ROUTLEDGE

Framing and Managing Lean Organizations in the New Economy

Darina Lepadatu and Thomas Janoski

Framing and Managing Lean Organizations in the New Economy

This book examines the dominance and significance of lean organizing in the international economy. Scholars from each discipline see lean production as positive or negative; the book blends theory with practice by sorting out these different academic views and revealing how lean is implemented in different ways.

The first part synthesizes academic research from a range of disciplines—including, engineering, sociology, and management—to present the reader with an integrated understanding of the benefits and drawbacks of lean management. The second part links this theory to practice, with a set of case studies from companies like Apple, Google, Nike, Toyota, and Walmart that demonstrate how lean is implemented in a variety of settings. The book concludes with three models, explaining how Toyotism, Nikefication with offshoring, and Waltonism provide full or less complete models of lean production. It clearly presents the positive and negative aspects of lean and insights into the culture of lean organizations.

With its rich interdisciplinary approach, *Framing and Managing Lean Organizations in the New Economy* will benefit researchers and students across a range of classes from management, sociology, and public policy to engineering.

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To

Elena and Constantin Neacsu, who were both teachers in Romania and instilled in me a love for learning, travel and intellectual curiosity for everything around me, and

Edy Neacsu, who stimulates me to search deeper connections between economy, society and politics.

DL

Edward Janoski who took me to the UAW toy sales in River Rouge just before Christmas when I was young, and

Laura Jannika, Donald Janoski, and the late Robert Janoski who have lived with the auto and steel industries.

TJ

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Abbreviations

AG	*Aktiensgesselschaft*, a joint stock company with limited liability (a corporation)
AHRD	Academy of HR Development
AMA	American Medical Association (US)
ANA	American Nursing Association (US)
AQP	Association for Quality and Participation (formerly known as the International Association for Quality Circles—IAQC)
ASQ	American Society for Quality, the current engineering association for quality
ASQC	American Society for Quality Control, renamed American Society for Quality
ASTM	American Society for Testing and Materials
BAA	*Bundesanstalt für Arbeit,* and then in the 2000s, *Bundesagentur für Arbeit*—Federal Employment Agency in Germany
BLI	Business leadership initiative at Ford Motor Company patterned on GE
CAD/CAM	Computer assisted design and computer assisted manufacturing
CalPERS	California Public Employees Retirement System, a very large interest group that Invests California pension funds for employees and workers; it can influence the stock market and CEO tenure
CEO	Chief Executive Officer, which is the most powerful manager in a corporation
CFO	Chief Financial Officer
COO	Chief Operating Officer
CPFR	Collaborative planning, forecasting, and replenishment program used at Walmart
DFMA	Design for Manufacture and Assembly are standardized designs of component parts across suppliers, which reduces the number of parts needed across different organizations
DMAIC	Define, Measure, Analyze, Improve, Control strategy in Six Sigma; it is somewhat similar to PDCA or PDSA in lean production

DMAIV	Define, Measure, Analyze, Improve, Verify strategy in Six Sigma
DNA	Deoxyribonucleic acid is a molecule that carries genetic instructions for the development, functioning, growth, and reproduction of all known organisms; it is used here as describing the foundations of an institution or process
DQP	Diversified Quality Production or the German approach to quality
DRUM	Dodge Revolutionary Union Movement
ee	Employees (used in tables to save space)
EU	European Union
FIFA	*Federation Internationale de Football Association*, or the controlling organization for international soccer or football
FLA	Fair Labor Association organized to protect foreign workers
FMC	Ford Motor Company
FPV	Ford Performance Vehicles of Australia
GE	General Electric Corporation
GERPISA	Research organization for the study of automobile production and wages based in Paris, France, or *Groupe d'études et de Recherche Permanent sur L'industrie et les Salariés de l'Automobile* (Group to Study and Research Industry and Salaries in the Automobile Industry)
GM	General Motors Corporation
GMAD	General Motors Assembly Division
HBUC	Historically Black Universities and Colleges
HR	HR department or discipline
IAQC	International Association of Quality Control (name changed to Association for Quality and Participation in 1987)
IG Metall	*Industriegewerkschaft Metall*, or the metal worker's union that handles automotive production. Pronounced "Ee-Gay-Me-Taal" with accent on last syllable
ILO	International Labor Organization headquartered in Geneva, Switzerland
ILPC	International Labour Process Conference
ILRA	International Labor Relations Association, associated with LERA and IRRA
IMVP	International Motor Vehicle Project at MIT
IPO	Initial public offering when a private company sells shares on the stock exchange.
IRRA	Industrial Relations Research Association, replaced by LERA (US)
ISO	International Organization for Standardization (ISO in French) located in Geneva, Switzerland; it is closely linked with Six Sigma
JIT	Just-in-time inventory system, a specific version of supply chain management

JMNESG	Japanese Multinational Enterprises Study Group, which studied 500 factories in 30 countries
JPM	Japanese production methods, very much like TPS or Toyotism
JUSE	Japanese Union of Scientists and Engineers
LERA	Labor and Employment Relations Association, replaces IRRA (US)
LIN	Lean Implementation Network at Ford Motor Company
L-L-L	"Lean, loyal, long-term" view of lean production that tends to emphasize the opposite of the "cutting" approach that neo-liberalism might envision
LMM	Lean Manufacturing Manager at Ford who reports to top management
MBO	Management by Objectives. The name for a process to evaluate employees; it was heavily criticized by Deming
MBWA	Management by walking around (*genchi genbutsu*, or 'go and see')
MCW	*The Machine that Changed the World* by Womack, Jones, and Roos (1990)
Mgt	Management (used in tables to save space)
M-Form	The multi-divisional form of organization used at GM with multiple divisions
MIT	Massachusetts Institute of Technology
MLB	Major League Baseball (US)
NBA	National Basketball Association (US)
NCAA	National Collegiate Athletics Association (US)
NHTSA	National Highway Transportation and Safety Administration (US)
NFL	National Football League (US)
NLRA	National Labor Relations Act that created the NLRB in 1933 and other items
NLRB	National Labor Relations Board (US)
NRP	Nissan Revival Plan under Carlos Ghosn as CEO
NTT	Nippon Telephone and Telegraph (Japanese phone company)
NMUK	Nissan Motors in the United Kingdom
NUMMI	New American United Motors Manufacturing, Inc., a project of GM and Toyota
NYSILR	New York School of Labor and Management Relations at Cornell University
OEM	Original equipment manufacturer (usually a big corporation that does assembly and marketing)
OKR	Objective Key Results. A process of employee and unit evaluation used by Google. It is superficially similar to MBO but praised as being much better
OPEC	Organization of Petroleum Exporting Countries
PDCA	Plan-Do-Check-Act (from Deming and Japan)
PDSA	Plan-Do-Study-Act (more connected to Shewhart)

PVMI	Program on Vehicle and Mobility Innovation at the Wharton School at the University of Pennsylvania
QCC	Quality Control Circle
QOS	Quality Operating System at Ford involving the UAW and management
QOSC	Quality Operating System Coordinators from the union and management
QR Codes	Quick Response codes that are two-dimensional improvements on bar codes
R&D	Research and Development department or spending
RFID	Radio frequency identification device
RMG	The Repetitive Manufacturing Group that sponsored research in lean production by the American auto industry in the late 1970s
SACOM	Students and Scholars Against Corporate Misbehavior, an organization against sweatshops
SCM	Supply chain management
SET	The second step of software development where the code is tested internally (see also SWE and TE)
SHRM	Society for HR Management
SIOP	Society for Industrial and Organizational Psychology
SPC	Statistical Process Control that measures conformance to quality standards
SWE	The first step in developing the code for new applications (SET) test the code (see also SET and TE)
SWOT	A strategic management strategy of identifying **S**trengths, **W**eaknesses, **O**pportunities and **T**hreats
SVOR	A strategic management strategy of identifying **S**trengths, **V**ulnerabilities, **O**pportunities and **R**isks
SUV	Sport and utility vehicle
TE	The third step of testing code from the perspective of the user (see also SWE and SET)
TMMK	Toyota Motor Manufacturing in Georgetown, KY
TPS	Toyota Production System, or Toyotism
UAW	United Autoworkers Union, American union that handles autoworkers except for Japanese transplants
USMC	The United States (US), Mexico (M) and Canada (C) trade agreement that replaced NAFTA
VoC	Varieties of Capitalism
VW	Volkswagen; largest automobile company in the world; based in Germany
WRAP	Worldwide Responsible Apparel Production

Japanese and German Terms

Bundesanstalt für Arbeit	German "Federal Institute for Labor or Work" until 2000
Bundesangenteur für Arbeit	German "Federal Agent for Labor or Work" after 2000
Chimuwaku	Japanese word for team is *Chimu*, and *Chimuwaku* means teamwork

The Three G's of *Kaizen*

Gemba	Japanese for "the actual place"—refers to management by walking around or getting to the actual place where work and quality is being (or not being) done
Genbutsu	Japanese for "go and see", which is related to *Gemba* and to the process of "managing by walking around" (MBWA)
Genjitsu	Japanese for "realness" or "the actual facts" that may be associated with *Gemba* ("the actual place") and *Genbutsu* ("go and see")
Heijunka	Japanese for "leveling" applied to leveling out demand or the production schedule to reduce overtime, waste, or under-production
Hitozukuri	Japanese for "making or forming people"
Hoshin Kanri	Japanese word for "policy action or deployment"—a method of strategic management for guaranteeing that the goals of the corporation drive the actions taking place on a day-to-day, month-to-month, or year-to-year basis
Jidoka	Japanese term for one of the pillars of *Kaizen*—means to focus on the causes of problems and to stop work immediately when things go wrong (the Ishikawa or fishbone diagram would be a *Jidoka* tool for discovering causes)

Kaizen	Japanese term for "continuous improvement"
Kanban	Japanese term that literally means "card", which were the cards attached to supplier's parts—more generally, it means the JIT inventory system
Karate	Japanese form of martial art with punches and kicks
Karojisatsu	Japanese term for suicide due to overwork
Karoshi	Japanese term for death due to overwork
Kata	Japanese term for a group of 10–30 movements that are memorized in each stage of white to black belt training; they become tacit knowledge in *karate*
Keiretsu	Japanese term for a group of corporations that do not do the same things, but cooperate together to keep each one of them afloat and profitable
Kotozukuri	Japanese work for "making things happen"—can be composed of both *Monozukuri*, which is "making things" or production; and *hitozukuri*, which is "making, forming, or socializing people"
Marugakae	Japanese term for being sponsored or financed by someone else who might be considered to be a patron
Madogiwaoku	Japanese word for "encompassing embrace"
Meister	German term that means "master" craftsperson, but also refers to a first or second line supervisor
Mitbestimmung	German word for codetermination, especially the codetermination law (literally, it means regulating together)
Mittelstand	German word for "middle" suppliers of parts for firms, usually privately and/or family-owned; some feel that they are the backbone of the German Model
Modell Deutschland	German term for the "German Model" or Diversified Quality Production
Monozukuri	Japanese for "production" or "making of things"—at Honda, it is used more in the sense of *kaizen* with continuous improvement; it can also mean a synthesis of technology, know-how, and enthusiastic spirit.
Nemawashi	Japanese word for achieving consensus through a process of getting everyone's approval for a proposed change; sometimes it is criticized for being slow

The Three Wastes

Muda	Japanese term for "waste" or futility—this tends to be the most general term. There are also 8–10 different indications of waste in a production facility
Mura	Japanese word for unevenness in production. It is often a scheduling problem concerning supplies or distribution of products; it could also refer to the stopping and starting of the assembly line

Muri	Japanese word for the overuse of equipment or people; it can also represent too many hours or putting parts on the line that are too heavy, etc.
Obeya	Japanese term for the "big room", but refers to working spaces that are open without offices or cubby holes
Oidashibeya	A windowless room for personnel the Japanese corporation would like to see quit; however, this "expulsion room" or "quitting room" houses these workers. They often do little useful work while they are there
Poka-yoke	Japanese phrase for removing possible or current mistakes in a process; "Yoke" means preventing something, and "Poka" means mistakes (used extensively by Shigeo Shingo)
Ringi	Japanese word for their problem-solving system that goes through many different employees to get cooperative agreement among organizational players
Sangen Shigui	Japanese term for problem-solving: "San" means three; "Gen" means reality that is in front of you, and "Shugi" means principles—it is the three-principled method for problem-solving in a real setting that involves *Genba, Genbutsu,* and *Genjitsu*

The Five S's

Seiri	Japanese word for sorting items in a specific location and removing items that do not belong there
Seiton	Japanese word for putting items in their proper place so they can be easily used
Seiso	Japanese term for cleaning, sweeping, or keeping a location clean (can also mean inspecting)
Seiketsu	Japanese term for standardizing processes
Shitsuke	Japanese term for self-discipline for workers
Takt time	German term for the time it takes to do one repetitive task on an assembly line (literally, the tick of a clock or a heartbeat)
Waigaya	Japanese word for "noise" or a type of meeting where everyone talks. It is oriented for fixing problems, but the word itself is Honda jargon, which means that discussion takes place in spontaneous and unstructured meetings

The Japanese Equivalent of the Five Whys

These Japanese words are not often used, but one often wonders what the five whys are in Japanese. There are six listed here since "why" and "how" are closely related.

Naze	Japanese term for "why"
Nani or *Nan*	Japanese term for "what"
Itsu	Japanese term for "when"
Do	Japanese term for "how"
Doko	Japanese term for "where"
Dare	Japanese term for "who"

Zaibatsu Japanese term for the large industrial conglomerates that controlled the Japanese economy before World War II. The *Keiretsu* is a weaker form of this organization—*Chaebol* in Korea might be closer in meaning

Preface

Lean production is now embedded in manufacturing throughout the world and is spreading to the services of many other industries. It is so much a bedrock to many industries that it becomes almost unseen to many of the scholars, workers, and customers using it. It is the purpose of this book to look at the many disciplines that analyze lean production and some of the major corporations in the world that actually use or claim to use it. Some parts of lean production are almost universal, like JIT inventory in supply chain management, and others are a tough sell and must be reinvigorated, like QCCs or teamwork. Within sociology, our own discipline, lean production is little observed. With this book, we hope to bring lean production to the forefront of scholarly analysis and to make up for the lacunae in the field of sociology especially.

There are a number of misnomers about lean production. One is that it is mainly about cutting the number of employees; this can be linked to outsourcing and off-shoring. While there is some truth to outsourcing and temporary employment, we see lean production as a way to grow employment through innovation and new processes. In some ways, the very term "lean production" is somewhat unfortunate. We often refer to the three Ls of lean production—lean, loyal, and long-term—as being more accurate (Janoski and Lepadatu 2014). The lean of only cutting certainly does not reflect the loyal and long-term aspects of lean production. However, in the penultimate chapter, we will discuss how lean production has also been associated with neoliberalism in government and the spirit of deregulation and cutting government services. We emphatically claim that this is not the case. One might be tempted to use another term; however, lean production has gained so much currency that we do not want to blaze new trails with another perhaps unfamiliar term. The term Toyotism, like Fordism before it, is more accurate.

In the development of this book, we have many people to thank. William Canak of Middle Tennessee State University—the long-term president of the award-winning Tennessee Labor and Employment Relations Convention (TERRA)—enthusiastically included many of our topics and presentations at the TERRA, and also connected to us to LERA people at the national level. We also thank Kim LaFevor, Dean of the College of Business,

Athens State University; three former HR managers at FMC; and a high-level UAW representative at Ford at the international level. We would like to thank Michael Samers of the University of Kentucky, Matt Vidal of Kings College of London, and Steven Vallas of Northeastern University. We would also like to thank Michael Burawoy of the University of California-Berkeley. Although the second author was not in his seminar on the division of labor at Berkeley, he was very much influenced by it through discussions with fellow students over the years. We thank Tommaso Pardi for including us in the GERPISA conferences in Puebla, Mexico in 2017, Paris, France and Sao Paolo, Brazil in 2018. Parts of this project were presented by the second author at the University of Kentucky Sociology Department colloquium in the fall of 2011, and by both of us at ASA Convention sessions in New York City in 2013, Seattle in 2016, and Philadelphia in 2018.

We'd like to thank Patricia E. White of the National Science foundation and Jan Stets of the University of California, Riverside who served three years at NSF for their help on The Maturing of Lean Production grant (NSF-ARRA 0940807) that provided summer support and travel money for both authors. Their support on the rewrites of a number of NSF proposals was very helpful and supportive. We also thank the anonymous reviewers, who though sometimes quite critical, helped reshape our focus and broaden our approach to many different disciplines. The NSF grant planted a seed that flourished and grew into multiple book projects: *Dominant Divisions of Labor* (2014), the forthcoming *International Handbook of Lean Production*, and this book project.

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the tours of the VW Wolfsburg plant in Germany in connection to the ILPC that was held in Berlin. We also had previously taken tours of the BMW plant in Bavaria and Spartanburg, SC as well as the Ford Motor Truck plant at the Ford Rouge Complex in Dearborn, MI. These tours were particularly helpful in understanding and seeing firsthand how the production process operates. For instance, one cannot miss the Andon boards at Toyota and their absence at the Honda plant in Marysville. Further, the conferences often attached to these tours gave us a link to scholars in the area of lean production when our own discipline of sociology has so few people studying this field. We also would like to thank employees at Sun Microsystems in China and Oracle in Silicon Valley. We would like to thank the United Automobile Workers for their willingness to be interviewed and provide valuable information on lean production in the United States, Japan, and China. We also thank the managers and employees at Apple, Google, Nike, Walmart, Costco, Amazon, and many other facilities in the United States.

Closer to home, the first author, Darina Lepadatu, would like to thank Kennesaw State University in metro-Atlanta for the Enhanced Tenured Faculty Leave provided during the data collection and writing phase of the book. She is appreciative of the many professional families that have supported her intellectual journey from the elite Petru Rares College in Piatra Neamt, Romania, to University of Bucharest, University of Kentucky, and Kennesaw State University, as well as the professional networks of information technology (IT) specialists that have facilitated the Silicon Valley interviews.

At the University of Kentucky, the second author, Thomas Janoski, would like to thank Patrick Mooney, who, as chair of the Sociology Department, supported our project by administering the NSF grant and providing the coffee cups that we gave out as a small token of our thanks to those we interviewed. He would also like to thank Claire Renzetti, the current chair at the Sociology Department at the University of Kentucky, and Mark Kornblum, the Dean of Arts and Sciences, who provided a phased retirement plan that was like having a six-month sabbatical every year for five years. This provided much of the time and resources to finish the project and this book. And in retrospect, he would like to thank his fellow piston shooters at the Chrysler Engine Plant in Trenton, MI for the insights that he gained working on the assembly line in the late 1960s.

Finally, we would like to thank Ronald Burt of the University of Chicago who advised us in 2001 that "you have a major auto company in your backyard—why don't you play to your comparative advantage?"

Atlanta and Lexington

1 Introduction

The Old and New Divisions of Labor

Are James Womack, Daniel Jones, and Daniel Roos correct in *The Machine that Changed the World* (1990) that lean production is the new model of the division of labor in the world? The division of labor is about how work is divided among workers, organizations, and industries. It has been observed since the time of Adam Smith (1776) and Emilé Durkheim (1997/1893)—farmers begetting bakers of bread and millers of wheat—about the actual procedures by which jobs are divided and organized so that they fit together in larger scale organizations. Adam Smith described the division of tasks involved in making a straight pin (obtaining wire, straightening it, cutting it, drawing it out, making a point, and putting a head on it). It inherently involves the division of work within a firm with greater specialization and repetition of tasks (1976/1776:8–9).[1] In fact, the Germans and many industrial engineers use "*takt* time" to describe the amount of time that it takes to do a repetitive task (for instance, 90 to 120 seconds on an assembly line). But the division of labor also consolidates some tasks through teamwork and job rotation, so it need not always be perceived negatively. In a sense, the division of labor refers to how people organize others to make things and deliver services. In most cases, it simply refers to dividing a project into smaller tasks, but it can also refer to the division of products between organizations (one firm makes pistons, another tie-rods, and an assembler puts them together as a car). Finally, it refers to country-level divisions of labor where one country produces one product, and another country produces a different product.[2] In this book, we focus on how this new division of labor is modeled by academics and organized by major corporations.

Although we will deal with some political issues in the conclusion, our presentation will concentrate on the distribution of tasks among workers. Many scholars see the division of labor as a fountain of progress, especially in earlier times, and a tsunami of boredom and alienation in some recent views. Marx viewed it as the source of inequality, and his followers have seen it as a plague descended upon the working people of the world with Taylorism and Fordism. But our focus will, for the most part, be on the division of work

tasks in and between organizations. But we leave the battles of nation-states and production systems for Chapter 5.

We have entered into a new age of the division of labor. It is new not only because it is global but also because production is organized with much more focus on flexibility and quality. These processes have emerged from the old Taylorism and Fordism, surpassed a variety of competing ideas, and become part of the DNA of global production. So far, lean production has had a muted reception in the general social science literature as it is often seen as a specialty of the business management and industrial engineering departments. We widen its application and show how it fits into both manufacturing and service industries in a variety of disciplines.

We have two theses in this book. First, in Part I, we review the various disciplinary approaches to lean production—management, industrial engineering, sociology, labor process theory, labor and management relations, and human resources (HR)—to show that even though industrial engineering concentrates the most on lean production, all of these approaches have a partial approach to the topic that stresses particular issues and overlooks others. Hence, a multi-disciplinary approach is very useful. We also discuss the unique contributions of the more European approaches of the German "diversified quality production" and the French "productive models" theory. And we conclude that the management approach of shareholder value theory is inherently antithetical to lean production. Second, in Part II, we review a number of firm or industry-named models—Toyotism, McDonaldization, Nikeification, Waltonism, and Siliconism—as they apply to 11 major corporations in today's economy. Out of the many different conceptions of the new division of labor, we show that the present division of labor is best conceptualized as lean production and Toyotism, with two lesser forms of lean production that we call Nikefication and Waltonism (Janoski and Lepadatu 2014; Besser 1996; Berggren 1992). These three models are the most important forms of lean production: (1) Toyotism, as the highest form of lean production, (2) Nikeification, as a middle form of lean that is bisected by lean and socio-technical theory as well as simple Fordism in its off-shore production, and (3) Waltonism, as the lowest form of lean relying solely on just-in-time (JIT) inventory. We also discuss how some firms try to implement lean methods but are only moderately successful.

The remainder of this introduction now discusses the old division of labor, the new division of labor in Toyotism by defining lean production, and then we introduce our chapters to come.

What was the Old Division of Labor? Taylorism, Fordism, and Sloanism

Two men dominated the old division of labor. The first, Frederick Winslow Taylor, suffered headaches and poor eyesight so despite having passed the entrance exams to the Harvard University in 1874. He then became an

apprentice pattern-maker and machinist at a pump-making factory in Philadelphia. He went on to become what we would now call a management consultant to the Watertown Arsenal and Bethlehem Steel, and later a professor at the Amos Tuck School of Business at Dartmouth University. His unbounded enthusiasm for machinery and factories led to his development of the theory of scientific management. While the industrial revolution, with theorization by Adam Smith's pin-making principles and Emile Durkheim's work on the division of labor, preceded what he had done in the breakdown of work, Taylor went further than others in specifying the division of labor's components of time and motion studies and piecework (Kanigel 1997).

The second, Henry Ford, grew up on a farm and although he had a basic education, he did not consider going to a university. His early life was based on tinkering until he started working for Thomas Edison. This gave him a chance to develop his ideas about automobiles, which was a newly emerging technology. He developed his ideas toward production on the basis of factories that he visited and also the disassembly processes at the Chicago stockyards. There is no evidence that Ford directly used any of Taylor's ideas—probably because Taylor died in 1915, just before Ford's influence was beginning to climb. Conversely, Taylor visited Ford's early plant before the Rouge facility was built (Ford lived to 1947). Ford was a self-taught autodidact who relied more on observation than books and was even a bit antagonistic toward higher education, though he did establish the Ford Trade School. Examples of both assembly lines and rational production existed as far back as the Venetian boat works, but Ford does not reference them and probably only had a passing knowledge of them (Ford 1922, 1926).

Consequently, these very different men are forever entwined as the two forceful personalities who shaped the modernist century of manufactured production in America and the rest of the world.

Taylorism and Scientific Management

In the Taylorism or scientific management approach, Frederick Taylor felt that the industrial order had been changed. In the past, man had been first, but in the future, the system must be first (Taylor 1911:2). This system had four principles. First, Taylor's engineers examined the work process in terms of how it was done. Using "time and motion studies", they would study the job by replacing informal or rule-of-thumb methods with scientific study of actual job processes and methods based on the results of a scientific study of a job's tasks. To do this, the engineers conducted experiments with the work process and developed more efficient ways of doing things including the physical movements of the body, thought processes of the mind, and optimal rest periods. Finally, they would provide "detailed instruction and supervision of each worker in the performance of that worker's discrete task" (Montgomery 1997:250).[3]

Second, some of these engineers, who in later decades became HR or personnel specialists, would scientifically select, train, and develop each employee rather than passively leaving them to train themselves. They classified workers to see if they fit the rigors or tedium of the work processes. They did not want workers whose abilities were limited and thus could not do the job, but they also did not want abilities to be too high so that workers would be bored with the job and want to do something else. Third, it targeted the wage system to create a payment system that strictly reinforced the optimal way of producing the product. Piecework wages were created that tied the number of products produced in an hour (or day) to increased wage rates if the worker exceeded a certain minimum. And fourth, it targeted the management system by dividing work nearly equally between different types of managers and clerks. The "foreman's empire" of the late 1800s was an anathema to Taylor because the foreman was essentially a subcontractor who had total control of the workplace (Nelson 1996:35–56). Instead, Taylor divided management up into nine different types of bosses or clerks: the route clerk, the information card clerk, the time and cost clerk, the shop disciplinarian, the gang boss, the speed boss, the repair boss, the inspector, and the overforeman (HR would evolve from some of the overforeman's tasks). Of course, Taylor's professional engineers also designed the whole process. This was called functional foremanship and to a large degree foresaw the functional divisionalization of organizations—separate supply, HR, production, quality control, and many other departments—that became common in the 20th century.

The end result of Taylorism was the individualization of work, so each worker has strong incentives to produce more products in order to get higher wages, and management controlled those incentives. It was a pure stimulus-response system that did not see work as existing beyond the immediate tasks before the worker. Engineers did the thinking about work techniques and designed the piecework system, and workers just followed orders.

While the Tayloristic system of scientific management might make sense from the perspective of a rare single-minded individual worker who wanted to make the most money possible, it did not work for most workers. The system had three weaknesses. First of all, Taylorism removed thinking from the workers' purview and actually sought out dull workers.

> One of the first requirements for a man who is fit to handle pig iron as a regular operation is that he should be so stupid and so phlegmatic that he more nearly resembles in his mental make-up the ox than any other type.
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> (Taylor 1911:59)

This was exemplified in Taylor's testimony to Congress where he described the brawny Swede Schmidt who loaded pig iron (see Box 1.1).[4]

Box 1.1 Frederick Winslow Taylor and Scientific Management

Frederick Winslow Taylor (1856–1915) was a self-taught mechanical engineer who sought to improve industrial efficiency. Although he was an excellent student, Taylor avoided college and went to work as an apprentice in a steel company. He was soon promoted and focused on developing more and more efficient ways of doing things. He eventually came up with a theory of separating mental and manual work, perfecting time-and-motion studies to do so, and redesigning factory processes. In doing so, he was an early management consultant. Taylor was one of the leaders of the movement toward efficiency, and his ideas were influential in the progressive era from 1890 to 1920. Taylor explained his techniques of efficiency in *The Principles of Scientific Management* (1911), which, 110 years later, the Academy of Management voted "the most influential management book of the 20th century". His pioneering work was applied to the shop floor of numerous factories, and this eventually helped to create much of what is now known as industrial engineering. Taylor made his reputation on his work in extreme efficiency, which he named "scientific management".

After the industrial conflicts and unrest that followed his methods, he testified before Congress about his system. He used the example of the Swede Schmidt, who he referred to in derogatory terms, whom he then trained to set a record in loading pig iron ingots on a train.

Taylor: "Schmidt, are you a high-priced man?"
Schmidt: "Vell, I don't know vat you mean . . . "
Taylor: "You see that car?"
Schmidt: "Yes".
Taylor: "Well, if you are a high-priced man, you will load that pig iron on that car tomorrow for $1.85. Now do wake up and answer my question. Tell me whether you are a high-priced man or not".
Schmidt: "Vell, did I got $1.85 for loading dot pig iron on dot car tomorrow?"
Taylor: "Yes, of course you do . . . "
Schmidt: "Vell, dot's all right".

In actuality, Schmidt was a German named Henry Noll, rather than a Swede (Kanigel 1997:540–60; Braverman 1974:106–7; Wrege and Perroni 1974). Apparently Taylor changed the details for effect or perhaps not to offend the questioner.

Taylor made his fortune patenting steel-process improvements. Taylor was also an athlete who won the 1881 doubles championship with Clarence Clark at what is now the US Tennis Association Open, and 19 years later, he finished fourth in golf at the Olympics in Paris.

Schmidt (aka Noll) received 61% more pay for moving 362% more pig iron compared to the average worker. Schmidt's case has become legendary, although the evidence shows that no other worker in history could break his record. Taylor's assistants wrote that "other workers broke down after two or three days", showing that Taylor's methods were not so scientific after all (Kanigel 1997). Although Taylor's pig-iron experiments had proven to be seriously flawed (Wrege and Perroni 1974), Taylor made the point that a "first-class worker" selected based on a scientific method can double or triple his productivity if properly motivated. Taylor did not care about dumbing the work down.

Second, Taylor thought workers would make more money under this system, but managers saw something else in the methods and pressured engineers to change the piecework rates so that when workers achieved high levels of production, the amount of money they actually received was ratcheted downward. Workers thought this was duplicitous and unfair, and labor conflicts led to Taylor's testimony before Congress. Nonetheless, more and more firms gradually came to adopt many aspects of the Tayloristic processes of work design, even if they did not always implement piecework. Third, the discovery of the informal group in the Hawthorne experiments at Western Electric showed that the social influence of the group had even more control over worker's performance than manager's exhortations or engineer's piecework charts. Taylor's theory had absolutely no conception of groups or norms except as a negative factor to be expunged.

While Taylor's proposed principles of standardization and specialization had a tremendous impact on industrial productivity throughout the entire 20th century, the basic premises of his managerial philosophy have been highly criticized from the beginning. In 1915, Robert Hoxie, the special investigator for the US Commission on Industrial Relations of the House of Representatives, reported on Taylor's management practices to show that scientific management was undemocratic because it did not involve workers in the fundamental parts of the production process, such as the setting of task, the wage rate or the general conditions of employment (Hoxie 1966). But American owners and most managers could care less about workplace democracy. The other major complaints against scientific management allude to the fact that the obsession with efficiency overshadows the fundamental social aspect of work (Mintzberg 1989) while the increased specialization leads to workers' deskilling, degradation of work, and alienation (Braverman 1974). Nevertheless, Taylorism marched on.

Fordism and Mass Automobile Production

The concept of Fordism—intrinsically tied to Taylorism or scientific management—took the world by storm in from 1918 to 1968 (Nye 2013). Since it used an assembly line, it could not make the pace of work the central aspect of payment like Taylorism; nonetheless, it shared many concepts of work design. Fordism consisted of both technical and social parts with a total of ten aspects. The technical aspects of Fordism had five principles. First, parts and processes underwent intensive standardization, with replaceable parts a key aspect of this approach. Second, these standardized parts were a natural fit with the assembly line which demanded the repetitive installation of exactly the same parts. Third, the assembly line relied on massive economies of scale to promote productivity in terms of the quantity of cars produced. And this of course, also produced higher revenues due to widespread sales based on a lower price for the car. The results were record levels of profitability. The massive vertically integrated plant on the Rouge River, which was largely built after World War I, embodied this massive scale of production (Ford 1988/1926; Sorenson 1956; Levinson 2002). Fourth, the standardization of material parts and assembly line technology led to a further standardization of human workers. This involved the deskilling of labor and the end of craft production with its careful fabrication of small numbers automobiles. Fifth, the production process then created a mass market for homogenized products, whether automobiles or hamburgers, by molding tastes for the same things (Ritzer 2019). The results led to the spread of automobile dealerships throughout the country with accompanying repair shops and gas stations. Later, it led to cookie cutter houses and fast food restaurants. All of this, of course, presumed the creation of a large road system that was capped off by the interstate highway system created by President Dwight Eisenhower. Fast food restaurants and inexpensive motels were then built at every exit.

There are five more social and political aspects of Fordism. First, Henry Ford increased wages with his unheard-of five-dollar day. Ford argued that he wanted his workers to be able to buy his product (1922, 1926). Previously, automobiles were for the rich and totally unaffordable by autoworkers. Ford's plan lowered the price of automobiles and increased the wages of his workers. But the "five-dollar day" was exaggerated in terms of who it applied to (i.e., there were moral requirements administered by the Ford Sociology Department). Second, the Fordist system became associated with the unionization of the auto industry by the United Autoworkers (UAW), and this led to collective bargaining for yet higher wages and an extensive array of benefits. While Ford and others did not intend to create this part of the Fordist system, it nevertheless became a standard feature in the industrialized North and Midwest. Third, the negotiation of uniform wages based on profits and productivity had a spillover effect on the surrounding industries—unionized or not. As such, worker demand for products and the