Subjective Employees Objective Results: Applying Management Theory in an Engineering World

An Online Continuing Education Course for Engineers

Course Number: BS-3037

Credit: 3 Hours / 3 PDH / 3 CPD

Subjective Employees Objective Results: Applying Management Theory in an Engineering World

Richard "Dick" Grimes, CPT

TABLE OF CONTENTS

Introduction

I had the good fortune to spend a few years in my career as the Manager of Training and Development for a large design-build engineering company.

Part of my job was to design and lead team-building programs with clients, vendors, and our team on many large, long, and complex projects. When I wasn't doing that, I was working with our "high-potential employees" to develop the leadership and business skills needed to grow our company into new markets and bigger projects.

Naturally, most of the talent with whom I worked were engineers, and I learned a few traits about them that eventually shaped my approach to doing any kind of adult training.

Engineers, or most of them, grasped objective ideas and concepts quickly, but the more esoteric, "warm and fuzzy" it was when dealing with people instead of steel, concrete, or the physical sciences, the more "so what" and "how does that apply to this situation" questions I heard.

Since getting work done through people, i.e., "leadership", deals with emotions, personalities, and psychological factors instead of the laws of physics and specific construction drawings, I looked for a way to translate some of the most significant management theories from the business world into a useful and practical field guide for a leader in the blue-collar world of construction and engineering.

Most engineering consulting firms are small businesses without the luxury of a training manager to develop their workforce into a productive and motivated group. The weight of that falls on two or three key people who are also trying to keep the business open, and workforce development via smart leadership techniques may be way down their list of things to get done daily.

But, if there were a handy guide written specifically for those busy individuals in a way that helped them understand the "why" of something, then there's an excellent chance they can figure out the "how" for themselves.

So, this is my attempt to do that. I'll help you understand how the science of getting work done through people has evolved and how you can apply it in your situation. All of that is laid out in a straightforward approach that should appeal to engineers and answer the "so what" of every situation.

- Richard Grimes, 2026

Rationale For Topics Flow

I tried to create a logical progression of topics to keep answering the engineer's "so what" questions that would keep me on track and not wander off into a dry academic lecture from grad school. Continually asking myself, "Why would they want to know this?" has been a big help.

We start with a review of the major milestones in the evolution of management theory, so you understand what kind of employee/productivity problems were being encountered that led to these works. If you understand the why of each study, the applicable results to your engineering/construction world become more evident.

Having introduced you to these major works in the evolution of management theory, you can look over direct comparison and contrast tables that will help to clarify everything.

Then we will wrap it up with some very direct applications to typical engineering and construction situations to drive home the points made throughout the course.

It is intended to be a quick reference guide for most of the leadership obstacles you will encounter. If you have suggestions for improvement, please get in touch with me through this website. I'd love to hear from you.

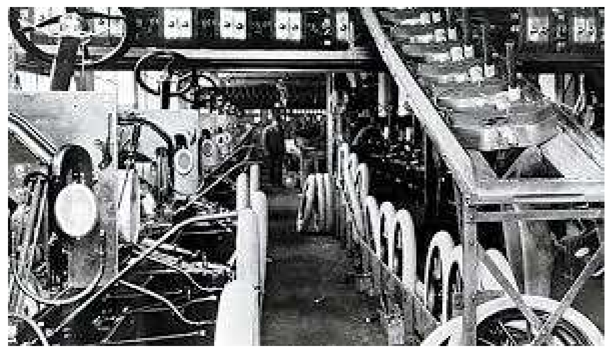
-Richard Grimes

The Birth of Management Science

Just as every successful engineering project, like a bridge or skyscraper, begins with site preparation and a solid foundation, this guide project will require a solid foundation, too.

Not one made of concrete and steel but of background knowledge and understanding of the typical workplace and labor cadre upon which we'll construct our guide.

Also, we must acknowledge the fact that human nature hasn't changed significantly over the past 100+ years. Psychological, social, and economic factors that would impact an early twentieth- century craftsman, artisan, or laborer still exist today, and lessons learned then are applicable now.



If I asked you to name the event that really kicked off the American Industrial awakening and surge of growth in the early twentieth century, you would probably say*, "Henry Ford's assembly line in 1913".*

And you would be correct. But to understand the nature of the work and workforce at the time, so we can really understand our employees today, we'll need to dig a little deeper to learn why the assembly line – seemingly an obvious idea now – wasn't "discovered" earlier.

The moving assembly line does look like an obvious idea in hindsight—*parts move to workers instead of workers chasing parts*—but it only became practical and revolutionary in 1913 because several interlocking prerequisites had to align first.

These pieces fell into place gradually over the 19th and early 20th centuries, and no one had both the ***need and the capability*** to combine them at scale until Henry Ford's team did.

Here are the main reasons it wasn't "discovered" much earlier:

1. **Interchangeable Parts Weren't Reliable Until the Late 19th Century**
   True mass production requires every part to fit perfectly without hand-fitting or filing.

   Eli Whitney demonstrated the concept in 1798–1801 for muskets, but early interchangeable parts were still imprecise and required skilled adjustment.

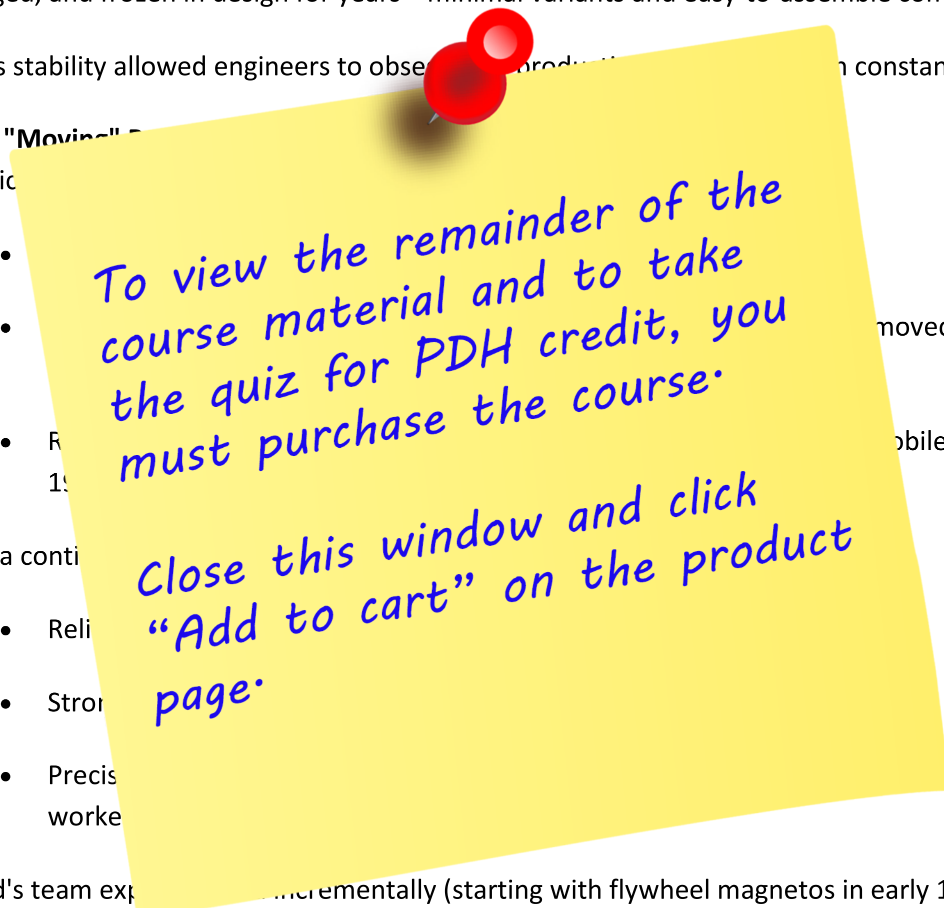
   Precision machine tools capable of consistently producing hardened steel parts to tight tolerances only matured in the 1880s–1900s (better milling machines, micrometers, gauges). Without this foundation, an assembly line would constantly jam or produce defective products.

2. **No Product Had Both High Volume Demand and Design Simplicity**

Most manufactured goods before ~1900 were either low-volume and complex (custom ships, carriages, early automobiles), or high-volume but simple/low-precision (cans, matches, cigarettes).

Early cars (pre-1908) were artisanal luxury items with frequent design changes and hand-crafted parts. In contrast, Ford's Model T (1908) was deliberately designed from the start to be simple, rugged, and frozen in design for years—minimal variants and easy-to-assemble components.

This stability allowed engineers to obse… n constant redesign.



3. **The "Movin…**
Static…

- … moved carcasses
- R… biles around 19…

But a conti…

- Reli…
- Stro…
- Precis… k or leave worke…

Ford's team exp… incrementally (starting with flywheel magnetos in early 1913), then scaled to the full chassis line later that year.

4. **Economic & Market Conditions Weren't Ripe Earlier**

Before the 1910s, there was no massive consumer market demanding millions of identical complex products annually. The U.S. had a huge, tariff-protected domestic market with growing middle-class purchasing power and terrible rural roads—perfect for a cheap, durable car like the Model T.

Europe had fragmented markets (tariffs, different standards), so no equivalent pressure for extreme volume.