

PRACTICE FORUM

# Leadership concepts in manufacturing environments: A brief historical review and conclusion with recommendations for education and training of I-O psychologists

Karen A. Tinker-Walker<sup>1\*</sup> and Jimmy D. Walker<sup>2</sup>

<sup>1</sup>Northwest Arkansas Community College and <sup>2</sup>Capella University

\*Corresponding author. E-mail: [ktinker1@nwacc.edu](mailto:ktinker1@nwacc.edu)

(Received 09 July 2019; revised 25 September 2019; accepted 10 November 2019)

Viewing production-line workers from a historical standpoint, the attention on manufacturing in the 19th and into the 20th centuries was on production (Fifelski, 2014) and production-oriented leadership style, in contrast to employee-oriented leadership style (Likert, 1961; see also Kosicek, Soni, Sandbothe, & Slack, 2012). Around the turn of the 20th century, changes took place, and it appears as if two different approaches were taken in manufacturing environments: research-practitioner-based leadership approaches and management-based leadership approaches; the latter approach is less a leadership style and more a social management philosophy emphasizing business operation (Vitolla, Rubino, & Garzoni, 2017). This review should bring awareness that industrial and organizational (I-O) psychologists once took on the lead to major successes that arose from work in manufacturing companies; however, today there is hardly any contribution by I-O psychologists to the manufacturing sector.

## Research-practitioner-based leadership approaches

The breakthrough in research within the industrial sector was the Hawthorn studies conducted by Mayo (1930). The researcher realized that workers were more productive when they were observed and felt they were of value to the organization. With Mayo's different perspective of workers and supporting the worker to be valued as a social aspect of production gave rise to the human relations movement. As part of the human relations movement was McGregor with his writing "The Human Side of Enterprise" in 1960. McGregor introduced his "Theory X and Theory Y" (McGregor, 1960, 2000; see also Burke, 2011), which are concerned with two opposing views of employees: Theory X, in which employees dislike work and need direction and close, authoritarian supervision (Landis, Hill, & Harvey, 2014; McGregor, 2000); and Theory Y, in which employees are motivated to work and serve the organization. Inspired by Maslow (1943), McGregor took on a humanistic perspective toward employees and their work attitudes. He opined that people are motivated to reach higher potentials and satisfy their needs through work (Bobic & Davis, 2003). McGregor called for "humanism to shape the future of management" (1960, p. 554; also see Pirson & Lawson, 2010).

Parallel during the 1960s were the International Harvester Studies as building blocks in I-O psychologists' work in manufacturing environments. Fleishman (1998) conducted surveys in the Harvester trucking company, which developed into pre- and post-training assessments of

foremen's consideration of workers and being effective supervisors. Further studies resulted in recognizing that leadership quality is complex and differs from one individual supervisor to another. The conclusion was that leadership effectiveness depends on training outcomes, personality, and situations (situations describe the climate the foreman works in). Hence, these studies laid the foundation for studies on organizational climate and culture.

Continuing with McGregor's rather humanistic perspective, Argyris (1957) viewed the treatment of employees as an essential aspect of the success of an organization. At first, his belief was that employees' needs stood against organizational needs (Bonjean, 1963). But with his "dedication to reducing injustice" (Argyris, 2003, p. 1178), he took on the notion that injustice was founded on workers not being heard, therefore errors were not uncovered, and actions were not taken to solve the immediate problem. Argyris viewed this as knowledge cycling in a *single-loop learning* process. The inclusion of assumptions into the loop of action and consequences evolves into *double-loop learning* (Argyris, 1999). The single-loop and double-loop learning concepts were fundamental in Argyris's *organizational learning* theory that he, together with Schön (1989), investigated through participatory *action research* (Lewin, 1946/2010; also see Kristiansen & Bloch-Poulsen, 2017). One such research-consultative project was Lazes's Xerox case, where Argyris and Schön had workers and management collaborate, resulting in a change regarding how the company defined productivity—a move away from productivity-per-worker to organizational productivity (Argyris & Schön, 1989).

Out of organizational learning, Argyris and Schön paved the way to the learning organization that came to fruition through Senge's (1994) book, *The Fifth Discipline: The Art and Practice of The Learning Organization*, which was first published in 1990. The five disciplines, or dimensions, of a learning organization are systems thinking, personal mastery, mental models, building shared vision, and team building. Even though Senge (1994) and Schein (1997) gave examples of success stories of major and well-known companies, gaps to the prominently research-based leadership concepts have been identified. Fillion, Koffi, Ekionea, and Booto (2015) viewed several outcomes of companies that claimed to be learning organizations and found that the majority have implemented changes, but either just a few of the five disciplines, or disciplines have been dealt with separately. Inclusion of five disciplines at all times calls for a systemic thinking, which is complex and takes time. The time aspect may have been why only a few manufacturing companies integrated organizational learning into their overall management systems.

Law and Chuah (2004) took the concept of the learning organization and developed a project-team-based learning framework that they named project-action learning (PAL). The premise of PAL is to progress through team learning processes that entail a performance goal, which conducted through a project, and a learning goal. Of interest are team performance and collective efficacy; with individuals, the interest is on self-efficacy (Bandura, 1982) and individual performance, which is evaluated by the individual him or herself, coworkers, and the experimenter or management.

Taking a small step back in time, beginning with the 1973 petroleum embargo and the oil crisis (Spector, 2014), the American economy slowly lost its lead. Wondering how best to manage the declining economy, transactional leadership and Burn's (1978) transforming leadership received attention. In his attempt to put these theories into practice, Iacocca, the chief executive officer of the Chrysler auto company during the 1980s, was successful in saving Chrysler from bankruptcy and it became a profit-maker again (Spector, 2014). Iacocca also achieved "high levels of employee morale, and had helped employees generate a sense of meaning in their work" (Spector, 2014, p. 366), and he became an icon of how to lead an industry. However, in 1991, another financial crisis brought hardships and ultimately Iacocca was removed from Chrysler's leadership. Even though Anastakis (2007) has spoken highly of Iacocca for being a great entrepreneur, scholars claimed that Iacocca did not transform the organizational culture or get employees involved (Spector, 2014). With regard to transformational leadership (Bass, 1985), scholars asserted that Iacocca, with his appearance of self-sacrifice, was a charismatic rather than a transformational leader.

Transformational leadership originated in Burns's (1978) concept of transforming leadership, which Bass (1985) adopted into his concept of transformational and transactional leadership. Transformational leadership encompasses the dimensions of individual consideration, intellectual stimulation, inspirational motivation, and idealized influence (Avolio & Bass, 1991, 2004; Bass, 1985). Avolio and Bass (1991, 2004) took this concept to create a model that encompasses a wide array of leadership styles and called it the full-range leadership model; on the continuum spectrum are laissez-faire leadership at one end, transactional leadership in the middle, and transformational leadership at the other end of the spectrum. The Multifactor Leadership Questionnaire, MLQ-5X (Avolio & Bass, 2004), an instrument to measure leadership style, has been a popular tool (Antonakis, 2012; Antonakis, Avolio, & Sivasubramaniam, 2003) that has been applied in research on manufacturing environments (e.g., Gabers, 2016; Mesu & Sanders and van Riemsdijk 2015; Uçar, Eren, & Erzen, 2012).

Again, economic circumstances played a big role in the manufacturing sector. The great recession took a toll for many companies and businesses in the late 2000s and early 2010s. To keep up with constant changes and still be successful in the automotive industry, Omar, Mears, Kurfess, and Kiggans (2011) showed through their research working with Renault and Mitsubishi in Born, Belgium, that organizational learning needs to involve the full range of employees and collaboration with other same industry companies, engineers, and academic institutions. The researchers' influence led Clemson University to found the International Center for Automotive Research (CU-ICAR) that not only provides a comprehensive program that enables successful organizational learning in manufacture work environments but also promotes research in manufacturing education. CU-ICAR was founded in 2007, and today it offers one course in Manufacture Project Management, which includes "Management, leadership, socio-cultural and technical skills training for the successful management of an automotive development or research team" (Clemson University, 2019).

Even though the business sector recuperated from the recession and advanced successfully by applying leadership theories, the U.S. manufacturing industry has faced strong competition over the last few decades because products have been produced more cheaply in some foreign countries. Those remaining manufacturing industries in the U.S. have faced downsizing and/other challenges. U.S. businesses have also become more service-oriented, which had been predicted by Drucker (2001). A need for a changed management or leadership style in the manufacturing environment arose. Strategies were identified that were needed for desired workflow, customer satisfaction, and worker satisfaction, which suggested the application of transformational leadership. Transformational leadership has the capacity to achieve "best possible organizational performance" (García-Morales, Jiménez-Barrionuevo, & Gutiérrez-Gutiérrez, 2012, p. 1040; Palmer, 2016). Even though there are studies with encouraging outcomes that can be applied to manufacturing companies (e.g., Fusch & Fusch, 2015; Kurtessis, Eisenberger, Ford, Buffardi, Stewart, & Adis, 2015; Shunlong & Weiming, 2012; Steensma, 2010; Wayne, Shore, & Liden, 2017; Woehl, 2011; Yaghoubipoor, Tee, & Ahmed, 2013), the implementation of the transformational leadership style has proven cumbersome. This may be due to applications of leadership theories not complementing product processes well. There seems to be a continued search for a holistic leadership concept that can handle all needs of a production company and also be competitively successful (Baker, 2003; Moccia, 2016; Sanders, 2013).

### Management-based leadership approaches

During the industrialization of the late 19th and beginning of the 20th centuries, companies were operated by owners who exploited workers for the benefit of personal gains (Pearson, 2009). A slight shift away from autocratic leadership (Chiang, 2012; Gastil, 1994; Lewin, Lippitt, & White, 1939; Morse & Reimer, 1956) or authoritarian leadership (Wang & Guan, 2018) began with the founding of the Wharton Business School of the University of

Pennsylvania in 1881 (Grachev & Rakitsky, 2013). Much of its teachings were geared toward motivating employees with the goal to maximize profit, whereby a good relationship with employees was a core tenet.

The era arose in which work efficiency was the primary focus, especially when Taylor (1911) introduced scientific management in 1903 (Grachev & Rakitsky, 2013). At first, Taylor addressed in particular engineering managers for efficient shop management. However, he came to disapprove of how workers suffered under the attempts to minimize labor costs, as well as punishment by coworkers if a worker tried to exceed productivity. He sought for a way to be fair to workers while also improving productivity and increasing profits. Studying time spent and details of production workflow, Taylor calculated a piece-rate system with a standard set just below the minimum of attainable production, which was then the production norm for a daily wage. He also laid thereby the foundation of systems thinking, in which workers are an integral part, along with rational analysis, a form of systemic-based science of managing production facilities (Grachev & Rakitsky, 2013). Taylor, hence, also paved the road for scientific work organizations. Taylorism became a popular trend long into the 20th century.

In the 1950s, however, American industries were shaken up due to manufacturing innovation in Japan. Japanese production was economically struggling (Knouse, Carson, Carson, & Heady, 2009) due to the devastations of World War II. Americans assisted in rebuilding Japan; among those was Deming (1986), who put more attention on product quality rather than quantity. He also believed that everyone in the manufacturing company was responsible for making incremental improvements. His approach brought Toyota its major breakthrough in the early 1960s (Knouse et al., 2009). By the 1970s, Japanese cars were of high quality and fuel-efficient, which alarmed the U.S. car industry. Many then took a good look at Deming's principles of quality—later constructed as Deming management model—where one of Deming's principles is to integrate leadership (Anderson, Rungtusanatham, & Schroeder, 1994; Douglas & Fredendall, 2004; Knouse et al., 2009).

Inspired by Deming's continuous improvement approach, Japanese companies developed a model known as Kaizen (Imai, 1986). Fundamentally, Kaizen is about efficiency of time management of operation flows (e.g., Carnerud, Jaca, & Bäckström, 2018; Marin-Garcia, Juarez-Tarraga, & Santandreu-Mascarell, 2018). Some U.S. companies have recently implemented Kaizen (e.g., Stahl, 2013), though more in the sense of a production process rather than in today's Japanese companies as a work/life philosophy (Macpherson, Lockhart, Kavan, & Iaquinto, 2018). For the most part in respect to U.S. management principles, Deming's quality improvement ideology has been associated with total quality management (TQM); however, he was not recognized as the founder of TQM (Martínez-Lorente, 1998).

Total quality management was a popular topic in the 1980s and 1990s due to the fact that Japanese production took a strong economic lead, and U.S. companies were trying to figure out how to regain that lead. TQM refers to quality control (Feigenbaum, 1983) needed to produce outstanding products and customer services. TQM is essentially about constantly checking and adjusting strategies and processes to improve effectiveness and productivity to suit customer demands, uphold customer satisfaction, and remain competitive in the business world (Kosicek et al., 2012; Mallur, Hiregoudar, & Soragaon, 2012). Key aspects for successful TQM are top management commitment, employee involvement, customer focus, information technology (IT), improved production planning and control, employee performance recognition system, management vision and mission, and supplier quality management (Aich, Muduli, Onik, & Kim, 2018; Mallur et al., 2012; Kothari, Shrimali, & Pradhan, 2017), whereby IT may play the essential role in success in product and productivity for small- and medium-sized companies (Aich et al., 2018). One can recognize that some of the key factors may not have a strong reliance on leadership style, such as production planning and control, recognition system, and IT; it may appear as if manufacturing businesses have further factors to consider besides leadership style and its effects.

Since the 1980s, another management philosophy became popular, leader-member-exchange leadership (LMX) (Dansereau, Graen, & Haga, 1975). Founded on social exchange theory (Thibaut & Kelley, 1959) and equity theory (Adams, 1963), LMX has a stronger focus on employees as team members than TQM has. The supervisor forms a working relationship built on trust, and both parties share responsibilities and decision making (Dansereau, Graen, & Haga, 1975). It was found that workers' sense of responsibility and duty stand in relation with organizational citizen behavior (Organ, 1988, 1997); these determine the degree of being dedicated to and reciprocating in ways that favor both their supervisors and the company (Han, Sears, & Zhang, 2018). Interactions are at the core of LMX, specifically superior-subordinate interactions, and therefore LMX been viewed as a process approach, one that is also represented in transactional leadership. The interactions between superiors and subordinates, the supervisor's expectations, and contingent rewards for jobs performed are all part of transactional leadership (van Breukelen, Schyns, & Le Blanc, 2006). However, it has been shown that LMX can also be of benefit with transformational leadership (Shunlong & Weiming, 2012).

Continuing with the historical view of manufacturing in the U.S., much emphasis has been on lean production starting at the beginning of the 21st century (Krafcik, 1988). The term lean manufacturing was used by Krafcik in his search for high performance in productivity when discussing competitive manufacturing research. In this context, the car manufacturing company Toyota in the 1990s became famous for its production system and world-leading levels of efficiency (Chiarini, Baccarani, & Mascherpa, 2018); its U.S. car sales had resulting successes. Even though there has not been a consensus on the definition of lean production (Pettersen, 2009), the general understanding of lean manufacturing is simplifying and standardizing work procedures to achieve high quality and productivity by reducing or even eliminating waste in production time and cost (Mehta & Shah, 2005). Because lean manufacturing might not be possible in some cases, company leaders began looking at types of teamwork and employee issues in order to increase production. A way to compensate for this has been to integrate LMX (Dansereau et al., 1975) because this approach takes employees into consideration as members of a team.

The most current approach to work performance and efficiency as well as product quality in the manufacturing industry is Six Sigma. Six Sigma is based on the use of statistical methods to calculate variation in processing; one then reduces variations in processing to arrive at improved operation and capacity, as well as lower operation costs (Murumkar & Teli, 2019). Six Sigma arose from the TQM approach, specifically with the aim of continuous improvement. Lean Six Sigma combines the framework from lean manufacturing, making use of reduction of waste, defects, and process variations and the outcomes of increased quality, cost effectiveness, and customer satisfaction (Albliwi, Antony, & Lim, 2015).

Six Sigma and lean manufacturing, despite their advanced applications of technology and customer focus, are still production process approaches and are set relatively equivalent to TQM. As product process approaches, they are in need of management philosophies or leadership paradigms to complete overall organizational progress and sustainability (Moccia, 2016; Sanders, 2013). There has been ambiguity due to difficulties in translating theory into practice, especially in regard to a clear approach to TQM, and its relation "with the bottom line" (Soltani, Lai, Javadeen, & Gholipour, 2008). In addition, due to high competitiveness with cheaper production and sales of goods in the global market, it appears the first focus of quality management in manufacturing today is centered on technology and customer satisfaction, even when discussing creativity (Zimon, 2015). The component of human-resources management within quality management appears to have taken a relatively low priority. It seems still much the case in regard to "human resource focus . . . [that] the empirical literature is silent with respect to any new or overlooked aspects" (Baker, 2003, pp. 170, 175). Taking an employee-centered orientation has occurred mostly in relation to work place health (e.g., Anger, 2015; Geldart, Smith, Shannon, & Lohfeld, 2010; Rampasso, Anholon, Gonçalves Quelhas, & Filho, 2017; Wang, Liu, Yu, Wu, Chang, & Wang, 2017; Zoller, 2004) and safety culture (e.g., Abellon & Wilder, 2014; Beus,



2010; Burke, Sarpy, Tesluk, & Smith-Crowe, 2002; Ghahramani & Khalkhali, 2015; Lundell & Marcham, 2018; Oliver, Cheyne, Tomas, & Cox, 2002). In establishing a safety culture, Lundell and Marcham (2018) state that transformational leadership may be most effective.

There may be a need for a refreshed view of the human side (McGregor, 1960; Moccia, 2016) in manufacturing, and it appears there is a search by manufacturing companies for a solution that is all inclusive, perhaps a multidisciplinary approach (Wilson, 1998; see also Johannessen, Olsen, & Olaisen, 2005). In the search for a holistic management philosophy, Gutierrez-Gutierrez, Barrales-Molina, and Hale (2018) worked toward a framework that unites knowledge from various disciplines in order to merge approaches, with particular consideration of human resources quality management in regard to new product development. Their model outlines that training, empowerment, and teamwork constitute the foundation of HR-related quality management practices; these establish the foundation of learning orientation and knowledge integration, where both combined with strategic flexibility lead to new product development. They stress the importance of organizational learning (Argote, 2011; Argyris, 2004; Schön & Argyris, 1978, 1996) for a company's innovation potential and progress. This and others' search for a holistic management philosophy may be the reason, or is recommendable for production companies to integrate transformational leadership as the "soft factor" and means to success into a holistic quality management approach (Moccia, 2016, p. 229).

### The numbers in the literature say a lot

When typing in a general search in an online library that has 52 databases, the numbers can provide some insights. The search with "manufacture" (entailing both "manufacture" and "manufacturing") returned 175,024 results and "manufacture AND leadership" 7,017 results in journal articles, books, dissertations, reports, newspapers, and a few blogs, including articles in foreign languages. The search with "production-line" returned 506,755 results (mostly on strategies dealing with, for instance, reduction of waste). These huge numbers (175,024 pertaining to manufacturing and 506,755 pertaining to production-line) show there is an enormous interest in the subject of manufacturing. A closer look reveals that most literature is in the form of books.

Reducing the search to only journal articles, "production line" returned 28,702 results. The search of "production line" in psychology-related journals returned only 414 results, though not all articles have the focus on manufacturing/production-line workers; of the 414 results, 284 pertained to "production line AND transformational leadership." This shows that there is an increasing interest in transformational leadership in manufacturing research and/or companies. The sources from which many articles could be retrieved were from the *Journal of Applied Psychology*, *Journal of Managerial Psychology*, and, astonishingly, from the *Applied Ergonomics* journal.

When viewing the sources of journal articles on transformational leadership pertaining to manufacturing environments, some were associated with engineering. Therefore, a search in databases of engineering was conducted. It was found that the *Journal of Cleaner Production* had the most articles referring to leadership; the majority of articles were published within the last two years. Other journals in which one finds a few articles on leadership are *Engineering Management Journal* (returned 13 results), *Journal of Management in Engineering* (returned 11 results), *Leadership and Management* (returned two results). Other journals were retrieved, such *Journal of Applied Mechanical Engineering*, *Global Journal of Engineering Science and Research Management*, and *International Journal of Project Management and Safety Science*; however, these articles were not accessible without membership to those journals. The numbers indicate engineers' growing interest in leadership topics, particularly in transformational leadership, even though leadership goes beyond engineers' training and field of expertise. Engineers are gradually taking on more leadership roles (Perry, Hunter, Currall, & Fraunheim, 2017), and more engineers are publishing on leadership in engineering-related journals. Engineers see themselves

compelled to do this because "... global mobility and competition resulting from increasingly transnational economies demand that North American engineers lead cross-cultural, interdisciplinary teams and respond to a range of stakeholder concerns [and] merging technical and humanistic aspects of engineering is rooted in the idea of professional service" (Rottmann, Sacks, & Reeve, 2015, p. 3). The thought comes to mind that the manufacturing sector has circled back to the times of scientific management (Grachev & Rakitsky, 2013) that took place in the early 20th century. Perhaps a new Taylorism (Taylor, 1911) mentality is needed for those trained in psychology, particularly I-O psychologists.

### Conclusion and recommendation

This literature review provided a general overview of the history and development of leading U.S. manufacturing companies becoming successful because psychological concepts were applied. The timetable of leadership theories adopted into U.S. manufacturing companies shows that many leadership studies were conducted in and applied to manufacturing environments up to the 1970s, followed by decades of transactional leadership having some impact as leadership style (see Table 1). Transformational leadership has made a slow entrance into manufacturing environments, but as a separate focus rather than as an integrated part of a whole manufacturing system. This timetable of leadership theories' arising and being implemented into manufacturing environments corresponds with Burke's (2018) writing of the evolution of psychological organizational development. Burke explained that organizational development reflected economic events, especially economic growth, and then stagnated since the 1970s. Beginning with the 1990s and especially starting with the time of the recession around 2008, I-O psychologists followed the economic trend and geared strongly to the service-oriented market. This has contributed to a shift in interest of I-O psychologists to focus on the business sector and to neglect the manufacturing sector. In addition, many larger manufacturing companies have moved facilities to foreign countries. Most small- and medium-sized manufacturing companies are trying to survive the highly competitive economy and get by with the necessary leadership investment while focusing on productivity, workplace safety, and other requirements, such as those determined by the Occupational Safety and Health Administration (OSHA). They seem to not have resources to try to improve by applying insights from I-O psychology.

The manufacturing sector has been deserted by I-O psychologists and left to those with strong production process-oriented leadership; these have been the Kaizen model since the late 1980s, lean manufacturing with start up in the 1990s, and Six Sigma since the 2010s. Recently Balzer, Brodke, Kluse, and Zickar (2019) addressed this departure from manufacturing by stating, "the industrial and occupational (I-O) psychology community has largely ignored the Lean research literature as well as ceded applied work in Lean to other organizational practitioners" (p. 215). They further write: "There is a dearth of evidence-based research by the field on the psychosocial aspects of Lean that would enrich the understanding of Lean, whether and why it works, and how best to implement it" (p. 216). This backs up some of the outcomes of this literature review and concluding claims.

Balzer et al. (2019) conducted a thorough literature search and review for I-O psychology content pertaining to Lean. Similar to our literature search, I-O psychology research has been extremely scarce. Balzer et al. also offer some possible explanations why I-O psychologists have ignored Lean. One explanation, and perhaps excuse, is that Lean may have been viewed as a fad, a transitional style, and not worth showing interest in. As another major deterrent, the researchers believe that Lean research does not reach the standard of I-O psychology and thus has not been included in I-O psychology journals; therefore, there is a lack of information on Lean among I-O psychology academicians, researchers, and practitioners. In regard to leadership, Balzer et al. state there is a need to study the relationship between leadership theories and practices as well as leadership and organizational effectiveness. We agree with their recommendation and add that there is

Table 1: Time Line of Leadership Theory Applied to U.S. Manufacturing

Research-practitioner based leadership		Management-based leadership	
Perspective		Perspective	
Rather humanistic	Rather behavioristic	People-oriented	Production process
			1900s—Taylor’s scientific management
Before 1920s--autocratic l.	Autocratic leadership	Still mostly autocratic	Autocratic
1920s, 30s—trait theories			
Late 1930s—Murray’s manifest needs theory			
1940s--	1940s behaviorism -----> Training programs for leaders		
	late 1940s—leader interaction approach → situational leadership		
1950s—e.g., hygiene factors, expectancy theory			1960s—product quality
1960s—Vroom’s equity theory, goal setting theory	1960s—Fiedler’s situational favorability	→ equity theory, Yetton Model	
	1970s—transactional l.		1970s—Deming Model
	Late 1970s transforming leadership		
1980s,90s—Organizational Culture (e.g., Schein `85)		1980s--Leader-Member Exchange theory → Late 1980,90s—Total Quality Mngmt	Kaizen Model
	1990s, 2000s transformational leadership	1990s—LMX; - Hersey and Blanchard situational leadership - Human Resources Mgmt	since 1990s/2000s Lean Manufacturing
			2010s—Six Sigma

Note: The leadership theories/styles in *Italics* did not originate from research and practices in manufacturing environments but were applied in manufacturing environments.

a need to seek a holistic leadership approach that embraces all facets of a company. This echoes Gestalt theory, where all entities work together as one system; not one of the entities can be neglected, otherwise the whole system does not function smoothly.

Another article that supports our claim recently has been published. Burke (2018) writes about the rise and fall of organizational development (OD), hence a very closely related theme as this



article, addressing more I-O psychology practitioners. As one of the reasons for the fall of OD, Burke asserts that corporations are not driven by their own mission but by strategy, and then states it would be “best to beat if not destroy the competition” (2018, p. 196). This can be agreed upon; companies need to check frequently that all entities of the company align with the corporation’s mission. With pressures to focus on production, some facets of the system may be neglected, causing disturbances in the long run. However, we disagree with Burke’s recommendation “to beat if not destroy the competition.” The opposite appears more applicable. Just as teamwork within the company is beneficial, collaboration outside the company makes it strong, too. Hence, having a community orientation strengthens the company. For instance, companies become competitive in the sense of being economically robust; plus, being socially responsible elicits good reputation for the company, which in itself promotes the products or at least heightens desire to work for the company. Community-orientation may be a way of taking Burke’s recommendation of “expanding their client base beyond the usual suspects—business-industry corporations” (2018, p. 196). With this kind of mindset, we recommend that I-O psychologists and students should work in collaboration with other education and training programs, professionals, and manufacturing companies. I-O psychology graduate students can complete internships in manufacturing environments to get an understanding of processes, work flows, influences of leadership, organizational culture and climate, exposure to environmental stressors, work languages, working with people of different population groups, and the gaps between production and administration, as well as production and organizational decision making. Or students can complete internships with business consultants who are not trained in I-O psychology but advise, coach, and train on manufacturing matters based on their expertise or gained insights from working with manufacturing-related professionals. University professors can shadow manufacturing managers over the summer term and/or take a sabbatical to work part-time and conduct observations for the rest of the work days; these observations may lead to insights that would otherwise remain masked. I-O psychology practitioners and consultants can visit with consultants outside of the field to share insights or perhaps temporarily exchange jobs; they could have weekly meetings with article readings and discussions from journals of different professional fields. Overall, they can start forming collaborations with other professionals who work within or for manufacturing companies, gain as much insight as possible, and share those insights then with I-O psychology colleagues, practitioners, students, and conference participants.

I-O psychologists may be familiar with TQM and lean approaches, but they most likely do not know about manufacturing-related aspects, such as Kaizen. One must have a fundamental understanding of management and operation concepts of manufacturing environments to be able to assist with leadership concepts in manufacturing companies. To achieve this, colleges need to provide this foundation. Currently if a student wants to specialize in providing service to manufacturing companies, he or she would have to complete courses from business and engineering programs in addition to his or her I-O psychology program courses. Also, graduate I-O psychology programs generally offer courses that contain research–practitioner-based leadership approaches. What is needed are I-O psychology programs, perhaps also organizational management and similar programs, to integrate management-based leadership approaches so students have a foundation to understand people and product processes in manufacturing environments.

Burke (2018) also calls for “a voice for the field” (p. 203). We are planning to present excerpts from this practice forum at the Society for Industrial and Organizational Psychology (SIOP) conference in April 2020; this will include a think-tank activity to gather ideas from educators and practitioners regarding how to provide I-O psychologists with the means to be supportive to manufacturing companies. Guiding questions may be as follows: What is needed to provide graduate students with the knowledge/training to understand manufacturing operations, processes, and tangibles? What is needed to get graduate students and practitioners prepared to face the challenges manufacturing companies are confronted with? What is needed or what service can be offered (and by whom) so practitioners are equipped to provide quality services to manufacturing companies? How can one stimulate an increase in research pertaining to manufacturing

environments? The outcome of the ideas and suggestions will be put together and shared with a SIOP forum or submitted for publication to reach a large readership. The goal is to adjust curricula, training, or services that are geared toward supporting manufacturing, particularly to small- and medium-sized manufacturing companies.

If more I-O psychologists and programs generate psychological knowledge and implementation strategies geared to manufacturing environments, perhaps more small- and medium-sized manufacturing businesses will arise, possibly making America a leading manufacturer power world-wide again. One may also consider the current politics and discussions regarding bringing manufacturing back to the U.S. Now is a good time to summon I-O psychologists to provide services and road maps for leadership that fit into a holistic concept of manufacturing environments.

## References

- Abellon, O. E., & Wilder, D. A. (2014). The effect of equipment proximity on safe performance in a manufacturing setting. *Journal of Applied Behavior Analysis*, *47*(3), 628–632. doi: [10.1002/jaba.137](https://doi.org/10.1002/jaba.137)
- Adams, J. S. (1963). Towards an understanding of inequity. *Journal of Abnormal and Social Psychology*, *67*(5), 422–436. doi: [10.1037/h0040968](https://doi.org/10.1037/h0040968)
- Aich, S., Muduli, K., Onik, Md. M. H., & Kim, H.-C. (2018). A novel approach to identify the best practices of quality management in SMES based on critical success factors using interpretive structural modeling (ISM). *International Journal of Engineering and Technology*, *7*(3), 130–133. doi: [10.14419/ijet.v7i3.29.18540](https://doi.org/10.14419/ijet.v7i3.29.18540)
- Albliwi, S. A., Antony, J., & Lim, S. A. H. (2015). A systematic review of Lean Six Sigma for the manufacturing industry. *Business Process Management Journal*, *21*(3), 665–691. doi: [10.1108/BPMJ-03-2014-0019](https://doi.org/10.1108/BPMJ-03-2014-0019)
- Anastakis, D. (2007). Industrial sunrise? The Chrysler bailout, the state, and the reindustrialization of the Canadian automotive sector, 1975–1986. *Urban History Review*, *35*(2), 37–50. doi: [10.7202/1015920ar](https://doi.org/10.7202/1015920ar)
- Anderson, J., Rungtusanatham, M., & Schroeder, R. (1994). A theory of quality management underlying the Deming management method. *Academy of Management Review*, *19*, 472–509. doi: [10.5465/amr.1994.9412271808](https://doi.org/10.5465/amr.1994.9412271808)
- Anger, W. K. (2015). Effectiveness of total worker health interventions. *Journal of Occupational Health Psychology*, *20*(2), 226–247. doi: [10.1037/a0038340](https://doi.org/10.1037/a0038340)
- Antonakis, J. (2012). Transformational and charismatic leadership. In D. V. Day & J. Antonakis (Eds.), *The nature of leadership* (pp. 256–288). Thousand Oaks, CA: Sage.
- Antonakis, J., Avolio, B. J., & Sivasubramaniam, N. (2003). Context and leadership: An examination of the nine-factor full-range leadership theory using the multifactor leadership questionnaire. *The Leadership Quarterly*, *14*, 261–295. doi: [10.1016/S1048-9843\(03\)00030-4](https://doi.org/10.1016/S1048-9843(03)00030-4)
- Argote, L. (2011). Organizational learning research: Past, present and future. *Management Learning*, *42*(4), 439–446. doi: [10.1177/1350507611408217](https://doi.org/10.1177/1350507611408217)
- Argyris, C. (1957). *Personality and organization: The conflict between system and the individual*. New York, NY: Harper.
- Argyris, C. (1999). The next challenge for TQM: Taking the offensive on defensive reasoning. *The Journal for Quality and Participation*, *22*(6), 41–43.
- Argyris, C. (2003). A life full of learning. *Organization Studies*, *24*(7), 1178–1192. doi: [10.1177/01708406030247009](https://doi.org/10.1177/01708406030247009)
- Argyris, C. (2004). Reflection and beyond in research on organizational learning. *Management Learning*, *35*(4), 507–509. doi: [10.1177/1350507604048276](https://doi.org/10.1177/1350507604048276)
- Argyris, C., & Schön, D. A. (1989). Participatory action research and action science compared: A commentary. *American Behavioral Scientist*, *32*(5), 612–623. doi: [10.1177/0002764289032005008](https://doi.org/10.1177/0002764289032005008)
- Avolio, B., & Bass, B. (1991). *The full range of leadership development*. Binghamton, NY: Center for Leadership Studies.
- Avolio, B. J., & Bass, M. B. (2004). *Multifactor leadership questionnaire, manual and sample set* (3rd ed.). Redwood City, CA: Mind Garden.
- Baker, B. L. (2003). *TQM practice and theory: A meta-analysis of empirical studies* [Dissertation]. Colorado Technical University. ProQuest Dissertations Publishing No. 3117237.
- Balzer, W. K., Brodke, M. H., Kluse, C., & Zickar, M. J. (2019). Revolution or 30-year fad? A role for I-O psychology in Lean management. *Industrial and Organizational Psychology: Perspectives on Science and Practice*, *12*(3), 215–233. doi: [10.1017/iop.2019.23](https://doi.org/10.1017/iop.2019.23)
- Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist*, *37*(2), 122–147. doi: [10.1037/0003-066X.37.2.122](https://doi.org/10.1037/0003-066X.37.2.122)
- Bass, B. M. (1985). *Leadership and performance beyond expectations*. New York, NY: The Free Press.
- Beus, J. M. (2010). Safety climate and injuries: An examination of theoretical and empirical relationships. *Journal of Applied Psychology*, *95*(4), 713–727. doi: [10.1037/a0019164](https://doi.org/10.1037/a0019164)
- Bobic, M. P., & Davis, E. D. (2003). A kind word for Theory X. *Journal of Public Administration Research and Theory*, *13*(3), 239–264. doi: [10.1093/jopart/mug022](https://doi.org/10.1093/jopart/mug022)

- Bonjean, C.** (1963). New patterns of management [Book review by Rensis Likert]. *Social Forces*, *42*(2), 260–261. doi: [10.2307-2575710](https://doi.org/10.2307-2575710)
- Burke, W. W.** (2011). On the legacy of Theory Y. *Journal of Management History*, *17*(2), 193–201. doi: [10.1108/175113411111112596](https://doi.org/10.1108/175113411111112596)
- Burke, W. W.** (2018). The rise and fall of the growth of organization development: What now? *Consulting Psychology Journal: Practice and Research*, *70*(3), 186–206. doi: [10.1037/cpb0000116](https://doi.org/10.1037/cpb0000116)
- Burke, M. J., Sarpy, S. A., Tesluk, P. E., & Smith-Crowe, K.** (2002). General safety performance: A test of a grounded theoretical model. *Personnel Psychology*, *55*(2), 429–457.
- Burns, J. M.** (1978). *Leadership*. New York, NY: Harper Perennial.
- Carnerud, D., Jaca, C., & Bäckström, I.** (2018). Kaizen and continuous improvement: Trends and patterns over 30 years. *TQM Journal*, *30*(4), 371–390. doi: [10.1108/TQM-03-2018-0037](https://doi.org/10.1108/TQM-03-2018-0037)
- Chiang, T.-J.** (2012). *Two faces of a control freak: Decomposing authoritarian leadership and its effects on work unit effectiveness* [Dissertation]. University of Washington, ProQuest Dissertations Publishing, 3521446.
- Chiarini, A., Baccarani, C., & Mascherpa, V.** (2018). Lean production, Toyota production system and kaizen philosophy. *TQM Journal*, *30*(4), 425–438. doi: [10.1108/TQM-12-2017-0178](https://doi.org/10.1108/TQM-12-2017-0178)
- Clemson University.** (updated 2019). Automotive engineering academic program: Course descriptions. Retrieved from [www.clemson.edu/cecas/departments/automotive-engineering/academic-programs/automotive-engineering-course-descriptions.html](http://www.clemson.edu/cecas/departments/automotive-engineering/academic-programs/automotive-engineering-course-descriptions.html)
- Dansereau, F., Graen, G. B., & Haga, W. J.** (1975). A vertical dyad linkage approach to leadership within formal organizations. *Organizational Behavior and Human Performance*, *13*, 46–78. doi: [10.1016/0030-5073\(75\)90005-7](https://doi.org/10.1016/0030-5073(75)90005-7)
- Deming, W.** (1986). *Out of the crisis*. Cambridge, MA: Massachusetts Institute of Technology Center for Advanced Engineering Study.
- Douglas, T. J., & Fredendall, L. D.** (2004). Evaluating the Deming management model of total quality in services. *Decision Sciences*, *35*(3), 393–422. doi: [10.1111/j.0011-7315.2004.02569.x](https://doi.org/10.1111/j.0011-7315.2004.02569.x)
- Drucker, P. F.** (2001). *The essential Drucker: The best of sixty years of Peter Drucker's essential writings on management*. New York, NY: Harper Collins Publishers, Inc.
- Feigenbaum, A. V.** (1983). *Total quality control* (3rd ed.). New York, NY: McGraw-Hill.
- Fifelski, J. B.** (2014). *Imprinted products: Domestic manufactures and nineteenth century American literature* (Doctoral dissertation). Available from ProQuest Dissertations & Theses Global database (Accession Order No. ATT 3684555).
- Fillion, G., Koffi, V., Ekionea, J., & Booto, P.** (2015). Peter Senge's learning organization: A critical view and the addition of some new concepts to actualize theory and practice. *Journal of Organizational Culture, Communications and Conflict*, *19*(3), 73–102.
- Fleishman, E. A.** (1998). Patterns of leadership behavior related to employee grievances and turnover: Some post hoc reflections. *Personnel Psychology*, *51*(4), 825–834.
- Fusch, P. I., & Fusch, G. E.** (2015). Leadership and conflict resolution on the production line. *International Journal of Applied Management and Technology*, *14*(1), 21–39. doi: [10.5590/IJAMT.2015.14.1.0](https://doi.org/10.5590/IJAMT.2015.14.1.0)
- Gabers, C.** (2016). *Leadership in small U.S. industrial machining and fabricating companies* [Dissertation]. Open Access by the Programs in Business Administration at ScholarWorks at Georgia State University. Retrieved from [https://scholarworks.gsu.edu/cgi/viewcontent.cgi?article=1079&context=bus\\_admin\\_diss](https://scholarworks.gsu.edu/cgi/viewcontent.cgi?article=1079&context=bus_admin_diss)
- García-Morales, V. J., Jiménez-Barrionuevo, M. M., & Gutiérrez-Gutiérrez, L.** (2012). Transformational leadership influence on organizational performance through organizational learning and innovation. *Journal of Business Research*, *65*(7), 1040–1050. doi: [10.1016/j.jbusres.2011.03.005](https://doi.org/10.1016/j.jbusres.2011.03.005)
- Gastil, J.** (1994). A meta-analytic review of the productivity and satisfaction of democratic and autocratic leadership. *Small Group Research*, *25*(3), 384–410. doi: [10.1177/1046496494253003](https://doi.org/10.1177/1046496494253003)
- Geldart, S., Smith, C. A., Shannon, H. S., & Lohfeld, L.** (2010). Organizational practices and workplace health and safety: A cross-sectional study in manufacturing companies. *Safety Science*, *48*(5), 562–569. doi: [10.1016/j.ssci.2010.01.004](https://doi.org/10.1016/j.ssci.2010.01.004)
- Ghahramani, A., & Khalkhali, H. R.** (2015). Development and validation of a safety climate scale for manufacturing industry. *Safety and Health at Work*, *6*(2), 97–103. doi: [10.1016/j.shaw.2015.01.003](https://doi.org/10.1016/j.shaw.2015.01.003)
- Grachev, M., & Rakitsky, B.** (2013). Historic horizons of Frederick Taylor's scientific management. *Journal of Management History*, *19*(4), 512–527. doi: [10.1108/JMH-05-2012-0043](https://doi.org/10.1108/JMH-05-2012-0043)
- Gutierrez, L. J., Barrales-Molina, V., & Hale, K.** (2018). The role of human resource-related quality management practices in new product development. *International Journal of Operations & Production Management*, *38*(1), 43–66. doi: [10.1108/IJOPM-07-2016-0387](https://doi.org/10.1108/IJOPM-07-2016-0387)
- Han, Y., Sears, G., & Zhang, H.** (2018). Revisiting the “give and take” in LMX: Exploring equity sensitivity as a moderator of the influence of LMX on affiliative and change-oriented OCB. *Personnel Review*, *47*(2), 555–571.
- Imai, M.** (1986). *Kaizen: The key to Japan's competitive success*. New York, NY: McGraw-Hill Education.
- Johannessen, J.-R., Olsen, B., & Olaisen, J.** (2005). Intellectual capital as a holistic management philosophy: A theoretical perspective. *International Journal of Information Management*, *25*(2), 51–171. doi: [10.1016/j.ijinfomgt.2004.12.008](https://doi.org/10.1016/j.ijinfomgt.2004.12.008)
- Knouse, S. B., Carson, P. P., Carson, K. D., & Heady, R. B.** (2009). Improve constantly and forever: The influence of W. Edwards Deming into the twenty-first century. *TQM Journal*, *21*(5), 449–461. doi: [10.1108/17542730910983371](https://doi.org/10.1108/17542730910983371)

- Kosicek, P. M., Soni, R., Sandbothe, R., & Slack, F. (2012). Leadership styles, industry fit, and quality focus. *Competition Forum*, *10*(2), 49–54.
- Kothari, H., Shrimali, S., & Pradhan, B. L. (2017). Key factors of TQM implementation and impact in industries of Nepal: A conceptual model. *Pacific Business Review International*, *9*(7), 181–193. Retrieved from [http://www.pbr.co.in/2017/2017\\_month/Jan/19.pdf](http://www.pbr.co.in/2017/2017_month/Jan/19.pdf)
- Kracik, J. F. (1988). Triumph of the lean production system. *Sloan Management Review*, *30*(1), 41–52. Retrieved from <https://www.lean.org/downloads/MITSloan.pdf>
- Kristiansen, M., & Bloch-Poulsen, J. (2017). Participation and social engineering in early organizational action research: Lewin and the Harwood studies. *International Journal of Action Research*, *13*(2), 154–177. doi: [10.3224/ijar.v13i2.05](https://doi.org/10.3224/ijar.v13i2.05)
- Kurtessis, J. N., Eisenberger, R., Ford, M. T., Buffardi, L. C., Stewart, K. A., & Adis, C. S. (2015). Perceived organizational support: A meta-analytic evaluation of organizational support theory. *Journal of Management*, *43*(6), 1–31. doi: [10.1177/0149206315575554](https://doi.org/10.1177/0149206315575554)
- Landis, E., Hill, D., & Harvey, M. (2014). Synthesis of leadership theories and styles. *Journal of Management Policy and Practice*, *15*(2). Retrieved from [http://www.na-businesspress.com/JMPP/LandisEA\\_Web15\\_2\\_.pdf](http://www.na-businesspress.com/JMPP/LandisEA_Web15_2_.pdf)
- Law, K. M. Y., & Chuah, K. B. (2004). Project-based action learning as learning approach in learning organisation: The theory and framework. *Team Performance Management*, *10*(7/8), 178–186. doi: [10.1108/13527590410569904](https://doi.org/10.1108/13527590410569904)
- Lewin, K. (1946/2010). Action research and minority problems. *Journal of Social Issues*, *2*, 34–46. doi: [10.1111/j.1540-4560.1946.tb02295.x](https://doi.org/10.1111/j.1540-4560.1946.tb02295.x)
- Lewin, K., Lippitt, R., & White, R. K. (1939). Patterns of aggressive behavior in experimentally created social climates. *Journal of Social Psychology*, *10*, 271–301. Retrieved from <https://doi.org/10.1080/00224545.1939.9713366>
- Likert, R. (1961). *New patterns of management*. New York, NY: McGraw-Hill.
- Lundell, M. A., & Marcham, C. L. (2018). Leadership's effect on safety culture. *Professional Safety*, *63*(11), 36–43.
- Macpherson, W. G., Lockhart, J. C., Kavan, H., & Jaquinto, A. L. (2018). Kaizen in Japan: Transferring knowledge in the workplace. *Journal of Business Strategy*, *39*(3), 40–45. doi: [10.1108/JBS-04-2017-0048](https://doi.org/10.1108/JBS-04-2017-0048)
- Mallur, S. B., Hiregoudar, N. L., & Soragaon, B. (2012). A comparative study of importance and practices of CSFS of TQM practices and their impact on performance of North Karnataka SMEs manufacturing sectors: A survey result. *International Journal of Management Research and Reviews*, *2*(10), 1810–1830.
- Marin-Garcia, J. A., Juarez-Tarraga, A., & Santandreu-Mascarell, C. (2018). Kaizen philosophy. *TQM Journal*, *30*(4), 296–320. doi: [10.1108/TQM-12-2017-0176](https://doi.org/10.1108/TQM-12-2017-0176)
- Martinez-Lorente, A. R. (1998). Total quality management: Origins and evolution of the term. *The TQM Magazine*, *3*, 1–19. doi: [10.1108/09544789810231261](https://doi.org/10.1108/09544789810231261)
- Maslow, A. H. (1943). A theory of human motivation. *Psychological Review*, *50*(4), 370–396. doi: [10.1037/h0054346](https://doi.org/10.1037/h0054346)
- Mayo, E. (1930). Changing methods in industry. *Personnel Journal*, *8*(5), 326–332. Retrieved from <http://psycnet.apa.org/record/1930-01269-001>
- McGregor, D. (1960). Theory X and theory Y. *Organization Theory*, 358–374.
- McGregor, D. (2000). The human side of enterprise. *Reflections*, *2*(1), 6–15. doi: [10.1162/152417300569962](https://doi.org/10.1162/152417300569962)
- Mehta, V., & Shah, H. (2005). Characteristics of a work organization from a lean perspective. *Engineering Management Journal*, *17*(2), 14–21. doi: [10.1080/10429247.2005.11415282](https://doi.org/10.1080/10429247.2005.11415282)
- Mesu, J., Sanders, K., & van Riemsdijk, M. (2015). Transformational leadership and organisational commitment in manufacturing and service small to medium-sized enterprises: The moderating effects of directive and participative leadership. *Personnel Review*, *44*(6), 970–990. doi: [10.1108/PR-01-2014-0020](https://doi.org/10.1108/PR-01-2014-0020)
- Moccia, S. (2016). The role of value and virtues in TQM: An overview of literature. *The TQM Journal*, *28*(2), 216–234. doi: [10.1108/TQM-03-2014-0031](https://doi.org/10.1108/TQM-03-2014-0031)
- Morse, N. C., & Reimer, E. (1956). The experimental change of a major organizational variable. *Journal of Abnormal and Social Psychology*, *52*(1), 120–129. doi: [10.1037/h0048893](https://doi.org/10.1037/h0048893)
- Murumkar, A., & Teli, S. N. (2019, April 5–7). *Quality cost and Six Sigma frameworks to improve quality*. Conference paper presented at the 2nd International Conference on Recent Innovations and Technological Developments in Mechanical Engineering (ICRITDME), Jaipur, India. Retrieved from <https://www.researchgate.net/publication/332170633>
- Oliver, A., Cheyne, A., Tomas, J. M., & Cox, S. (2002). The effects of organizational and individual factors on occupational accidents. *Journal of Occupational and Organizational Psychology*, *75*(4), 473–488. doi: [10.1348/096317902321119691](https://doi.org/10.1348/096317902321119691)
- Omar, M., Mears, L., Kurfess, T., & Kiggans, R. (2011). Organizational learning in automotive manufacturing: A strategic choice. *Journal of Intelligent Manufacturing*, *22*(5), 709–715. doi: [10.1007/s10845-009-0330-6](https://doi.org/10.1007/s10845-009-0330-6)
- Organ, D. W. (1988). *Organizational citizenship behavior: The good soldier syndrome*. Lexington, MA: Lexington Books.
- Organ, D. W. (1997). Organizational citizenship behavior: It's construct clean-up time. *Human Performance*, *10*(2), 85–98. doi: [10.1207/s15327043hup1002\\_2](https://doi.org/10.1207/s15327043hup1002_2)
- Palmer, A. M. (2016). *Leadership style and job satisfaction as predictors of employee innovation in the automotive manufacturing industry* [Dissertation]. Northcentral University.
- Pearson, G. (2009). *The rise and fall of management: A brief history of practice, theory and context* (1st ed.). London: Routledge.



- Perry, S. J., Hunter, E. M., Currall, S. C., & Frauenheim, E. (2017). Developing engineering leaders: An organized innovation approach to engineering education. *Engineering Management Journal*, *29*(2), 99–107. doi: [10.1080/10429247.2017.1298189](https://doi.org/10.1080/10429247.2017.1298189)
- Pettersen, J. (2009). Defining lean production: Some conceptual and practical issues. *The TQM Journal*, *21*(2), 127–142. doi: [10.1108/17542730910938137](https://doi.org/10.1108/17542730910938137)
- Pirson, M., & Lawson, P. (2010). Humanism in business: Towards a paradigm shift? *Journal of Business Ethics*, *93*, 553–565. doi: [10.1007/s10551-009-0239-1](https://doi.org/10.1007/s10551-009-0239-1)
- Rampasso, I. S., Anholon, R., Gonçalves Quelhas, O. L., & Filho, W. L. (2017). Primary problems associated with the health and welfare of employees observed when implementing lean manufacturing projects. *Work*, *58*(3), 263–275. doi: [10.3233/WOR-172632](https://doi.org/10.3233/WOR-172632)
- Rottmann, C., Sacks, R., & Reeve, D. W. (2015). Engineering leadership: Grounding leadership theory in engineers' professional identities. *Leadership*, *11*(3), 351–373. doi: [10.1177/1742715014543581](https://doi.org/10.1177/1742715014543581)
- Sanders, J. H. (2013). Impact of management theories X, Y, and Z on Lean Six Sigma. In *Proceedings of the 2013 Industrial and Systems Engineering Research Conference* (pp. 2195–2200). ProQuest document ID 1471960672.
- Schein, E. H. (1997). *Organizational culture and leadership* (2nd ed.). San Francisco, CA: Jossey-Bass.
- Schön, D. A., & Argyris, C. (1978). *Organizational learning: A theory of action perspective*. Reading, MA: Addison-Wesley.
- Schön, D. A., & Argyris, C. (1996). *Organizational learning II: Theory, method and practice*. Reading, MA: Addison-Wesley.
- Seng, P. M. (1994). *The fifth discipline: The art and practice of the learning organization*. New York, NY: Currency Doubleday.
- Shunlong, X., & Weiming, Z. (2012). The relationships between transformational leadership, LMX, and employee innovative behavior. *Journal of Applied Business and Economics*, *13*(5), 87–96.
- Soltani, E., Lai, P.-C., Javadeen, S. R., & Gholipour, T. H. (2008). A review of the theory and practice of managing TQM: An integrative framework. *Total Quality Management*, *19*(5), 461–479. doi: [10.1080/14783360802018103](https://doi.org/10.1080/14783360802018103)
- Spector, B. (2014). Flawed from the “get-go”: Lee Iacocca and the origins of transformational leadership. *Leadership*, *10*(3), 361–379. doi: [10.1177/1742715013514881](https://doi.org/10.1177/1742715013514881)
- Stahl, F. (2013). *Worker leadership: America's secret weapon in the battle for industrial competitiveness*. Cambridge, MA: MIT Press.
- Steensma, J. T. (2010). *Transformational leadership and safety in steel mills: A quantitative study in a high hazard environment* [Dissertation]. Available from ProQuest Dissertations & Theses Global database (Accession Order No. ATT 3541974).
- Taylor, F. (1911). *Principles of scientific management*. New York, NY: Harper and Bros.
- Thibaut, J. W., & Kelley, H. H. (1959). *The social psychology of groups*. New York, NY: John Wiley & Sons.
- Uçar, A. C., Eren, E., & Erzen, E. (2012). Determination of the relationship between leadership perceptions of blue collars and organizational outcomes by using MLQ analysis. *Procedia: Social and Behavioral Sciences*, *41*, 196–208. doi: [10.1016/j.sbspro.2012.04.024](https://doi.org/10.1016/j.sbspro.2012.04.024)
- van Breukelen, W., Schyns, B., & Le Blanc, P. (2006). Leader-member exchange theory and research: Accomplishments and future challenges. *Leadership*, *2*(3), 295–316. doi: [10.1177/1742715006066023](https://doi.org/10.1177/1742715006066023)
- Vitolla, F., Rubino, M., & Garzoni, A. (2017). The integration of CSR into strategic management: A dynamic approach based on social management philosophy. *Corporate Governance*, *17*(1), 89–116. doi: [10.1108/CG-03-2016-0064](https://doi.org/10.1108/CG-03-2016-0064)
- Wang, H., & Guan, B. (2018). The positive effect of authoritarian leadership on employee performance: The moderating role of power distance. *Frontiers in Psychology*, *9*, 357. doi: [10.3389/fpsyg.2018.00357](https://doi.org/10.3389/fpsyg.2018.00357)
- Wang, Z., Liu, H., Yu, H., Wu, Y., Chang, S., & Wang, L. (2017). Associations between occupational stress, burnout and well-being among manufacturing workers: Mediating roles of psychological capital and self-esteem. *BMC Psychiatry*, *17*(1), 1–10. doi: [10.1186/s12888-017-1533-6](https://doi.org/10.1186/s12888-017-1533-6)
- Wayne, S. J., Shore, L. M., & Liden, R. C. (2017). Perceived organizational support and leader-member exchange: A social exchange perspective. *Academy of Management Journal*, *40*(1), 82–111. doi: [10.5465/257021](https://doi.org/10.5465/257021)
- Wilson, E. O. (1998). *Consilience: The unity of knowledge*. New York, NY: Alfred A Knopf.
- Woehl, J. H. (2011). *How leadership styles reflect on lean manufacturing practices and culture* [Dissertation]. Capella University, School of Business and Technology. ProQuest Dissertation No. 3473260.
- Yaghoobipoor, A., Tee, O. P., & Ahmed, E. M. (2013). Impact of the relationship between transformational and traditional leadership styles on Iran's automobile industry job satisfaction. *World Journal of Entrepreneurship, Management and Sustainable Development*, *9*(1), 14–27. doi: [10.1108/20425961311315692](https://doi.org/10.1108/20425961311315692)
- Zimon, D. (2015). The impact of the quality management system to improve manufacturing logistics. *Applied Mechanics and Materials*, *803*(3), 155–160. doi: [10.4028/www.scientific.net/AMM.803.155](https://doi.org/10.4028/www.scientific.net/AMM.803.155)
- Zoller, H. M. (2004). Manufacturing health: Employee perspectives on problematic outcomes in a workplace health promotion initiative. *Western Journal of Communication*, *68*(3), 278–301.

**Cite this article:** Tinker-Walker, K.A. and Walker, J.D. (2020). Leadership concepts in manufacturing environments: A brief historical review and conclusion with recommendations for education and training of I-O psychologists. *Industrial and Organizational Psychology*, *13*, 90–102. <https://doi.org/10.1017/iop.2020.17>