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QA SIG

Quality Assurance Special Interest Group

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# The Revolution in Manufacturing Quality: What can we learn?

Larry Schuiski

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**AGILEAN™ CORPORATION**

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# Agenda

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## *Revolutions in Manufacturing*

- **Productivity**
- **Quality**

## *Quality Programs in Manufacturing*

- **Total Quality Management (TQM)**
- **Six Sigma**
- **Theory of Constraints**
- **Lean**

## *Lessons for the Service Sector*

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## Relative Productivity of Manufacturing/Services

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- **Fifty years ago the typical manufacturing worker produced \$48,000 worth of products and services (2000 dollars)**
  - **Fifty years ago the typical service sector worker produced about \$39,000**
- **Today the typical manufacturing worker produces \$207,000**
  - **While today the service sector worker's output has raised to \$54,000**

**In 50 years Manufacturing productivity has improved by 330%  
Services productivity has only improved by 47%**

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# Competing on the Global Stage

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- **Manufacturers had no choice but to increase productivity**
  - **For the last 50 years they have had to compete globally**
  - **Any less performance improvement and they would all be out of business**
- **U.S. based Services organizations have not had that pressure...**
  - **Until now**
  - **Today services companies must compete on a global scale**
  - **AND individual workers must compete – on a job-by-job basis with low labor cost countries**

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# What can Services Companies Learn?

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- **It's all about Quality!**
  - **Manufacturers have learned that the key to their survival is an unrelenting focus on quality – through all aspects of their operations**
- **Quality programs are not just for the hard tangible world of manufacturing**
  - **There is a softer side of quality that can be applied to all aspects within a services organization**

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# What is Quality?

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- You'd think there would be a clear consistent definition of quality
- The fifth edition of Juran's Quality Handbook offers two definitions:
  - Quality means those features of products which meet *customer* needs and thereby provides *customer* satisfaction
  - Quality means freedom from *deficiencies*

**These definitions only work if there is agreement on...  
who is a *customer* and what is a *defect*?**

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# Quality in Manufacturing

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- **Customers are defined as anyone that is the next step downstream in the value chain**
- **Defects are defined as anything that creates waste**
- **These definitions allow quality to be defined in terms of customer value**
  - **Quality means continuously improving the effectiveness and the efficiency of value added tasks... while reducing or eliminating non-value added tasks**

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# The Seven Wastes

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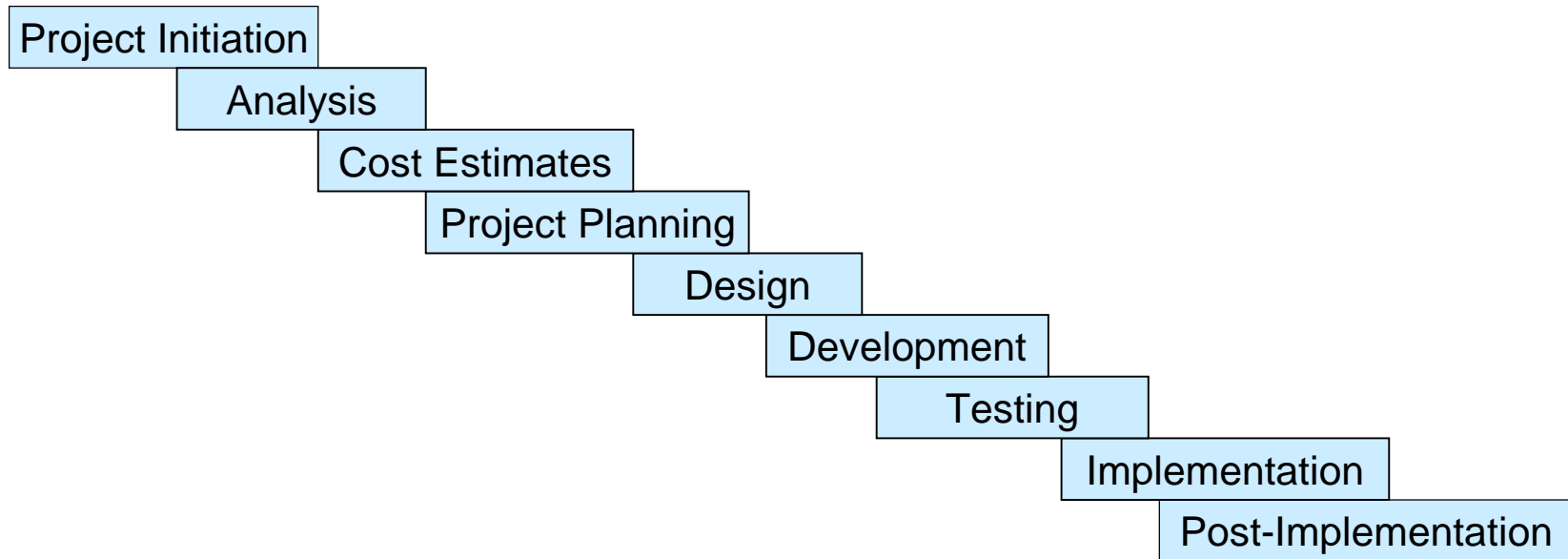
- **Overproduction**
- **Waiting**
- **Transportation**
- **Unnecessary processes**
- **Stocks**
- **Motion**
- **Defective products**

**A DEEP view of what constitutes a defect:  
Anything that produces WASTE is a defect**

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# The Scope of Quality within Manufacturing

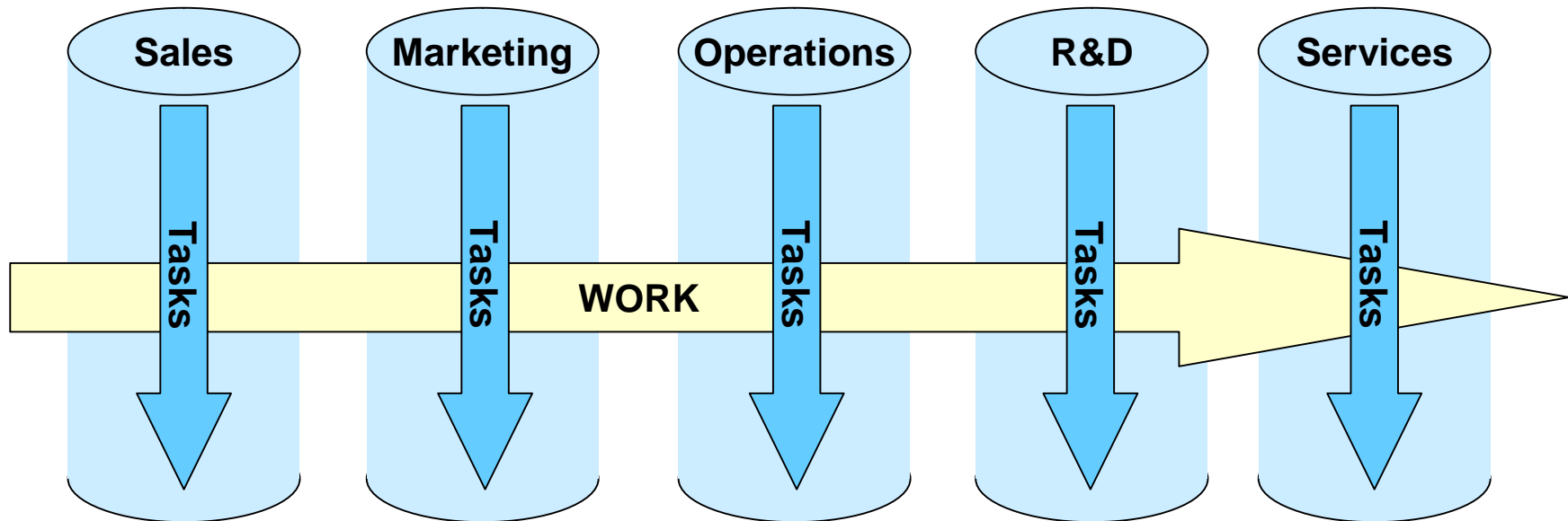
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**A BROAD view of the root cause of quality defects:  
Defects are considered SYSTEMIC, not one-time events**

# Why Quality is Hard to Manage

## Functional Organizations



**Functional tasks align vertically & work aligns horizontally  
This makes it very difficult to manage quality**

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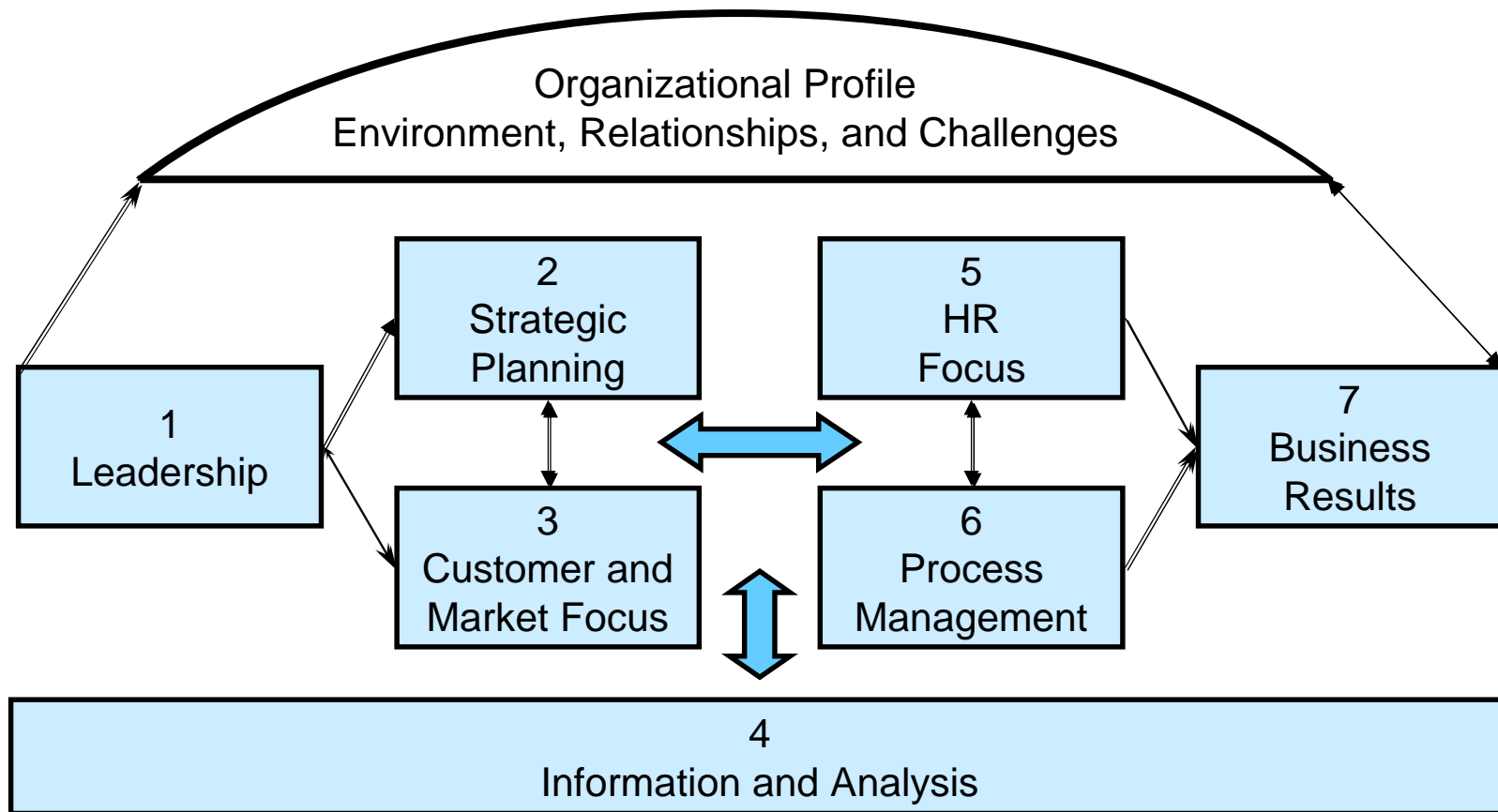
# Manufacturing Quality Techniques

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- **Total Quality Management (TQM)**
- **Theory of Constraints**
- **Six Sigma ( $6\sigma$ )**
- **Lean**

# Total Quality Management – Top Down

## Baldrige Criteria for Performance Excellence Framework

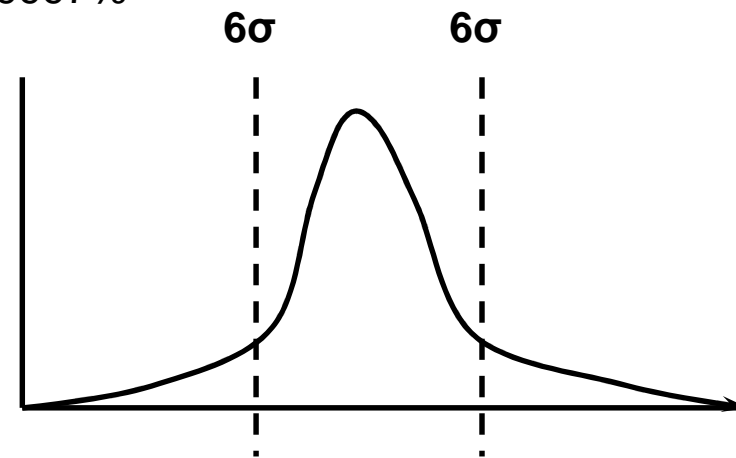
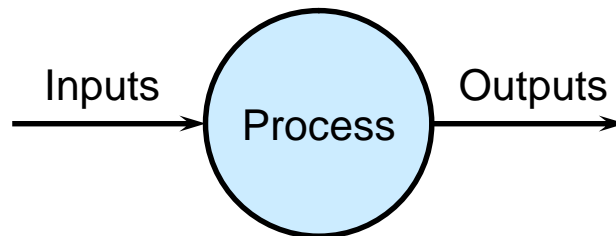


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# Six Sigma – Bottom Up

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- **Six Sigma is aimed at the near elimination of defects from every product, process, and transaction.**
  - The approach is to define, measure, analyze, improve, and control (DMAIC)
  - The main emphasis is on cost and waste reduction, yield improvements, capacity improvements, and cycle-time reductions, with heavy emphasis on satisfying customer needs
- **Six Sigma is about removing variation**
  - Variation in the inputs, the process, and the outputs is considered evil
  - The goal of six sigma is a yield of 99.9997%



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# Theory of Constraints – Up/Down from a Bottleneck

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- **If any event is allowed to produce as fast as it can, any imbalance in the process will grow indefinitely**
  - Creates over or under production
  - Constraints, natural or otherwise, keep it in check
- **Two types of resources**
  - Bottleneck when the capacity is equal or less than the demand
  - Non-bottleneck when the capacity is greater than demand
- **The bottleneck provides scheduling for both upstream and downstream processes**
  - It is a waste to have greater capacity than a bottleneck
  - Eliminate monuments
- **Throughput, inventory, and operating expense should be the goals**
  - Not cost reduction or efficiency

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# Lean – Continuous Flow of Value

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- **Precisely specify value by specific product**
  - Focus on tasks that add value someone would pay for
- **Identify the value stream for each product**
  - Follow the money
- **Make value flow without interruptions**
  - Concept of Takt time
  - Eliminate work-in-process (WIP)
- **Let the customer pull value from the producer**
  - The customer is any downstream consumer of the current value adding task
- **Pursue perfection**
  - Someone owns maintaining and improving the process
  - Poka-yoke or mistake proof processes
  - Anyone can stop the line

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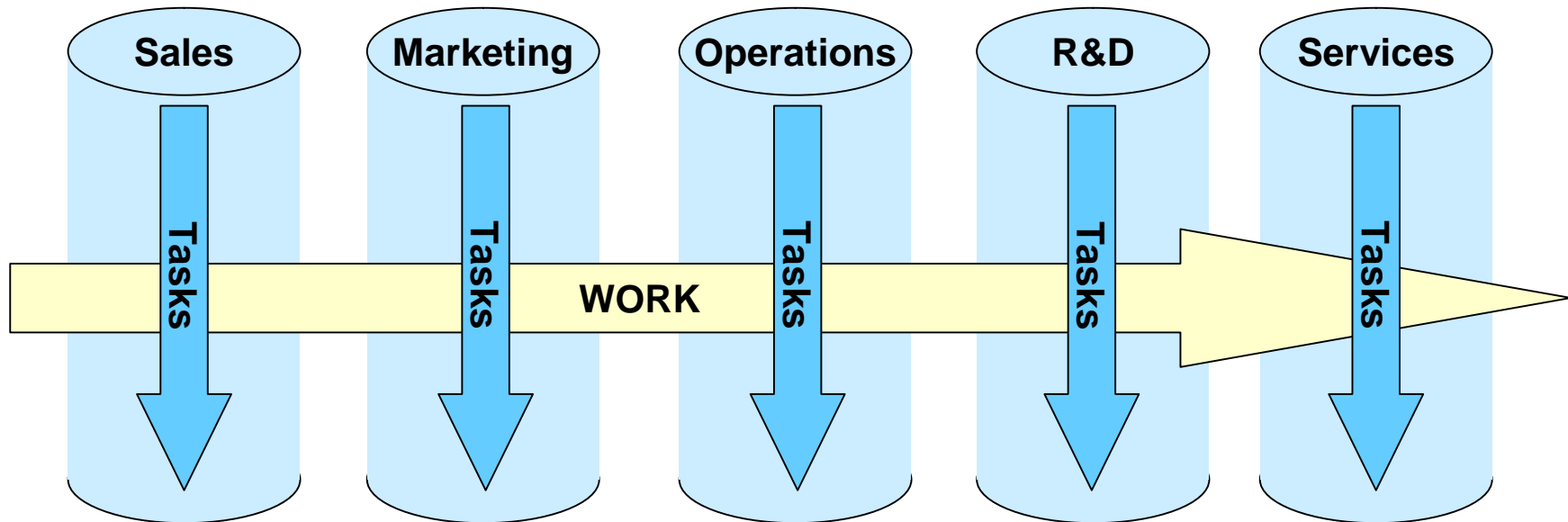
## What can the Service Sector Learn?

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# Service Sector vs. Manufacturing

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## Functional Organizations



**Value chains are just as important  
They are just much harder to see...**

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# The Depth & Breadth of Quality in Services

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- **Who would consider these quality problems?**
  - Computer down
  - Non-productive meetings
  - Asked to complete a task that does not contribute to current priority
  - Incomplete requirements for an assigned task
  - Insufficient training
  - Waiting for information

**How many of these conditions lead to poor productivity?**

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# Total Quality Management

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- **Obtain a copy of the Criteria for Performance Excellence and perform a self-assessment**
  - [www.quality.nist.gov](http://www.quality.nist.gov)
- **Sample questions**
  - How do senior leaders guide your organization?
  - How does your organization establish its strategic objectives and turn them into action plans?
  - How does your organization determine customer requirements and ensure the continuing relevance of your products and services?
  - What is your organization's approach to measuring and improving performance at all levels?
  - How does your organization ensure the quality and availability of information?
  - How do your organization's work practices motivate and enable employees?
  - How does your organization manage its key processes?

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# Six Sigma

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- **Standardization promotes productivity improvement through simplicity and consistency**
  - Standardization has a bad connotation because it restricts everyone's freedom to do their work as they like
  - If you don't know where you stand, how do you know if you improved?
- **Standardization helps to understand variation**
  - Variability is the bane of productivity
  - Standardize all interfaces
  - Reduce the number of inputs, outputs, and their allowed variations
- **Define, Measure, Analyze, Improve, and Control (DMAIC)**
  - Systematically attack the points of pain
  - Please don't skip define and measure
- **Track down the cause of pain**
  - The five whys

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# Theory of Constraints

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- **Events that are allowed to produce as fast as possible create bottlenecks**
  - Bottlenecks contribute to the waste of overproduction
  - Should people always produce as fast as possible?
  - Who has added a new report just because someone had some spare time?
- **Know where your bottlenecks are and use them as a management tool**
  - If dependent events are getting strung out, get a drummer and rope them together
  - Avoid monumental efforts
- **Focus on throughput not efficiency**
  - Focus on reducing the overall cycle time of a process
  - Improving the efficiency of any one functional step just creates or moves your bottlenecks

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# Lean

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- **Follow the money**
  - Sort tasks that add value from tasks that if given a choice:  
*No one would pay for!!!*
  - Eliminate queues
- **Consider the cell/team approach**
  - Each cell/team contains all of the resources to function independently
  - Allow the cell/team to abstract complexity from the overall process
  - Each cell/team has a defined takt time to do its work
  - Design processes so each cell/team maintains continuous flow
- **Pursue perfection**
  - If you are not actively attempting to get ahead, then you are falling behind
  - Apply mistake proofing to your processes
  - Anyone can stop the line

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# Choose to Compete

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- **Competition is about sustaining operational leadership**
  - Competitiveness operational performance
  - In manufacturing, quality is the price of doing business, and the state of the art has now advanced to a new level
  - The same must now be true for the services sector
- **The power of compounding interest**
  - Don't attempt to make a killing, just make progress
  - If you do not get started you will fail
  - If you attempt too much you will fail
  - If you start, but get too far behind, you will fail

**That is why it is called a revolution**