applying a Monte Carlo analysis to project management

estimating the overall project duration in collaborative R&D projects

		Task duration [days]		
		Min	Max	Dependencies
Task 1	Person 1	1	6	
Task 2	Person 1	3	15	Task 1
Task 3	Person 2	2	5	
Task 4	Person 2	1	5	Task 3
Task 5	Person 1	4	10	Task 2 & 4

Figure 1: Summary of the tasks, task durations and dependencies

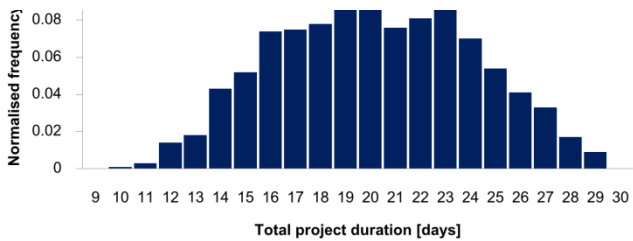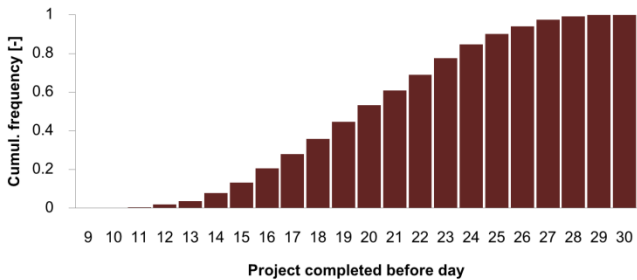**Figure 2:** Overall project duration estimate based on task duration estimates

Figure 3: Probability of completing the project before the day

SUMMARY

• MoDS was applied to estimate the overall duration of a project

• Project tasks were broken down and maximum and minimum duration estimates made

• A Monte Carlo analysis was carried out to determine the probability of meeting a 20 day project deadline.

Meeting a project deadline is often critical to a business as it can be the difference between success or failure. Hence quantifying the overall project duration at the planning stage is an important aspect of meeting that deadline. Identifying, estimating and quantifying known project risks is good practice for all project managers as these can be applied to estimate task risks and to propagate these estimates forward to an overall estimation of project duration.

THE CHALLENGE

A Monte Carlo analysis feature within MoDs was applied to estimate the overall duration of the project represented by the tasks summarised in Figure 1. Senior managers would like to know the probability that the project will be complete within, say 20 days.

APPLYING A MONTE CARLO ANALYSIS

The project was planned to be broken down into the five tasks listed in Figure 1. The task maximum duration *i.e.* worst case scenario, and minimum duration, *i.e.* best case scenario were estimated. It was considered that these tasks would be carried out within these timeframes according to a normal distribution.

The project was to spilt between two persons with Person 1 completing Task 1 and Task 2 before moving onto Task 5. Person 2 would complete Tasks 3 and 4. Due to this constraint on resources, dependencies were added according to Figure 1. In addition, Task 5 could only be started once Tasks 2 and 4 were complete.

The simple model to describe the project duration, D is and Tasks, T can be summarised as

$$D=\max[(T_1+T_1),(T_3+T_4)]+T_5$$

A Monte Carlo analysis was carried out using MoDS using 1000 random realisations.

RESULT

The results are presented in Figure 2 and 3, showing the estimate of the total project duration. The method can be used to quantify that the probability of successfully completing the project within fewer than 20 days is only 53%.