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## 4.5. Juran Quality by Design Model

We look at each of these as we step through the sequence at a high level.

### 4.5.1. Step 1: Establish the Project and Design Goals

All design should take place project by project. There is no such thing as design in general; there is only design in specific. In strategic planning, we set out the vision, mission, strategies, objectives, and so on. Each is a specific thing. In product planning, we start with a project, that is, something to plan. We might design a new training room, a new car, a wedding, a customer toll-free hotline, or a new Internet process for bidding on travel booking (such as [Priceline.com](https://www.priceline.com), [Expedia.com](https://www.expedia.com)). Note that each is a specific thing, and each can be clearly differentiated from anything else. A training room is not a cafeteria, a new car is not a Howitzer, a hotline is not long-distance service, and the travel booking process is not a bookstore online. This is a significant point. Without being able to differentiate what we are designing from anything else, everything collapses into vagueness. So a project is our starting point.

### 4.5.2. Step 2: Identify the Customers

Going back to the 1980s Total Quality Management (TQM) days, we learned that those who receive the product are customers in some way. If we were designing a training room, the trainees would be an important customer segment. So, too, would the custodians, because they have to clean the room, set it up in different ways, and so on. Customers of the new car include the purchasers, the insurance organizations, the dealers, the carriers, etc. Customers of the hotline include our clients, our service agents, etc. We can include as customers for the travel process the travelers, airlines, and the Web server entity. From all this emerges the basic understanding: A customer is a cast of characters, and each has unique needs that must be met.

### 4.5.3. Step 3: Discover the Customers' Needs

Wants, needs, perceptions, desires, and other emotions are all involved in our discovery of customer needs. We need to learn how to separate things and prioritize them. But at this point, we need to emphasize that not all high-priority customers (such as the car buyer) are the only ones with high-priority needs. We also stress that just because some customer entity is lower in priority doesn't mean at all that it automatically has lesser-priority needs. We need to understand the "voice of the customer" and the "voice of the market."

Take, for example, the automobile carriers; we simply cannot overlook their needs for the car to be only so high and only so wide. If we ignored their needs, they could stop the product from reaching the cash-paying ultimate customer, our buyer. So, too, could regulators (the various states, the National Highway Transportation Safety Board, the Environmental Protection Agency, etc., impose "needs" that if unmet, could stop the process from going forward at all). So from all this, we reach another point: Customers have to be prioritized in an agreed upon way.

## 4.5.4. Step 4: Develop the Product or Service Features

The word "feature," as used in product planning, means what the product does, its characteristics, or its functionality. In structured product planning, we adopt a different definition: A feature is the thing that the customer employs to get her or his needs met. For example, in our training room, the trainees need to take notes as they learn. A feature might then be a flip chart, a white board, or a desk. Our custodians might need to move things around quite a bit, so features might include portability, size, weight, and modularity.

As our list of features grows, we soon realize that we cannot possibly have all features at the same priority level. So we need a way to put things in order, once again, and in an agreed upon way. We finalize by optimizing and agreeing on the list of features and the goals for them as well. Note what optimization means: Not all features survive product planning.

## 4.5.5. Step 5: Develop the Process Features

Because we know that the process is the thing that creates the features, we need to examine current and alternative processes to see which ones will be used to create the features. We need to be sure that the product feature goals can be accomplished via the processes we choose. In other words:

Process capability must reconcile with product requirements. That statement is very important. No process knows its product goals; product goals come from humans. Ideal product goals would naturally reflect the various customers. But the key issue is this: Variation comes from processes; goals come from humans.

In the example of the training room, process goals might be to reset the room in 20 minutes, keep a supply of flip charts in a closet, certify the trainees to a standard, and so on. As before, we need to list all the possible routes to making the product, select the ones we will use based on some rationale, establish goals for the processes, and reach an optimum.

## 4.5.6. Step 6: Develop Process Controls and Transfer to Operations

## 4.5.6.1. Develop Process Controls

Control is basic to all human activity, from how the body regulates itself as to temperature and metabolism, to financial controls in how we run our organizations or homes. Control consists of three fundamentals:

In product planning, we need to ensure that the processes work as designed within their capabilities. In the training room, for example, controls might take the form of a checklist for resetting the room and a minimum inventory of flip charts. Control makes use of the concept of the feedback loop.

Here's an example you might keep in mind:

Did you ever check the oil in your car? The dipstick is a form of control point. Note that we begin with a control subject (volume of oil), a unit of measure (quarts or liters), a sensor (you and the dipstick), and a goal (keep the oil somewhere between "full" and "add"—inside those hash marks). Then we move on to sample the process (clean the dipstick, put it back in, remove it, and observe the oil level). Next we adjust when adjustment is called for (oil levels below the add demarcation require us to add oil until we bring the oil up to somewhere between add and full, the agreed goal). If the oil is already within the hash marks, the control activity is to replace the dipstick, shut the hood, and drive on until another checkpoint is reached (perhaps next month). Note that the control activity must reflect the agreed upon goal for control. In the engine oil example, the control point was "inside the hash marks," so the control action is to bring the oil to somewhere "inside the hash marks." Many people miss this point; for example, they add oil until the stick reads "full." This is overcontrol. Control actions must reflect control goals.

## 4.5.6.2. Transfer to Operations

Transfer to operations winds up the whole design process. As used here, "operations" means those who run the process, not "manufacturing." To continue the examples used earlier, operations for the training room is the activity of the trainers, the custodians, and the purchasing department. For the new car, operations include manufacturing, transport, dealer relations, and the legal department. For the hotline, operations means the customer service agents who answer the phone. In the travel bidding process, operations include those who shop the bid or reject it and those who maintain the software that interfaces the prospect with the carriers. From the lessons of the era of productivity, the Industrial Revolution, and into the twentieth century, we have learned that the involvement of the operators is key to any well-running process.

With the development of the Ford Taurus came solid understanding of the value of a "platform" team. Designers, engineers, workers, purchasing agents, salespeople, and managers all sat under one roof to develop the car. The concept of platform teams is well ingrained in many car organizations today. The Chrysler Technical Center in Auburn Hills, Michigan, is a later example of such broad collaboration. Thus, successful transfer to operations must include the operators in the design process as early as possible.

The remainder of this section will provide details, practical guidance, and examples for each of these steps.