1. **Appendix** **2B: cost of quality (Slide #1 is the title slide)**

*Learning Objective 9: Identify the four types of quality costs and explain how they interact.*

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#### Quality costs − Costs incurred to prevent defects or that result from defects in products. Many companies are working hard to reduce their quality costs. Those companies that are succeeding have a high quality of conformance in the sense that the overwhelming majority of the products that they produce conform to design specifications and are free from defects.

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#### There are four broad categories of quality costs:

* + 1. **Prevention costs** − Are incurred to support activities whose purpose is to reduce the number of defects.

*Helpful Hint: Suppose an ice cream company has been having problems with unpleasant gritty ice crystals in its ice cream. Ask students how they would prevent the ice crystal defect. One approach would be to investigate the manufacturing process. Perhaps the gritty ice crystals are caused by temperature variations in the freezer. Controlled experiments could be run varying the temperature and inspecting for ice crystals. If this is the cause, the variation in temperature could be decreased or the ingredients changed so they would be less sensitive to temperature changes.*

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* + 1. **Appraisal costs** − Are incurred to identify defective products before the products are shipped to customers.

*Helpful Hint: Continuing the ice cream example, ask students how they would “inspect out” the ice crystal problem. This may be more difficult and expensive than it first appears. For example, the problem could occur only in half-gallon containers or at random in a small (but important) number of containers. Or, the ice crystals could only be detected by tasting ice cream near the bottom of the container. “Inspecting out” the problem would make a lot of ice cream unsaleable.*

* + 1. **Internal failure costs** − Are incurred as a result of identifying defects before they are shipped to customers.

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* + 1. **External failure costs** − Are incurred as a result of defective products being delivered to customers.

*Helpful Hint: Continuing with the ice cream example, ask students to identify examples of internal and external failure costs. Internal failure costs could result from throwing away defective ice cream. External failure costs could result from customers returning defective ice cream or failing to purchase the ice cream company’s product at a later date.*

* + 1. Examples of each type of quality cost include:
       1. **Prevention** − Quality training, quality circles, statistical process control activities, etc.
       2. **Appraisal** − Testing and inspection of incoming materials, final product testing, depreciation of testing equipment, etc.

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* + - 1. **Internal failure** − Scrap, spoilage, rework, etc.
      2. **External failure** − Cost of field servicing and handling customer complaints, warranty repairs, lost sales arising from reputation of poor quality, etc.

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* + 1. **Distribution of quality costs** − Graphs are often used to depict the relationship between the four types of quality costs. The graph illustrates **four key concepts**.
       1. When the quality of conformance is low, total quality cost is high and most of this cost consists of internal and external failure costs.
       2. Total quality costs drop rapidly as the quality of conformance increases.
       3. Companies reduce their total quality costs by focusing their efforts on **prevention** and **appraisal** because the cost savings from reduced defects usually overwhelm the costs of additional prevention and appraisal.

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*Helpful Hint: Continuing with the ice cream example, the prevention activities mentioned earlier may reveal that, if fluctuating temperatures is the problem, a simple thermostat may solve the problem. The cost to identify the problem and install a thermostat is much less that the costs of scrapped ice cream, customer returns and complaints, and lost future business.*

* + - 1. Total quality costs are minimized when the quality of conformance is less than 100%. This is a debatable point in the sense that some experts believe that total quality costs are not minimized until the quality of conformance is 100%.

*Learning Objective 10: Prepare and interpret a quality cost report.*

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#### Quality cost report − This report details the prevention, appraisal, internal failure, and external failure costs that arise from a company’s current quality control efforts.

* + 1. When interpreting a cost of quality report managers should look for **two trends**. First, increases in prevention and appraisal costs should be more than offset by decreases in internal and external failure costs. Second, the total quality costs as a percent of sales should decrease.

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* + 1. Quality cost reports can also be prepared in graphic form. Managers should still look for the same two trends whether the data are presented in a graphic or table format.

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* + 1. **Uses of quality cost** **information:**
       1. It helps managers see the financial significance of defects.
       2. It helps managers identify the relative importance of the quality problems faced by the company.

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* + - 1. It helps managers see whether their quality costs are poorly distributed. In general, costs should be distributed more toward prevention and to a lesser extent appraisal than toward failures.
    1. **Limitations of quality cost** **information**
       1. Simply measuring and reporting quality cost problems does not solve quality problems.

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* + - 1. Results usually lag behind quality improvement programs. Initially, prevention and appraisal cost increases may not be offset by decreases in failure costs.
      2. The most important quality cost, lost sales arising from customer ill-will, is often omitted from quality cost reports because it is difficult to estimate.

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1. **International** **aspects of quality**

#### The International Organization for Standardization, based in Geneva Switzerland, has established quality control guidelines, known as the ISO 9000 standards. For a company to become ISO 9000 certified by a certifying agency, it must demonstrate that:

* + 1. A quality control system is in use, and the system clearly defines an expected level of quality.

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* + 1. The system is fully operational and is backed up with detailed documentation of quality control procedures.
    2. The intended level of quality is being achieved on a sustained basis.