Company X

Inventories Optimization

Functional Specifications

Document Version: 1

Company X

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II Use Case Model

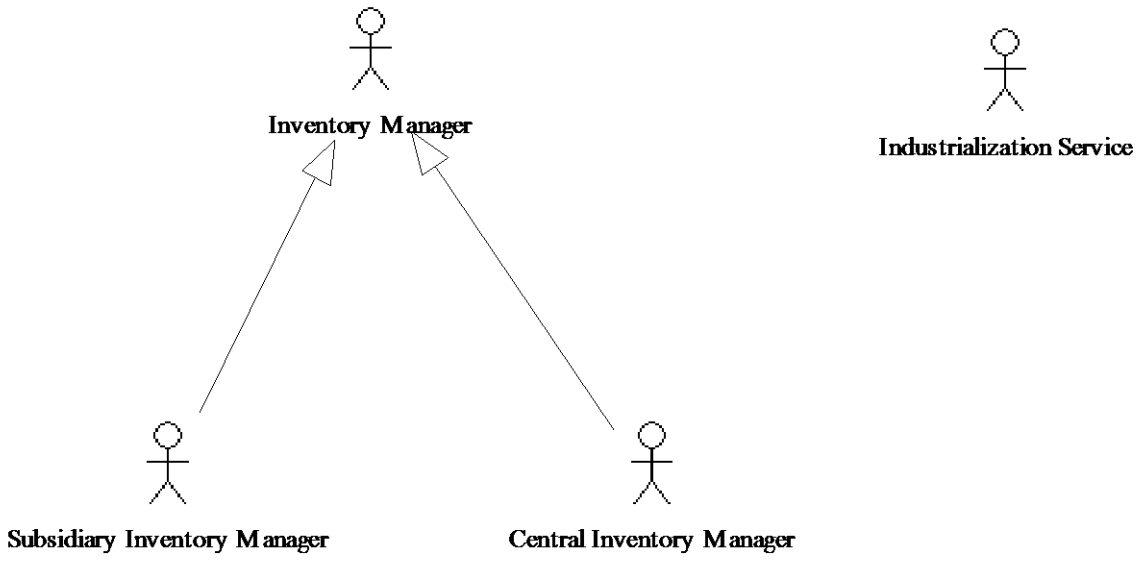
II.1 Actors

1. Central Inventory Manager — He's co-responsible for the inventories performance in all subsidiaries, in collaboration with each local inventory manager. He analyzes each subsidiary's situation, makes benchmarking and can propose some optimizations.

2. Subsidiary Inventory Manager — There's one such manager in each subsidiary.

   He's co-responsible for the inventories performance in his own subsidiary, in collaboration with the central inventory manager. He analyzes the local inventory's situation and sets the parameters of the Inventories Management tool.

3. Industrialization Service — It provides some of the data requested by the application through automatic updates of the European Subsidiaries Logistics Datamart.



Both Inventory Managers have a symetrical role for the most part. Therefore, we define a generalized actor "Inventory Manager" who can represent either manager.

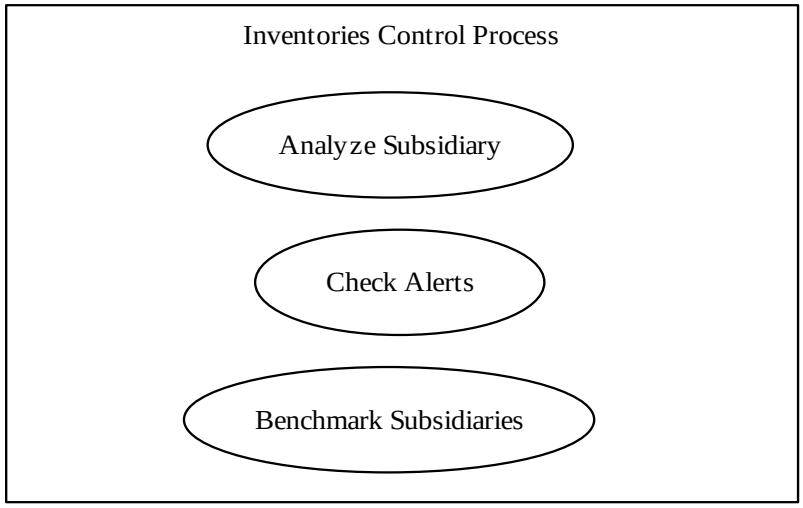
II.2 Use Case Packages (Summary)

Following are the Use Case Packages for this project :

1. **Inventories Control Process**

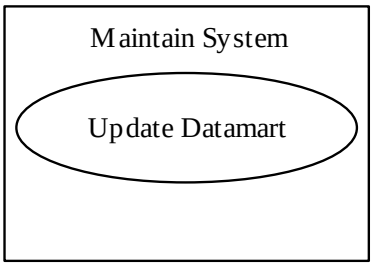
- The functions included in this package cover one functional process of the logistics domain named “Inventories Control Process”. It concerns all functionalities related to inventories analysis and controls made by the inventories manager.

- This package includes 3 main use cases as shown in the following diagram :



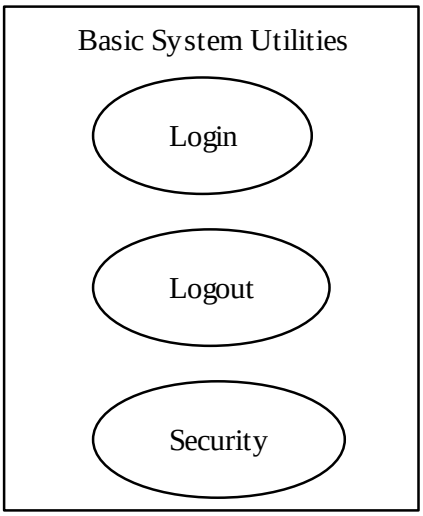
2. **Maintain System Information**

- The functions of this package concern the Datamart and its maintenance.
- It includes only one main Use Case as shown in the following diagram :



3. **Basic System Utilities**

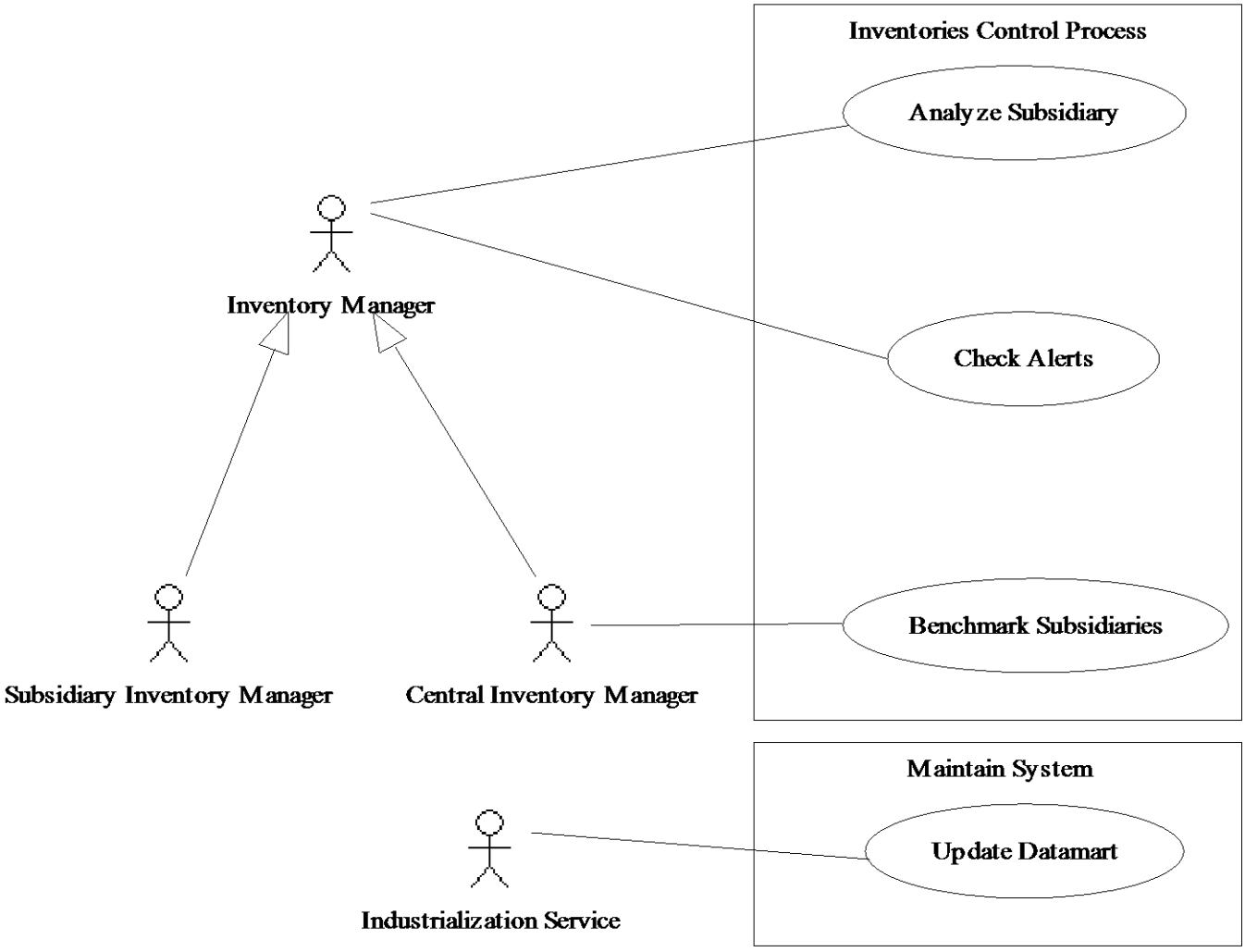
- This package gathers several basic functions, like the Login/Logout functions
- It includes three main Use Cases as shown in the following diagram :



II.3 Use Case Packages Detail

II.3.1 Main UC View

Following is the Use Case Diagram showing the main Use Cases of the application :



The Central Manager and each Subsidiary Manager can make similar analysis through the Analyze Subsidiary and Check Alerts Use Cases, while only the Central Manager is allowed to make comparisons between subsidiaries through the Benchmark Subsidiaries Use Case.

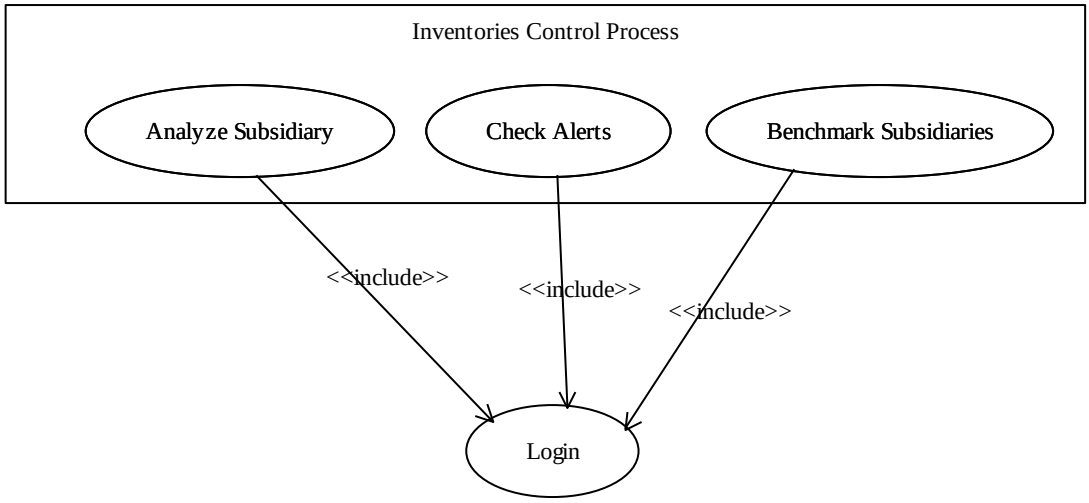
The Update Datamart Use Case concerns only the Industrialization Service.

II.3.2 UC Brief descriptions

Use Case	Brief description
Analyze Subsidiary	The inventory manager (central or local) needs to have an update regarding one inventory's performance. He defines the scope of his analysis through a multi-criteria selection (subsidiary, products, etc...), then reports or graphics based on quality measurement indicators are displayed. The manager can then either display other indicators or define a new selecti in order to go deeper into its analysis until he has a clear view of the inventor situation.
Select Parameters	The inventory manager selects parameters regarding the products to be analyzed and the time frame of the analysis, then selects the outputs to be displayed.
Display Analysis Outputs	…
Check Alerts	…
Benchmark subs	…
Update Datamart	…

II.3.3 Main Extensions and Inclusions

Following is the Use Case Diagram showing the extensions/inclusions of the “Login” Use Case :



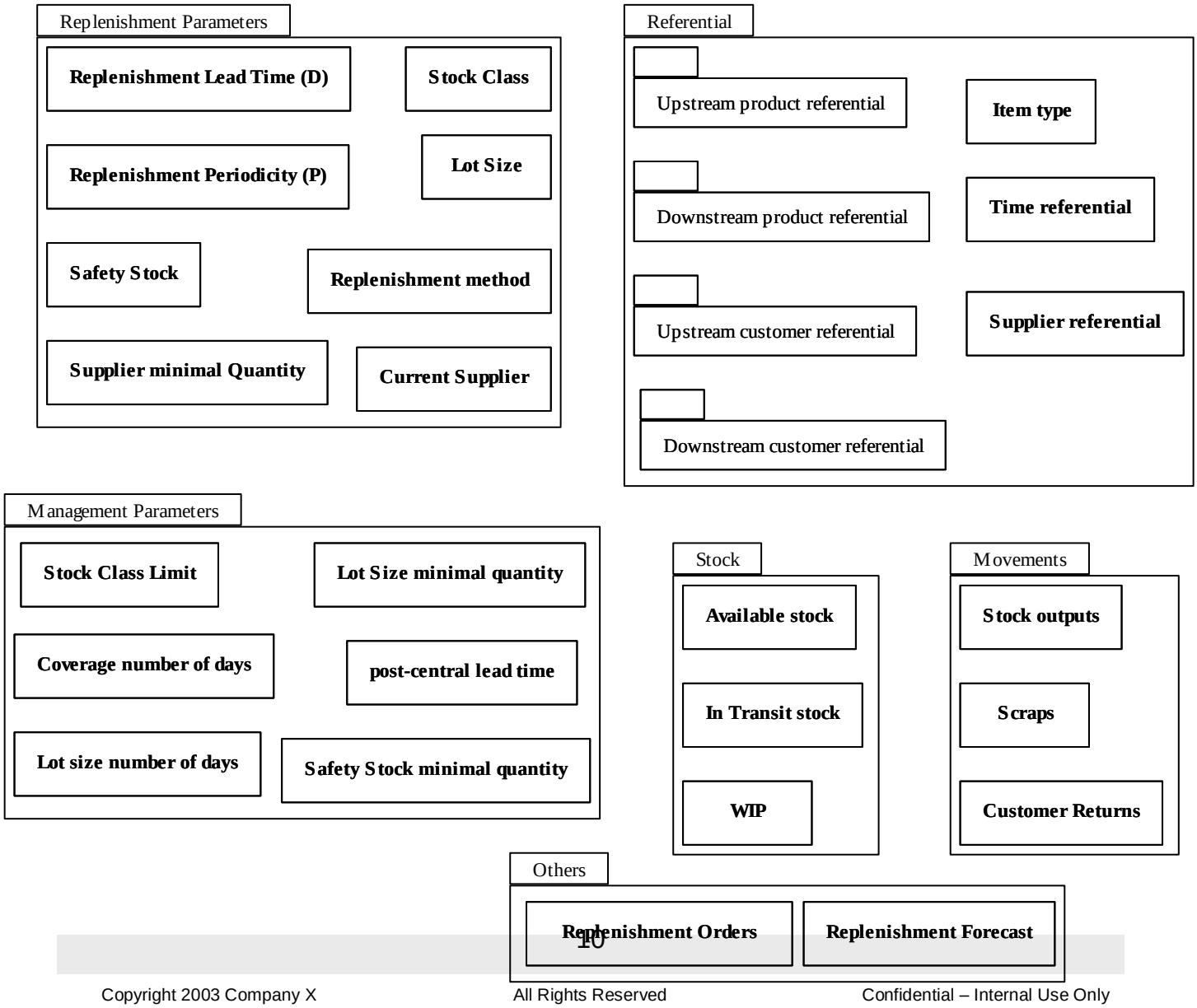
Before executing any of the UC of the Inventories Control Process Package it is necessary to go through the Login Use Case.

III Glossary (Static Description : Business Entities)

III.1 Data definitions

III.1.1 Packages view

Here's a view of all Data gathered by packages :



III.1.2 Referential Package

III.1.2.1 Supplier Referential

Inside a Warehouse's stock most product are replenished from an external source : either a Supplying Center, another warehouse inside the subsidiary or another subsidiary's warehouse. This source is called the supplier.

Suppliers have a code and a label.

III.1.2.2 Time Referential

The time referential describes the inclusion links between days, weeks, months and years.

III.1.3 Replenishment Parameters Package

III.1.3.1 Stock Class

It is a classification of items according to quantitative criteria. Here, we use a classification based on each item's stock output : the items with the higher outputs are gathered in class "S", then come the "A", "B", "C" ... classes (sorted by descending order).
This process helps creating homogenous groups of items.
See description for stock classes limits here.

III.1.3.2 Supplier minimal Quantity

It is a minimal order quantity imposed by a supplier in order to avoid big handling costs (mainly for low level items). Any initial order calculation made by the warehouse replenishment management system must be rounded up to that quantity.

III.1.3.3 Replenishment Lead Time

It is the number of working days between the replenishment order calculation and the input of products in stock. It is in fact the sum of three lead times : supplier handling (time necessary to prepare the order), transportation, warehouse handling (time necessary to put the products in stock).

Therefore D can vary from one supplier/warehouse flow to the other.

All stored data inside this package have the following characteristics :

- key = **« Warehouse / Item / Week »**
- horizon = 2 full years + current year
- weekly update.

III.1.4 Management Parameters Package

III.1.4.1 Stock Class Limit

Stock classes depend upon item's stock output (see description here). To determine the limits between stock classes we use a parameter which corresponds to the minimum average output that an item needs to reach in order to be included inside a class
➔ each class has its own low limit and its high limit is also the upper class low limit.
The S class has no high limit (999,999).

III.1.4.2 Safety Stock minimal Quantity

If the initial safety stock calculation quantity is below this minimal quantity, it is then rounded up to that minimal quantity.

III.1.5 Stock Package

III.1.5.1 Available Stock

It is the part of the inventory that is physicaly inside the Warehouse, stored and available for sales purpose but not yet allocated to a specific customer.

III.1.5.2 In Transit Stock

It is the part of the inventory that belongs to the Warehouse (for comptability purposes) even though it is not physicaly stored yet. The « in transit » quantity is incremented right after the delivery of goods by the supplier.

III.2 Indicators definitions

III.2.1 Stock Package

III.2.1.1 Stock level

It is calculated at the warehouse/item/day level as the sum of three elements :

Stock level = Available stock + In transit Stock + WIP

It can be calculated at an aggregated level (RF, Subsidiary, ...) by summing all warehouse/items/day values.

III.2.1.2 Average Stock Output

It is the stock outputs for which we calculate a weekly average value for the past 6 months.

At the warehouse/item/day level, for W-1 :

Average Stock Output = Average of Stock Outputs on [W-1 ; W-26]

The average calculation has to made as a “mean” of values inside the horizon : missing data must not be taken into account. For example, for a new item for which there’s data only for the past 4 weeks one must calculate the average of those 4 weeks, not the total of those weeks and divide it by 26.

If the available horizon is shorter than the required 6 months because the datamart Data Sets are too recent, we’ll use the maximum available horizon. This principle will be applied to all calculated indicators that require a past horizon.

It can be calculated at an aggregated level (RF, Subsidiary, ...) by summing all warehouse/items/day values.

III.2.2 Service Package

III.2.2.1 Number of stockout items

It is the number of distinct warehouse/items couples – inside a specified group – whose stock level is zero.
As for the “total number of items” indicator, the content of the group is defined in the context of each specific output.

Number of stockout Items = **Number of distinct warehouse/items couples whose stock level is 0** **[inside specified group]**

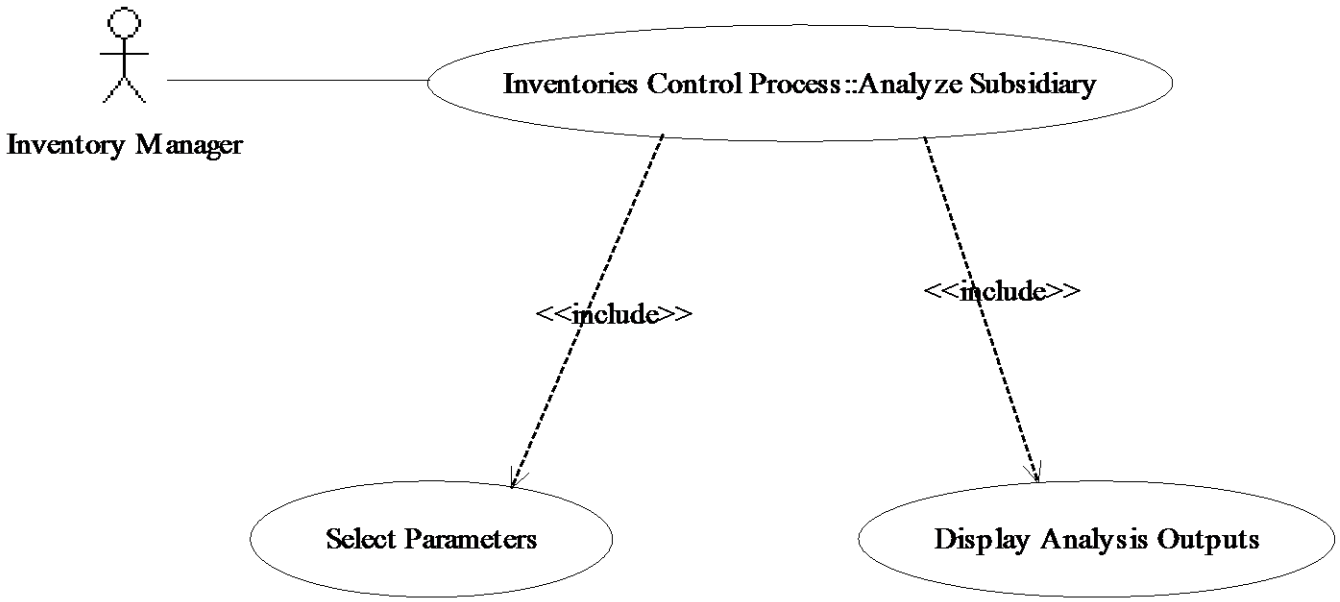
IV Use Case Detail

IV.1 Analyze Subsidiary UC

IV.1.1 General Description

IV.1.1.1 UC Diagram

Following is the Use Case Diagram showing the extensions/inclusions of the “Analyze Subsidiary” Use Case :



IV.1.1.2 Descriptive table

Summary	The inventory manager (central or local) needs to have an update regarding one inventory's performance. He defines the scope of his analysis through a multi-criteria selection (subsidiary, products, etc...), then reports or graphics based on quality measurement indicators are displayed. The manager can then either display other indicators or define a new selection in order to go deeper into its analysis until he has a clear view of the inventory's situation.
Trigger	The analysis may be triggered off when : • The indicators calculated by the "check alerts" use case or the inventories reporting revealed some weaknesses that need to be checked in detail • It is necessary to define a target stock coverage for budget purposes ➔ an analysis may help define which coverage may be achieved for each product • A sensitive product requires a close watch or any special event makes the inventory's situation unstable
Objective	Having an overview of one inventory's performance and/or spotting some weaknesses in the management that must be enhanced.
Frequency of use	On Inventory Manager's request.
Actors	Central Inventory Manager or Subsidiary Inventory Manager.
Pre conditions	The Subsidiaries Datamart is up to date. The Inventory Manager is logged on.
Post conditions	None

IV.1.2 Use Case Narrative – Main Course

The main course corresponds to an analysis made by the Central Inventory Manager.

Step	Activity	Alt. Course / Excep.
1	From the menu page of the application the Inventory Manager selects the “analyze subsidiary” option/tab.	
2	He selects either the subsidiary or the warehouse to be analyzed. That selection is made through two lists : - The subsidiary list contains all subsidiaries that can be found inside the customer referential (which corresponds to all subsidiaries for which we have data in the ESULD). - The warehouse list contains all warehouses that can be found inside the customer referential. The lists are exclusive : the Inventory Manager has to make a selection either in the subsidiary list or in the warehouse list. In both cases only one selection is allowed but if a subsidiary is selected, all warehouses attached to this subsidiary are implicitely selected (which is equivalent to making a mutli warehouses selection). Both lists contain a concatenation of the label and the code of the entity.	AC 2a
3	Through a popup window or a small frame inside the page, the manager selects several parameters that will define which products will be included in the analysis, which will be the Time Frame of the analysis and which output will be displayed. ➔ Execute Use Case “Select Parameters”	
4	The system extracts the data according to the selected parameters, then displays the corresponding output (graphics or reports). ➔ Execute Use Case “Display Analysis Outputs”	EX 4a
5	The inventory manager modifies some parameters in order to display other outputs → iterate steps 3 and 4 as many times as necessary.	
6	The inventory manager ends the analysis and goes back to the menu page.	AC 6a

IV.1.3 Alternate Courses

IV.1.3.1 AC 2a "Analysis made by the Subsidiary Manager"

The Central Manager may select any subsidiary/warehouse inside the Datamart but the Subsidiary Manager may only analyze the warehouses he's responsible for.

Step	Activity	Alt. Course / Excep.
1	The subsidiary list now contains only the subsidiaries the manager is allowed to analyze. They're defined by the "affect rights" UC. Consequently, the warehouses list contains only the warehouses attached to those subsidiaries. Other rules are the same as in the main course.	
2	Go back to step 3 of the main course.	

IV.1.3.2 AC 6a "New Subsidiary/Warehouse selection"

The Inventory Manager wants to analyze another subsidiary or warehouse.

Step	Activity	Alt. Course / Excep.
1	Execute step 2 of the main course.	
2	All previously made selections regarding products, time frame and outputs are erased. Default values regarding these parameters are preselected again.	
3	Execute the main course from step 3 on.	

IV.1.4 Exceptions

IV.1.4.1 EX 4a “No data available”

The selection parameters defined by the Inventory manager are too restrictive : no data exist in the Datamart Data Sets for that selection.

Step	Activity	Alt. Course / Excep.
1	The system determines that the set of selection parameters cannot lead to an output. Those specific selections are described in the “Display Analysis Outputs” UC.	
2	The system displays this message “No data available for that selection – Try another selection”.	
3	The Inventory manager must resume the main course at step 3.	

IV.1.5 Dynamic diagrams

IV.1.6 Supporting Requirements

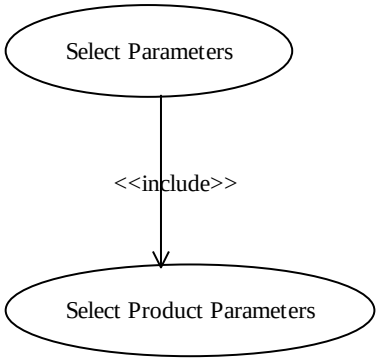
<A list of any special requirements associated with the use case.>

IV.2 Select Parameters UC

IV.2.1 General Description

IV.2.1.1 UC Diagram

Following is the Use Case Diagram showing the extensions/inclusions of the “Select Parameters” Use Case :



IV.2.1.2 Descriptive table

Summary	The inventory manager selects parameters regarding the products to be analyzed and the time frame of the analysis, then selects the outputs to be displayed.
Trigger	See “Analyze subsidiary” UC.
Objective	Having a set of values for all parameters that define the outputs to be displayed.
Frequency of use	See “Analyze subsidiary” UC.
Actors	See “Analyze subsidiary” UC.
Pre conditions	Subsidiaries or warehouses have been selected.
Post conditions	All types of parameters are selected.

IV.2.2 Use Case Narrative – Main Course

Step	Activity	Alt. Course / Excep.
1	The Inventory Manager selects the parameters regarding the products to be included in the analysis. ➔ Execute Use Case “Select Product Parameters”	AC 1a AC 1b
2	The Inventory Manager selects the Time Frame of the analysis. Most data of the Datamart are available on the horizon [Y-2 ; W-1]. For some outputs, the “time frame” parameter determines on which part of this total horizon the analysis will apply. For the graphics it also determines if it must be displayed at a weekly or monthly level. The possible selections are : • The past 6 months (Default value). • The past 2 years Among the different analysis proposed in the ‘analyze subsidiary’ use case some are made at a weekly level, some at a monthly level, some at both levels. The value of the Time Frame parameter can therefore have different meanings depending upon which analysis level is required : • The past 6 months : only weekly analysis = [W-26 ; W-1] • The past 2 years : = [W-104 ; W-1] for weekly analysis = [M-24 ; M-1] for monthly analysis In order to determine precisely the analysis period, it is necessary to define the current week W and the current month M. The Use Case “Display Analysis Outputs” describes which outputs are influenced by this parameter and how. The default value means that if the Inventory manager doesn’t make a Time Frame selection, the “6 months” value will automatically be selected.	

<table>
<tr>
<td>3</td>
<td>The Inventory Manager selects in a list the output to be displayed.
The outputs are grouped by category.

Here’s the content of the list :

<table>
<tr><th>CATEGORY</th><th>OUTPUT</th></tr>
<tr><td rowspan="5">STOCKS</td><td>Stock level by item list</td></tr>
<tr><td>Stock and Coverage by class report</td></tr>
<tr><td>Pareto Analysis</td></tr>
<tr><td>…</td></tr>
<tr><td>…</td></tr>
<tr><td rowspan="5">SERVICE</td><td>…</td></tr>
<tr><td>Stockout Items list</td></tr>
<tr><td></td></tr>
<tr><td></td></tr>
<tr><td>…</td></tr>
<tr><td rowspan="3">PARAMETERS</td><td>Flow Parameters summary report</td></tr>
<tr><td>Flow Parameters by item list</td></tr>
<tr><td>Management Parameters report</td></tr>
</table>

Only one output can be selected. There is no default value for that selection.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>The inventory manager has now made a selection for all three parameters (Products, Time Frame, Output).
He validates his whole selection (by clicking on a “OK” button for example).

After data extractions, the selected output is displayed. See UC “Analyze Subsidiary” – step 4).</td>
<td></td>
</tr>
</table>

IV.2.3 Alternate Courses

IV.2.3.1 AC 1a "Use Default values for selections"

The Inventory manager doesn't need to make a selection regarding all three types of parameters since default values are initially defined for some of them.

Step	Activity	Alt. Course / Excep.
1	The Inventory manager makes no selection regarding products. The default value (ALL products) applies, meaning that no product restriction is required.	
2	The Inventory manager makes no selection regarding time frame. The default value (6 months) applies.	
3	The Inventory manager selects only the output → execute step 3 of the main course.	
4	Execute step 4 of the main course (validation).	

IV.2.3.2 AC 1b "Second round of selections"

After a first round of selection has been made an output has been displayed. The Inventory manager wants to display another output. He needs to make a new selection.

Step	Activity	Alt. Course / Excep.
1	All previously made selections are still active. Therefore these values are preselected. The Inventory manager may keep some of those previous selections and modify only part of the selection. For example, if the Inventory manager wants to display the same output but an another time frame, he doesn't modify the product selection nor the output selection but changes only the time frame parameter. → execute required steps among steps 1 to 3 of the main course.	
2	Execute step 4 of the main course.	

IV.2.4 Exceptions

IV.2.5 Supporting Requirements

<A list of any special requirements associated with the use case.>

V GUI Needs

V.1 US456: GUI needs for Use Case “Analyze Subsidiary”

VI Non Functional Specifications