

Is the “Culture” of the Lean Production Process Transferable?

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ABSTRACT

The Japanese Automotive Industry is globally recognized for lean production efficiencies and these efficiencies are critical for supporting Toyota’s ranking as one of the world’s leading automakers (Levin, 2014)(Chiarini & Vagnoni, 2014). Ever ambitious, Toyota is constantly seeking improvements and expansion. Considering that over half the company’s profits come from America, further growth in America is one promising expansion avenue (The Economist, 2002). When examining, Toyota’s, efficiency and growth specific to America, it is interesting to question if Toyota’s Production System (TPS), specifically their lean production processes, translate effectively in America. The following paper will provide, first, a definition of Toyota’s Lean Process, second, an examination of cultural ideas that support Toyota’s lean practices and third, an exploration of the lean process application explicitly examining if lean processes support efficiency in American production plants. Finally, based on a review literature and a review of American manager observations, managerial recommendations for developing a culturally aligned lean production process will be offered.

Keywords: Toyota, lean, efficiency, culture, Schein, production

INTRODUCTION

Toyota has experienced rapid development since the organization's beginning in 1933 as a small division of Toyoda Automatic Loom Works under the leadership of Kiichiro Toyoda. The first vehicle was released in 1935 and the organization was renamed from Toyoda to Toyota Motor Company in 1937. Ten years later in 1947, after World War II ended Toyota developed a prototype for a small car, a product to address a market segment that had largely been ignored. But this innovative idea alone did not translate to financial growth for Toyota as conditions in the Japanese economy were bad. Due to financial struggles, the organization began to reduce their workforce. In a last-ditch effort, new management was introduced, and the company began investing in technology. These changes worked, increased efficiencies were observable, and production immediately began to improve. By 1951, the manufacturer introduced the Land Cruiser and nearly 500 cars were produced each month. From this point forward, Toyota focused on quality vehicles and low production costs.

Toyota recognized that they were creating a competitive advantage balancing between quality and low cost. To maintain this competitive advantage, Toyota invested significantly in research and development. The first Toyota research lab, The Battery Research Laboratory was established in 1939 to conduct research on batteries. Next, in 1940, Toyota developed the Physical and Chemical Research Institute to promote and develop science and technology unique to Japan and to contribute to the advancement of scholarship and industry. Through the years more R&D plants were developed like the Toyota Central Research and Development Laboratories in 1960 and Genesis Research Institute in 1996 (75-Year History TOP, 2012). Toyota's Annual Report (2017) describes 16 Research and Development Sites worldwide with five in Japan and three in North America.

By 1980, Toyota was the second largest world producer of cars behind only General Motors. To expand, in 1984, Toyota partnered with General Motors to create the joint venture, New United Motor Manufacturing Inc. (NUMMI) and this began Toyota's production in the United States (Xue-Hong, Yong-Lin, 2011). The venture was profitable and in 1990, Toyota hit records sales totaling over \$4 billion. By 1991, Toyota was becoming a global power house, selling more than one million cars and trucks in the American market alone. Toyota's platform on quality cars and low-cost production was clearly effective and in 2013, Toyota overtook General Motors in the number of sales and according to MarketWatch (2018), Toyota's sales and revenue has steadily grown from 2014 to 2018.

- 2014 Sales/Revenue 25.69T
- 2015 Sales/Revenue 27.24T
- 2016 Sales/Revenue 28.4T
- 2017 Sales/Revenue 27.62T
- 2018 Sales/Revenue 29.38T

Toyota is not only thriving, financially, but the company is also outperforming their competitors. "Toyota consistently makes the highest-quality cars with the fewest defects of any competing manufacturer, while using fewer man-hours, less on-hand inventory, and half the floor space of its competitors," (Liker, 2004 p. 1). In 2018, Toyota reportedly manufactured over 6 million cars in Japan and North America, alone, but interestingly, between the years of, Japan consistently manufactures about double the number manufactured North America as indicated in Table 1 (Appendix). Certainly, Toyota's lean manufacturing and focus on efficiencies has

contributed to the organization's growth, but do Toyota's lean practices easily translate from Japan to the United States?

TOYOTA'S LEAN PRODUCTION PROCESS

Recall, after World War II, Toyota made the decision to change their core business from building textile machinery to car manufacturing (Womack and Jones, 1996). With this change, "Toyota adopted innovation in production management as an integral part of its competitive strategy and then spent the 1950s and 1960s making this strategy work," (Cusumano, 1988, para. 6). For the next sixty years, the auto manufacturer worked diligently to develop their manufacturing philosophy based on lean productions, a unique formula based on superior performance and employee commitment.

First, Toyota's lean production is based on superior performance and can be linked to management's emphasis on long-term growth in market shares which leads to large production volumes and accumulations of employee experiences. Jeffrey Liker (2004) wrote the book, *The Toyota Way*, in which he describes the 14 guiding principles of Toyota as indicated in Table 2 (Appendix). The first two Toyota guiding principles are, "Base your management decisions on a long-term philosophy, even at the expense of short-term financial goals," and "continuous improvement." Toyota's production system is based on long term goals that recognize the significance of daily decisions as evident with the philosophies of Six Sigma and Just-in-Time (JIT). Six Sigma is a methodology used to improve the business process through the utilization of statistical analysis. The Six Sigma methodology is defined by 5 DMAIC steps, Define, define the problem and the scope, Measure, determine what data is available, Analyze, identify possible root causes, Improve, identification of possible solutions and Control, recommendations and an implementation plan are identified. Six Sigma supports the long-term goals through short term steps and the JIT philosophy supports the long-term goals through maintenance of daily efficiencies. JIT literally means to make only what is needed, when it is needed, in the amount it is needed. JIT Production seeks to reduce overall business costs through the elimination of process excesses and improving return on investment within a reduced time frame. Six Sigma and Just-in-Time create short term stepping stones that support long term goals and continuous improvement, ultimately supporting superior performance.

Second, Toyota's lean production is supported by employee commitment. As part of the Toyota Lean Production Process, each individual employee is recognized as critical to overall organizational success. The concepts of Kaizen and Jidoka explain and emphasize that each employee's ability to observe quality control is truly instrumental to organizational success (Nkomo, 2012). Kaizen means combining the collective talents of a team to create continuous improvement, a strategy where employees at all levels of the company work together proactively to achieve consistent and incremental improvement in manufacturing. The philosophy has dual features, as an action plan and as a philosophy. As an action plan, Kaizen focuses on improvements within specific areas of the company. As a philosophy, Kaizen supports the development of a culture where employees are engaged in improvement. Jidoka is loosely translated to automation with a human touch (iSixSigma, 2018). This means if a problem occurs on the production line, a worker should notice, stop and notify the team of abnormalities. While there is a production line at Toyota, human observation and human mental processes are essential for maintaining high quality control. In other words, with lean production Toyota, did not simply implement conventional mass-production processes more effectively than competitors, Toyota

integrated unique ideas of Six Sigma, Just-in-Time, Kaizen and Jidoka to create a unique philosophy where organizational leaders and employees continually chose to interact with the production process (Cusumano, 1988, para 6). Toyota has trained their team members to seek superior performance through a willingness to identify themselves as critical, as a cornerstone, as essential to the overall organizations production process.

Summarily, The Lean Enterprise Institute defines lean production as, “The core idea is to maximize customer value while minimizing waste. Simply, lean means creating more value for customers with fewer resources,” (What is lean?, 2009). Toyota is able to maintain their lean production through an ongoing focus on superior performance driven by the commitment of the employees.

TOYOTA’S LEAN PRODUCTION PROCESS CULTURALLY BASES

There is no question that Toyota’s lean process is innovative. In fact, “Lean production has been the most important innovation in manufacturing systems since Henry Ford’s moving assembly line and the inception of mass production,” (Shih, 2018, para. 9). So significant, many competitors have adopted aspects of the lean production process, competitors like Chrysler, Ford, Daimler, Honda, and General Motors have developed like systems, even hospitals and the postal service have developed TPS like systems (Takeuchi, Osono and Shimizu, 2008), and Toyota’s production process has been the subject of countless research studies.

Researchers Takeichi, Osono and Shimizu (2008) studied Toyota for six years and based on their experiences and data, the researchers conclude that the Toyota Production System (TPS) is necessary but not sufficient to account for Toyota’s comprehensive success. They describe that TPS as a “hard” innovation that supports a company in dynamically improving operations, but also state that Toyota pairs their “hard” strategy and tools of efficiency with “soft” interactions that relate to individual employees and corporate culture.

The company succeeds, we believe because it creates contradictions and paradoxes in many aspects of organizational life. Employees have to operate in a culture where they constantly grapple with challenges and problems and must come up with fresh ideas. That’s why Toyota constantly gets better. The hard and the soft innovations work in tandem. Like two wheels on a shaft that bear equal weight, together they move the company forward. Toyota’s culture of contradictions plays as important a role in its success as TPS does, but rivals and experts have so far overlooked it. (Takeuchi, Osono and Shimizu, 2008 para. 3).

In other words, Toyota’s philosophy of lean is not simply based on quantitative data and measurement alone, rather Toyota is simultaneously recognizing each employee as a knowledge worker that specifically accumulates the “Chie,” or wisdom of experience (Takeuchi, Osono and Shimizu, 2008 para. 3).

Dr. Peter Drucker also studied the Japanese Auto Industry and identified three characteristics supporting efficiencies and process success. Dr. Drucker (1981) stated that the business culture in Japan is different than the business culture in America. Drucker noticed that Japanese leadership is not only valuing the knowledge of the individual employee as unique, organizational leadership recognizes the importance of supporting their external community, country and ultimately a “greater good.”

The Japanese perspectives of “greater good,” certainly creates a scenario where the organizations are operating differently than American automakers. The Japanese manager seeks

to build a family or home with their employees, an “Ie” relationship. The system of “Ie” is a Japanese concept that is firmly rooted in the historic and socio-cultural traditions of Japan and the phrase “Ie” can literally translated to family or home (Schwartz and Bergfeld, 2017). The “Ie” relationship is expected not only to exist but to prosper, ideally lasting for an employee’s complete lifetime (Kawamura, 1992). “Ie” can be defined by the following points:

- the primary objective of the parties in the “Ie” relationship is to survive and prosper,
- ideally “Ie” is forever,
- it is the leader’s (parent’s) responsibility for the welfare of the employees (family),
- the “Ie” members will give their all for the benefit of the organization and
- each “Ie” will have a unique culture for which members are indoctrinated (Schwartz and Bergfeld, 2017; Giuseppe Piva, 2016).

Long studied and highly respected, Toyota’s Lean Process is clearly not based on quantitative efficiencies alone, but on management ideas recognizing the value of each employee, their unique knowledge, “Chei” and the employee’s role within the organizational family, “Ie.” But, as the organization pursues ongoing global expansion, do the “soft” philosophy of lean management transfer as easily as the processes and the materials? Some experts believe the answer is no, as lean production is something beyond processes and materials, “While Japanese “good practices” are potentially applicable to any market, the U.S. and other non-Japanese managers must first understand and then consider adopting some of these techniques,” (Cusumano, 1988 para. 3).

TOYOTA LEAN PRODUCTION PROCESS EFFECIENCY IN AMERICA

In fact, Toyota senior executives take great pleasure in explaining that other companies find it difficult to emulate Toyota not only because of the management strategies but because of the unique organizational mindset (Steward and Raman, 2007). As Toyota continues to seek improvement and expansion within the United States, it is important to considered how Toyota’s innovative ideas of Six Sigma, Kaizen, Just-in-Time, “Chei” and “Ie” fit within the cultural expectations of American employees.

Is Toyota’s Lean Production Philosophy Thriving in The United States?

Is Toyota’s Lean Production Philosophy, the relentless elimination of anything that is not adding value, thriving in the United States? To answer this question, consider the Americanized introduction process of the lean philosophy. Recall the 1984 partnership between Toyota settled and General Motors forming the New United Motor Manufacturing Inc. (NUMMI), in Fremont California (Chappell, 2007).

With the introduction of NUMMI, the first efforts to train American employees about Toyota’s Lean Production processes began. For the initial training, it was determined that an effective strategy would be to bring 300 U.S. NUMMI employees to Japan to work on production lines within the Japanese Toyota plants (Chappell, 2007). The goal was to allow the employees to receive on the job training then they could bring their knowledge back to the GM/Toyota plant in California. However, observation and experience alone, did not support

comprehensive transfer of the lean philosophy. The American employees learned the processes, but they did not fully accept the cultural philosophies, in fact autoworker union leadership resented Toyota's presence and they were leery to sign contracts with NUMMI (Chappell, 2007). Thus, Toyota began modifying philosophies to accommodate Americanized perspectives. In order to gain American autoworker trust, NUMMI become more egalitarian than typical plants in Japan. Further, the NUMMI dispensed with executive dining rooms and managers opted to wear the same uniforms as the plant workers rather than business suits. With these concessions, American employees began to meet Toyota leadership half way and over time, the NUMMI employees appreciated the lean production opportunities specifically seeking employee feedback. While, the plant "worked" was it efficient? As more and more accommodations were made to support Americanized philosophies, did the evolving lean production process remain efficient? A 1984 study by the Massachusetts Institute of Technology found that the U.S. needed twice the manpower to produce a car and much more floor space and inventory than the Japanese plants (Womack, Jones, and Roose, 1990). With NUMMI, it appeared that Toyota's lean production process could be difficult to recreate.

Interestingly, even before the NUMMI Fremont plant was fully operational, Toyota began to build their own plant in Georgetown, Kentucky, Toyota Motor Manufacturing, Kentucky (TMMK). As this was a Toyota owned plant, Toyota could fully control the assembly process, "Assembled instrument panels are carried to the main assembly line by automated guided vehicles, engines flow from the assembly area in perfect coordination, different parts required to customize each vehicle are preassembled into kits and arrive just when they are needed, (Shih, 2018, para. 7). The plant in Kentucky grew to become the 14th largest manufacturing plant in the world, historically producing the Camry and the Avalon (Humphrey, 2017). Over time, nine other Toyota production plants have been introduced on American soil. The Toyota plants in the United States are identified in Table 3 (Appendix). But, are the Toyota plants on American soil, meeting Toyota's production expectations? This question is difficult to answer.

While, Japanese manufacturers have certainly made tremendous inroads into the global marketplace, the organization has been plagued by some production challenges, like the recall of 3.8 million U.S. vehicles in 2009 with floor mat issues followed by an additional 3.4 million recalls due to issues of sticky gas pedals and software glitches (Cole, 2011). Additionally, *Automotive News* reported that more than 20 million Toyota Vehicles had been recalled since the autumn of 2009 (Roland, 2011). The Camry Model has experienced the most model recalls with 54 recalls, the Tundra has experienced the second most recalls with 49 and the Corolla in third receiving 48 model recalls (NHTSA, 2017). Since 2006, the Camry has been manufactured and assembled in Kentucky, since 2006 the Tundra has been manufactured and assembled in Texas and since 2011 the Corolla has been manufactured and assembled in Mississippi (Toyota Operations by State, 2018). It should also be noted, the company experienced billions in fines due to a series of problems with its automobiles (Steward and Raman, 2007). These incidents may indicate that the Toyota Corporation is straining to keep pace with the company's rapid expansion and with technological change (Steward and Raman, 2007).

In 2013, Toyota introduction production of the Lexus into the Kentucky Plant. "Producing the Lexus ES in Kentucky makes sense for Toyota," says Alec Gutierrez, an analyst at Kelley Blue Book. "While the tax incentives over the next 10 years certainly didn't hurt, the move will allow Toyota to further reduce the risk of a strong yen" that undermines profits on cars made in Japan and shipped to the U.S," (Healey, 2013, para. 5). This production shift from Japan

to the U.S. also indicated that Toyota is willing to make changes to gain a stronger foothold in the U.S. (Healey, 2013).

But, four years later in 2017, Toyota issued a warning to Kentucky Toyota, calling for cost cuts now or to face an uncertain future, "The automaker can build a Camry in Japan, ship it all the way to Kentucky and make more money selling that car than from one built at Toyota's factory in the state, the plant's president told employees in a 2 1/2 minute-long internal video obtained by Bloomberg News," (Lippert and Buckland, 2017 para. 2). Further, announced, in July of 2018, many of the early 2018 Toyota Camrys available in Toyota's U.S. showrooms will not be built in Toyota's Georgetown, Kentucky, assembly plant, in fact, all, of the 2018 Toyota Camrys sold in July came across the Pacific from Japan (Cain, 2017).

Toyota, ever seeking efficiencies and expansion, is seeking solutions to these issues. Looking towards the future, the company is planning to move to a new type of Lean Management, the Toyota New Global Architecture (TNGA). The new system will be heavily based on electrification, autonomous cars, and advanced technologies with the intent of further reducing production costs. Toyota's Tsutsumi plant in Japan was the first factory to adopt the flexible new TNGA production method, which helps explain why it's less expensive to produce a Camry at that plant than in Kentucky (Pleskot, 2017). At its core TNGA has the mission of "Making Ever-better Cars," with increased core strength and enhancing each model's unique features to accentuate appeal.

Toyota is searching for solutions to support efficiencies in the United States plants. The right "formula" for "lean" production in the United States has not yet been identified. An *Industry Week* study in 2008 found that almost 70% of all US plants used lean, but only 2% achieved their objectives and a further 24% achieved significant results (Pay, 2008). "Most companies attempting to implement lean manufacturing have focused on the manufacturing process (the technical system) and have ignored the organizational factors (the social system) of the change management process," (Lathin and Mitchell, 2001).

It should be noted that America is not alone in their struggle to efficiently apply lean production processes, historically, lean production has not produced maximized efficiencies in all countries, "lean manufacturing practices are more effective in countries and companies that have more collectivist or group cultures than individualist cultures. In addition, nation trumps organization: a plant's collectivist organizational culture will not overcome the individualistic culture of the country in which it is located," (Wiengarten, Gimenez, Fynes and Ferdows, 2015). When considering the adoption of lean, it is important to identify manufacturing stability where the first level of management supports the lean process (Pampanelli, Found and Bernardes, 2014).

Why Might the Lean Process Fail in the United States?

"When something fails over 90% of the time, it's usually tossed to the curb. Lean implementations fail at least that often," (Morgan, 2016). In fact, some have identified that lean programs, in the United States, fail up to 98% of the time (Beyer, 2017). Many managers and researchers have studied why lean productions fail in organizations within the United States and some of their conclusions are listed in Table 4 (Appendix). Based on these comments, overall themes can be identified. First, lean processes may fail because the lean philosophy is not comprehensively integrated into the organizational culture. Second, organizational leadership

does not fully embrace or understand the lean philosophy. Third, employees do not fully embrace or understand the comprehensive lean philosophy.

In other words, the cultural ideals associated with lean production, impact an employee's perceptions of the comprehensive lean process (Locinci, Kasa, Demeter, Heidrich and Jenei 2017). The successful use of lean manufacturing requires much more than tools, dimensions of the nation's culture must be considered as the nation's culture can impact LP operating performance (Kull, Yan, Liu & Wacker, 2014). "For managers, the results indicate that, in order to implement LM successfully, it is fundamental to go beyond LM technicalities by adopting soft practices and nurturing the development of an appropriate OC profile," (Bortolotti, Boscarri & Danese, 2015). In other words, managers should be involved in the transition to lean through awareness of and engagement with the plant employee subculture and work to develop a homogeneous plant floor culture (Locinci, Kasa, Demeter, Heidrich and Jenei 2017).

RECOMMENDATIONS FOR CULTURALLY ALIGNED LEAN PROCESSES

The Toyota Production System created in Japan has aspects that are culturally based (Wong, 2007)(Oudhuis and Olsson, 2013). Meaning, the practices associated with lean production, Kaizen, "Chei," Jidoka and "Ie" are outgrowths of unique Japanese environmental conditions, including culture, educational system unionization structure, religion history and geography (Phil and MacDuffie, 1999)(Hofstede, 1980)(Ralston et al., 1997) Further, these unique conditions, distinctive characteristics of Japan's production processes are also suggestive of difficulties that may occur if production plants are transferred outside of Japan (Phil and MacDuffie, 1999).

The ideas of reduction of waste, Six Sigma and Just-in-Time are easily recognized as valuable within organizations. But, the "soft" ideas of Kaizen, "Chei," Jidoka and "Ie" are not equally valued from culture to culture or organization to organization and these values translate to work practices and human resources practices, specifically aligned with Japanese culture (MacDuffie, 1995, Phil, 1996). Japanese has unique human resources perspectives fostering a corporate culture that values life-time employment, enterprise unionism, seniority-based wages, work teams, job rotation, problem solving groups and status barriers (Phil and MacDuffie, 1999).

As Toyota plans for growth in the United States, it is recommended that Toyota continue with "hard" lean tools, the main tenants of lean, Just-in-Time inventory, efficient workflow, as needed employee workforce, subassembly kits and reliance of innovative technology. It is also recommended that as the organization expands globally, the tenants of "soft" lean operations also serve as a foundation, the ideas of family, communication, support, teamwork and long-term development receive equal attention, but experience alignment in order to best fit with the host or transplant organizational culture. "However, implementing and sustaining lean processes are easier in some organizations than others. There may be societal culture differences, as the sources in initial implementation in Japan have not been followed by global success," (Pakdil and Leonard, 2017). For these reasons, a specific process for integration of lean production "soft" skills is recommended (Kurdve, Zackrisson, Wiktorsson and Harlin, 2014). Explicitly, a framework that comprises the culture of the organization, recognizing the interdependent systems and how the different components interact with one another (Miller, 2011).

Customize Lean Production to Organizational Cultural Needs

Based on eliminating waste, lean production has a foundation of “hard” tools and strategies that close distance gaps, reduce transportation, reducing movements, maintain Just-in-Time inventory and minimize down time and these foundations or “hard” tools guide the necessary “soft” skills of Jikoda- intelligent automation, Kaizen- continuous improvement, Chei- wisdom of experience, and Ie- family. Certainly, one of the expected outcomes of the lean production process is that through the organizational pursuit of waste reduction and high quality, employees learn to individually and independently, recognize inefficacies, pursue continuous improvement, gain wisdom from experience and develop into teams. But these secondary and expected individual employee outcomes often fail (Erthal and Marques, 2018)(Thelen, 2018).

Simply implementing lean assembly processes does not guarantee the development of an employee or employee teams that recognizes errors and learn from experiences. Lean thinking and lean culture depend on many variables (Anderson, 2014) and research supports the need for a holistic and long-term adoption strategy of lean processes that integrates both hard and soft elements (Jayamaha, Wagner, Grigg, Campbell-Allen, & Harvie, 2014).

Model of cultural layers

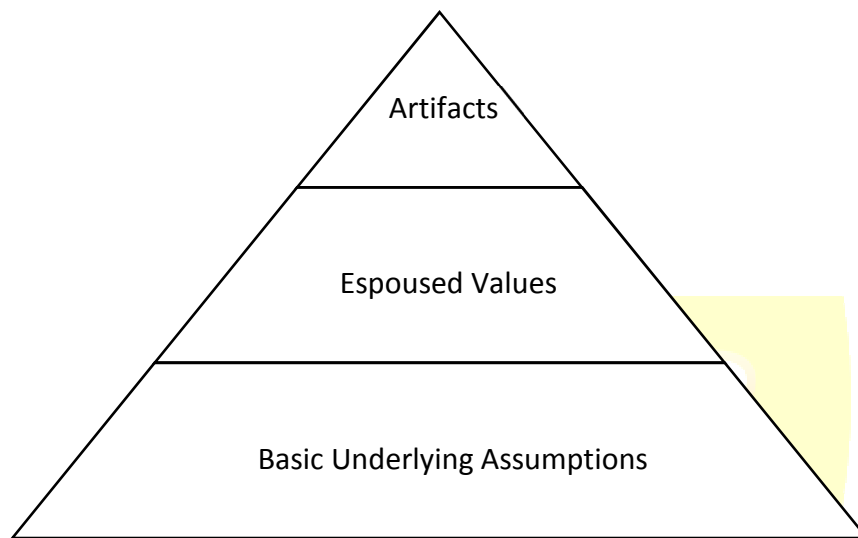
“But, the challenge to implement and sustain lean processes lies in the need to identify the organizational culture infrastructure that will allow this system that was first used by Japanese firms to operate will in other organizational contexts,” (Leonard, 2015). If the organizational culture is not assessed, the values and norms that support lean processes may create conflict with the culture that already exists within host organization (Leonard, 2015). Clearly, assessment of organizational cultures, is an essential ongoing process that supports lean production.

There are multiple ways to examine culture and using the Cultural Layers Model developed by Schein allows for an assessment and in-depth exploration of organization culture. The research of Dr. Edgar Schein pioneered the concepts of cultural nature and the idea of analyzing the factors the support or create organizational culture (Hatch, 1993). Interestingly, Schein examines culture and organizational change as both are complex and organizational culture can simultaneously advance and impede organizational change. Dr. Schein stated, “Culture is always helping and hindering problem solving. It’s important to understand both,” (Kuppler, 2016). Schein further explains organizational culture is a pattern of basic assumptions that a group learns to use in problem solving and culture as an accepted way of thinking, perceiving and feeling about issues (Schein, 1992). Not adopted in a single day, rather over time, culture is formed as employees go through changes, experiences and solve problems, “Organizational learning, development, and planned change cannot be understood without considering culture as the primary source of resistance to change,” (Schein, 1992, p. xiv). Through his research, Dr. Schein created his Model of Cultural Layers, with three layers, artifacts, espoused values and basic assumptions.

Artifacts are the first level and can be easily viewed, heard and felt by individuals. This includes dress code, office furniture, facilities, employee behavior, mission and vision of the organization. The second level constitute conscious strategies and goals, critical for shaping organizational culture, this includes employee’s attitudes and mindset. The third layer are the underlying assumptions and they can be hard to discern because they may exist in the unconscious. These underlying assumptions form around deeper dimensions of human

relationships, reality and truth. The three layers move from surface to deep levels of perception, the artifacts are surface characteristics that are easily viewed moving all the way to deep subconscious employee perceptions that may even be unknown to the individual in level three the underlying assumptions. Dr. Schein's model is a layered examination of organizational culture that allows for isolated assessment of both broad and basic employee assumptions.

Figure 1: Model of Schein's Cultural Layers



Integration of Schein's Model and Toyota's Lean Production

Schein's model can capture the essence of organizational culture through an in-depth study of the multiple levels of organizational development, specifically recognizing the dynamic attributes and evolutionary process of organizational culture (Yang, n.d). Additionally, Schein created the model recognizing the ongoing need for organizational change and if strategic in the change process, engaged managers can actively design organizational culture through management of external and internal employee dimensions (Schein, 2010). The following will discuss the aspects of the lean process, "hard" tools and strategies, "soft" skills and the learn philosophy as they relate to the individual employee and transplant organizational culture, artifacts, espoused values and basic underlying assumptions. Specifically, suggesting that managers rely on Schein's three step model to support an engaged and dynamic examination of their employee's actions, espoused values and underlying assumptions throughout the lean production process. Relying on defined categories of organizational culture may support manager's thorough understanding of their employee experiences with the integration of the lean production process.

The following will describe how to align Schein's Cultural Layers Model with the integration of the learn process can support systematic review of employee's experiences. The most surface level or first layer of culture, according to Schein, are artifacts. This first level examines aspects of the culture that are easily visible. In the lean production process, the artifacts are the observable actions such as reducing transportation, Just-in-Time inventory, streamlining movements, etc. As managers align employees with the unique culture of lean, it

can be helpful to first begin with supporting an employees' comprehension of the artifacts of the lean process. Managers should teach about the processes, allowing employees to both observe and perform actions that support streamlining and waste reduction within the organization. Also, in relation to the artifacts, and after teaching, the manager should begin to assess each employee's understanding of the artifacts through mini-reviews and observation.

Finally, the manager will support the employee's comprehension and alignment with the artifacts of lean by providing ongoing training with tool application. Building this foundation will help employees visualize the lean process, understand expectations and began to utilize lean communications in a scaffolded environment.

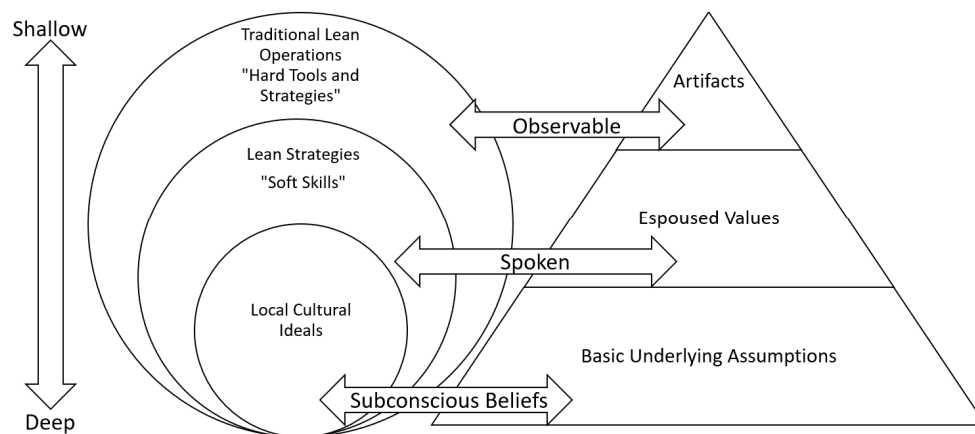
The next level of Schein's Cultural Layers Model identifies espoused values. These are the values of the employee and the organization that are readily shared with others and serve as the justifications for individual and organizational philosophies. In the lean process, the employee's and organizational espoused values should, ideally, be aligned with important lean process philosophies like Kaizen, Jadoka, "Chei" and "Ie." The manager, responsible for integrating lean processes, should seek to identify and understand their employee's espoused values specially checking for alignment with critical "soft" skills. Similarly, to the examination of the employee and organizational alignment with the lean process "hard" tools and strategies, the managers should move through teaching, assessing and developing employee's experiences with the "soft" skills of lean. Teaching and describing the definitions and significance of Kaizen, Jadoka, "Chei," and "Ie," in relation to effective lean production. Next, employees should be assessed and observed for their understanding and ability to community the "soft" skills of lean. Finally, the manager should offer ongoing training and development regarding "soft" skills such that employees understand how to communicate, describe and apply.

The third level of Schein's model refers to employee's and organizational basic underlying assumptions, the unconscious assumptions and values that have formed within each employee due to their human experience, both internal and external to the organization. In many organizations the underlying assumptions may contradict with observed behavior and only through analysis can the assumptions be identified and understood. It is at this level, the deepest level of culture, that lean process philosophies must be accepted to be fully integrated for a successful long-term application because within the effective lean process each employee must become a leader of efficiency with the ability to not only identify inefficiency but choose to communicate and change inefficiencies. For this level of quality control and self-direction, the employee must fundamentally accept their instrumental role within the efficiency process. A higher-level of management, one that is fully engaged, is required to understand an employee's underlying assumptions. To obtain this level of information about an employee, the manager must participate in a comprehensive assessment of the employee, through communication, observation, assessment and training. Management should continually teach about the values of lean processes and the significance of each individually employee in created an effective lean operation. Management must be engaged in assessments that support insight into the employee's true perceptions of lean and managers should provide ongoing updated training regarding the value of lean production.

The lean process is more than a set of tools, it is a comprehensive, dynamic system consisting of interdependent elements. The unique culture of the transplant organization is not necessarily prepared for or aligned with the Japanese philosophy of lean. The implementation of the lean process will create new procedures and the new process will ultimately alter the organizational culture. Management must be engaged with, aware of and guiding employees not

only on the “hard” tools of lean but also regarding the “soft” skills and underlying philosophies of the lean process. To support managers in their heightened level of required engagement, a strategic step process, is recommended. One suggested process is for the manager to continually assess their employees alignment with the artifacts and “hard” tools or lean, assess their employee’s alignment with the espoused values and “soft” skills and continually assess their employees basic underlying assumptions and understanding of the foundational philosophies of lean. When all three are aligned, the artifact aligned with lean, the espoused value aligned with lean, the basic underlying assumptions aligned with lean the employees have the potential to truly self-directed within a team of organizational efficiency. Figure 2 shows the managerial role of cultural assessment while implementing lean production.

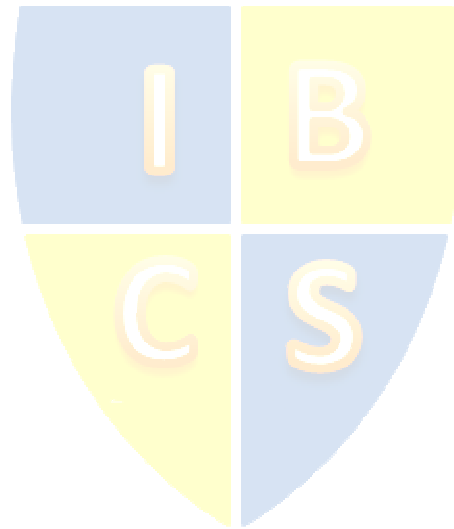
Figure 2: Toyota’s Lean Production Alignment with Schein’s Cultural Layers



CONCLUSIONS

Lean production is a system that transformed the automobile industry over the last seventy years. But, will the system remain relevant in the future? Katsuaki Watanabe, Toyota’s past president and current senior advisor, has said that Toyota’s future will depend on its ability to strike the right balance. Specifically, a balance between the short term and the long-term; between being a Japanese company and being a global company; between the manufacturing culture of Toyota City and the design culture of Los Angeles (Watkins, 2013). With the intent to further expand into the United States, Toyota must reflect on and pursue balance, recognizing the cultural contrasts between the conditions of the American and Japanese auto industries. Toyota leadership is aware of this contrast and that Toyota philosophies will have to shift over time, to fit within transplant country cultures. “We still have to become far more Americanized,” Shoichiro Irimajiri, a top executive at the Honda Motor Company, said in a recent interview (Reuters, 2017). In addition, current Toyota President Akio Toyoda said, “We may be a Japanese brand....but we’re also one of America’s car markers” (Reuters, 2017).

In order for the lean process to become more Americanized it is ideal to support American employees in gaining insight and understanding about the significance of and values behind the lean production process. But, the lean production process in America, must also adjust and customize such that American employee's cultural perspectives fit within expected organizational operations. Applying Schein's Cultural Layers Model may be helpful for managers in supporting a valuation of employee's observable, stated and underlying assumptions as they relate to lean operations. Employees that are aligned with lean philosophies in all three layers, artifacts, espoused values and underlying assumptions may be more able to self-direct and commit to a comprehensive organizational lean production process.



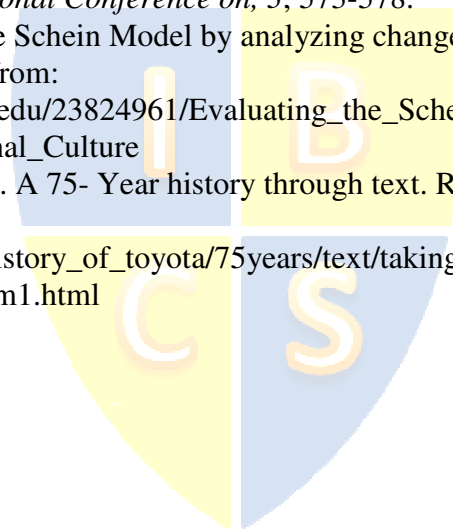
REFERENCES

- Anderson, M. (2014). Lean for all seasons. *Manufacturing Engineering*, 153(5), p. 83-84, 86-89.
- Bortolotti, Boscari, & Danese. (2015). Successful lean implementation: Organizational culture and soft lean practices. *International Journal of Production Economics*, 160(C), 182-201.
- Cain, T. (2017). All of the new 2018 Toyota Camrys sold in America in July Were Japan imports. *The Truth About Cars*. Retrieved from: <https://www.thetruthaboutcars.com/2017/08/new-2018-toyota-camrys-sold-america-july-japan-imports/>
- Chappell, L. (2007). Would the Toyota system work in U.S.? NUMMI was a test run. *Automotive News*. Retrieved from: <http://www.autonews.com/article/20071029/ANA03/710290332/would-the-toyotasystem-work-in-u.s.-nummi-was-a-test-run>
- Chiarini, A., & Vagnoni, E. (2014). World-class manufacturing by Fiat. Comparison with Toyota Production System from a Strategic Management, Management Accounting, Operations Management and Performance Measurement dimension. *International Journal of Production Research*, 53(2), 1-17.
- Cole, R. (2011). What really happened to Toyota? *MIT Sloan Management Review*. Retrieved from: <https://sloanreview.mit.edu/article/what-really-happened-to-toyota/>
- Cusumano, M. (1998). Manufacturing innovation: Lessons from the Japanese Auto Industry. *MIT Sloan*. Retrieved from: <https://sloanreview.mit.edu/article/manufacturing-innovation-lessons-from-the-japanese-auto-industry/>
- Drucker, P. (1981). Behind Japan's success. *Harvard Business Review*. Retrieved from: <https://hbr.org/1981/01/behind-japans-success>
- Emiliani, B. (2016). Lean success and lean failure. *Bob Emiliani Lean Leadership*. Retrieved from: <https://bobemiliani.com/lean-success-and-lean-failure/>
- Erthal, A., & Marques, L. (2018). National culture and organizational culture in lean organizations: A systematic review. *Production Planning & Control*, 29(8), 668-687.
- Giuseppe Piva. (2016). Japanese Art. Retrieved from: <http://www.giuseppepiva.com/en/news/ie-system-different-approach-signatures-japanese-art>
- Hatch, M. (1993). The dynamics of organizational culture. *The Academy of Management Review*, 18(4), p. 657-93.
- Healey, J. (2013). First take: Toyota finally trusts U.S. to build a Lexus. *USA Today*. Retrieved from: <https://www.usatoday.com/story/money/cars/2013/04/19/toyota-lexus-kentucky-es-rx-production-canada-toyoda/2096409/>
- Humphrey, B. (2017). 20 Companies with the Biggest Facilities in The World. *The Clever*. Retrieved from: <https://www.theclever.com/20-companies-with-the-biggest-facilities-in-the-world/>
- Jayamaha, N., Wagner, J., Grigg, N., Campbell-Allen, N., & Harvie, W. (2014). Testing a theoretical model underlying the 'Toyota Way' – An empirical study involving a large global sample of Toyota facilities. *International Journal of Production Research*, 52(14), 1-19.
- iSixSigma. (2018). Jidoka. Retrieved from: <https://www.isixsigma.com/dictionary/jidoka/>
- Kawamura, S. (1993). Japanese management style. *Japan & The World Economy*, 5(3), 289-292.
- Kull, Yan, Liu, & Wacker. (2014). The moderation of lean manufacturing effectiveness by dimensions of national culture: Testing practice-culture congruence hypotheses. *International Journal of Production Economics*, 153, 1-12.

- Kuppler, T. (2016). 20 organizational culture change insights from Edgar Schein. *Human Synergetics International*. Retrieved from: <https://www.humansynergetics.com/blog/culture-university/details/culture-university/2016/01/14/20-organizational-culture-change-insights-from-edgar-schein>
- Kurdve, Zackrisson, Wiktorsson, & Harlin. (2014). Lean and green integration into production system models – experiences from Swedish industry. *Journal of Cleaner Production*, 85, 180-190.
- Lathin, D., & Mitchell, R. (2001). Lean manufacturing: Techniques, people and culture. *Quality Congress. ASQ's ... Annual Quality Congress Proceedings*, 321-325.
- Leonard, K. (2015). The effect of organizational culture on implementing and sustaining lean processes. *Journal of Manufacturing Technology Management*, 26(5). Retrieved from: https://www.researchgate.net/publication/277728428_The_effect_of_organizational_culture_on_implementing_and_sustaining_lean_processes
- Levin, D. (July, 2014). Nissan and Honda battle for second place. *Fortune*. Retrieved from: <http://fortune.com/2014/07/10/nissan-honda-toyota/>
- Liker, J. (2004). *Toyota Way: 14 Management Principles from the World's Greatest Manufacturer*. McGraw-Hill, New York: NY. ISBN: 9780071392310
- Liker, J. & Rother, M. (n.d.) Why lean programs fail. *Lean Enterprise Institute*. Retrieved from: <https://www.lean.org/Search/Documents/352.pdf>
- Lippert, J., & Buckland, K. (2017). Toyota puts U.S. workers on alert: Made in Japan Camrys are cheaper. *Bloomberg*. Retrieved from: <https://www.bloomberg.com/news/articles/2017-11-20/Toyota-puts-u-s-workers-on-alertmade-in-japan-camrys-cheaper>
- MacDuffie, J. P. (1995). Human resource bundles and manufacturing performance: Organizational logic and flexible production systems in the world auto industry. *Industrial and Labor Relations Review*, 48: 197–221.
- MarketWatch. (2018). Annual Financials for Toyota Motor Corp. Retrieved from: <https://www.marketwatch.com/investing/stock/tm/financials>
- McMahon, T. (2013). Top 10 reasons why lean transformation fails. *A Lean Journey*. Retrieved from: <http://www.aleanjourney.com/2013/05/top-10-reason-why-lean-transformation.html>
- Miller, L. (2011). Lean culture and continuous improvement require enabling structures. *Industry Week*. Retrieved from: <https://www.industryweek.com/lean-six-sigma/lean-culture-and-continuous-improvement-require-enabling-structures>
- Morgan, B. (2016). Why lean fails so often. *Association for Manufacturing Excellence*. Retrieved from: <https://www.ame.org/target/articles/2016/why-lean-fails-so-often>
- NHTSA. (2017). National Highway Traffic Safety Administration. *United States Department Of Transportation*. Retrieved from: <https://www.nhtsa.gov/vehicle/2011/TOYOTA/COROLLA/4%252520DR/FWD>
- Oudhuis, M., & Olsson, A. (2013). Cultural clashes and reactions when implementing lean production in a Japanese-owned Swedish company. *Economic and Industrial Democracy*, 36(2), 259-282. Retrieved from: <https://journals.sagepub.com/doi/pdf/10.1177/0143831X13505118>
- Pampanelli, Found, & Bernardes. (2014). A Lean & Green Model for a production cell. *Journal of Cleaner Production*, 85, 19-30.

- Pay, R. (2008). Everybody's jumping on the lean bandwagon, but many are being taken for a ride. *IndustryWeek*. Retrieved from: <https://www.industryweek.com/companies-amp-executives/everybodys-jumping-lean-bandwagon-many-are-being-taken-ride>
- Pil, F. K. (1996). The international and temporal diffusion of high-involvement work practices. Philadelphia, Ph.D. Dissertation, Wharton Business School.
- Phil, F. and MacDuffie, J. (1999). What makes transplants thrive: Managing the transfer of "Best Practices" at Japanese auto plants in North America. *Journal of World Business*, 34(4). Retrieved from: <http://www.pitt.edu/~fritspil/pil%20macduffie%20jwb.pdf>
- Pleskot, K. (2017). Toyota: It's cheaper to ship Camrys from Japan than make them in the US. *MotorTrend*. Retrieved from: <https://www.motortrend.com/news/toyota-cheaper-ship-camrys-japan-make-u-s/>
- Poppendieck, M. (2002). Principles of lean thinking. *Poppendieck, LLC*. Retrieved from: <http://sel.unsl.edu.ar/ApuntesMaes/Anteriores/MetodologiasAgiles/LeanThinking.pdf>
- Roland, N. (2011). Toyota doesn't go far enough on safety management changes. *Automotive News*.
- Schein, E. H. (1992). *Organizational culture and leadership* (2nd ed). San Francisco: Jossey-Bass.
- Schein, E.H. (2010). *Organizational Culture and Leadership*. San Francisco: Jossey-Bass.
- Schwartz, H., & Bergfeld, M. (2017). What Japan's over 1,000-year-old family owned businesses can teach us. *Munich Business School*. Retrieved from: <https://www.munich-business-school.de/insights/en/2017/family-business-japan/>
- Shih, W. (2018). Inside Toyota's giant Kentucky factory: Japanese production techniques, Made in America. *Forbes*. Retrieved from: <https://www.forbes.com/sites/willyshih/2018/04/17/inside-toyotas-giant-kentucky-factory-japanese-production-techniques-made-in-america/#217710a133e4>
- Steward, T., & Raman, A. (2007). Lessons from Toyota's Long Drive. *Harvard Business Review*. Retrieved from: <https://hbr.org/2007/07/lessons-from-toyotas-long-drive>
- Takeuchi, H., Osono, E. & Shimizu, N. (2008). The contradictions that drive Toyota's success. *Harvard Business Review*. Retrieved from: <https://hbr.org/2008/06/the-contradictions-that-drive-toyotas-success>
- The Economist. (2002). Twenty years down the road. Retrieved from: <https://www.economist.com/business/2002/09/12/twenty-years-down-the-road>
- Toyota's Annual Report. (2017). Financial highlights for the year ended March 31, 2017. Retrieved from: https://www.toyota-global.com/pages/contents/investors/ir_library/annual/pdf/2017/ar17_3_en.pdf
- Toyota. (2018). 75 Years of Toyota. Retrieved from: http://www.toyota-global.com/company/history_of_toyota/75years/data/automotive_business/sales/activity/north_america/index.html
- Toyota. (2018). Operations by State. Retrieved from: <https://www.toyota.com/usa/operations/map.html#!/Vehicles>
- United States Securities and Exchange Commission. (2017). Retrieved from: <https://www.sec.gov/Archives/edgar/data/1094517/000119312517211041/d322218d20f.htm>
- Watkins, M. (2013). What is organizational culture? And why should we care? *Harvard Business Review*. Retrieved from: <https://hbr.org/2013/05/what-is-organizational-culture>

- What is lean?* (2009). Retrieved from Lean Enterprise Institute: <http://www.lean.org/whatslean/>
- Wiengarten, F., Gimenez, C., Fynes, B., and Ferdows, K. (2015). Exploring the importance of cultural collectivism on the efficacy of lean practices: Taking an organizational and national perspective. *International Journal of Operations & Production Management*. Retrieved from: <https://www.ideasforleaders.com/ideas/lean-manufacturing-more-effective-in-collectivist-cultures>
- Womack, J., & Jones, D. (1996). Lean thinking banish waste and create wealth in your corporation. *Action Learning: Research and Practice*, 4(1), p. 105-114.
- Womack, J., Jones, D., & Roos, D. (1990). *The Machine That Changed the World*. Free Press. ISBN: 978-0-7432-9979-4
- Wong, M. (2007). The role of culture in implementing lean production systems. *International Federation for Information Processing*, 246, p. 413-422. Retrieved from: https://link.springer.com/content/pdf/10.1007%2F978-0-387-74157-4_49.pdf
- Xue-Hong, J., & Yong-Lin, W. (2011). How to Become the World Top Auto Manufacturer: Development Experiences of GM, Toyota and Hyundai for Chinese Auto Enterprises. *Information Management, Innovation Management and Industrial Engineering (ICIII), 2011 International Conference on*, 3, 573-578.
- Yang, L. (n.d.). Evaluating the Schein Model by analyzing changes to organizational culture. *Academia*. Retrieved from: http://www.academia.edu/23824961/Evaluating_the_Schein_Model_by_Analyzing_Changes_to_Organizational_Culture
- 75- Year History TOP. (2012). A 75- Year history through text. Retrieved from: http://www.toyota-global.com/company/history_of_toyota/75years/text/taking_on_the_automotive_business/chapter2/section5/item1.html



APPENDIX**Table 1. Toyota production numbers**

(United States Securities and Exchange Commission, 2017)

2014	2015	2016	2017	2018		
Japan	4,344,892	4,124,593	3,980,576	4,109,038	4,285,844	
North America	1,759,439	1,932,618	1,970,053	2,062,862	1,902,304	

Table 2. Toyota 14 Guiding Principles by Jeffrey Liker

The Toyota Way (Liker, 2014) describes 14 guiding principles of Toyota.

The 14 Principles are as follows:

1. Base your management decisions on a long-term philosophy, even at the expense of short-term financial goals.
2. Create a continuous process flow to bring problems to the surface.
3. Use “pull” systems to avoid overproduction.
4. Level out the workload (heijunka). (Work like the tortoise, not the hare.)
5. Build a culture of stopping to fix problems, to get quality right the first time.
6. Standardized tasks and processes are the foundation for continuous improvement and employee empowerment.
7. Use visual control so no problems are hidden.
8. Use only reliable, thoroughly tested technology that serves your people and processes.
9. Grow leaders who thoroughly understand the work, live the philosophy, and teach it to others.
10. Develop exceptional people and teams who follow your company’s philosophy.
11. Respect your extended network of partners and suppliers by challenging them and helping them improve.
12. Go and see for yourself to thoroughly understand the situation (genchi genbutsu).
13. Make decisions slowly by consensus, thoroughly considering all options; implement decisions rapidly (nemawashi).
14. Become a learning organization through relentless reflection (hansei) and continuous improvement (kaizen).

Table 3. Toyota manufacturing plants in the United States

- Toyota Motor Manufacturing Mississippi, Inc., (TMMMS) located in Blue Springs and manufactures and assembles the Corolla.
- Toyota Motor Manufacturing Kentucky, Inc., (TMMK) located in Georgetown, Kentucky and manufactures and assembles the Camry, Avalon and Lexus.
- Toyota Motor Manufacturing Texas, Inc. (TMMTX) located in San Antonio, Texas and manufactures and assembles the Tundra and Tacoma.
- Toyota Motor Manufacturing Indiana, Inc. (TMMI) located in Princeton, Indiana and manufactures and assembles the Sequoia, Sienna and Highlander.
- Toyota Motor Manufacturing Alabama, Inc. (TMMAL) located in Huntsville, Alabama and manufactures mostly engines for TMMTX and TMMI.
- Toyota Motor Manufacturing West Virginia, Inc. (TMMWX) located in Buffalo, West Virginia and manufactures mostly 2GR-FE, 2ZZR-FE and 1AR-FE.

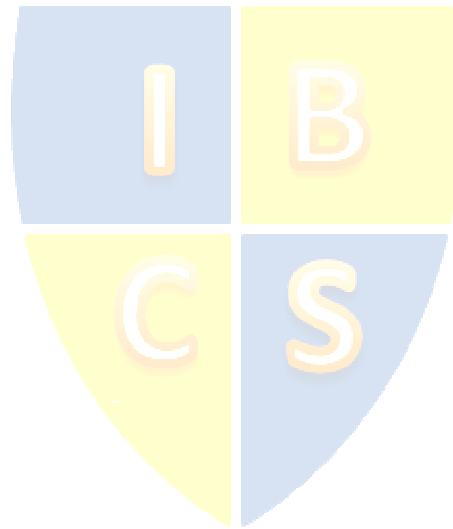


Table 4. Expert opinions regarding learn process integration in the United States

Author	Reason for Lean Manufacturing Failure
Liker and Rother, n.d.	“We mistook lean solutions for the process that leads to what we see in a Toyota plant. We need to look more deeply at the human thinking and processes that underlie specific practices that we observe.”
Denning, 2011	“The management task is not to impart a routine for doing work, but rather to inspire new work habits and mindsets for continually improving the work.”
McMahon, 2013	Lean is a fundamental change in the value delivery system.
Olofsson, 2015	“Lean is seen as something good in itself. To strive after being good is unfortunately not enough since the word holds a different meaning for different people.”
Emiliani, 2016	“Lean transformation” may be something that most organizations do not actually want (neither leaders nor workers), preferring instead to make the kinds of improvements that don’t amount to much – but apparently it is good enough.”
Morgan, 2016	Lean processes is a philosophy that requires ongoing employee behavioral changes.
Erthal and Marques, 2018	Levels of national culture and organizational culture can hinder implementation of the lean process. Specifically, the countries traits of masculinity and power distance can impact effective or ineffective implementation of lean production.
Thelen, 2018	“However, far too many believe that simply applying the tools (5S, Kaizen, value stream mapping and so on) will get them on the road to quick success. They do not take the time to learn of the theories and concepts needed to sustain the transformation. They do not review those theories and concepts thoroughly and align the business to the methodology.”
Quinn, 2018	“Top leadership either does not understand it or is unwilling to embrace the philosophy.”