



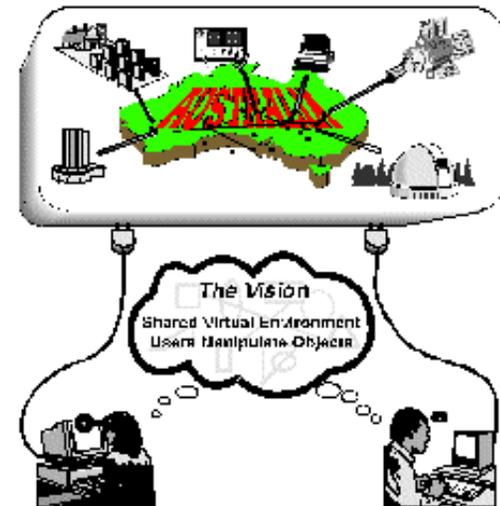
GridSim:

“Java-based Modelling and Simulation of Deadline and Budget-based Scheduling for Grid Computing”

Rajkumar Buyya and Manzur Murshed

Monash University,
Melbourne, Australia

www.buyya.com/ecogrid



www.gridcomputing.com

Simulation Parameters

- Resources
 - Cost : cheapest: 10, Expensive: 20 (normal distribution for costing).
 - Speed: 0.5 to 1.5 (1, standard machine. normal distribution for speed).
- Users:
 - Users job contains 20 tasks with variation of +/-2 with random submission.
 - Users submitted jobs only after completion of previous job.
- Jobs = 20 tasks
 - Each task takes 50units.
 - Heterogeneous tasks (future)
- Simulation Time = $7 \times 60 \times 60$ units (approx.7hours).
- As the number of users grows, the probability of getting at least one resource per user, throughout the deadline, decreases.
- This low probability demands high ($\gg 1$) *D_Factor* and *B_Factor* in order to achieve very high job completion rate.

D-Factor

Job_Time_{MAX} = Time to process all the tasks, serially,
using the slowest resource

Job_Time_{MIN} = Time to process all the tasks, in parallel,
giving the fastest resource the highest priority

$$D_Factor = \frac{Deadline - Job_Time_{MIN}}{Job_Time_{MAX} - Job_Time_{MIN}}$$

- Any job with $D_Factor < 0$ would **never** be completed
- *As long as some resources are available throughout the deadline,* any job with $D_Factor \geq 1$ would **always** be completed

B-Factor

Job_Cost_{MAX} = Cost to process all the tasks, in parallel within *deadline*, giving the costliest resource the highest priority

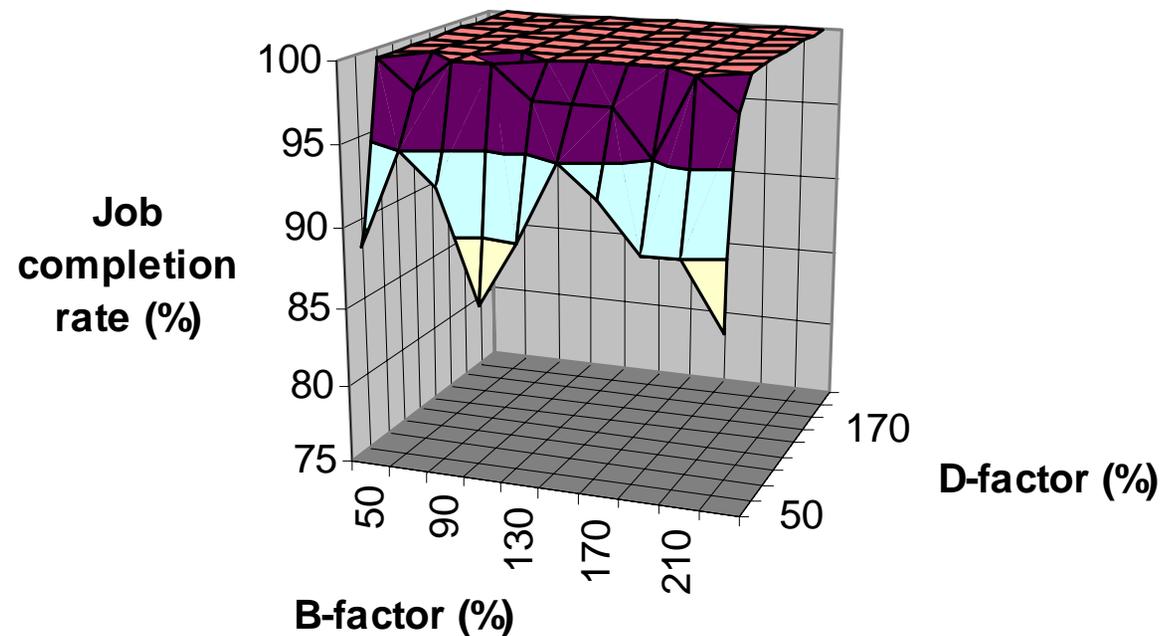
Job_Cost_{MIN} = Cost to process all the tasks, in parallel within *deadline*, giving the cheapest resource the highest priority

$$B_Factor = \frac{Budget - Job_Cost_{MIN}}{Job_Cost_{MAX} - Job_Cost_{MIN}}$$

- Any job with **$B_Factor < 0$** would **never** be completed
- *As long as some resources are available throughout the deadline*, any job with **$B_Factor \geq 1$** would **always** be completed

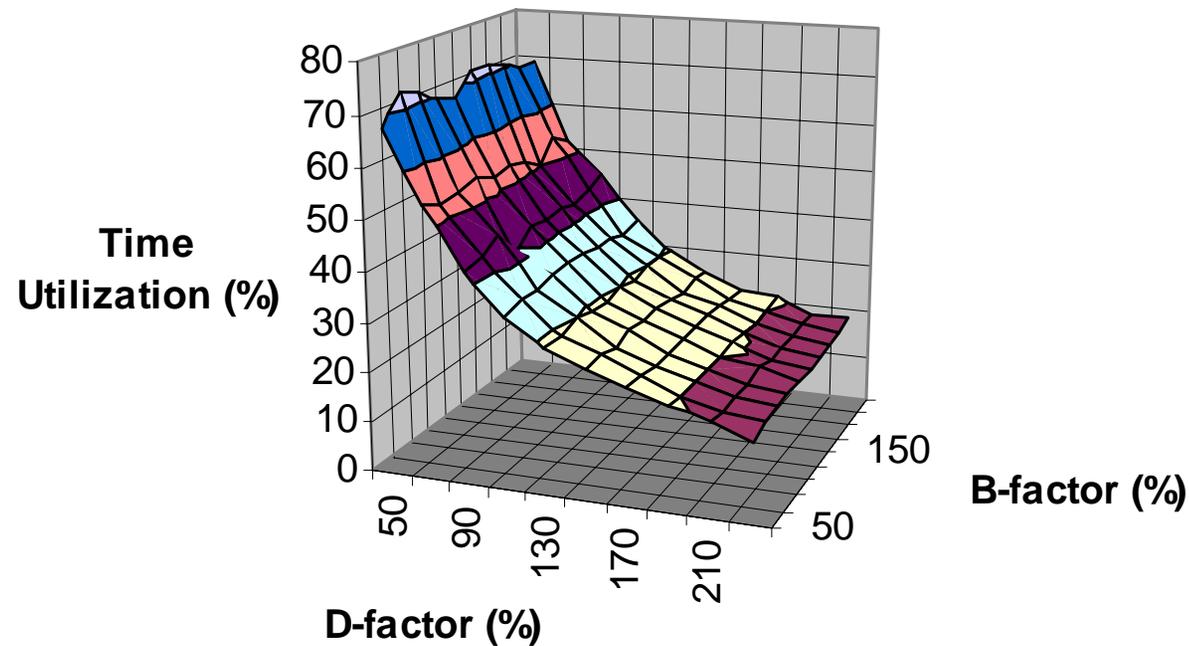
Job Completion & Time Optimise

Users=21, Resources=25, Optimization: TIME



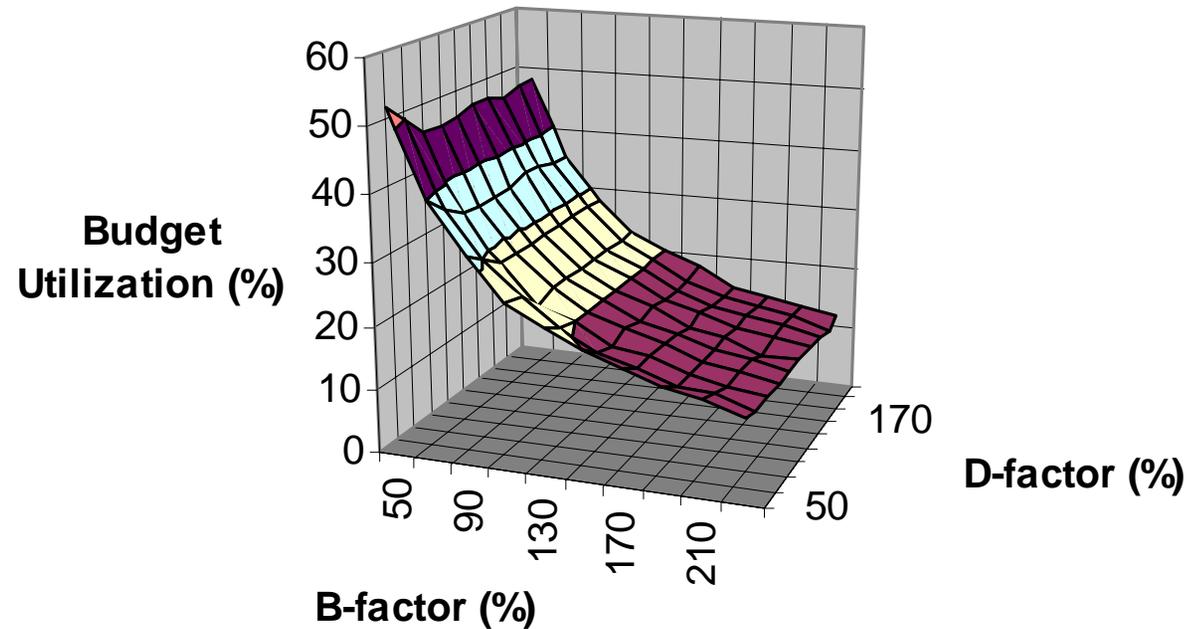
Time Utilisation & Time Optimise

Users=21, Resources=25, Optimization: TIME



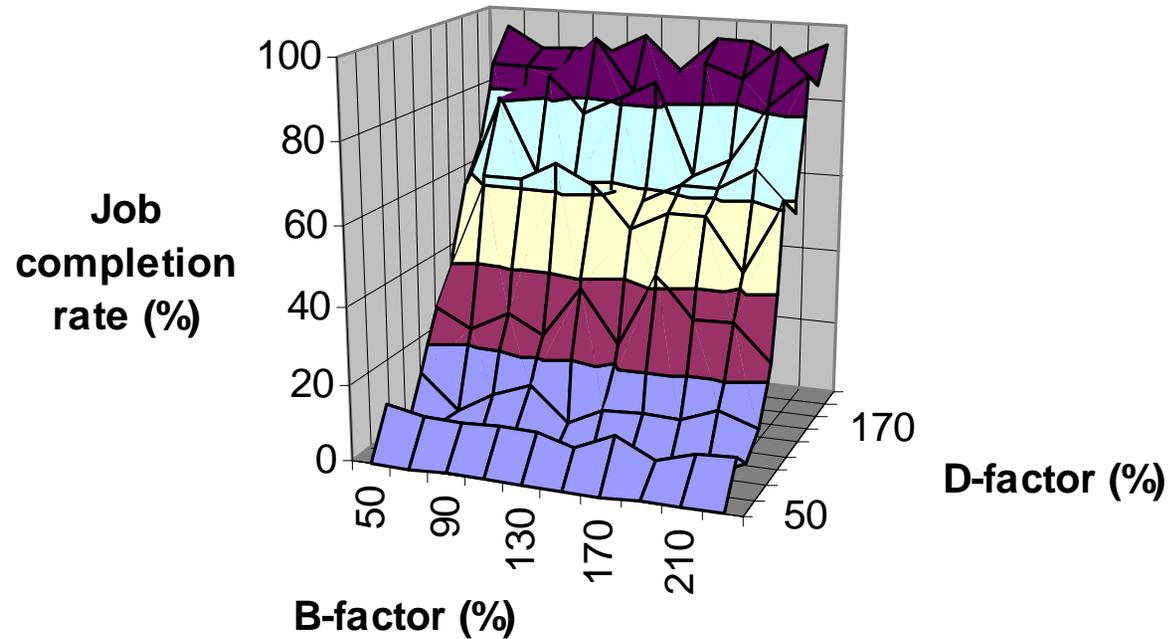
Budget Utilisation & Time Optimise

Users=21, Resources=25, Optimization: TIME



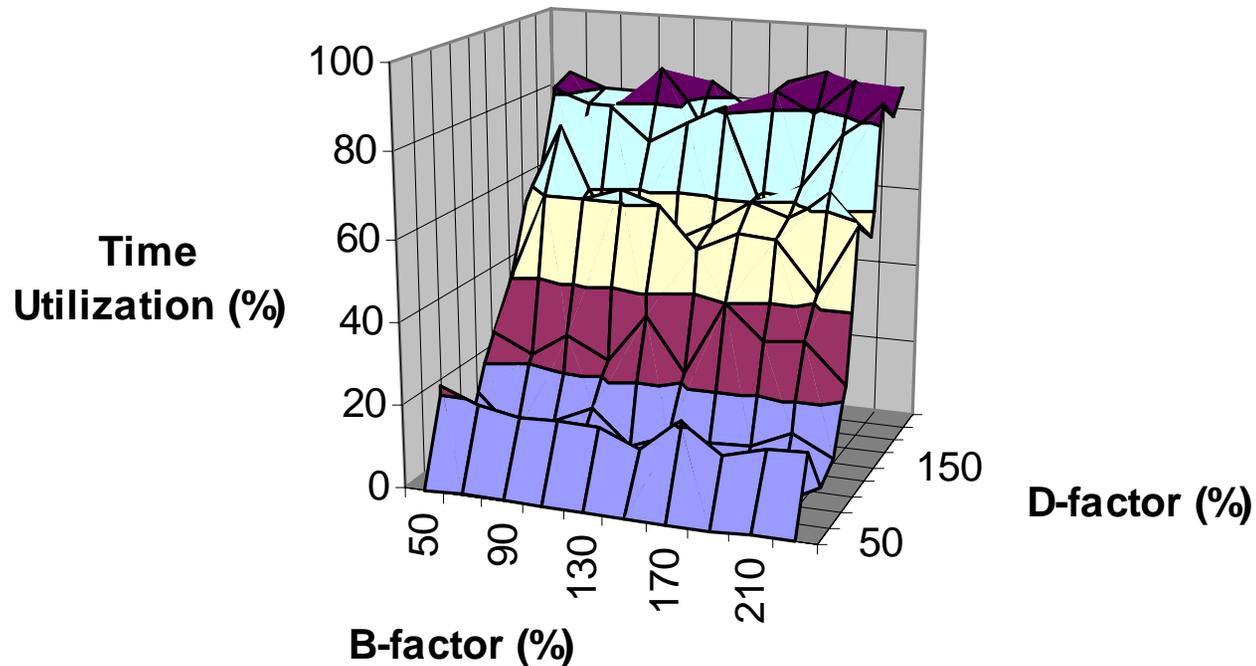
Job Completion & Cost Optimise

Users=21, Resources=25, Optimization: COST



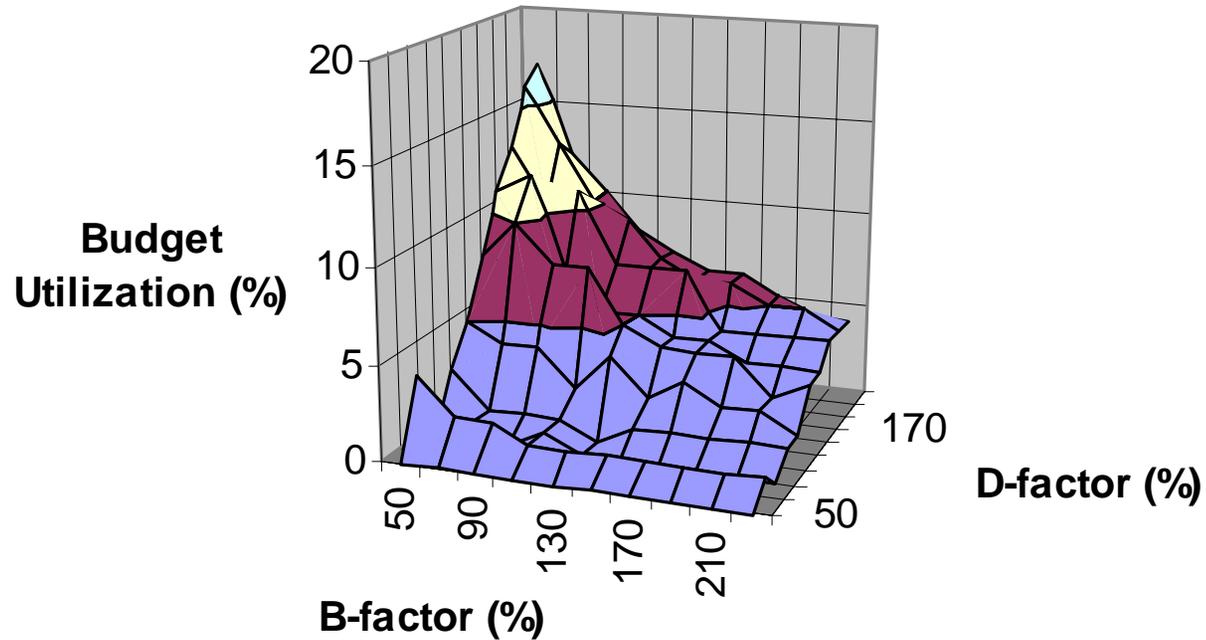
Time Utilisation & Cost Optimise

Users=21, Resources=25, Optimization: COST



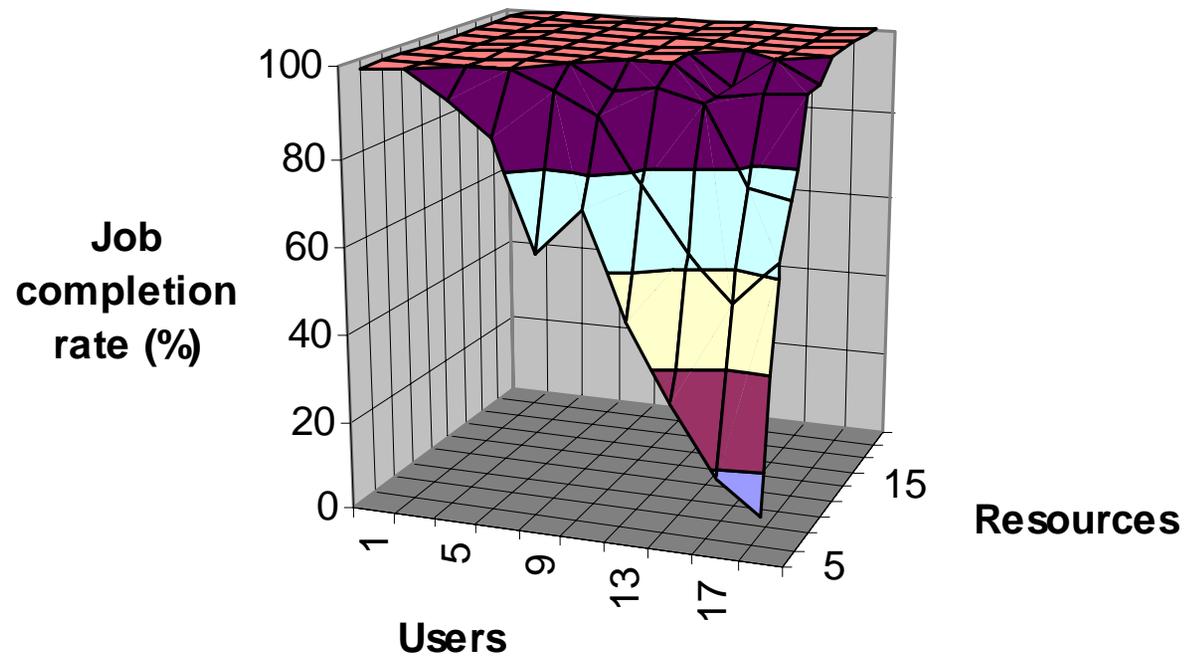
Budget Utilisation & Cost Optimise

Users=21, Resources=25, Optimization: COST



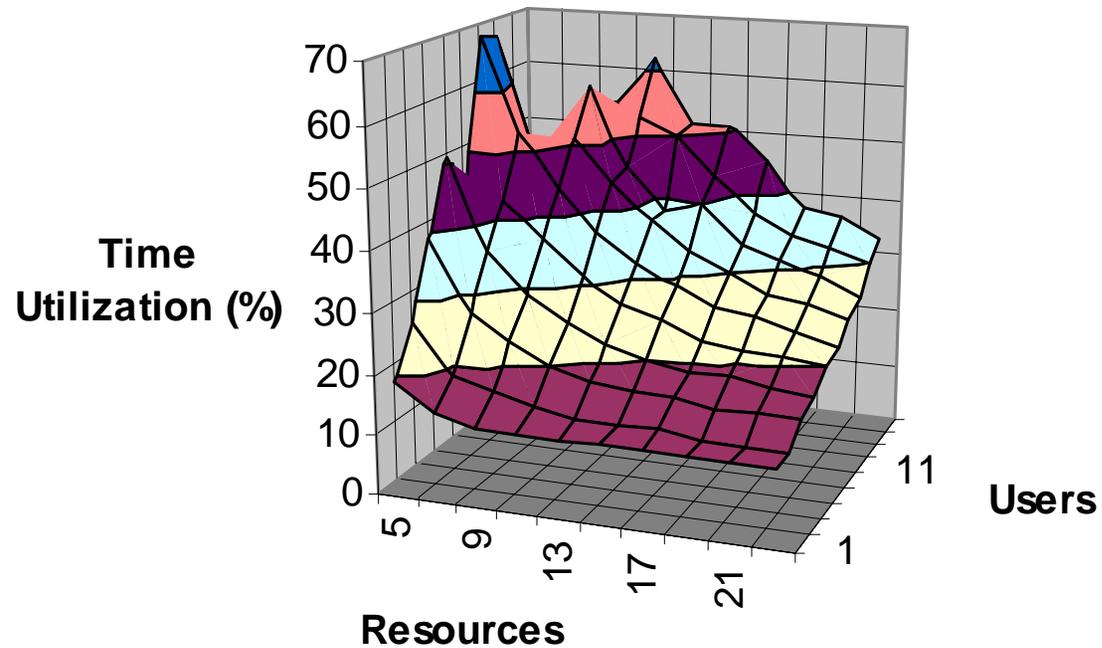
Job Completion for Optimise Time

B-factor = D-factor = 110%, Optimization: TIME



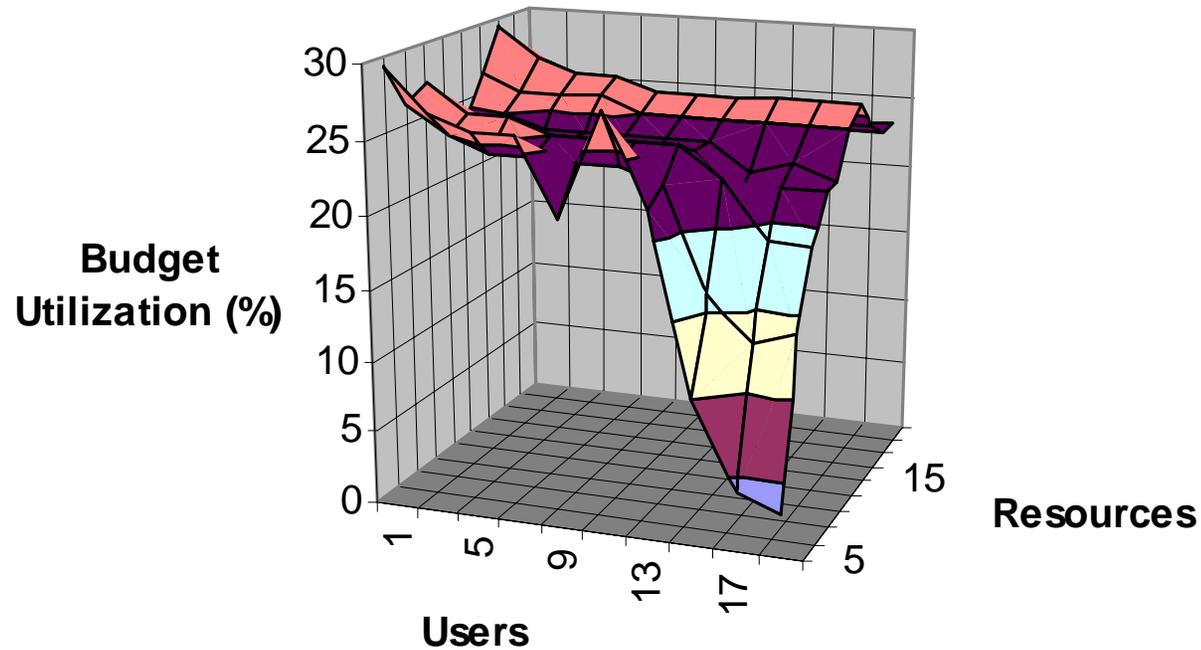
Time Utilisation for Optimise Time

B-factor = D-factor = 110%, Optimization: TIME



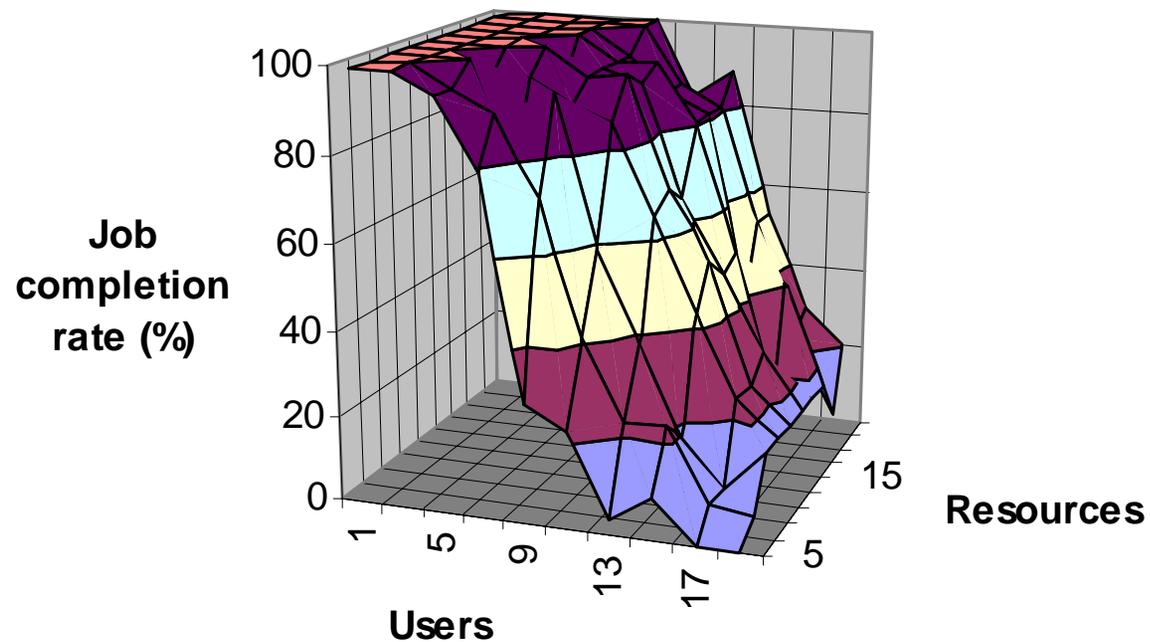
Budget Utilisation for Optimise Time

B-factor = D-factor = 110%, Optimization: TIME



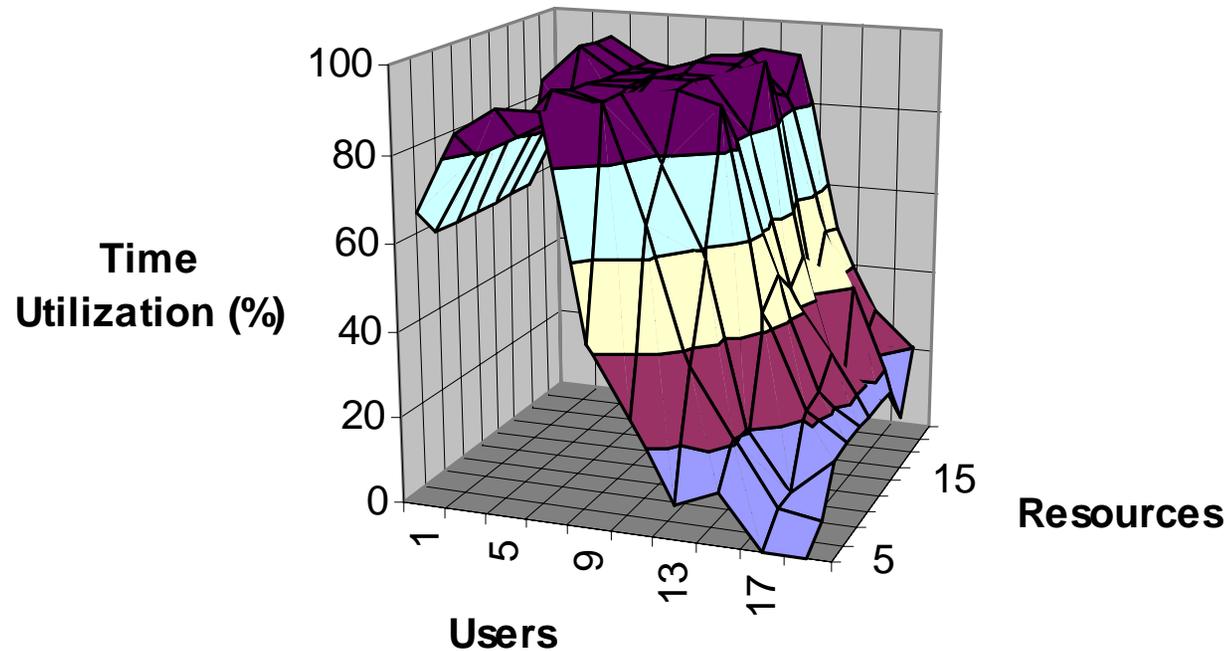
Job Completion for Optimise Cost

B-factor = D-factor = 110%, Optimization: COST



Time Utilisation for Optimise Cost

B-factor = D-factor = 110%, Optimization: COST



Budget Utilisation for Optimise Cost

B-factor = D-factor = 110%, Optimization: COST

