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Rockwell Automation

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Example Functional Specification Document

Background

- What is the basic background for the project you will be simulating? Know your audience for this part – if they will be very familiar with the project, you do not need to go into much detail for the background.

Project Overview

- Describe the overall objectives of the model – what are you looking to get out of it?

- What level of detail will your model need to have? If you know of any major simplifying abstractions, you can list them here. It is possible, especially with a greenfield project, that some of the details will not have been defined at the start of the simulation. For these parts of the model, the structure should be kept as flexible as possible so that greater detail may be added and tested as it becomes available.

System Information

- This is the where most of the information for the model should be documented. All processes that will be modeled should be described in this part, preferably with flowcharts whenever possible.

- While thinking through processes, remember to think through how the model should respond if an unexpected situation occurs, such as shortages, overages, and changeovers. In the real system, operators may foresee such situations and make adjustments; the model needs to be built to either make those same adjustments or have a defined process for when such situations arise.

Model Initialization

- Identify what will control the demand and timing of events. The first sections of the functional specification scope will typically be more data-focused, covering schedules, arrival patterns, or whatever input data will drive the flow of entities into the model.

System Scope and Definition

- If your model run will cover multiple forecast periods, how will future forecasts be generated? Should the model handle this period-to-period adjustment, or will you enter all the forecasts at once? If all the forecasts are entered up front, should the model have any way of adjusting future forecasts based on model conditions?

- Decision processes are just as important as physical process for flowcharting. Often decision processes may be less documented, so it is crucial to spend enough time on fleshing out details for them

- For any manufacturing model, raw materials must be addressed – will the model assume that they will always be available as needed, or will there be a delivery schedule? If the model needs to account for raw materials, how should the model process when the needed materials are not available? Storage capacity for raw materials may also be part of the model, but then delivery rates need to be included.

Production

- This is the part of the specification that gets into the process flows and defines exactly how they will work. Typically, each section will have at least one process flowchart to visually explain how the process is operated. The flowchart should contain decisions that will need to be made by the simulation. The accompanying descriptions can go into greater depth on each process step, e.g. what information is needed for the decision, are any statistical distributions known, does this section interact with any other parts of the model.

Input Parameters

The list of inputs that will be needed to plan the facility simulation are as follows. This is the list of currently known inputs and it is likely that this list will increase as the simulation progresses.

- List the known input data that the model will need. At this point, data structure is not as important, but it is good to define what types of data and what level of detail will be needed. If the sources of the data are known, they can be included as well, to highlight what sections of input data may need additional definition or work to find.

Output Parameters

- List the known output statistics that the model will need to generate. It is important to think about confidence intervals from the beginning – which statistics are most important and if known, what is the desired confidence interval for those key statistics?

- Output data can be an iterative process. As the initial results are presented, questions may be asked about other results that were not originally captured. While it is good to capture the major sections of data output that will be needed, it may not be possible to develop an exhaustive list from the beginning.

Testing Scenarios

- List the scenarios that you wish to test.

- If there are future scenarios that will not be a part of the initial phase but that you know may be later incorporated, they should be listed somewhere in the document. If there are a number of scenarios for future development, it may be better to create an entire section for documenting them. The goal of the documentation is both for the purposes of clarifying that they will not be included in this phase of model development and for reminding the developer to design the model so as to make later changes as simple as possible. The lack of these scenarios should be repeated in the assumptions section to document that they will not be included.

System Assumptions

The assumptions that the model makes about demand and production supply are as follows:

- The assumptions section covers multiple sections of the specification and model. It is likely that some assumptions will be listed in individual sections; they can be repeated here to have a central listing. Since different people may have different views of the model and how it will be used, it is good to get input from others for this section, as you may not realize that you are making assumptions that have not been listed. This can be a controversial section, so it is best to have the needed dialogue about what will and will not be in the model before development begins.

Animation

- If extensive animation is needed, make sure that it is included in the functional specification. Most users will take advantage of some animation purely for validation and verification, but if presentation-ready animation will be required, it will increase the time needed to complete the project.