In this case study, you are being asked to use your skills with simul8 to help management to address quality issues and prepare the company for expansion.

The Cristallo factory is adopting the 24/7 weekly production cycle. Operationally, bikes are transported from each assembly station to the next one automatically. Each activity station has a preferred number of 4 shift workers. But each can operate with a minimum of 2. When bikes arrive at a workstation, they are queued up until a space becomes available with one of the workers. Each workstation can hold up to a maximum of 30 bikes in its queue.

Management are determined to address their quality issues. They have been presented with a number of options to address the quality issues in production and increase the throughput of orders and profitability of the factory. You are being asked to verify their predictions or show them to be inaccurate.

This work is an extension of the analysis of the case company. The task will be to investigate development options for the company using Dynamic Simulation with the Simul8 (Links to an external site.) suite. You will need to build and test/validate your own model and use it to explore alternative scenarios for the future of the business.

In this assessment, you are asked to provide an estimate of lower and upper limits of production over the course of a year, and an analysis what can be done to improve the situation.

Modelling expansion options at Cristallo eMotorbikes

1. Introduction

In the simul8 workshops you worked to develop a Simul8 model of the current Cristallo factory. In **assignment 2** you will work individually, improving on that model, to pursue expansion options.

The Cristallo factory is moving to a 24/7 weekly production cycle. Operationally, bikes are transported from assembly station to the next one automatically. Each activity station has 4 shift workers. When bikes arrive at a workstation, they are queued up until a space becomes available with one of the workers. Each work station can hold up to a maximum of 30 bikes in its queue.

Management are also determined to address their quality issues. They have been presented with a number of options to address the quality issues in production, and increase the throughput of orders and profitability of the factory.

In the first instance, the production and marketing managers have noted that the most popular models are models 1 and 2:

- Comici
- Delgard

Which sell in approximately the same numbers, and both more than twice the sales of models 3 and 4:

- Rossi
- Torre

However, there have been growing problems with Power System 1, which is used in models 1 and 2. Furthermore, the more expensive power system of models 3 and 4, cause far fewer production difficulties. Management has decided to explore production of the two models 1 and 2, but to use Power System 2 in their construction rather than Power System 1.

Cristallo have never had a dynamic simulation done for them to highlight bottlenecks or issues. They have worked in the past with a preferred shift requirement of 4 people to each activity. They would like to see how many motorbikes they can complete in a year with that setup. They also know that the minimum they can run on each shift is 2 people to each process. So, they also want to know how many bikes can be produced with only 2 people to each process for a year. They will then know a lower and an upper figure for yearly production of bikes. They have asked you to calculate that limit for them.

Management have estimated on paper that they should be able to produce 4000 models per year, and if so, they will be able to make these changes sustainably. However, any production number above 4500 models produced per year would make it possible for new investments to be made to allow for expansion and higher sales.

Management are keen to know if the targets are achievable. If the numbers are not achievable, they would want to know if it would be possible to make changes so that production targets are reachable. If your model shows that production surpasses 4000 per year, management wish to know what are the maximum numbers that can be achieved. You are to explore these issues using simul8 and report back to management.

Key Objectives

1. **Produce** an adapter simul8 model showing how the factory could operate the 6 shifts (weekday and weekend), with two of their models being produced at an expected throughput of 4000 models per year, equally spread between models 1 and 2, using Power System 2 rather than Power System 1. Use analysis from your first case study in your model building.
2. Produce the lower and upper figure estimates for the year of working with 2 people per activity per shift; and 4 people per activity per shift. **Describe** the models you have made, ensuring that you describe all elements used in the model, justify each model produced with **trials and verification**, and refer to outputs you have produced in Simul8.
3. **Run the models for one year**, reporting on the number of motorbikes that can be completed, and any issues you see in production (assume for the moment that queues can hold a maximum of 30 incoming units).

4. **Interpret the results** of the simulation made, answer direct questions of management, and offer suggestions to management on the viability of this arrangement and any production issues they should prepare for. In particular, if there are any queues that cause significant backlogs, make suggestions to management for dealing overcoming the problems.

5. Write a report containing:

   - Executive summary: briefly stating the **key objectives**, methods, results and recommendations
   - Produce a contents page, with list of figures
   - Provide a description of your simul8 models, highlighting the key features (this must include material derived the analyses of assignment 1 and emphasising the enhancements)
   - Provide the required management solution and an analysis of what this will mean for the business, addressing all of the **key objectives**.
   - Provide your recommendations: interpreting the results of the analysis and the consequent suggestions for management action