Print

Developing an Input/Output Process Map

An input/output process map, or I/O map, is a graphical representation of the process that is more detailed than both the macro view and the SIPOC map. Like SIPOC maps, I/O maps are particularly useful for problem-solving teams, because they enable you to capture detailed process information in one map.

When you develop an I/O map, you list the process steps, list the inputs at each step, and identify the outputs for both the process as a whole and for the individual process steps.

You also identify the most critical inputs, and include operating specifications and targets if they are available. We illustrate the steps for creating an input/output map using the anodize parts scenario, which you were introduced to in the previous lesson.

This case study is detailed in the book Visual Six Sigma, Making Data Analysis Lean. We revisit the anodize parts scenario in the Design of Experiments module. Recall that a company that manufactures anodized aluminum parts for stereo equipment has experienced very low yields. The anodize process consist of anodizing aluminum parts and then dying the parts to rich blemish free black color.

A team is formed to address this issue. An early step is to develop an input/output process map for the anodize process. First, the team identifies key process steps. These steps are the major, higher-level activities that are performed in the process.

They establish the first and last steps, which are the boundaries of the process. Then they identify the other major steps that are within the boundaries of the process. Next, the team identifies inputs for each step.

The inputs fall into one of the following categories: materials, methods, machines, manpower, measures (or measurements), and environment. Then the team identifies the final output and critical outputs for each step.

For the final output, finished parts, the team identifies the CTQs (the critical to quality characteristics). Remember that the CTQs are characteristics that are critical from the perspective of the customer.

The quality of the surface finish is the most important characteristic. The team learns that there are four CTQs that are directly related to the surface finish of the parts.

These are the thickness of the coating and three readings from a color spectrophotometer: L*, a*, and b*. Next, the team identifies critical process inputs. These are the inputs that the team believes have the greatest impact on the outputs.

These inputs are investigated as the team moves further into the problem-solving process. Finally, if you have targets and specifications for the critical inputs and CTQs, you can add these to the I/O map.

For the anodize scenario, the team has identified targets and specifications for the CTQs. The team used data and exploratory data analysis tools to determine these values.

For each of the critical inputs, specifications and target values do not exist. The team uses a designed experiment to identify optimal settings for each of these variables, or factors, to hit the targets for the four CTQs. See the Design of Experiments module to learn more about this scenario.

Note that, if mapping the process seems frustrating or overwhelming, the process boundaries might be too wide. You might need to narrow the focus of the process to a specific step or group of steps.

Asking the following questions can help you narrow the focus: Is there a particular part of the process known to be the most troublesome? Where do most of the errors occur? Will improvements to the initial steps of the process reduce the number of problems downstream?

Statistical Thinking for Industrial Problem Solving

Close