

# Engineering Leadership

A leader is one who knows the way goes the way  
and shows the way

**John C. Maxwell**

Logic will get you from A to B. Imagination will  
take you everywhere

**Albert Einstein**

**Ref: Green Engineering: Innovation, Entrepreneurship, and Design  
CRC Tylor and Francis, 2017**

# Ancient Leadership

- Leadership is a topic that originated long back in history when people started understanding the importance of leaders' role in various facets of life.
- “The Republic” by Plato is arguably the first attempt to shed light on the theory of politics and leadership.
- Leadership, and its study, has roots in the beginning of civilization. Egyptian rulers, Greek heroes, and biblical patriarchs all have one thing in common, that is leadership.

# The Rise of Modern Leadership

- The industrial revolution created a paradigm shift to a new theory of leadership in which “common” people gained power by virtue of their skills.
- New technology, however, was accompanied and reinforced by mechanization of human thought and action, thus creating hierarchical bureaucracies.
- One major contributor to this era of management and leadership theory was “Max Weber,” a German sociologist who observed the parallels between the mechanization of industry and the proliferation of bureaucratic forms of organization.

# Understanding Leadership

- Leadership is one of social science's highly examined phenomena. Nonetheless, leadership is often easy to recognize in practice but it is difficult to describe accurately.
- Leadership first comes from the human heart and second from the mind. It is a human experience and process, both emotional and intellectual
- Leadership is a skill comprised of many traits and qualities including vision, mission, values, commitment, motivation, and consensus building.
- Leading means having a vision and sharing it with others. It requires providing the resources and infrastructure for today and the future.

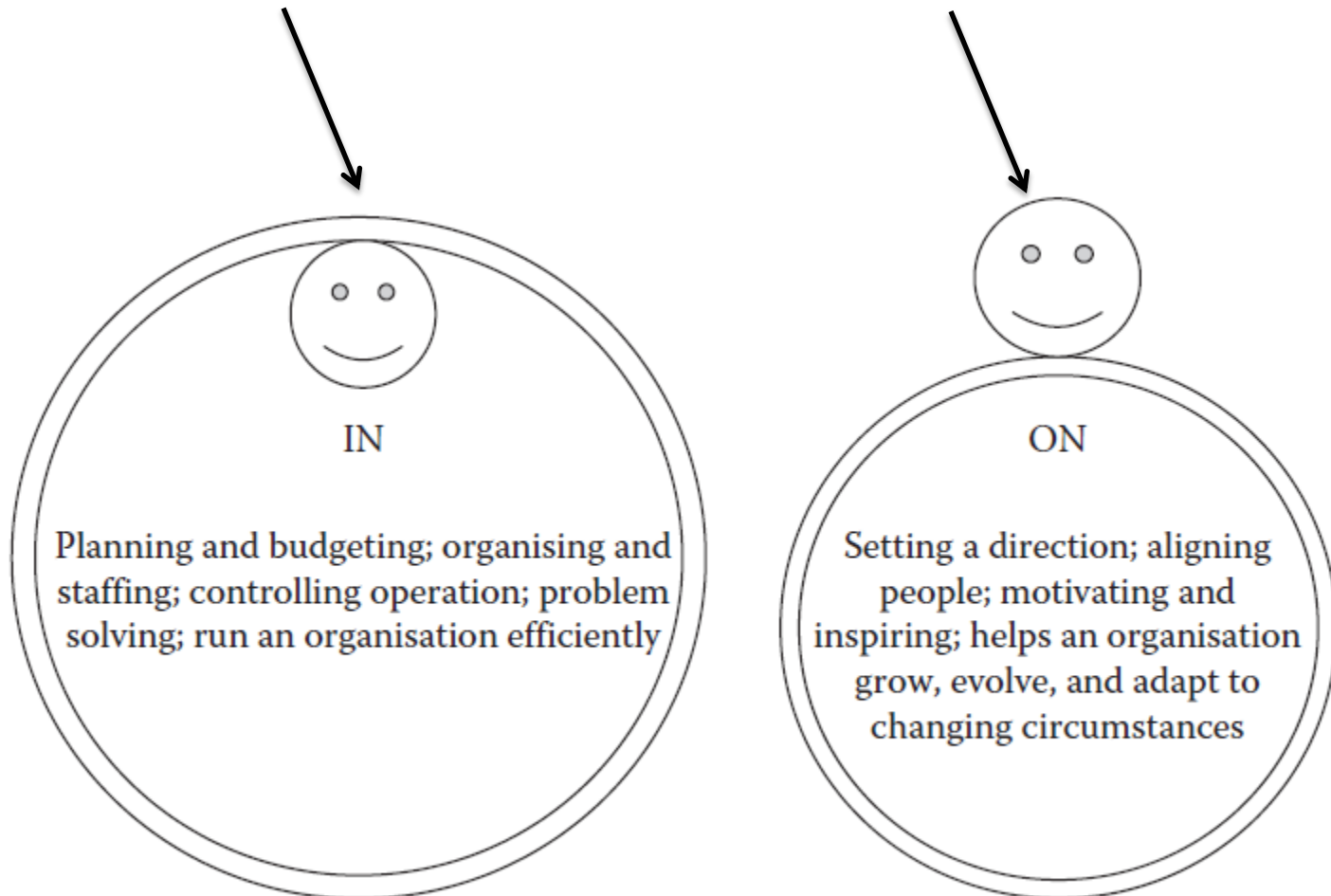
# Leadership Theories

- **Great Man Theory:** Man quality; Military leadership
- **Trait Theory:** people are either born or not born with leadership qualities .
- **Behavioral Theory:** Great leaders are made, not born.
- **Situational Theory:** Leader's effectiveness is related to the leader's traits or behaviors to differing situational factors.
- **Charismatic Theory:** Personal power.
- **Transactional Theory:** A way to maintain the status quo and manage the day-to-day operations of a business.
- **Transformational Theory:** Inspiring followers to higher levels of performance for the sake of the organization.

# The Importance of Leadership

- In general, people will perform at about 60% of their potential with no leadership at all.
- The acquired 60% depends on the need for a job, peer pressure, decent management, etc.
- Therefore, an additional 40% may be realized if effective leadership is available.

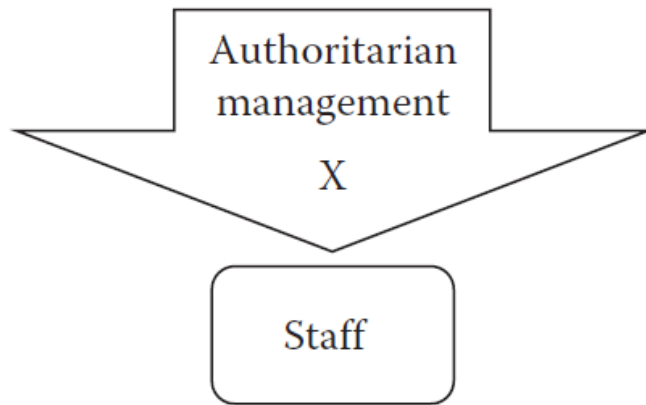
# Management and Leadership



Managers are people who do things right and leaders are people who do the right things

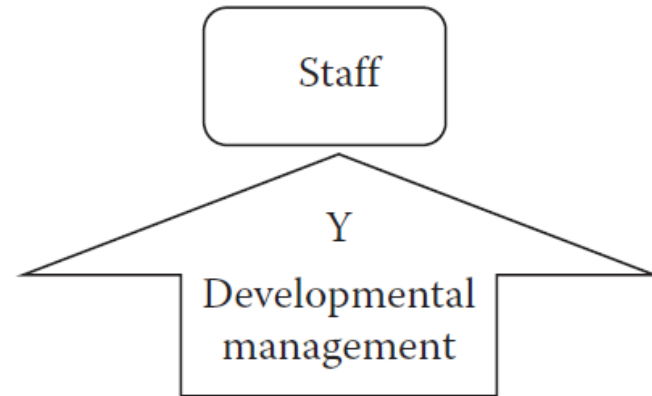
# Motivation and Management

## Theory X and Theory Y



Some people inherently do not enjoy work. They are not ambitious and have little desire for responsibility and prefer to be directed. The motivation occurs only at the physiological and security levels.

My Way or the Highway!



Work is as natural as play if the conditions are good. Motivation occurs at the social, physiological and security levels. People can be self-directed and creative at work if properly motivated.

Country Club!



# Theory Z Approach to Management

- Theory Z, management tends to promote stable employment, high productivity, and high employee morale and satisfaction. It places more reliance on the attitude and responsibilities of the workers, whereas XY theory is mainly focused on the management and motivation from the manager's and organization's perspective.
- **Good Manager:** According to Theory Z, the management must have a high degree of confidence in its workers in order for this type of participative management to work.

# Emotional Intelligence (EQ)

All learning has an emotional base. **Plato**

- EQ is the ability to understand and manage oneself emotions, and those of others. EQ differs from what the people think of intellectual ability, in that EQ is learned, not acquired.
- EQ is the ability to understand and manage emotions in positive ways to ease stress, communicate efficiently, understand others, overcome challenges, and resolve conflict.
- It has been stated that in industry, IQ gets you **hired**, but EQ gets you **promoted**.

# EQ: Self Mastery and Social Mastery

## EQ competencies and domains

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### **Self-mastery**

Self-awareness	Ability to identify own emotions and their impact. Being emotionally aware is just the first step to emotional management.
Self-regulation	Ability to control emotions and behavior. Exert greater self-control: like a traffic signal, stop (red)/think (yellow)/act (green).
Self-motivation	Stay positively self-motivated with a desire to do things by an interest in learning. It is also self-improvement versus a pursuit of wealth and status.

### **Social mastery**

*This is feasible when one has achieved self-mastery*

Empathy	Ability to understand and share others experiences and emotions. It is about compassion and caring. Empathy is a matter of projecting outside of oneself to appreciate what other people are going through.
Social skills	Ability to recognize and understand the emotions of others and connect with them.

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# Positive Psychology and Leadership

- Positive psychology focuses on thriving individuals, especially on their strengths and virtues, on their subjective experiences, and on living a good life.
- When positive psychology is applied in the workplace, the outcome is positive organizational behavior. POB leads to increased optimism, positivity, resiliency, and efficacy.
- Positive leaders drive positive emotions within themselves and their followers, and may lead to more work satisfaction, better engagement, increased performance, and better atmospheres.

# Authentic Leadership

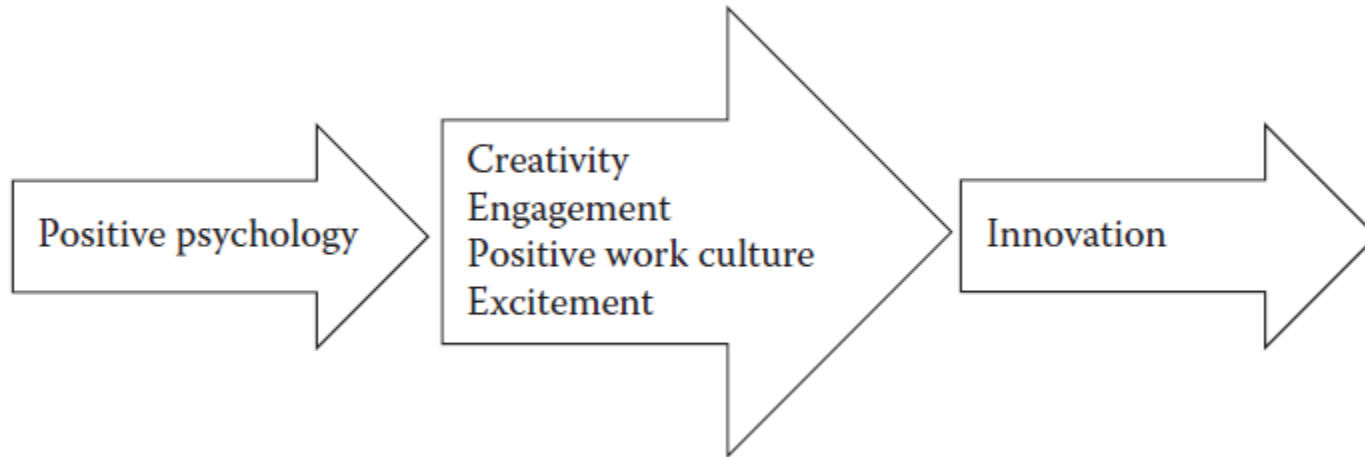
Don't find fault, find a remedy. **Henry Ford**

- Authentic leadership brings together the concept of authenticity with positive psychology; it focuses on whether leadership is genuine.
- Authentic leaders have insight, sometimes referred to this as vision, but that usually has exclusive reference to the future. They demonstrate initiative.
- The essence of authentic leadership is EQ. People with high IQs and low EQs can hardly be called authentic leaders. In contrast to IQ, which basically does not change in one's adult life, EQ can be developed.

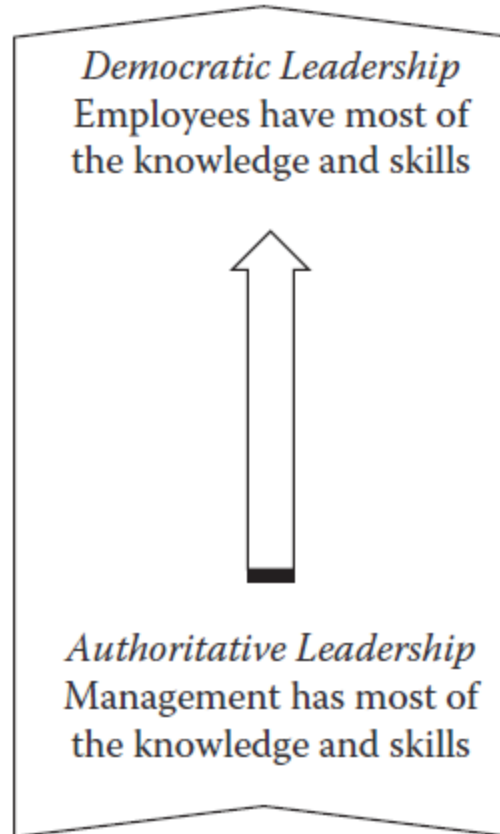
# Innovation Leadership

- Innovative leadership is the ability to think differently and motivate others to create new and better ideas to move toward positive results. It has two approaches.
- First is an innovative approach to leadership to bring new thinking and different actions to how to lead, manage, and go about work.
- Second is about leadership for innovation where leaders must learn how to create an organizational climate where others apply innovative thinking to solve problems and develop new products and services.

# Impact of Positive Psychology on Creating Innovation Environment

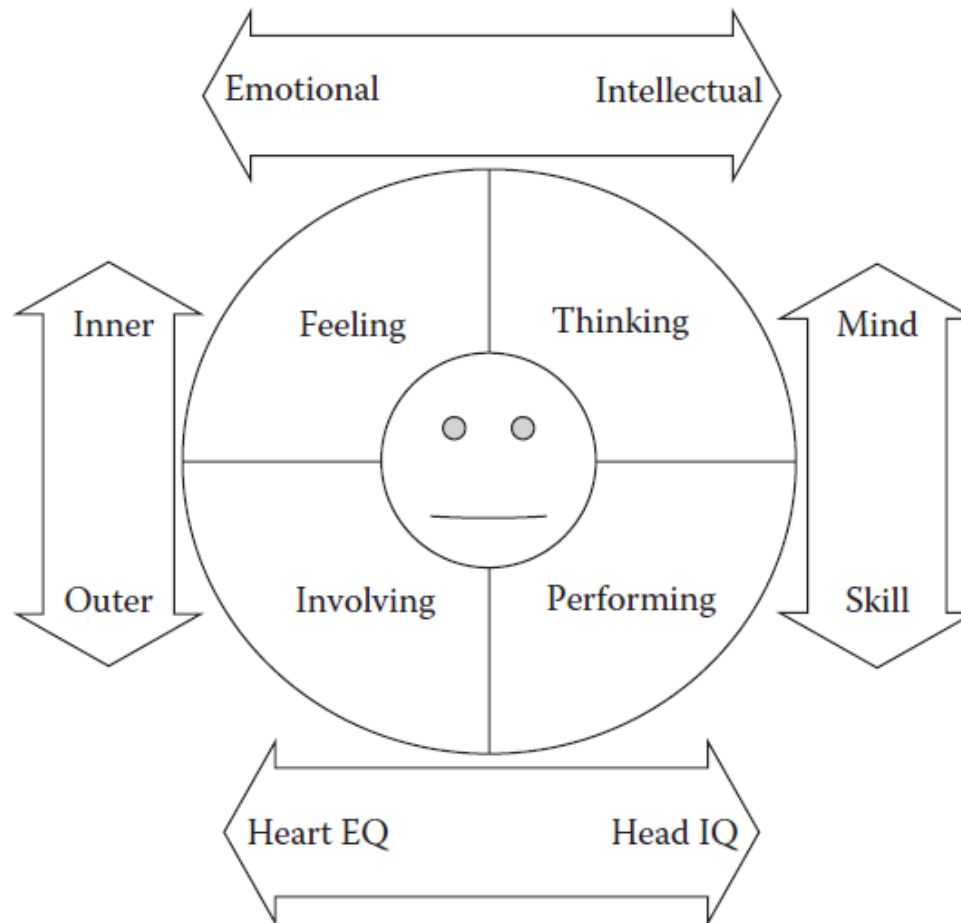


# Leadership Styles





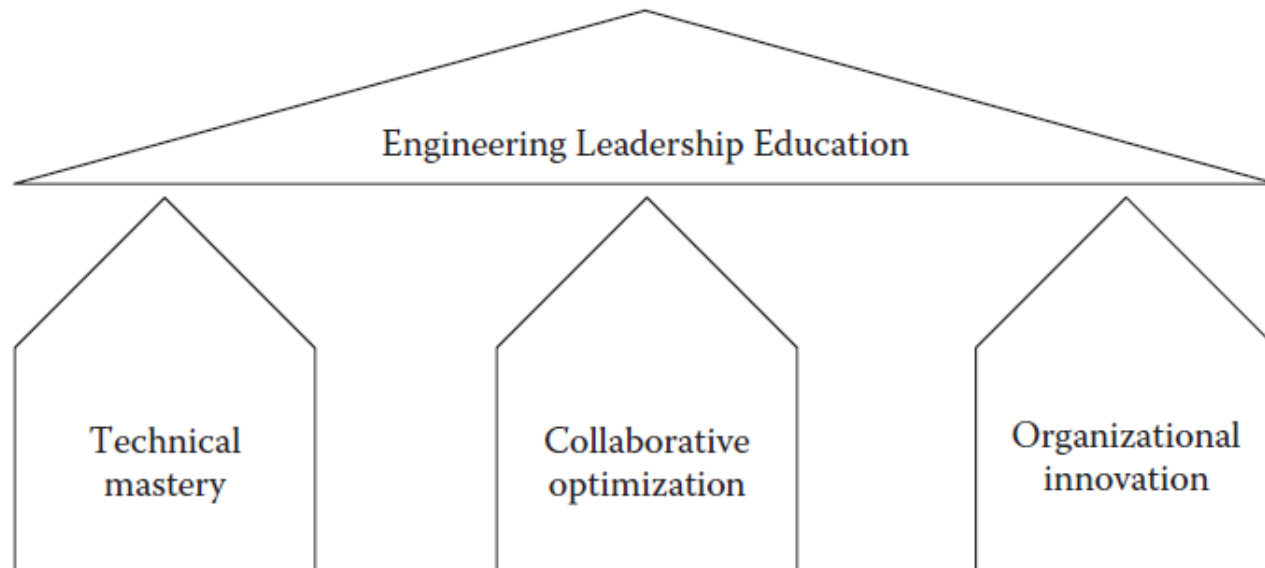
# Imbedding Leadership in Engineering Profession



# Leadership as a Need in Engineering

- Some comments from Robert Lutz, then former president and vice chair of Chrysler Corporation, and now retired General Motors vice chair, noted in an IEEE-USA's Today's Engineer article, "Robert Lutz Gives Engineers The Nod":
- Engineers need to be, like anybody else in business, proactive and somewhat outgoing. And they need to reach outside technical areas.
- Mainly, engineers need to be good communicators, because there is no point in achieving an engineering breakthrough; having a new idea; or coming up with a new material, if you cannot get your colleagues excited about it.

Leadership requires vision and developing a vision requires the ability to feel, see, think, listen, speak, and know. Usually **engineers** lead in unique ways that reflect engineering knowledge and thinking. An emerging model that encompasses three paradigms of engineering leadership



# Design as a Leadership Tool

- Design and understanding of design can make people better leaders. Good design, like good leadership, is transformative. Both empower people to reach their own potential and improve the world around them. That is a belief held by **Sheila Danko**, the J. Thomas Clark Professor of Entrepreneurship and Personal Enterprise in the Department of Design and Environmental Analysis at Cornell University.
- Design is the essence of engineering. From the above, it is clear that leadership is an integral part of engineering profession.
- **Question: can leadership be taught?**

# Knowledge Acquisition

- What is leadership? Is leadership a technical model? Or is leadership a behavior model? Or is leadership more a matter of style, or philosophy?
- What is EQ, compared with IQ?
- What does EQ measures?
- What advice would you give to an engineer going into a leadership position for the first time?
- Does every manager need to be a leader?

# Task 1: Leadership Portfolio

- The leadership portfolio is a communication task that expresses your story and development in the engineering leadership path. It is your opportunity to pose yourself as a leader with knowledge, insight, and experience.
- For this task, prepare your leadership portfolio that summarizes your leadership style including key qualities you possess, your strengths, and areas for improvement. Specify examples of your leadership experience in class, projects, campus, community, etc., and how you have exhibited specific leadership qualities in each. Finally, what you see as your unique advantage over others? Develop the portfolio using a high-level digital tool of your preference.

## Task 2: EQ and Leadership

Communication skills are no longer just nice to have. They are must-haves. The industry is going toward more collaboration-integrated project delivery. Many elements of EQ might be more familiar to us as “soft skills” and “people skills.” But those terms minimize EQ’s value. Investigate this topic and reflect the outcome as well as answer to the following questions.

- Do you think that engineers tend not to concern themselves with emotions, for being more interested in technical ideas, problems, and solutions?
- Do you think improving one’s EQ does come instantly or easily?
- As a student, what drives and motivates you?

## Task 3: Leadership by Design

- What counts as leadership and what counts as engineering?
- Who are leaders and who are engineers?
- Should faculties teach technical design skills only or should teach in addition personal development, management, and leadership design skills?
- Are high successful companies looking for engineers with high practical design skills or for engineers with high design leadership skills?



# Task 4: Leaders and Managers

Create a presentation that differentiate leaders from managers basing on the following 12 subjects:

Essence  
Focus  
Have  
Seek  
Approach  
Appeal to  
Power  
Energy  
Risk  
Direction  
Credit  
Blame

**Example:** Leaders Seek vision while managers Seek objectives.