MODELIZATION OF CSSD’s ORGANISATION: A REAL HELP TO MANAGE A PROJECT

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ANNUAL WFHSS & JMSI CONFERENCE 2012 OSAKA
13TH WORLD STERILIZATION CONGRESS
CHRU Lille:

- 1 sqkm
- about 3000 beds
- 90 operating rooms
- 13000 employees
PROJECT:

- To build a new CSSD (super center) for 5 hospitals
- As a replacement for 7 CSSD
- It means:
  + New organizations
  + Logistics
  + Automatization of the process
  + .....
ISSUE??

- How to size properly:
  - Operators?
  - Equipments (washer disinfectors, steam sterilizers, shuttles....)?
  - Surfaces?

- How to determine accurately:
  - Running hours? Day and night? 1,2 or 3 shifts a day?
  - Logistics: How many times a day?
  - Process time (including logistics)?
IS EXPERIENCE ENOUGH???

- It helps but...
- Organizations are changing:
  + automatization
  + logistics by road instead of lifts
- So: to ensure:
  + Experience: yes
  + But supplemented with......

MODELIZATION
Modelization: consists in developing a model of a real system and recreating its organisation.

The simulation stage: consists in running the model in order to know its dynamic performance and predict the future performance.
INTRODUCTION > Modelization tools

- Modelization/flows simulation tools are commonly used in car industry since the early 70’s to design and to optimize production lines.

- Evolution of softwares enable us today:
  - to modelize complex flows
  - to represent them in 3D:
    - showing the flows like in real
    - showing the layouts of buildings, work stations, conveyors belts...

- The tool presented here is: DELMIA/QUEST®.
1. Introduction to flows’ modelization
2. Stakes and expectations
3. Methodology - main stages
4. Examples
5. Conclusion
6. Questions/answers
2. Stakes and expectations

Modelization is a tool to help in conception and optimization:

Conception:
+ Designing and sizing:
  - Logistics flows
  - Facilities,
  - Equipments
  - Workstations
  - Conveyors
  - Human resources

Optimization:
- Different scenarii
- Identify the best one regarding:
  + Costs
  + Time of process
  + ....
2. Stakes and expectations

- To identify risks
- To identify issues

= Reassuring when dealing with a new project!!

- To define procedures for a smooth production’s organization
- To ensure working with efficiency at the best cost
1. Introduction to flows’ modelisation
2. Stakes and expectations
3. Methodology - main stages
4. Examples
5. Conclusion
6. Questions/answers
1. Analysis :
   1. Set aims
   2. Set the operating restrictions of the project
   3. Set the organisation of the process
   4. Collect the data

2. Modelization/simulation

3. Construction of the solution : working out of target scenarii

4. Directions

5. Outcome
Analysis & data’s collect  
Functionning  
Operating restrictions

Aims  
Production  
Performances

Modelization  
Production

Simulations

Blocking points

Validation current model

Performances Resultant

Supply chain’s Organisation  
(target)

Simulations (Target)

Directions

Outcome

Analysis

Modelization/ simulation

Construction of the Solution
SUMMARY

1. Introduction to flows’ modelization
2. Stakes and expectations
3. Methodology - main stages
4. Example:
   - CSSD « STERINORD »
5. Conclusion
6. Questions/réponses
**Situation/context**: New CSSD instead of 7 CSSD in 5 hospitals

Super center called **STERINORD**
The aims of the study:
- to validate that provided facilities are able to process all the MD to be processed per day
- and make certain that delivery times meet the requirements

The main expectations:
- Size the logistics areas (for shuttles of dirty MD and shuttles of sterile MD),
- Size the human resources
- Estimate the lead time of process
- Suggest rules and leadership tools to organize the work and smooth the production.
CSSD STERINORD’s STUDY

Stage 1: Analysis

Validation of data and organisation of the supply chain in the CSSD
The main data are:

- the sequences of the process
- the times per step
- the times of cycles in WD or steam sterilizers
- loads in WD or a sterilizer: how many trays in each
- number of trays per customer and per shuttle
The number of trays is an average increased of 10%.

Quantity = 1102 trays/day

### CSSD STERINORD’s STUDY : DATA

#### QUANTITY OF TRAYS – PER DEPARTMENT & PER GROUP

<table>
<thead>
<tr>
<th>Department</th>
<th>Indi</th>
<th>CC</th>
<th>AN</th>
<th>NX</th>
</tr>
</thead>
<tbody>
<tr>
<td>SALENGRO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bloc Traumatologie + septique</td>
<td>13</td>
<td>0</td>
<td>52</td>
<td>65</td>
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<tr>
<td>Bloc Neurochirurgie</td>
<td>12</td>
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<tr>
<td>Urgences chirurgicales</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>15</td>
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<td>0</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>Bloc Chirurgie Plastie</td>
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<td>0</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>Bloc Otoneurologie</td>
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<td>0</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>bloc Bruîle</td>
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<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Bloc Chirurgie Enfant</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>Sain CHU</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sain CHU</td>
<td>27</td>
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<tr>
<td>JDF</td>
<td></td>
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<tr>
<td>BLOC GYNECOLOGIQUE UF 4129</td>
<td>4</td>
<td>3</td>
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<td>20</td>
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<tr>
<td>BLOC OBSTETRIQUE UF 4100</td>
<td>4</td>
<td>3</td>
<td>0</td>
<td>28</td>
</tr>
<tr>
<td>CHIR AMBU</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Huriez</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BLOCs COMMUNS</td>
<td>10</td>
<td>10</td>
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<td>40</td>
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<tr>
<td>ORL bloc</td>
<td>6</td>
<td>3</td>
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<td>6</td>
</tr>
<tr>
<td>Bloc CMCA</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Bloc opht</td>
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<td>BLOC CCV UF 7610</td>
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<td>42</td>
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<tr>
<td>BLOC PM + EEP UF 7650</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Calmette</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bloc thoracique</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>COL</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Bloc COL</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Saclin</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chirurgie</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>36</td>
</tr>
<tr>
<td>Obstétrique</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>28</td>
</tr>
<tr>
<td>Roubaix</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PPG</td>
<td>18</td>
<td>0</td>
<td>0</td>
<td>66</td>
</tr>
<tr>
<td>Central</td>
<td>12</td>
<td>6</td>
<td>6</td>
<td>60</td>
</tr>
<tr>
<td>Tourcoing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Central</td>
<td>30</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>178</strong></td>
<td><strong>58</strong></td>
<td><strong>88</strong></td>
<td><strong>779</strong></td>
</tr>
</tbody>
</table>

### Distribution /trays groups

- Indi: 71%
- CC: 8%
- AN: 5%
- NX: 16%
CSSD STERINORD’s STUDY: DATA

Synthesis of running times per step

- **Without reading the Datamatrix codes**

<table>
<thead>
<tr>
<th>Step</th>
<th>Single Instr.</th>
<th>Trays containing hollow instr. (coelioscopy)</th>
<th>Implants/trays</th>
<th>Regular trays</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reception</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12 min/shuttle</td>
</tr>
<tr>
<td>Sorting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hollow instr. rack loading</td>
<td></td>
<td>5 min</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Washer disinfectors (WD) loading</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 min /8 trays</td>
</tr>
<tr>
<td>Washing (in WD)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50 min /8 trays</td>
</tr>
<tr>
<td>Unloading WD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.5 min /8 trays</td>
</tr>
<tr>
<td>Assembly of instruments trays</td>
<td>12 min/12</td>
<td>8 min/tray</td>
<td>15 min/tray</td>
<td>4 min/tray</td>
<td></td>
</tr>
<tr>
<td>Packing</td>
<td>1 min/3</td>
<td>2 min/tray</td>
<td>2 min/tray</td>
<td>2 min /tray</td>
<td></td>
</tr>
<tr>
<td>Sterilizers loading</td>
<td></td>
<td>2 min/tray</td>
<td>2 min /tray</td>
<td>45 sec /tray</td>
<td></td>
</tr>
<tr>
<td>Sterilization</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>75 min /30 trays</td>
</tr>
<tr>
<td>Controls, labelling, shuttles</td>
<td>12 min /12</td>
<td>1 min /tray</td>
<td>1 min /tray</td>
<td>1 min /tray</td>
<td></td>
</tr>
</tbody>
</table>

12 single instruments <=>
1 tray

WD loading : 8 trays (split in 2)

- **When reading the Datamatrix codes on each instrument:**

Add 4 minutes /tray at the step of assembly
### CSSD STERINORD’s STUDY: DATA

#### TIME TABLE OF LOGISTICS

<table>
<thead>
<tr>
<th>CHRU</th>
<th></th>
<th>Seclin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arrival at CSSD</td>
<td></td>
<td>Arrival at CSSD</td>
</tr>
<tr>
<td>6h10</td>
<td>6h30</td>
<td>7h30</td>
</tr>
<tr>
<td>9h10</td>
<td>9h30</td>
<td>14h50</td>
</tr>
<tr>
<td>11h40</td>
<td>12h00</td>
<td>15h00</td>
</tr>
<tr>
<td>14h10</td>
<td>14h30</td>
<td>19h00</td>
</tr>
<tr>
<td>16h40</td>
<td>17h00</td>
<td>19h10</td>
</tr>
<tr>
<td>19h10</td>
<td>19h30</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Roubaix</th>
<th></th>
<th>COL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arrival at CSSD</td>
<td></td>
<td>Arrival at CSSD</td>
</tr>
<tr>
<td>7h45</td>
<td>7h55</td>
<td>10h15</td>
</tr>
<tr>
<td>14h30</td>
<td>14h40</td>
<td>10h20</td>
</tr>
<tr>
<td>19h00</td>
<td>19h15</td>
<td>16h15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tourcoing</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Arrival at CSSD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7h45</td>
<td>7h55</td>
<td></td>
</tr>
<tr>
<td>14h00</td>
<td>14h10</td>
<td></td>
</tr>
<tr>
<td>19h00</td>
<td>19h10</td>
<td></td>
</tr>
</tbody>
</table>

End of unloading = beginning of the process
The model is set to run on a 12 days period (included weekend).
ENGAGEMENT ON TIME DELIVERY (MONDAY/FRIDAY)

**Arrival in CSSD (dirty MD)**
- Between 8:00 & 15:00
  - **Departure (sterile MD)**: 5:00 (on following day)
  - Time for process = 14 / 21 hours

- Between 15:00 & 19:00
  - **Departure (sterile MD)**: 12:00 (on following day)
  - Time for process = 17 / 21 hours

- Between 19:00 & 8:00
  - **Departure (sterile MD)**: 18:00 (on following day)
  - Time for process = 10 / 23 hours

**Shuttles have to be ready 3 hours before departure (security)**

**Time for process**
- 11 / 18 hours
- 14 / 18 hours
- 7 / 20 hours
FLOWS MAPPING OF THE PROCESS IN THE CSSD

CSSD STERINORD’s STUDY : DATA

Reception  Sorting/cleaning  Assembly of intruments in trays /Packing  Sterilization  Shuttles loading  Sending

Running time
STAGE 2 : The model
CSSD STERINORD’s STUDY
CLEANING AREA

- Washers disinfectors (WD)
- Source = simulation of trays arriving by shuttles

Reception workstations
Sorting workstations
Preparation of hollow instruments
WD loading

Buffer = simulation of all the shuttles waiting for process
WD: 10 WD are planned, the model is running with 9 (to simulate 1 out of order)
Unloading WD workstations
Checking & packing single instruments
Assembly of trays
Packing

Conveyor belt: supplying the workstations with clean trays to assemble and pack

Steam sterilizers: 7 are planned, the model is running with 6 (to simulate 1 out of order)

Loading sterilizers workstations
The trays are differentiated by the colour and the shape.

The colour:
Point out the department to which the tray belongs. Each department has its own colour. It allows to visualise issues concerning the sorting of trays when loading the shuttles according to their destinations.

The shape:
Trays’ shapes match with the group of trays:
- Il Single instruments = trapezoid shape
- CC Coelioscopy hollow instr. = wire disc
- AN Implants = transparent disc
- NX Regular = full disc
LOADING SHUTTLES AREA

Sterilizers unloading

Validation workstations

Shuttles loading according destinations

Sorting workstations
VIDEO OF THE RUNNING MODEL
1. The model is running with an operator at each workstation:
   + Checks that equipments are enough to process all the trays in the lead time

2. Then the model can be run with different numbers of operators to find the most appropriate.

1. All the variations can be tested:
   + 2 WD out of order ?
   + 3 operators not there??
CSSD STERINORD’s STUDY

Sizing of facilities and surfaces
A few examples
Here are our data set due to the model:

- reading of Datamatrix codes for the assembly of instruments’ trays
- CSSD open from Monday 6:30 to Saturday 21:00

The human resources are:

<table>
<thead>
<tr>
<th>Shifts</th>
<th>Operators</th>
<th>Busy rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morning</td>
<td>Monday</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Tuesday/Friday</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Saturday</td>
<td>22</td>
</tr>
<tr>
<td>Afternoon</td>
<td>Monday/Friday</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Saturday</td>
<td>3</td>
</tr>
<tr>
<td>Night</td>
<td>Monday/Friday</td>
<td>8</td>
</tr>
</tbody>
</table>
The average of trays per shuttle is 9.5 in the model

**Number of trays in the reception area**

MAX: 185 TRAYS

**Comment:**
Peaks of 185 trays in reception area. It corresponds to 20 shuttles, that is **40 sq meters** (including aisles).
Comment:
Peaks of 64 trays at the buffer « automatic loading WD ». That is 8 loads WD (1 load = 8 trays split in 2).
This buffer has a capacity of 72 trays maximum (1 waiting load/WD).
It is able to deal with activity peaks and it is not necessary to create an overflowing area.
Count of racks coelioscopy/hollow

MAX: 14 trays –Coelio/hollow

Comment:
- Peaks of **14 trays coelio/hollow**, that is 7 specific racks (2 trays on a rack)
- Racks are never 100% full; if the hypothesis is 75% full: we need 9 racks.
- We plan 3 extra racks to consider the time of return back to the cleaning area

So the model recommends **12 specific racks** for coelioscopy and hollow instruments
CSSD STERINORD’s STUDY
LOADING STERILIZERS AREA

Count of trays waiting for loading

MAX: 37 Trays

Comment:
Peaks of 37 trays
Shows that it needs at maximum 2 workstations to load sterilizers

Shows that the trays are from all departments (mixed +++): need to sort in 3 main destinations
Comment:
Peaks of 120 trays, that is 4 loads waiting controls.

2 workstations for controls and loading shuttles will do.
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Modelization =

Valuable tool
+ to help to make decisions
+ To limit risks
+ To give a visual representation of flows

Gives reliable informations on:
+ costs
+ sizing
+ human resources
+ running times.
+ ...

If accurate data have been provided!!!!

Will still be used in the future if needed to check the changes in organization (new customer....)
Thank you for your attention!!!