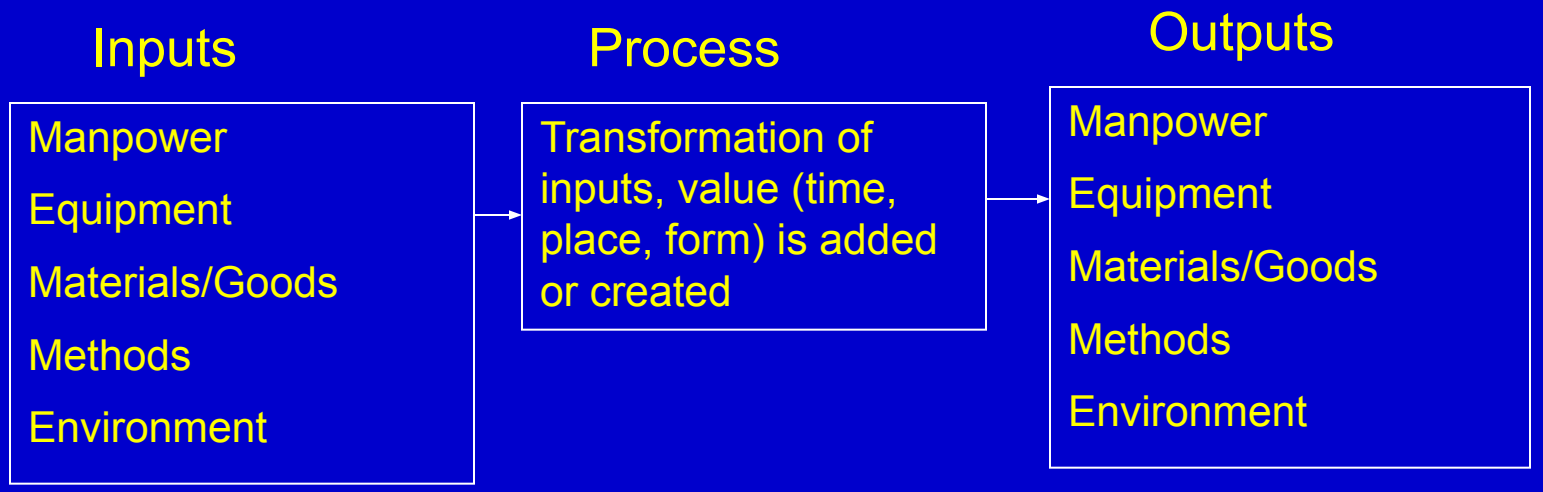
Chapter 2

Fundamentals of Quality

Process Basics

- Definition of a process
  - A **process** is a collection of interacting components that transform inputs into outputs toward a common aim called a **mission statement.**



Definition of a process

- It is management's job to optimize (improve) the entire process toward its aim.
- This may require the sub-optimization of selected components of the process.

Definition of a Process

- Processes exist in all facets of organizations and our understanding of them is crucial:
  - Administration
  - Sales and service
  - Human resources
  - Maintenance
  - Communication
  - Production
- Relationships between people are processes
- All processes can be studied, documented, defined, improved, and innovated.

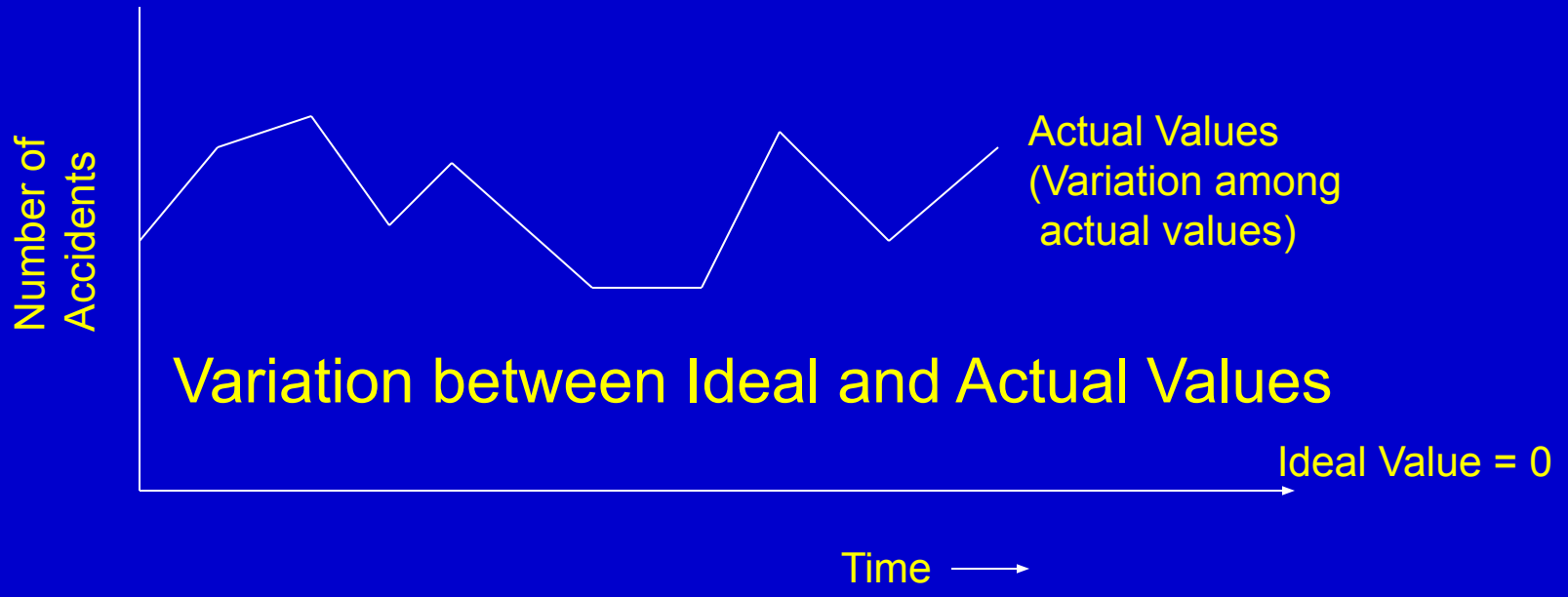
Definition of a process

- An organization is a multiplicity (great number) of micro sub-processes, all synergistically (robust) building to the macro process of that firm.

- All processes have customers and suppliers; these customers and suppliers can be internal or external to the organization.

Variation in a Process

- The outputs from all processes and their component parts vary over time.



Variation in a process

- **Special causes of variation** are due to events external to the usual functioning of a system.
- Examples could include (if they are not part of the system):
  - New raw materials
  - New employee
  - A new operator

Variation in a process

- **Common causes of variation** are due to the process itself.
- **Process capability** is determined by inherent (deeply come) **common causes of variation.**
- Examples of common causes of variation include:
  - Hiring, training and supervisory practices
  - Lighting
  - Stress
  - Management style
  - Policies and procedures
  - Design of products or services

Variation in a process

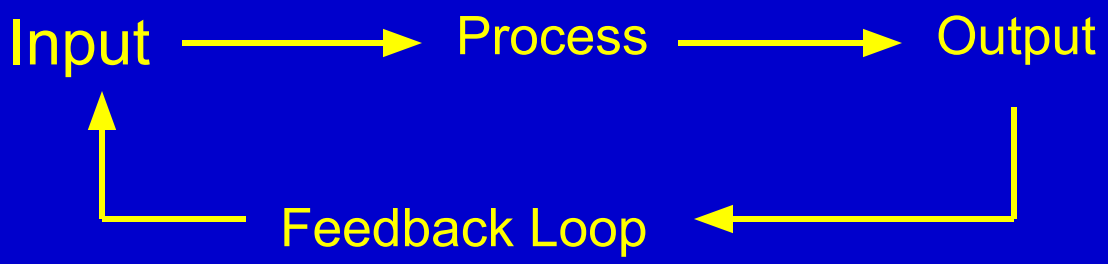
- Employees cannot control a common cause of variation.

- Managers must realize that unless a change is made in the process (which only they can make) the process's capability will remain the same.

Process Basics

More About the Feedback Loop

- A feedback loop relates information about outputs from any stage or stages back to another stage or stages so that an analysis of the process can be made.



More About the Feedback Loop

- There are three feedback loop situations
  - no feedback loop
  - special cause only feedback loop
  - special and common cause feedback loop

The Quality Environment

- The pursuit (follow up) of quality requires that organizations globally optimize (develop) their **system of interdependent (correlation) stakeholders.**
- This system includes employees, customers, investors, suppliers and subcontractors, regulators, the environment, and the community.

- Employees are the most critical stakeholders of an organization.
- According to quality expert Kaoru Ishikawa: “In management, the first concern of the company is the happiness of people who are connected with it. If the people do not feel happy and cannot be made happy, that company does not deserve to exist. . . The first order of business is to let the employees have adequate income. Their humanity must be respected, and they must be given an opportunity to enjoy their work and lead a happy life.”

Types of Quality

- There are three types of quality:
  - Quality of design / redesign
  - Quality of conformance
  - Quality of performance
- The above types of quality create the never ending spiral (cycle) of continuous improvement of products, services or processes

- **Quality of design**
  - Quality of design / redesign focuses on determining the quality characteristics of products that are suited to the needs and wants of a market, at a given cost; that is, quality of design develops products from a customer orientation.

- Quality of design / redesign
  - Quality of design studies begin with consumer research, service call analysis, and sales call analysis, and lead to the determination of a product concept that meets the consumer's needs and wants.
  - Next, specifications are prepared for the product concept.

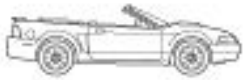
- **Quality of conformance**
  - **Quality of conformance** is the extent to which a firm and its suppliers can produce products with a predictable degree of uniformity (symmetry) and dependability (confidence and accreditation), at a cost that is in keeping with the quality characteristics determined in a quality-of-design study.
  - The ultimate (main) goal of process improvement and innovation efforts is to create products and services whose quality is so high that consumers (both external and internal) extol (celebrate, achieve) them.

- **Quality-of-performance**
  - **Quality of performance** studies focus on determining how the quality characteristics determined in quality-of-design studies, and improved and innovated in quality-of-conformance studies, are performing in the marketplace.
  - The major tools of quality-of-performance studies are consumer research and sales/service call analysis.
  - These tools are used to study after-sales service, maintenance, reliability, and logistical support, as well as to determine why consumers do not purchase the company's products.

Relationship between Quality and Cost

- Features and Price
  - Features and price determine whether a consumer will initially enter a market segment; hence features and price determine market size.
  - Dependability (confidence) and uniformity (organizing) determine a product's success, and therefore its market share, within a market segment.

- Generally, products or services with more features have higher costs to the manufacturer and higher prices to the consumer than products or services with fewer or simpler features.

Mustang Model	 COUPE	 CONVERTIBLE	 GT	 GT CONVERTIBLE
Price (MSRP)	$18,100	$23,625	$23,845	$28,100
Engine	90-hp, 3.8L OHV V-6.	90-hp, 3.8L OHV V-6.	260-hp and 302 lb.-ft. of torque, the 4.6L V-is	260-hp and 302 lb.-ft. of torque, the 4.6L V-is
Brakes	Standard brakes	Standard breaks	Anti-Lock Braking System to monitor wheel	Anti-Lock Braking System to monitor wheel slippage at any speed.
Seats	Standard	Standard	Leather sport bucket seats	Leather sport bucket seats

- **Dependability and Uniformity:**

Accreditation and standards

  - Uniformity and dependability create an inverse relationship between quality and cost. When the degree of uniformity and dependability of a product is high, the quality of the product is high, and the overall cost to both the manufacture and the consumer is less.

- Conclusion
  - Managers must balance the cost of having many market segments with the benefits of high consumer satisfaction caused by small deviations between an individual consumer's needs and the product characteristic package for his market segment. Also, managers must continually strive to reduce variation in product characteristics for all market segments.

- Stressing productivity often has the opposite effect of what management desires
- Management's ability to improve the process results in a decrease in defectives, yielding an increase in good units, quality, and productivity

Benefits of Improving Quality

- Several benefits result from improving a process:
  - rework decreases
  - productivity rises
  - quality improves
  - cost per good unit is decreased
  - price can be cut
  - workers' morale goes up because they are not seen as the problem. This last aspect leads to further benefits:
    - less employee absenteeism
    - less burnout,
    - more interest in the job
    - increased motivation to improve work.
- This is called the **chain reaction of quality**