

History of Quality Control

And Basic Quality Concepts

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The history of Quality Control

- ▶ Quality control in production is as old as the production process itself.
- ▶ In the Middle Ages and up to the Industrial revolution era, quality was determined based on the abilities and the technique of the worker, whose quality of production and productivity were both determined by his talent and his experience.
- ▶ Following the Industrial Revolution and the resulting factory system, quality and process control began to take on some of the characteristics that we know today.

Quality Control – how it all started

- ▶ Some argue that Quality Control started here...



Quality Control – how it all started

- ▶ It is more suitable to say it started with the introduction of mass production

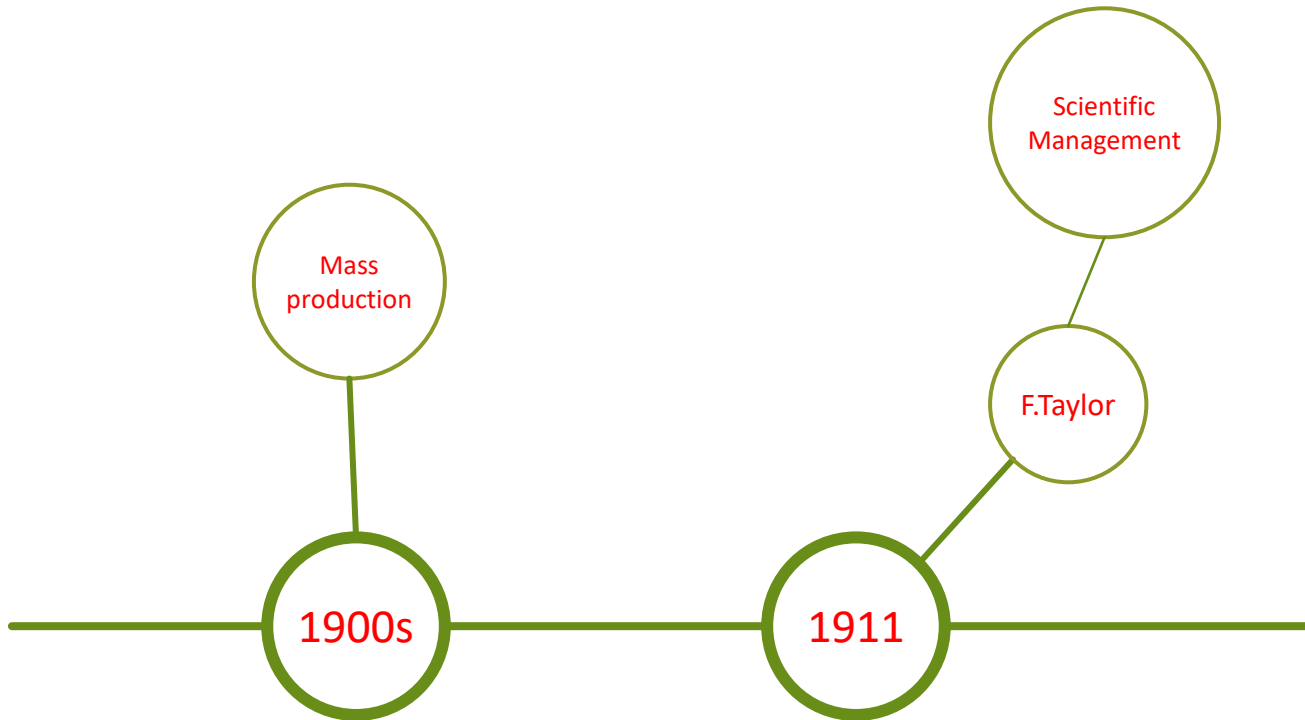


- ▶ Now, there is a greater need for quality than craftsmanship, because more products are produced by large numbers of people.

Fredrick W. Taylor

- ▶ Most quality scholars agree that it all started with Fredrick Winslow Taylor with the publication of his book Principles of Scientific Management, in 1911.





Fredrick W. Taylor and “Scientific Management” (1911)

- ▶ Taylor introduced the philosophy of “Scientific management”, which had a profound impact on management thought and practice.
- ▶ He believed that human performance could be defined and controlled through work standards and rules, which could increase productivity without increasing the number of skilled craftsmen needed at a factory.
- ▶ Taylor’s philosophy was one of the extreme functional specialization, to dismantle jobs into simple, separate steps for workers to perform repetitively without deviation and the inspector is responsible for the quality of the work.
- ▶ The effect of the philosophy to industrial management was so profound, that it gained a popular name: “Taylorism”.

1850's

1911

The end of craftmanship



1850's



1911

Fredrick W. Taylor and “Scientific Management” (1911)

- ▶ This brought minimal complexity and maximal efficiency, which stripped factory workers of power and had a largely negative effect on quality.
- ▶ Taylor later conceded that extreme functional specialization has its disadvantages, but his notion of process analysis and quality control by inspection of the final product still lives on.
- ▶ Taylor’s scientific management system, despite its flaws, was a product of its time: it evolved during an era of mass immigration, when the American labor system was being flooded with unskilled, uneducated workers, many of whom lacked advanced skills in English.

1850's

1911

The “era of inspection”

- ▶ The first stage of quality evolution was called "era of inspection."
- ▶ As more manufactured products became more complicated and jobs became more specialized, the need to inspect products for quality after manufacture became popular.
- ▶ In this stage the quality control of products was limited to a focus on corrective inspection, i.e., was a way to check the uniformity of the final product by separating the non-conforming products.
- ▶ Factory managers created inspection departments to keep defective products from reaching customers, a practice that focused more on the end results than on the process of manufacturing.



1850's

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Walter A. Shewhart

- ▶ In the 1920s and the 1930s, the concept of evaluating the manufacturing processes (instead of only the product) to promote product quality entered the American system.
- ▶ That was when one of the first and most revered quality scientists emerged: Walter A. Shewhart



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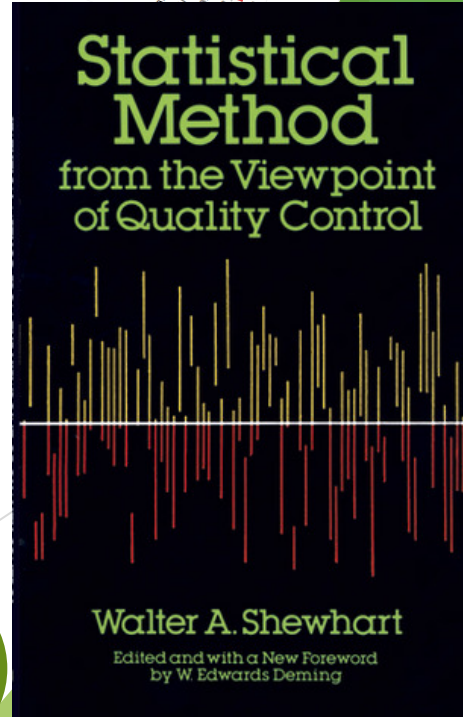
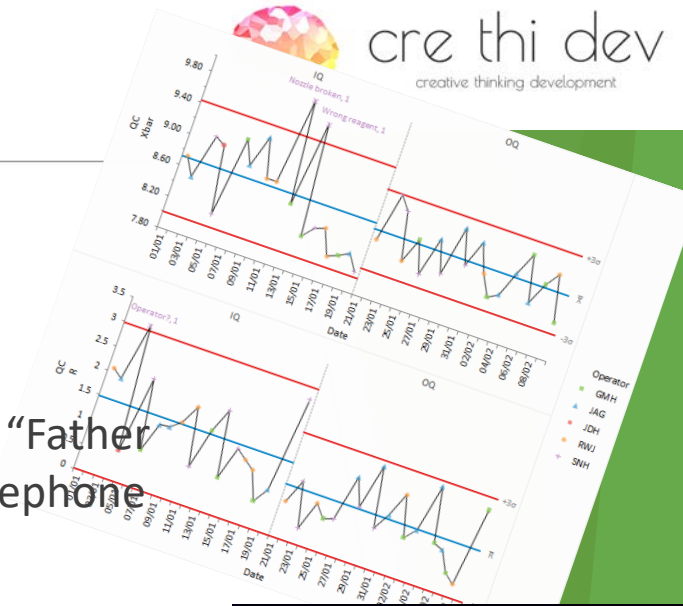
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Walter A. Shewhart

- ▶ In 1924, W.A. Shewhart, who is now considered the “Father of statistical quality control”, was working at Bell Telephone Laboratories.
- ▶ He developed a statistical diagram for the control of the production variables and wrote a now historic memorandum in 1924, in which he proposed the **control chart** to his superiors.
- ▶ Shewhart then wrote “*Statistical Method from the Viewpoint of Quality Control*” in 1939.



1910

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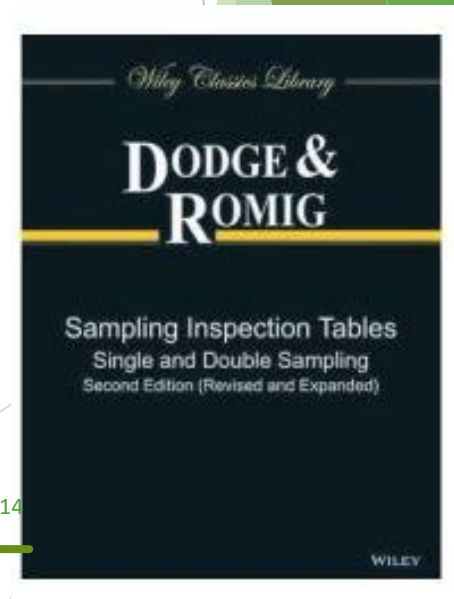
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Harold F. Dodge and Harry G. Romig

- ▶ Harold F. Dodge was one of the principal architects of the science of statistical quality control.
- ▶ In the late 1920's, H.F. Dodge and H.G. Romig, both of Bell Telephone Laboratories, working alongside Shewhart and contributing to his ideas, developed the area of **acceptance sampling** as a substitute for full product quality inspection.
- ▶ The Dodge-Romig Sampling Inspection Tables, an extensive and valuable set of ready-made tables, designed to minimise the total inspection, developed in the early 1930s and published in 1940, are their most known feats.
- ▶ By the late 1930's, Bell Systems uses statistical methods of control of production quality, however this is not universally accepted by the industry.



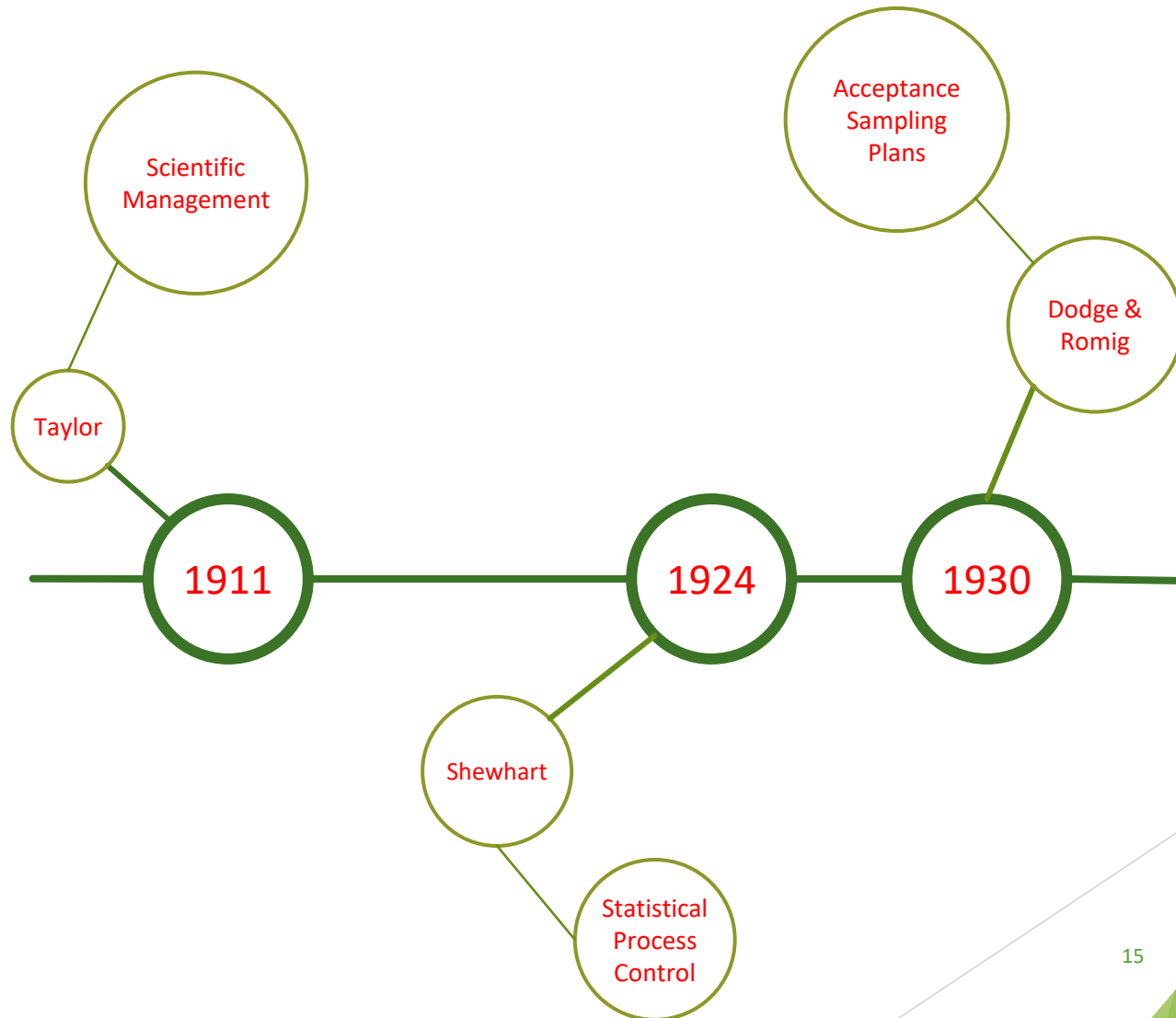
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1920-1940

- ▶ By now, product quality control was determined through inspections. This involved measuring, examining and testing the products, processes and services against specific requirements to ensure that each element adhered to set standards and guidelines.
- ▶ When businesses began to grow and expand and more products were manufactured throughout the day, companies started to experience difficulties in following the existing quality control standards.
- ▶ Change and development were brought during the 1940's by industry leaders and experts like Deming, Dodge, Juran and Romig. This would be the beginning of Total Quality Management as we know it today.

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William Edwards Deming

- ▶ Statistical quality control continued in the mid-twentieth century under the influence of William Edwards Deming.
- ▶ Deming is considered by many the father of quality management.



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The Deming years

- ▶ Deming started from the U.S. Census Bureau where he took charge of the groundbreaking statistical sampling program for the 1940 census.
- ▶ Deming successfully applied Shewhart's methods to war manufacturing during World War II, where statistical process control helped the armed forces speed up inspections without sacrificing safety.
- ▶ At the beginning of World War II, along with Ralph Wareham of General Electric and Charles Mummery of the Hoover Corporation, Deming began teaching ten-day courses in statistical quality control methods to engineers, inspectors, and other workers at companies engaged in wartime production.
- ▶ Deming's contributions to this new national focus on quality led to the formation of the American Society for Quality Control, of which he was a charter member, in 1946.

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Deming in Japan (1950's)

- ▶ Once the war ended and government contracts started to end too, many American managers put aside statistical quality control processes.
- ▶ So, Deming went to Japan: In 1947, the Supreme Command for the Allied Powers (SCAP) recruited Deming to help the Japanese prepare for their 1951 census.
- ▶ After accepting the assignment, Deming arrived to Japan, a country destroyed by World War II.
- ▶ Moreover, until the 1940's, Japanese products were considered poor quality imitations.

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1950's: The golden era of Quality

- ▶ In 1950 Deming gave a series of lectures in Japan to an audience of Business Executives and Engineers about production quality control. This can be considered the origin of TQM.
- ▶ According to Deming's philosophy, charts and checklists, as well as an uncompromising focus on the consumer as the most important part of the production line, were essential factors to building a quality product.
- ▶ The Japanese quality turnaround was surprisingly rapid.

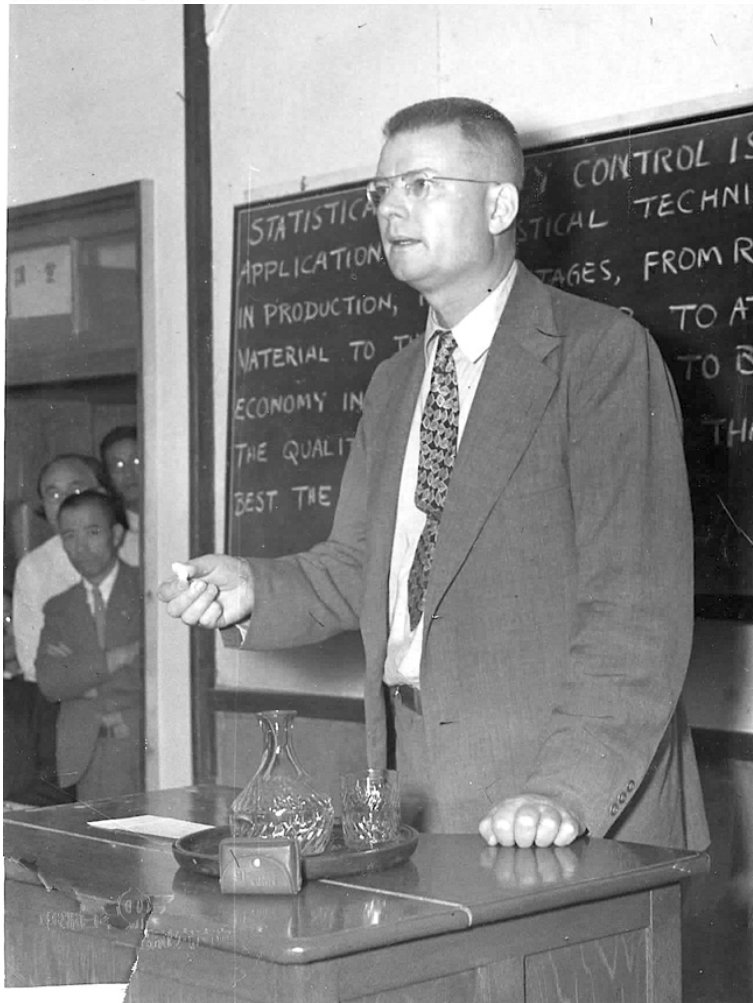
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Deming teaching in Japan, 1950

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Total Quality Control in Japan

- ▶ By 1954, the concept of total quality control (TQC) was adopted by Japanese management, who had simplified and modified Deming's ideas for application at the production level.
- ▶ Throughout the 50s and 60s, Japan's quality focus allowed manufacturers to produce increasingly higher-quality goods at lower prices.
- ▶ The Toyota Production System was developed during this period, focusing on minimizing inventory and waste.
- ▶ In 1960, Deming was awarded the Second Order of the Sacred Treasure in Japan, in honor of his work in enabling such a vibrant rebirth of Japanese industry on an international scale.

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Armand V. Feigenbaum

- ▶ Armand V. Feigenbaum is a pivotal figure in the history of quality.
- ▶ He publicized his idea of total quality control with his now famous book *Total Quality Control*, first published in 1951 under the title *Quality Control: Principles, Practice, and Administration*.
- ▶ He proposed a three-step process for quality improvement: quality leadership, quality technology, and organizational commitment.
- ▶ Feigenbaum also introduced the concept of **quality costs**.
- ▶ During the first international quality management conference in 1969, Feigenbaum would first use the phrase **Total Quality Management**.

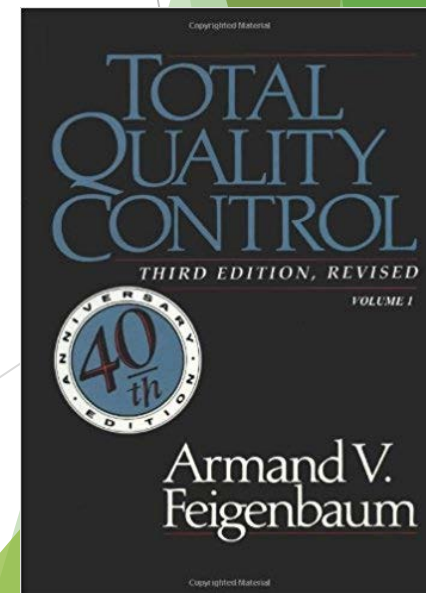
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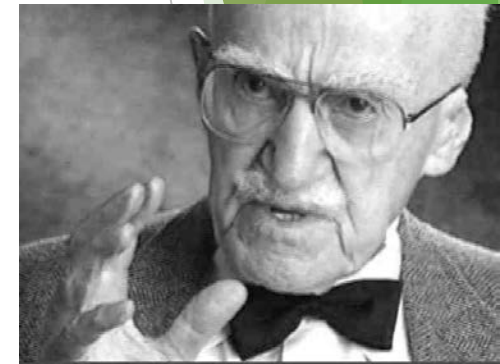
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Joseph M. Juran

- ▶ Dr Joseph Juran is well known to most quality scholars.
- ▶ Juran, like Shewhart, Dodge and Romig, started also from Bell Systems as an engineer in 1924; two years later, he was one of three people assigned to the new department formed to carry out what is known today as statistical quality control.
- ▶ Juran prepared what may have been the first text on statistical quality control, the *Quality Control Handbook*, first published in 1951.
- ▶ Like Deming, Joseph Juran traveled to Japan to conduct top and middle-level executive seminars. Juran's reputation in quality management led the Union of Japanese Scientists and Engineers to invite him to Japan in 1954.



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Joseph M. Juran

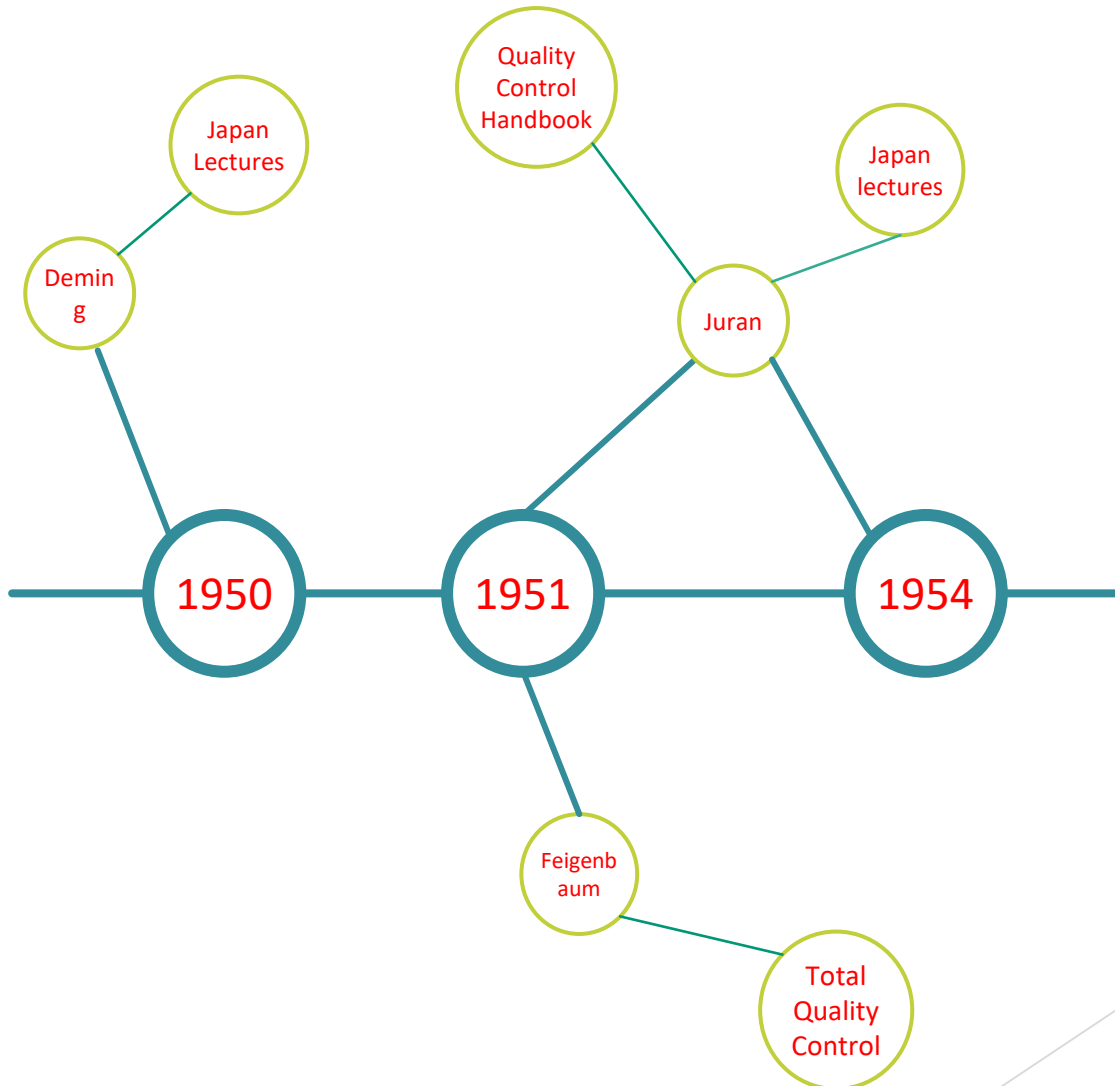
- ▶ Juran was one of the first that focused on the management aspects of quality.
- ▶ To Juran, quality management is not simply the issue of identifying and eliminating variations, it is serving customer needs – focusing the entire company on customers.
- ▶ Juran's definition of quality had 2 main elements:
 - ▶ **Fitness for use**
 - ▶ **Conformance to specifications**
- ▶ Juran proposed the quality trilogy: **quality planning, quality control,** and **quality improvement** to develop a universal thought process for quality.

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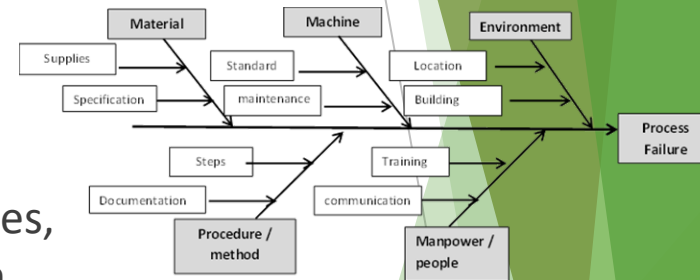
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Kaoru Ishikawa

- ▶ He is best known outside Japan for the Ishikawa or **Cause and Effect** diagram (also known as **Fishbone** diagram).
- ▶ He translated, integrated and expanded the management concepts of W. Edwards Deming and Joseph M. Juran into the Japanese system.
- ▶ In 1962, he introduced the idea of the Quality Circles, that would soon become very popular and form an important link in a company's Total Quality Management system.



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Kaoru Ishikawa

- ▶ He was also the one that introduced the **7 Quality Tools**.
- ▶ He shaped the Japanese style of TQC and originated an alternative concept – company wide quality control (CWQC) in 1968.
- ▶ Ishikawa, during the 1968 conference stated that TQM should apply to all employees within the organization – from the workers to the head management.
- ▶ The word “management” is a better substitute for “control”, with the idea that quality does not just have to be controlled, but managed. This idea gave birth to total quality management (TQM), in place of total quality control (TQC) or company wide quality control (CWQC)

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The birth of total quality management (TQM)

- ▶ Contrary to what was happening in Japan with Total Quality Control, managers in USA and elsewhere, considered Deming's quality techniques as time-consuming and unnecessary.
- ▶ But, by the 1970s, Japanese products were increasingly threatening America's ascendancy in the global economic market.
- ▶ In the late 1970s and early 1980s, American managers started to visit Japan to learn about the Japanese approach to manufacturing.
- ▶ Total Quality Management (TQM) arose in the 1980s as a result of the "rediscovery" of the teachings of Quality professionals, as Deming and Juran, as the American response to the Japanese economic threat.
- ▶ TQM emphasizes not only statistics but also quality-based approaches that embrace the entire organization, similar to the concepts found in Japan.

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Philip Crosby

- ▶ Philip Crosby is widely recognized for promoting the concept of "**zero defects**" and for defining quality as conformance to requirements.
- ▶ In 1979 he issued his first book, *Quality is Free*, which has been credited with playing a large part in beginning the quality revolution in the United States and Europe.
- ▶ He popularized the idea of the "**cost of poor quality**", that is, figuring out how much it really costs to do things badly.
- ▶ Crosby defined quality as a conformity to certain specifications set forth by management, set according to customer needs and wants.
- ▶ The concept of zero defects was ahead of its time. More recently the concept of zero defects has led to the creation and development of Six Sigma.

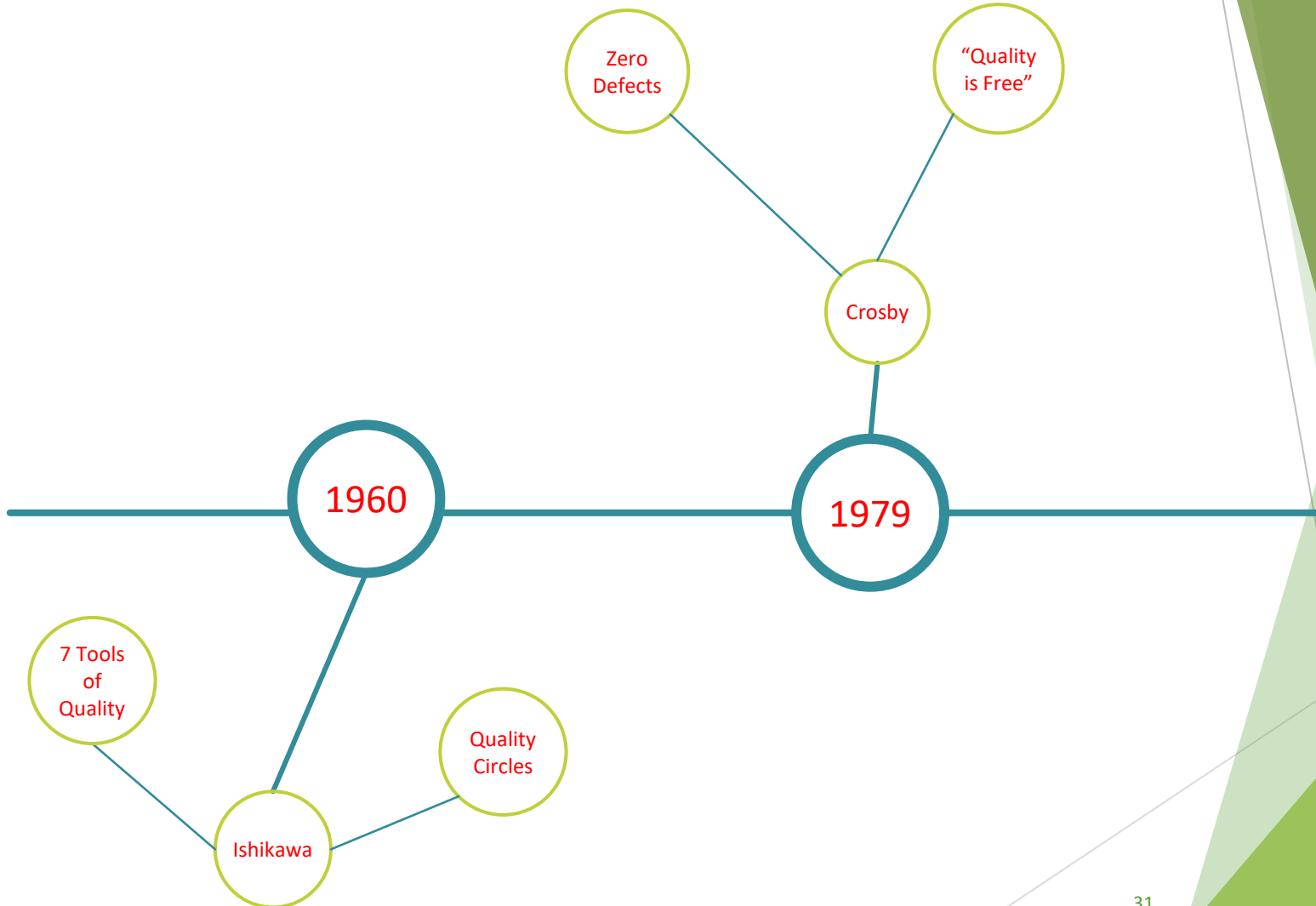
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The “Boom” of Quality after 1980

- ▶ In 1980, thirty years after he first taught the Japanese his methods, Deming was “rediscovered” in America.
- ▶ Deming appeared on CBS in June of 1980 in a documentary entitled *“If Japan Can ... Why Can’t We?”*
- ▶ It is believed that this television program introduced the organizational design that sparked the spread of TQM as a management theory.
- ▶ After the program aired, companies such as Ford and General Motors enlisted Deming’s aid for their quality programs.
- ▶ His seminars in the 1980s began attracting hundreds of managers from companies as AT&T, Procter and Gamble, and Xerox.

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Recent History

- ▶ Quality management philosophies and programs other than TQM soon followed, such as **Six Sigma** and **lean manufacturing**, as more companies improved their corporate-wide industrial and management processes.
- ▶ Six Sigma, pioneered by Motorola in 1986, has risen to prominence as a way to improve business processes by minimizing defects.
- ▶ In 1987, the first International Organization for Standardization (ISO) 9000 quality management standards were published.
- ▶ The **ISO 9000** standards have been expanded to include industry sector-specific versions for quality management.
- ▶ The concept of quality has expanded beyond the manufacturing sector to other business and public sector areas:
 - ▶ service, healthcare, education, and government.



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Recent developments

- ▶ The European Foundation for Quality Management, EFQM, was founded in 1989 when 67 European companies committed to achieve EFQM mission and vision.
- ▶ The EFQM Excellence Model is a holistic framework than can be applied to any organisation, regardless of size or sector. This was first used to support the assessment of organisations in the European Quality Award in 1992.
- ▶ In 2015, the fifth edition of the ISO 9001 standard was published. Previous editions include 1987, 1994, 2000, 2008.
- ▶ In 2016, 1.105.937 companies were certified to the standard according to the ISO survey, worldwide.



EFQM
Leading Excellence



1990

1992

2000

2015

2018

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What is Quality?

- ▶ Quality is a very elusive attribute; it is perceived, understood and interpreted differently by different people.
- ▶ There have been many attempts to define it conclusively and there is a multitude of definitions and interpretations about quality that have evolved with time.
- ▶ A few can be summarized as follows:
 - ▶ From customer point of view: quality means fitness for use and meeting customer satisfaction.
 - ▶ From process point of view: quality means conformance with the process design, standards and specifications.
 - ▶ From product point of view: quality means the degree of excellence at an acceptable price.
 - ▶ From the cost point of view: quality means best combination between costs and features.



What is Quality?

- ▶ ISO 9000:2015: Quality management systems—Fundamentals and vocabulary defines quality as the “degree to which a set of inherent characteristics of an object fulfills requirements.”
- ▶ **Simply stated, quality is meeting customer requirements.**
- ▶ The earlier definition by ISO 9000 standard stated quality as *the totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs.*



What is Quality Management?

- ▶ Originally, Management was not a part of Quality.
- ▶ In the 1920s there was only quality control. The goal of quality was to ensure that engineering requirements were met in final products. Later, as manufacturing processes became more complex, quality developed into a discipline for controlling process variation as a means of producing quality products.
- ▶ In the 1950s quality assurance and auditing were introduced. The drivers of independent verification of quality were primarily industries in which public health and safety were paramount.
- ▶ It was not until the 1980s, with total quality management (TQM), that businesses realized that quality wasn't just the domain of products and manufacturing processes, and total quality management (TQM) principles were developed to include **all processes in a company, including management functions and service sectors.**

What is Quality Management?

- ▶ It is the use of management techniques and tools to achieve consistent quality of products and services, i.e. to achieve maximum customer satisfaction at the lowest overall cost to the organization while continuing to improve the process.
- ▶ Specifically, for the food industry, that also involves the knowledge and application of techniques and programs for product safety.
- ▶ Quality management is, thus, the totality of functions involved in the determination and achievement of quality, including quality assurance and quality control.

What is a Quality Management System?

- ▶ A system of quality management includes all activities of the overall management function that determine the quality policy, objectives, and responsibilities and their implementation.
- ▶ As ISO 9000 explains, a management system provides **the means of establishing a policy and objectives and the means to achieve those objectives.**

What is Quality Assurance and Quality Control?

- ▶ Quality assurance and quality control are two aspects of quality management. While some quality assurance and quality control activities are interrelated, the two are defined differently.
- ▶ According to the vocabulary standard ISO 9000:2015:
- ▶ **Quality assurance** consists of that “part of quality management focused on providing confidence that quality requirements will be fulfilled.”
 - ▶ The confidence provided by quality assurance is **internal**: to management and **external**: to customers, government agencies, regulators, certifiers, and third parties.
- ▶ **Quality control** is that “part of quality management focused on fulfilling quality requirements.”

What is Quality Assurance and Quality Control?

- ▶ So...
 - ▶ quality assurance relates to how a process is performed or how a product is made
- ▶ Whereas...
 - ▶ quality control is more the inspection aspect of quality management.



Questions?

▶ Thank you!