



Workshop – April 12th – 13th – 2012
Decision Support Systems & Operations Management
Trends and Solutions in Industries

COLLABORATIVE MANUFACTURING PLANNING AND SCHEDULING SYSTEMS

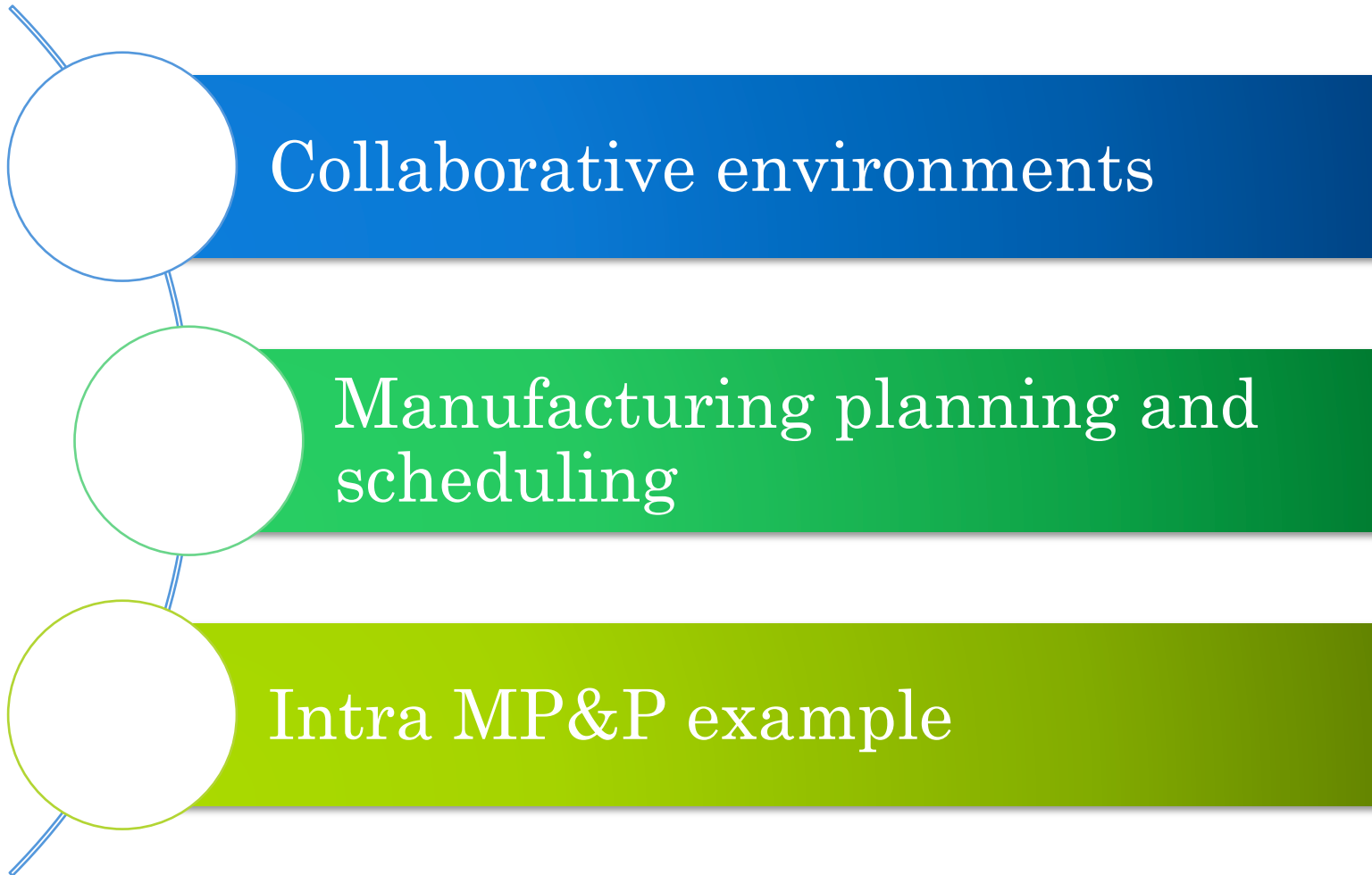
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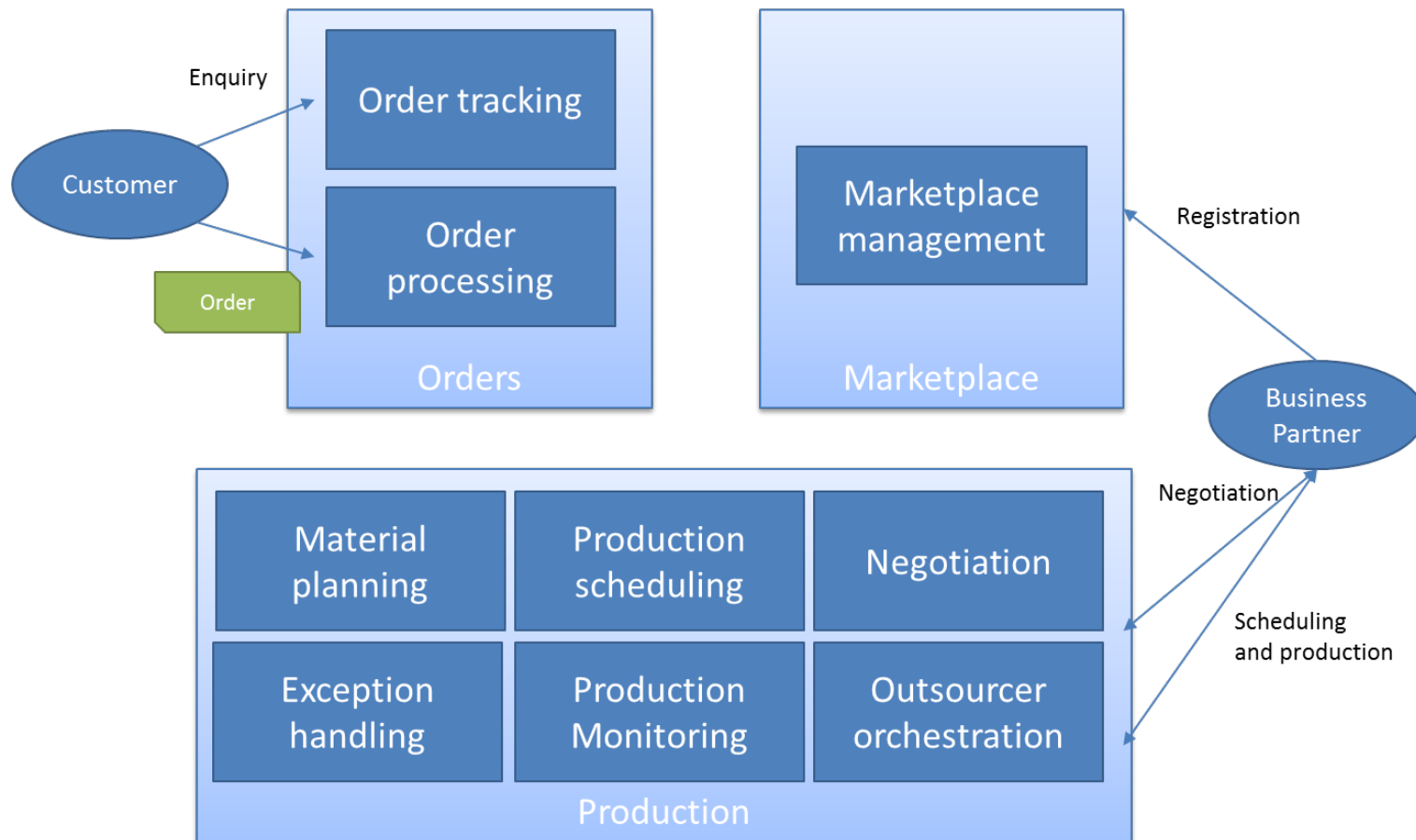
CONTENTS



COLLABORATIVE SYSTEMS

- Distributed factories or divisions require new ways of effective collaboration among all production units and stakeholders including suppliers and outsourced service providers
- Main characteristics for dynamic/collaborative environment:
 - Flexibility,
 - Timeliness,
 - Adaptability

COLLABORATIVE SYSTEM MANUFACTURING ENVIRONMENT



WEB-BASED MP&S

- Automating data transactions
 - E.g. direct XML data transfer
- Sharing MP&S resources and services
 - E.g. producing specialized parts on distant factories
- Structuring system in decentralized and distributed fashion
 - E.g. including several modules replicable and running on different machines
- Improved support for strategic and tactical decisions within MP&S network
 - E.g. real-time access to global information can help negotiations
- Web-based Scheduling tools: Legin, Lisa, NEOS etc...

OBJECTIVE

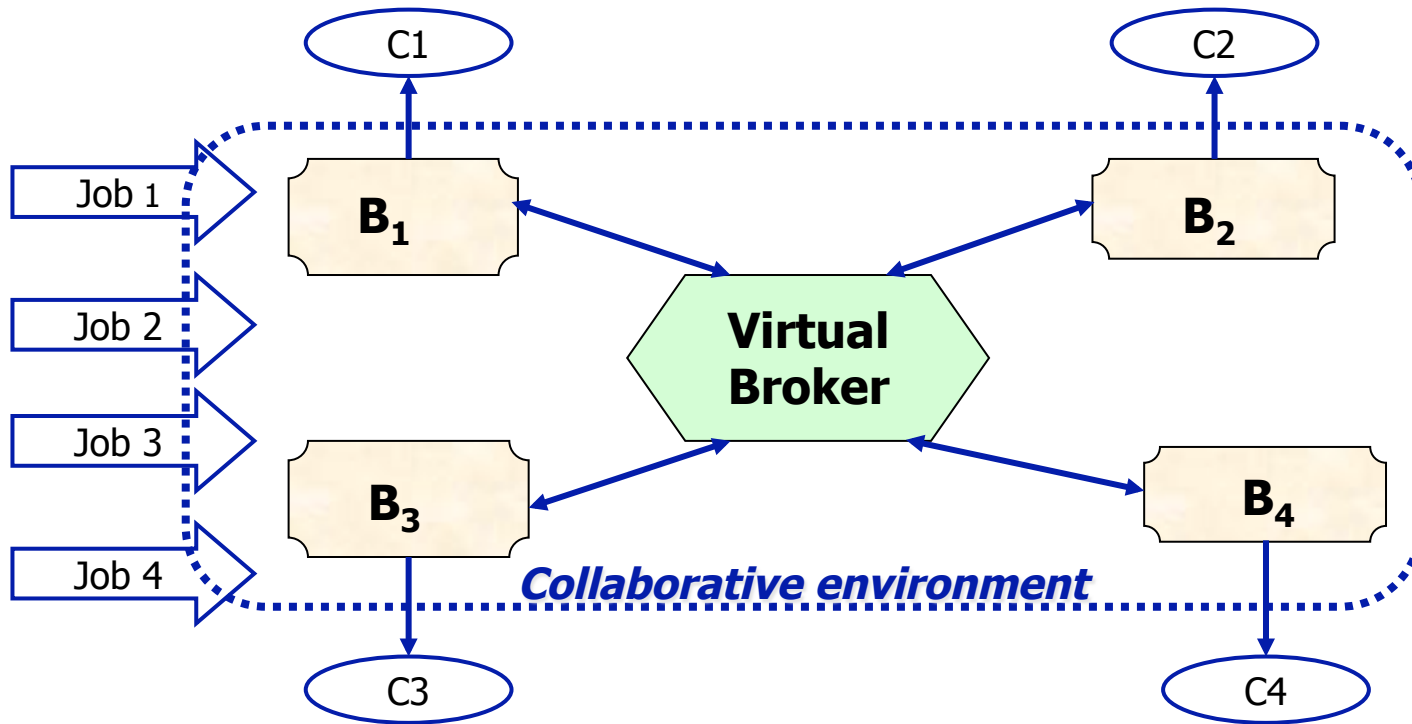
- To show, through an illustrative example, how collaborative MP&S enable improved decision support in web-based manufacturing solving processes
- Illustrative example:
 - 4 business partners ($B_1 \dots B_4$)
 - 4 distinct jobs each B_i can perform ($J_1 \dots J_4$)
 - 4 distinct scenarios ($R_1 \dots R_4$) where each B_i will produce either 1,2,3 or 4 jobs
 - 4 clients, each close to a B_i ($C_1 \dots C_4$)

○ Illustrative example:

- 4 business partners (B1...B4)
- 4 distinct jobs each Bi can perform (J1...J4)
- 4 distinct scenarios (R1...R4) where each Bi will produce either 1,2,3 or 4 jobs
- 4 clients, each close to a Bi (C1...C4)

COLLABORATIVE SYSTEM

ILLUSTRATIVE EXAMPLE



Illustrative example:

- 4 business partners
- 4 distinct jobs
- 4 distinct scenarios

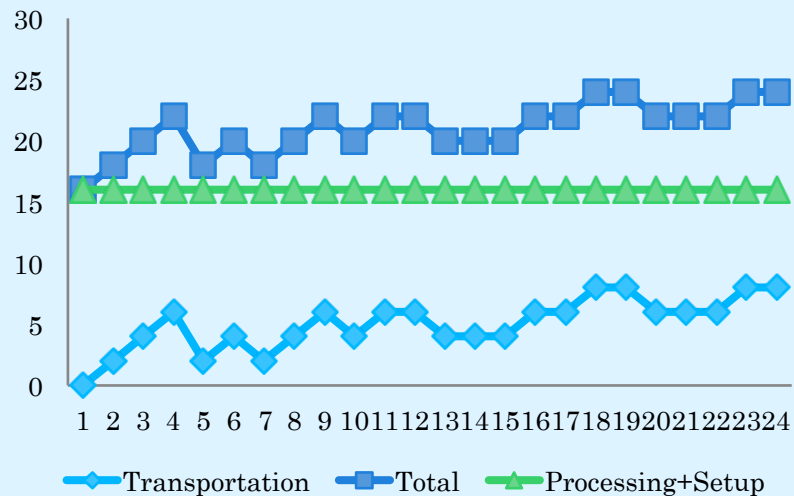
Transportation costs [i-j]

- Set-up 0.8 (all in same B_i), 1.5 (3 same B_i), 2 (2 same B_i), 3 (1 B_i)
- Processing -4 each

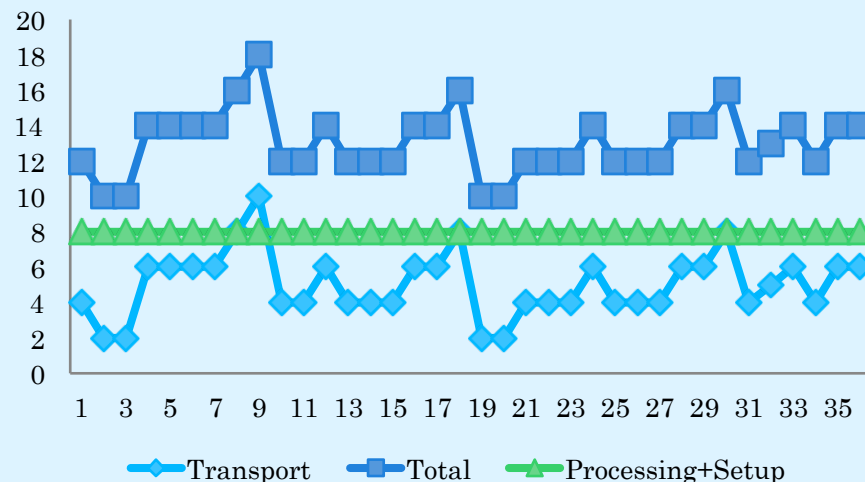
COLLABORATIVE SYSTEM: EXAMPLE

PROCESSING AND DELIVERING JOBS TO CLIENTS

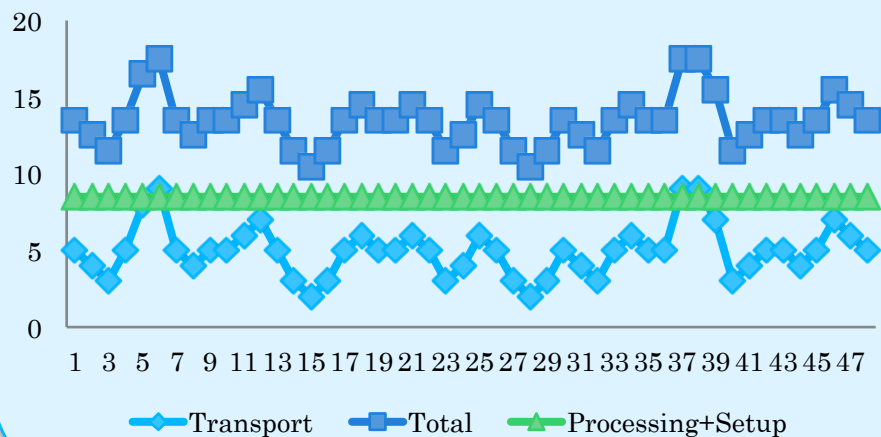
- Scenarios considering only 1 job per business include 24 situations;
- Scenarios considering 2 jobs per business include 36 situations. These occur when 2 of the 4 jobs will be processed on 1 of 4 businesses available and remaining 2 jobs on another available business;
- Scenarios considering 3 jobs include 48 situations that arise from the context of processing three of the set of the four jobs on one of the four businesses available and the remaining job being processed on another business of the four available;
- Scenarios considering 4 jobs include 4 different situations corresponding to processing each set of four jobs on 1 of the 4 businesses available;



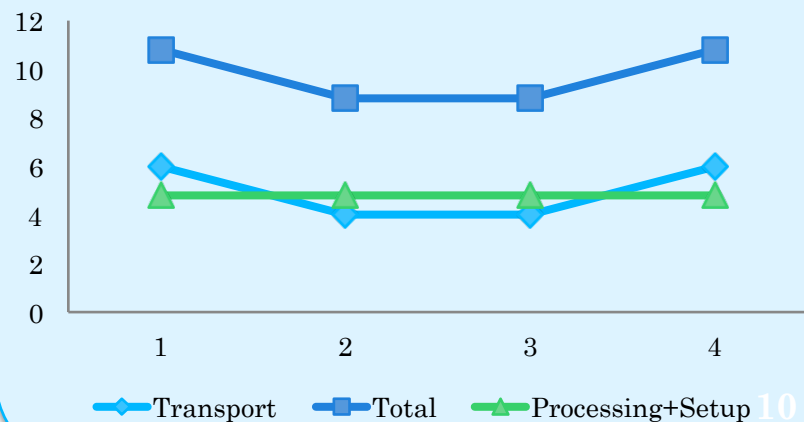
$$S1 = R_1^1, \dots, R_1^{24}$$



$$S2 = R_2^1, \dots, R_2^{36}$$

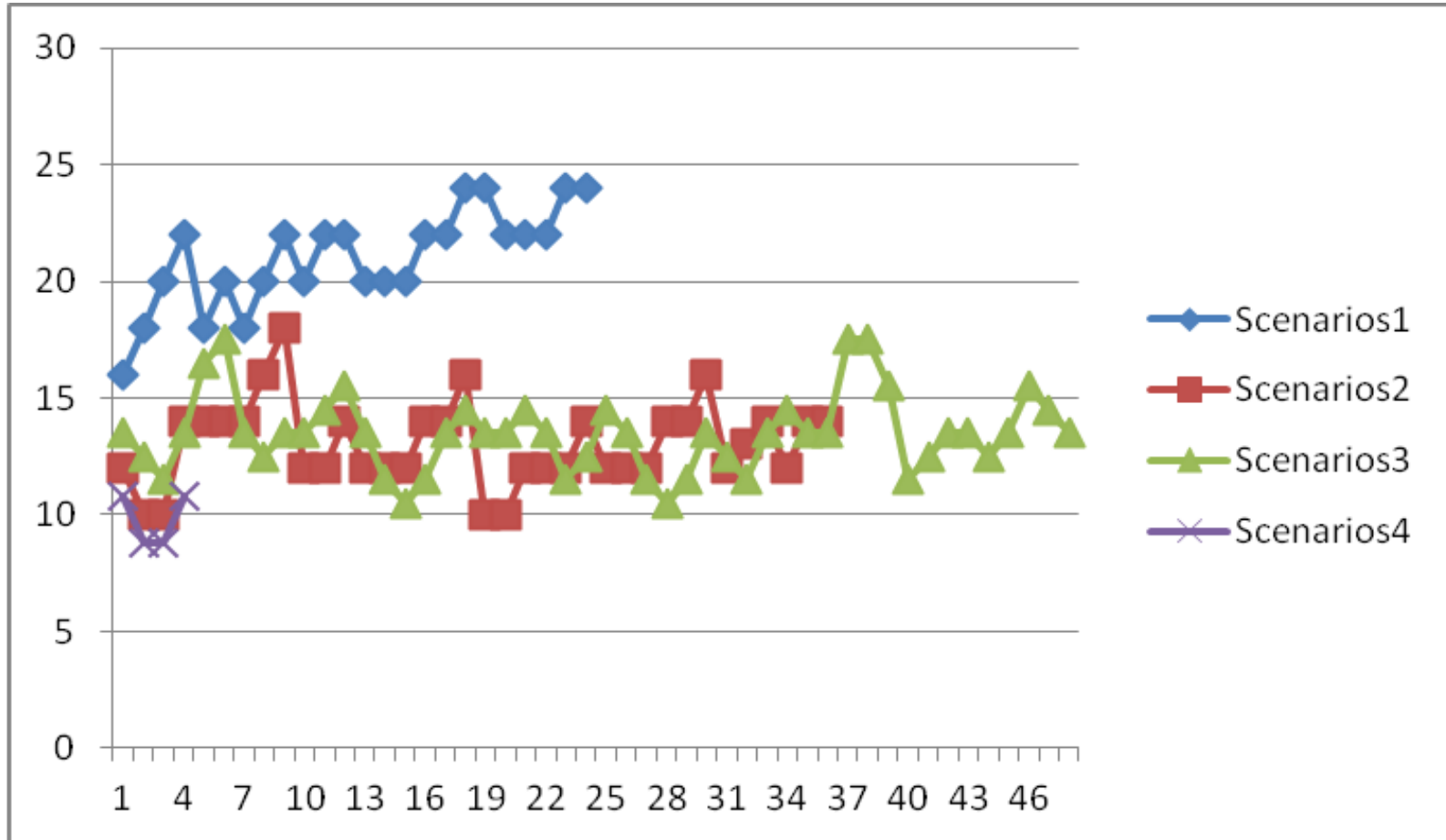


$$S3 = R_3^1, \dots, R_3^{48}$$



$$S4 = R_4^1, \dots, R_4^4$$

COLLABORATIVE SYSTEM RESULTS OBTAINED



COLLABORATIVE SYSTEM

BEST MINIMUM FOR EACH SCENARIO

Scenario $R_1^1 = \{(B_1, J_1); (B_2, J_2); (B_3, J_3); (B_4, J_4)\} = 16$

Scenario $R_4^2 = \{(B_2, J_1, J_2, J_3, J_4)\} = 8.8$

Scenario $R_4^3 = \{(B_3, J_1, J_2, J_3, J_4)\} = 8.8$

Scenario $R_2^2 = \{(B_1, J_1, J_2); (B_3, J_3, J_4)\} = 10$

Scenario $R_2^3 = \{(B_1, J_1, J_2); (B_4, J_3, J_4)\} = 10$

Scenario $R_2^{19} = \{(B_2, J_1, J_2); (B_3, J_3, J_4)\} = 10$

Scenario $R_2^{20} = \{(B_2, J_1, J_2); (B_4, J_3, J_4)\} = 10$

Scenario $R_3^{15} = \{(B_2, J_1, J_2, J_3); (B_4, J_4)\} = 10.5$

Scenario $R_3^{28} = \{(B_1, J_1); (B_3, J_2, J_3, J_4)\} = 10.5$

Note: B1 and B2 stronger position to negotiate....

SUMMARY

- Web-based MP&S model should be **flexible** and **adaptable** and can be used in different scheduling problems
- Illustrative example to demonstrate the need for decision making support in collaborative/negotiation environments
- Collaborative MP&S contribute to businesses competitive strategy.

FUTURE WORK

- **Develop platform for solving MS problems in real-time distributed manufacturing environment (intra and inter scenarios)**
- **Consider the spatial-temporal evolution (dynamic decision model)**
- **Consider a collaborative network with dynamic integration of partners**
- **Explore prediction and negotiation models combined with collaborative MP&S**

A decorative graphic on the left side of the slide. It features several vertical stripes in various shades of blue and light blue. Overlaid on these stripes are several circles of different sizes, also in shades of blue. One large circle is positioned near the top, and several smaller circles are scattered below it, some overlapping the stripes.

THANKS FOR YOUR ATTENTION!

Questions?