002); Chu et al.,(1998); Lee and Lin, (2001); Sloan and Shanthikumar, (2000); Duffuaa and Al-Sultan, (1999); Ip et al.,(2000); Carnero,(2015); Galán et al., (2014)
E-Maintenance and Internet of Things (IoT), Artificial intelligence (AI), Virtual Reality (VR) and Augmented Reality (AR). Prescriptive Maintenance (PreM)	Combines computerized maintenance system with Internet and electronic collaboration services. VR and AR technologies are used to support human workers during inspection and maintenance. The prescriptive maintenance philosophy is a step ahead providing real-time adaptive recommendations, using artificial intelligence, about the tasks that should be done and keep updating as the operation continues.	Pintelon et al.,(1999); Ben-Daya, Kumar, and Murthy,(2016); Satyanarayana and Prasad,(1996); Guillén, Crespo, Gómez, and Sanz,(2016); Nagarur and Kaewplang (1999); Westerkamp, (2002); Levrat, Lung, and Marquez,2008); Cheung et al.,(2005); Thomas et al.,(2004); Mobley,(1990); Campbell and Jardine,(2001); Parida et al. (2004)

The most used maintenance models that exist, were elaborated by Stoneham [68] including TPM, RCM, and CBM in his critical analysis. The Importance of maintenance and its management styles includes various optimization models, maintenance techniques, scheduling, and related information systems, have been discussed by researchers and have identified different gaps in each category Garg and Deshmukh, [32], perform a literature review, first with the aim to identify and categorize the various maintenance management models Fraser et al. [29]also conducted a literature review aimed at identifying and classifying different maintenance management models. Most of the maintenance management models were found to have been identified by specific features and practical scenarios. The most relevant revelations in the literature for maintenance management concluded ; Corrective Maintenance (CM), Preventive

Maintenance (PM), Total Productive Maintenance (TPM), Reliability-Centered Maintenance (RCM) and Condition Based Maintenance (CBM) and Predictive Maintenance(PdM) etc. can be highlighted as optimally acceptable strategies. The latest technologies and strategies, like IoT, AI, AR, VR, and e- maintenance in parallel to the prescriptive maintenance strategy are not yet widely accepted in the industry, nor are they popular among entrepreneurs.

4.6 Organizational structure

Organizational structure is normally described as the way of responsibility and power are allocated, and work procedures are carried out among organizational members. This is a framework of formal laws and powers to regulate and coordinate human activities and to motivate individuals to activate the goals and objectives of the organization. It is usually a hierarchy, in which an organization sets its own authority and means of communication, allocates rights, and explains it from the organizational chart. Countries like Sri Lanka face many difficulties in transforming responsibilities of individuals in the organizational structure to corporate results based on objectives due to one reason at high power distance (80) as per the study of Hofstede [34]. Other than that, it affects other dimensions such as uncertainty avoidance. For the dimension of uncertainty avoidance, Sri Lanka has a low score of 45 [34]; according to the study by Mohamed Ibrahim Mohamed Irfan,[55], Sri Lanka is a culture with moderately low uncertainty avoidance and low stress levels and low nervousness, because Sri Lankans are more tolerant to uncertainty and ambiguity. According to Hofstede Sri Lanka is considered as uncertainty accepting country. Which means that, Sri Lanka has a fair degree of acceptance for new ideas, willingness to try something new or different in innovative aspects, modern technology, or best business practices. Sri Lanka tends to be more tolerant of ideas or opinions from anyone and allows the freedom of expression. This kind of attitude may result for moderate level of performance accomplishments [55]. This tendency is similar to the maintenance and other management systems. Different types of organizational structures perform equally well; stable organization has not found many opportunities to increase profit than changing organization [38]. On the contrary, Leitao and Franco [45] give strong evidence about the relationship between the structure and performance, efficient organizational structure impacts positively on both types of performance: non-economic and economic. For the detailed context among structure on performance through learning or innovation: organizational learning has a positive influence on relationship orientation as well as on the improvement of effectiveness and firm performance [64]. Knowledge sharing and learning behaviors are positively associated with business process improvement and product and service offerings and they in turn are positively related to organizational performance [44]. Organizational learning influences organizational performance positively, both directly and indirectly through organizational innovation and

organizational innovation influences organizational performance positively.

The main feature of organizational structures is the flexibility and the ability to acclimatize to the changing environment to encourage harmony and collaboration. Six items are employed to represent organizational structure characteristics such as: flexibility [56], openness and authority, communication, delegation and decentralization [39] and complexity. Studies that actually investigate performance in relation to organizational structures are relatively rare and do not find clear relations between structure and performance. Aghion and Tirole [9] investigate formal and real authority in organizations, particularly in relation to other coordination and communication mechanisms

4.7 Problem Solving Culture

People always getting ready to solve industrial problems and make decisions based on the information available at the time. Ransom [67] revealed that most decisions are based on available data according to his study it was fewer than 50 %. According to him the secret to solving a problem is to define it correctly in key words, including the root cause, also stresses that Good problem definition is half the solution and to find the optimum answer to a problem, a creative thinking processes are required. Nolan [58] defines problem solving as the art of finding of ways to go where people want to go. George [33] defines problem solving as a process of acquiring an appropriate set of responses to a new situation. As per study made by Kepner-Tregoe [40] the most effective managers and leaders are also the best investigators. From the announcement of a problem until its resolution, they appear to follow a clear formula in both the orderly sequence and the quality of their questions and actions. Kepner-Tregoe have already provided proven problem-solving solutions and got results-based manufacturing process improvements in the areas of maintenance asset optimization, unit cost reduction, quality improvement, safety performance and project execution. The manufacturing companies worked with Kepner-Tregoe model include: Aristocrat Leisure Ltd, BHP Steel, Ltd, Corning, Inc., Cement Australia, Kawasaki Steel Corporation, Kennametal, Inc., Kobe Steel, Ltd., and The Trane Company.

Many maintenance departments today are “firefighting” instead of approaching their problems systematically. Prevention is a far better goal than trying to solve problems as they arise. While this strategy may be a little costly at first, it is not nearly as expensive as allowing problems to occur. Maintenance problem-solving is primarily concerned with four areas: maintaining critical systems, fixing the problem quickly and faster than the last time, determining what is causing the breakdown to happen so frequently, and identifying the 20 percent of breakdowns that are consuming 80 percent of maintenance resources. In particular, appropriate problem-finding and problem formulation drive companies/organizations to identify the fundamental

challenges in their environment and generate alternative innovative solutions [33]. From the maintenance task, corrective maintenance work requires problem-solving to restore equipment to fully operating condition. Reliability in corrective maintenance depends on achieving a correct diagnosis and applying an effective solution when dealing with faulty equipment. There is an evidence from a Sri Lankan case study in apparel Industry revealed that problem solving culture had the highest impact on team performance. [63].

4.8 Fund allocation and Budgeting

Inadequate organizational finance capabilities are an impediment to the maintenance as well as innovation of the enterprises, small, medium, or large as well. Maintenance and innovation costs are very high in any country. Therefore, organizations need a large amount of finance for this. According to Wijewardena et al. [86] who identified that the fiscal deficit was indeed a major problem facing most enterprises in Sri Lanka. This kind of situation may not only affect maintenance or innovation but also affect the survival of the business. Karunanayake [41] suggests that the biggest problem faced by small and medium scale industrialists is high cost of finance. There are some organizations which support manufacturing organizations to find finance in Sri Lanka. They are mainly through all commercial banks, national development banks and regional rural development banks. Finally, it can be concluded that this financial and budgetary constraints is preventing Sri Lankan businesses from innovative maintenance.

The only category of maintenance costs/ budget that can be truly controlled is the investment work planned to change or upgrade equipment improving of reliability. In the short term, this can usually be significantly reduced or eliminated - but in the long run this can be detrimental. If people do not improve the performance of the equipment, at the face of competitors, sooner or later they will fall behind. If reduced the number of maintenance head counts or related budgets without properly understanding the maintenance reliability priorities, it will take the lowest priority without performing the highest priority function first. In practice, this means that deferred priorities are improvements, and essential maintenance and preventative maintenance are taken as a "low priority." These monetary squeezes lead to an increase in unnecessary breakdowns. This cost elements are a very interesting indicator to measure the success of maintenance management strategies used. Similarly, controlling the cost of machinery failures can be the greatest benefit of maintenance decision making towards performance [81]. According to Barringer [13], businesses cannot be given so much reliability due to high failure costs and similarly, businesses cannot be expected higher reliability when the too much capital costs gone up. For this reason, maintenance management is constantly looking for ways to reduce operating costs and optimize life cycle costs. Also are minimizing spare and components, waste controlling and increasing of availability [14]. Eventually, it is

concluded that maintenance performance will increase if there is an optimal fund allocation and usage and establishing correct strategies

Published articles were categorized and analyzed. Based on the findings of this study, it is concluded that the factors for maintenance performance is established and thereby the theoretical structures are strengthened in the field of maintenance management. It emphasized the need for future systematic research efforts aimed at implementing and promoting more practical approaches to solidify the theoretical constructs.

V. CONCLUSION AND RECOMMENDATIONS

Based on the review findings, Table 01 presents the most applicable determinant organizational factors in maintenance culture. This analysis elaborates that there are eight (8) strongest organizational determinants that affect maintenance culture and their performance as well. Given the amount and the size of past studies, the results are strong. Therefore, it can be concluded that these identified factors have significant relationship. The key eight (08) factors include are planned maintenance, training and education, communication, technology and innovation, policy and strategy, organizational structure, problem solving culture and fund allocation and budgets. This literature review examined issues related to various aspects of organizational and operational factors in the maintenance and manufacturing culture in the business environment, especially based on this study that examined relevant articles published over the past four decades. The evolution of the maintenance culture clearly shows that the path of improvement in the maintenance philosophy has had some success today. Special attention should be paid to maintenance planning, problem solving, accurate communication, budgeting as required, training and personal development, as well as technical requirements especially innovation in maintenance. We Sri Lankan culture cannot escape from these tendencies.

It is important to state several other organizational and human factors that contribute to the maintenance and similar operations that emerge from this study, and future research needs should be made to identify whether these factors affect national culture or corporate culture. Researchers in the literature have shown that these factors are important in facilitating maintenance. They include high management commitment, coaching and mentoring, human errors, providing professional development opportunities, communication and interpersonal relationships and safety and environmental status. These factors seem to be similar to those found in the literature of other cultures and countries. It is emphasized that it is appropriate to use future research opportunities in investigating these new factors.

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