Conceptual design and simulated operation of economies of scope and scale manufacturing enterprises

This item was submitted to Loughborough University's Institutional Repository by the/an author.

Additional Information:

- A Doctoral Thesis. Submitted in partial fulfillment of the requirements for the award of Doctor of Philosophy of Loughborough University.

Metadata Record: https://dspace.lboro.ac.uk/2134/8300

Publisher: © Zihua Cui

Please cite the published version.
Top level Context Diagram

Project Engineer Commercial Furniture

- DM1 General Raw Material Supplier
- DM2 Sub-Contractor (Various)
- DM3 Metal Manufacturer (Laser)
- DM4 Sub-Contractor for Shop Fitting
- DM5 Contractor (Woodteam)
- DM6 Contractor (TDS)
- DM7 Customer (general)
- DM8 Customer (Specific Next)
- DM9 Transporters (various)
- DM10 Contractor (Advance)
Sub-interaction diagram related to BP4 and BP5

BP4.1 Obtain Order

BP4.2 Order Processing and Production Planning

Cutting list, due date

BP4.3 Machining

Production capacity, availability

Raw MDF, Pre-finished material, parts

Feedback, WIP inventory

Flat pack

Flat pack

Finished goods, Flat pack

BP4.4 Assembly

BP4.5 Warehousing and delivery

Order specification, due date

Order confirmation

Wood Manufacturing (Advance)

BP5.2.3 Raise purchase order

Raw material, parts

cutting list, material requirement, WIP list, CNC program

Order confirmation

Raw material, parts

Cutting list, material requirement, WIP list, CNC program

Project Title: Wood Manufacturing (Advance)

Modelled by: Tracy Cui

Created: 28/04/2008

Updated: 2007-7-17
Structure diagram for DP4 Wood Manufacturing

**General Blocks**
- CIMOSA Domain
- Non-CIMOSA Domain
- Activity
- External Link
- Event
- Information
- HR
- Physical
- Finance
- Conditional
- OR
- AND
- Sub-Process
- Chained Process
- Delay
- Flow of Resource
- Flow of Process
- Flow of Activity
- Alternative Flow
- Direct Generation
- Direct Supportive
- Indirect Supportive

**Resources**
- BP4.1 Obtain Order
  - BP4.1.1 Enquiry by Woodteam or external customer
  - BP4.1.2 Pricing
  - BP4.1.3 Confirm order

- BP4.2 Order Processing and Production Planning
  - EA421 Produce cutting list
  - BP4.2.2 Material purchase
  - EA422 Update WIP list and select next job
  - EA423 Prepare CNC program

- BP4.3 Machining
  - EA431 Beam saw cutting to size
  - EA432 CNC cutting
  - EA433 Sanding
  - EA434 Pressing
  - EA435 Edge banding (optional)
  - BP4.3.1.1 Transfer to lboro or customers

- BP4.4 Assembly
  - Sanding and Spraying EA 441
  - Assemble EA442
  - Secondary machining EA 443
  - Edge banding EA 444
  - Packaging EA445
  - Prototyping EA 446

- BP4.5 Warehousing and Delivery
  - Receive goods EA451
  - Storing EA 452
  - BP4.5.1 Delivery Goods to Customer

**Flow Type**
- Created: 27/04/2008
- Modelled by: ZC/AR
- Revised by: Z.Cui
- Updated: 2008-4-27

**Project Title:** DP4 Wood manufacturing
Structure diagram of BP5 Project Managing

BP5.1 Obtain Order From Customer
- BP5.1.1 Win new shop fitting and kit order process
- BP5.1.2 Win new Kit order process
- BP5.1.3 Win Existing shop fitting & kit order

BP5.2 Manage Order Fulfilment
- Receive order EA 521
- Assign PM EA 522
- Enter job to system EA 523
- Check feasibility EA 524
- Negotiate with Suppliers BP 5.2.1
- Negotiate with manufacturers BP 5.2.2
- Raise purchase order BP 5.2.3
- Monitor arrivals EA 525
- Arrange transports BP 5.2.4
- Generate deliver note EA 526
- Receive deliver acknowledgement EA 527
- Prepare invoice EA 528

BP5.1.1 Win New Shop Fitting and Kit order
- BP5.1.1.1 Discuss details with clients
- BP5.1.1.2 Pricing
- BP5.1.1.3 Sending quotation
- BP5.1.1.4 Accepting quotation

BP5.1.2 Win New Kit Order
- BP5.1.2.1 Discuss details with clients
- BP5.1.2.2 Pricing
- BP5.1.2.3 Sending quotation
- BP5.1.2.4 Accepting quotation

BP5.1.3 Win Existing Shop Fitting & Kit Order
- BP5.1.3.1 Public relation visits clients
- BP5.1.3.2 Client require details
- BP5.1.3.3 Pricing and quoting
- BP5.1.3.4 Send quote to client
- BP5.1.3.5 Accept quote
- BP5.1.3.6 Client raise order

General Blocks Resource Flow Control Logic Flow Type Operation Type

Loughborough University

Created: 28/04/2008

Modelled by: Tracy Cui

Updated: 2007-7-17

Project Title: Project Managing

Page: 5 OF 9

Revision: 1

Revised by: Z.Cui
Activity diagram of BP5.1 Obtain order from customers

- **Client approach**
  - **Meeting arrange**
  - **Give presentation to client**
  - **Discuss shop fitting details with clients**
  - **Discuss kit details with clients**
  - **Pricing and quoting**
  - **Send quote to client**
  - **Accept quote**
  - **Client place order**

- **BP5.1.1.1**
  - **BP5.1.1.2**
  - **BP5.1.1.3**
  - **BP5.1.1.4**
  - **BP5.1.1.5**

- **BP5.1.2.1**
  - **BP5.1.2.2**
  - **BP5.1.2.3**
  - **BP5.1.2.4**
  - **BP5.1.2.5**

- **BP5.1.3.1**
  - **BP5.1.3.2**
  - **BP5.1.3.3**
  - **BP5.1.3.4**
  - **BP5.1.3.5**
  - **BP5.1.3.6**

**Flow Control Logic**
- Conditional
- OR
- AND
- Sub-process
- Chained process
- Delay

**Flow Type**
- Flow of Resource
- Flow of Process
- Alternative Flow

**Operation Type**
- Direct Generation
- Direct Supportive
- Indirect Supportive

**General Blocks**
- CIMOSA Domain
- Non-CIMOSA Domain
- Activity
- External Link
- Event
- Information
- HR
- Physical
- Finance

**Resources**
- Physical
- Finance

**Project Title:** Activity diagram of BP5.1 Obtain order from customers

**Created:** 28/04/2008

**Modelled by:** Tracy Cui

**Updated:** 2008-4-28

**Page:** 6 OF 9

**Version:** 1

**Revised by:** Z.Cui
activity diagram of bp5.2 Manage order fulfilment process

Project Title: EA521
Receive order

EA522
Assign Project manager

EA523
Enter job into system

EA524
Check feasibility

BP5.2.1
Negotiate with wood manufacture

BP5.2.2
Negotiate with metal manufacture

BP5.2.3
Negotiate with sub-contractors

BP5.2.4
Raise purchase order for wood

BP5.2.5
Raise purchase order for metal

BP5.2.6
Raise purchase order for parts

BP5.2.7
Arrange transports

EA525
Monitor arrivals

Generate deliver note EA 526

Receive deliver acknowledgement EA 527

Prepare invoice EA 528
activity diagram for BP4.3 and BP4.4

EA431 Beam saw cutting to size
EA432 CNC cutting
EA433 Sanding
EA434 Pressing
EA435 Edge banding (optional)
BP4.3.1 Transfer to lboro or customers
EA436 Prototyping

Sanding and Spraying EA 441
Spray 1st coat EA 4411
Air dry (2-3hrs) EA 4412
Sanding EA4413
Spray top coat EA4414
Air dry (min 12hrs)
Assemble EA442
Secondary machining EA 443
Edge banding EA 444
Packaging EA445

Prototyping EA 446