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CUSTOMIZABLE SOLUTION FOR MULTI-LEVEL BILL OF MATERIALS (CostedBOM)

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1. Introduction

1.1 Abstract

The need to cost products, as accurately as possible, is increasing as the pressure to provide good margin and profitability analysis becomes more critical to manufacturers. When engineers want a cost for a product, they generally need to gather data of finance, sourcing, and production overhead. This paper presents an application that allows the engineers to obtain cost of multi-level BOM.

The purpose of the **Costed BOM** application is to offer a way to predict the manufactured cost of an item it accomplishes this by **rolling up** material, labor and overhead costs from the lowest levels of the BOM.

Bills Of Material (BOM) form the nucleus of any product-costing program. Most traditional approaches roll-up a BOM based on the material costs in inventory.

The presented application has a highly configurable roll-up algorithm:
- Used decimals
- Include/exclude detailed costs
- Set part total cost and set final part
- Currency conversion rates

Costed BOM reports are highly customizable, and PDF and Excel format are supported. The tool is a J2EE and XML application built on top of a Service Oriented Architecture (SOA) framework.

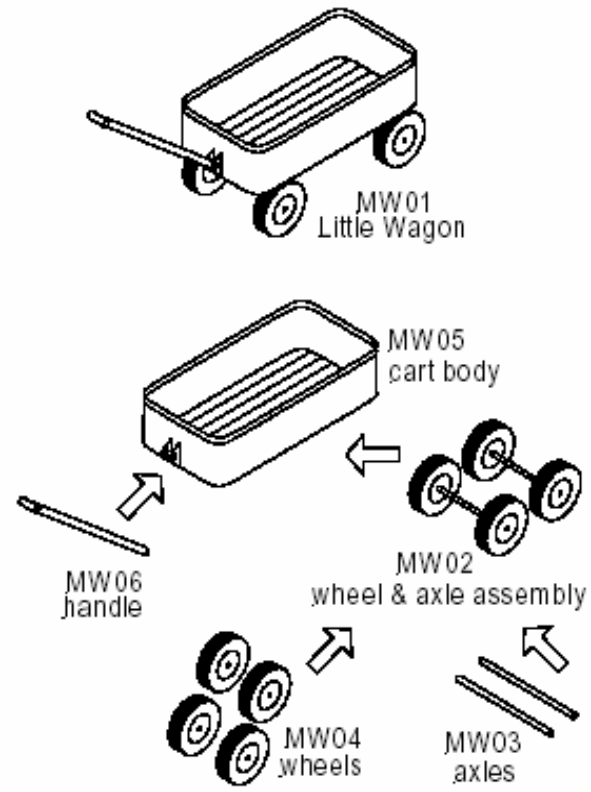
Key benefits:
- Java based architecture: platform independent implementation, JSP/Servlets web presentation layer – worldwide accessible application
- Cost information persistency – PLM system or external database
- BoM structure provider – TeamCenter or others PLM systems

1.2 Understanding rolled up cost

A rolled up cost is made up of all the lower level costs that went into it. To illustrate we will use the wagon example shown here. For simplicity, only material costs will be used. No labor or overheads will be considered at this time.

Indented BOM

Item	**Quantity**
MW01 Little Wagon	
. MW02 wheel & axle assembly	**(1)**
. . MW03 axles	**(2) $ 4.00**
. . MW04 wheels	**(4) $12.00**
. MW05 cart body	**(1) $20.00**
. MW06 handle	**(1) $ 3.00**



The rolled up cost for the MW02 wheel and axle assembly is $16.00, which is the total of the two components that go into it, MW03 ($4.00) and MW04 ($12.00).

The rolled up cost of the MW01 Little Wagon is $39.00. This is arrived at by adding up all the components below it; MW02 ($16.00) + MW05 ($20.00) + MW06 ($3.00).

A rolled up cost is used to predict the cost of a manufactured part. It is often used in the setting of standard costs and for projecting the cost of an item that has not been produced before.

2. Costed BOM implementation

2.1 Part cost information

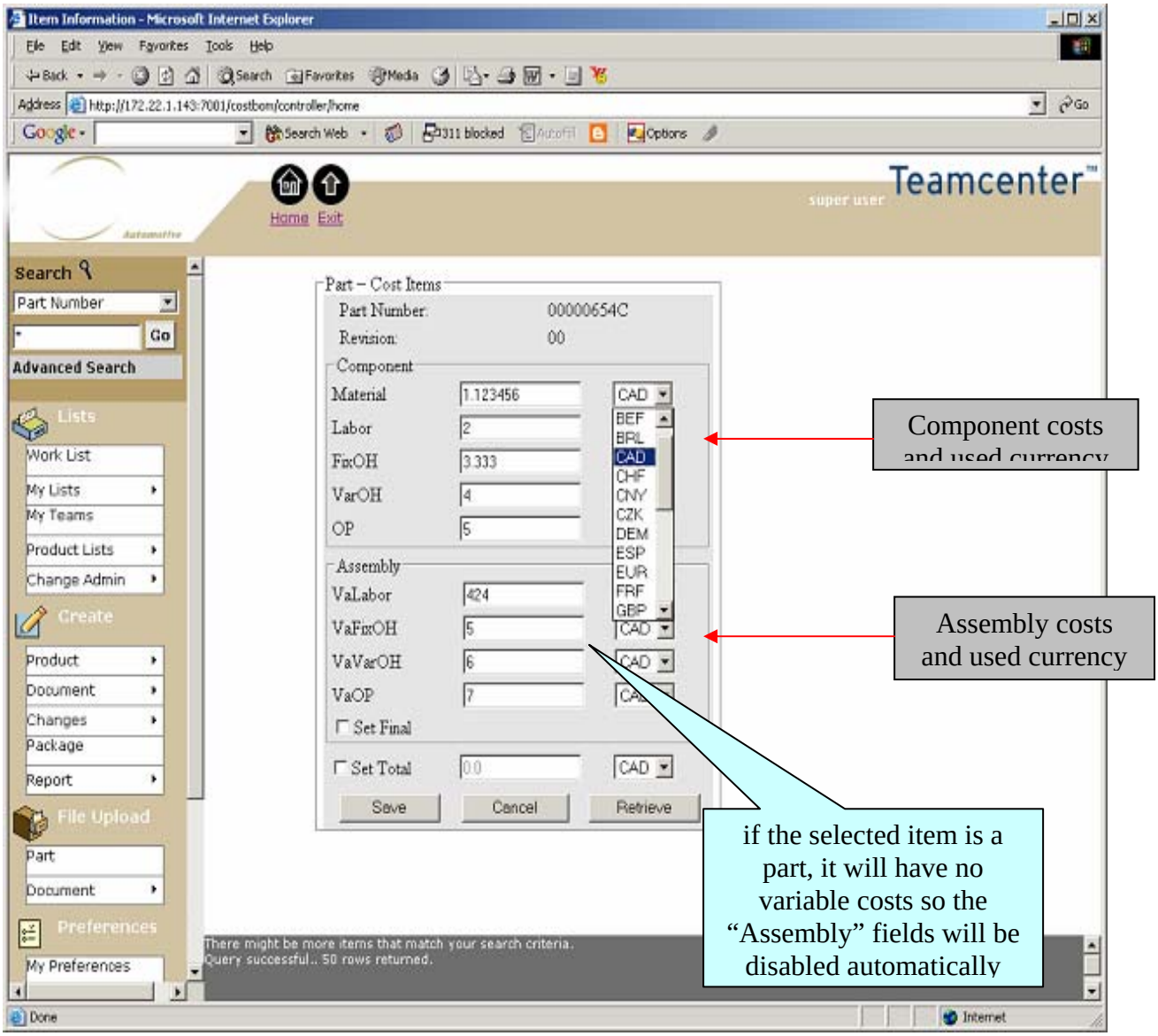
Part cost information is persisted into externally database or directly in TCAS, as extra-attributes for each item. The detailed costs and currencies can be modified and the changes are saved into PLM system.

Set Final functionality: - check out, to set the cost values from the form as final cost. In this case, roll-up calculation algorithm will ignore the costs for all sub-assemblies and sub-parts of the selected item.

Set Total functionality: check out, to set total cost and currency for the selected item. This value will be counted in the roll-up calculation algorithm. Detailed costs will be disabled and can be enabled again by un-checking Set Total.

Initially, the displayed costs are from PLM system, but anytime can be retrieved from external database using *Retrieve* button.

The web interface menu:



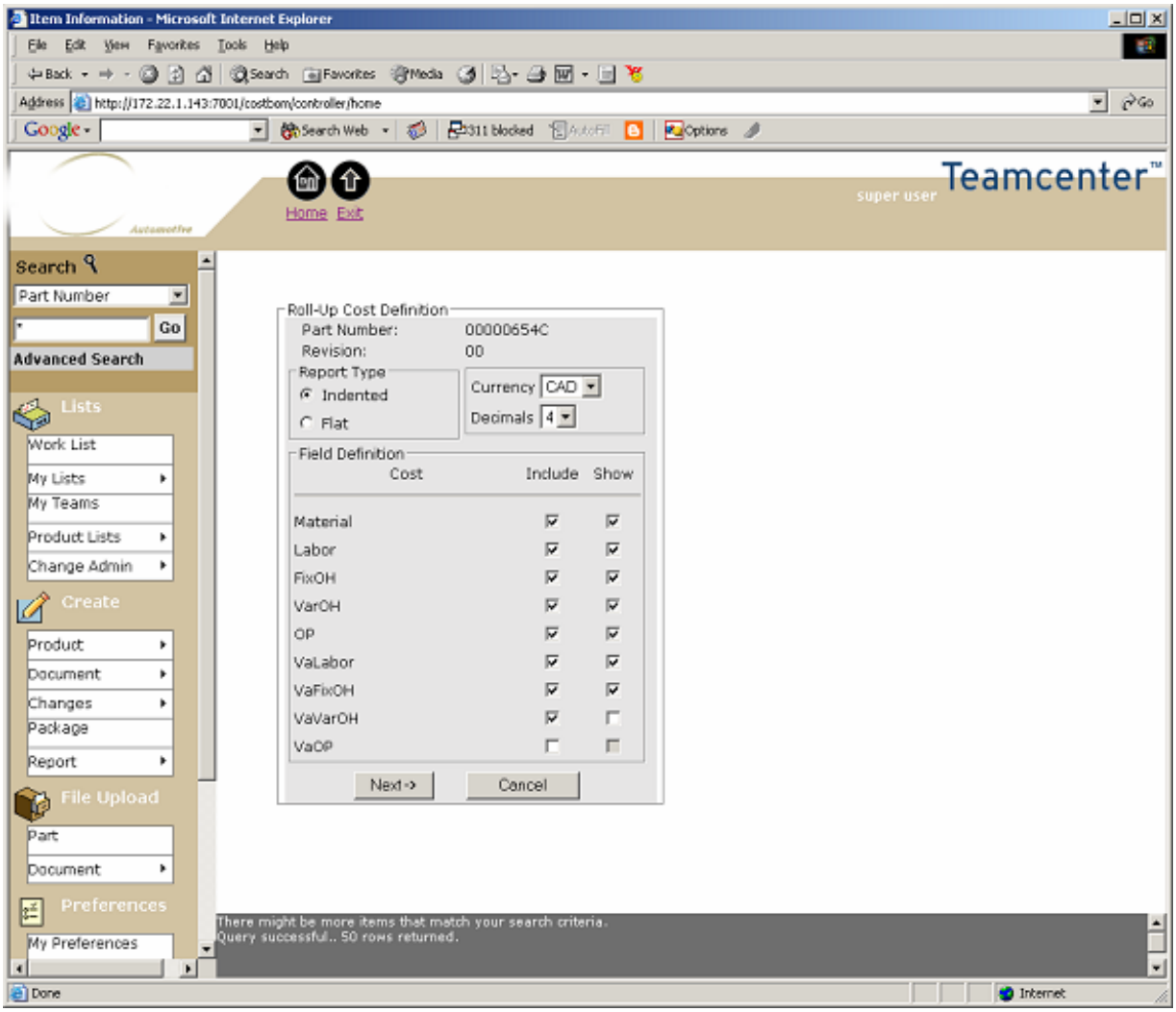
2.2 RollUp cost definition.

Data model and roll-up algorithm implementation are independent from BOM provider (usually an PLM system). Currently implementation is based on TeamCenter AS, as BOM provider, but application can be extended to read BOMs from others PLM system.

Roll-up calculation and generated report can be configured from *Roll-up Cost Definition* form:

- Report type (indented or flat)
- Currency target for generated report
- Show/Hide detailed cost in generated report
- Include/Exclude detailed cost in roll-up calculation

The web interface menu:

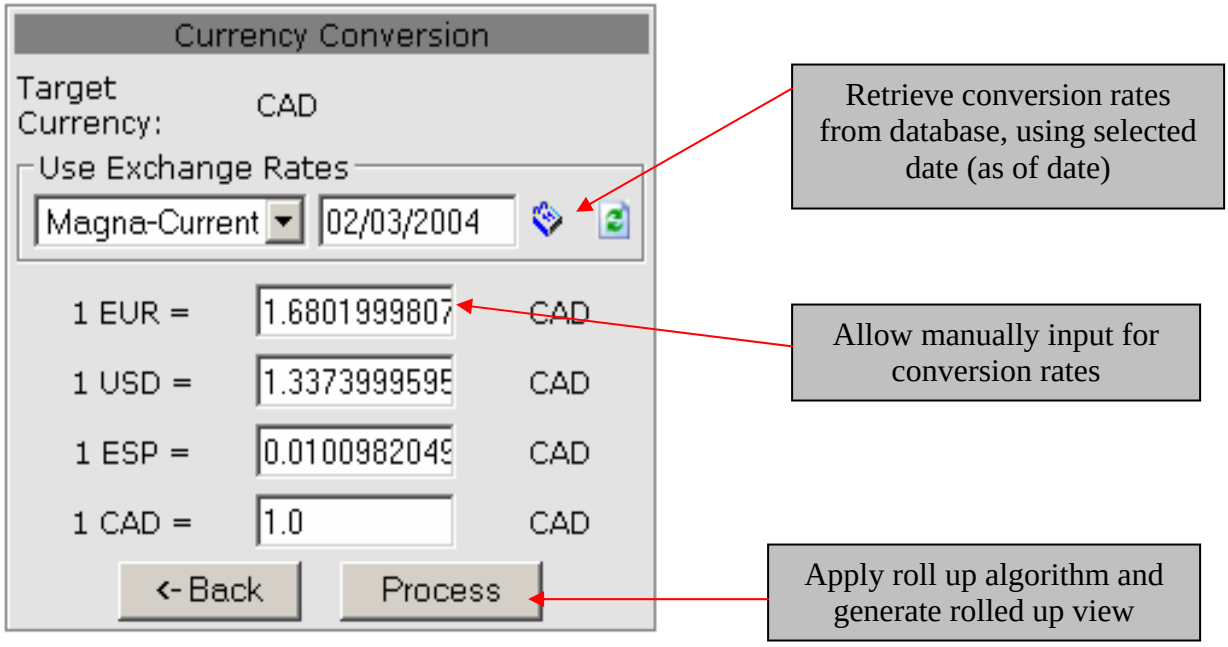


Currency Conversion manager view is displayed using *Next* button.

2.3 Currency conversion manager:

Currencies rates are retrieved from database for all currencies used in this item, based on the input date. By default, the rates are retrieved for current date, and if no rates are found in database, the most recent rate is retrieved. Also, the interface permit manually input for conversion rates, but input rates are not persisted.

The web interface menu:



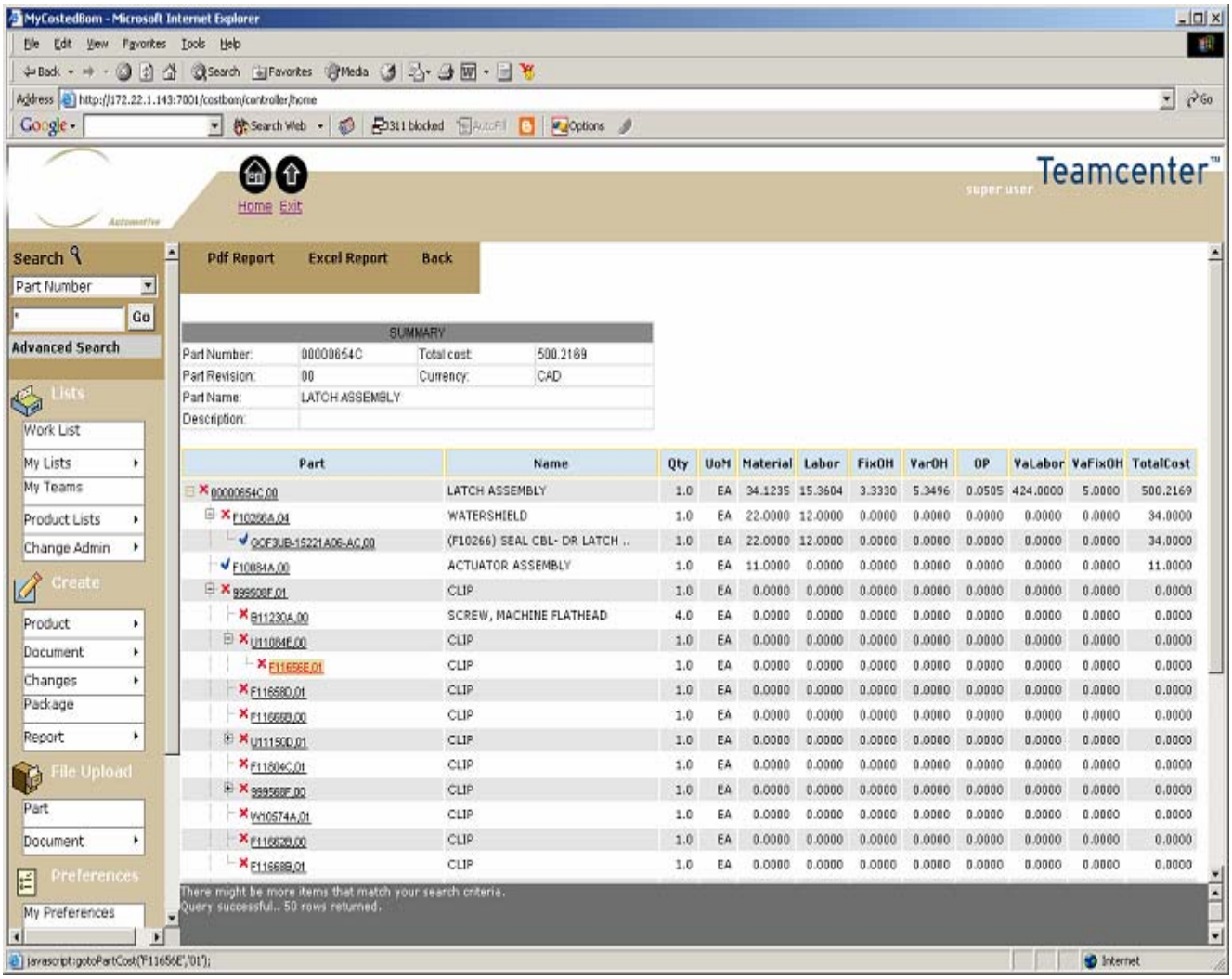
2.4 RollUp view

Applying roll-up calculation, customized using *Roll-up Definition* form, the result will be displayed into a tabular form. A summary is generated for the item on which the roll-up was applied.

If a certain item does not have filled the detailed costs (all costs are zero), a problematic situation (missing costs definition) is shown using a read X icon before the part number in tree view.

At any time, clicking on the part name, in the tree view, can modify the detailed costs for an item. After the changes are done, the roll-up algorithm is re-applied and changes are immediately visible, but there is no persistence for this changes.

The web interface view:

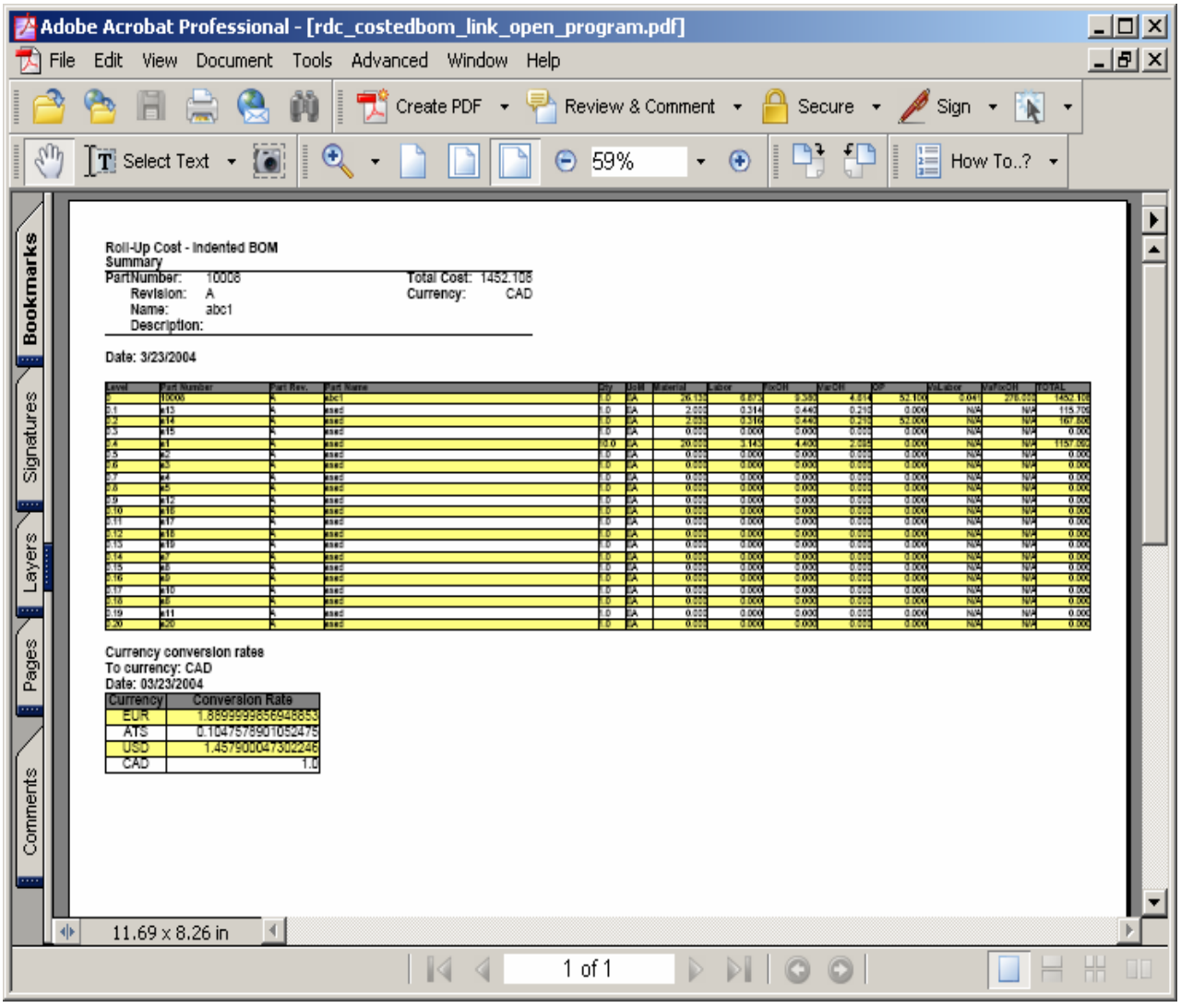


2.5 Cost reports

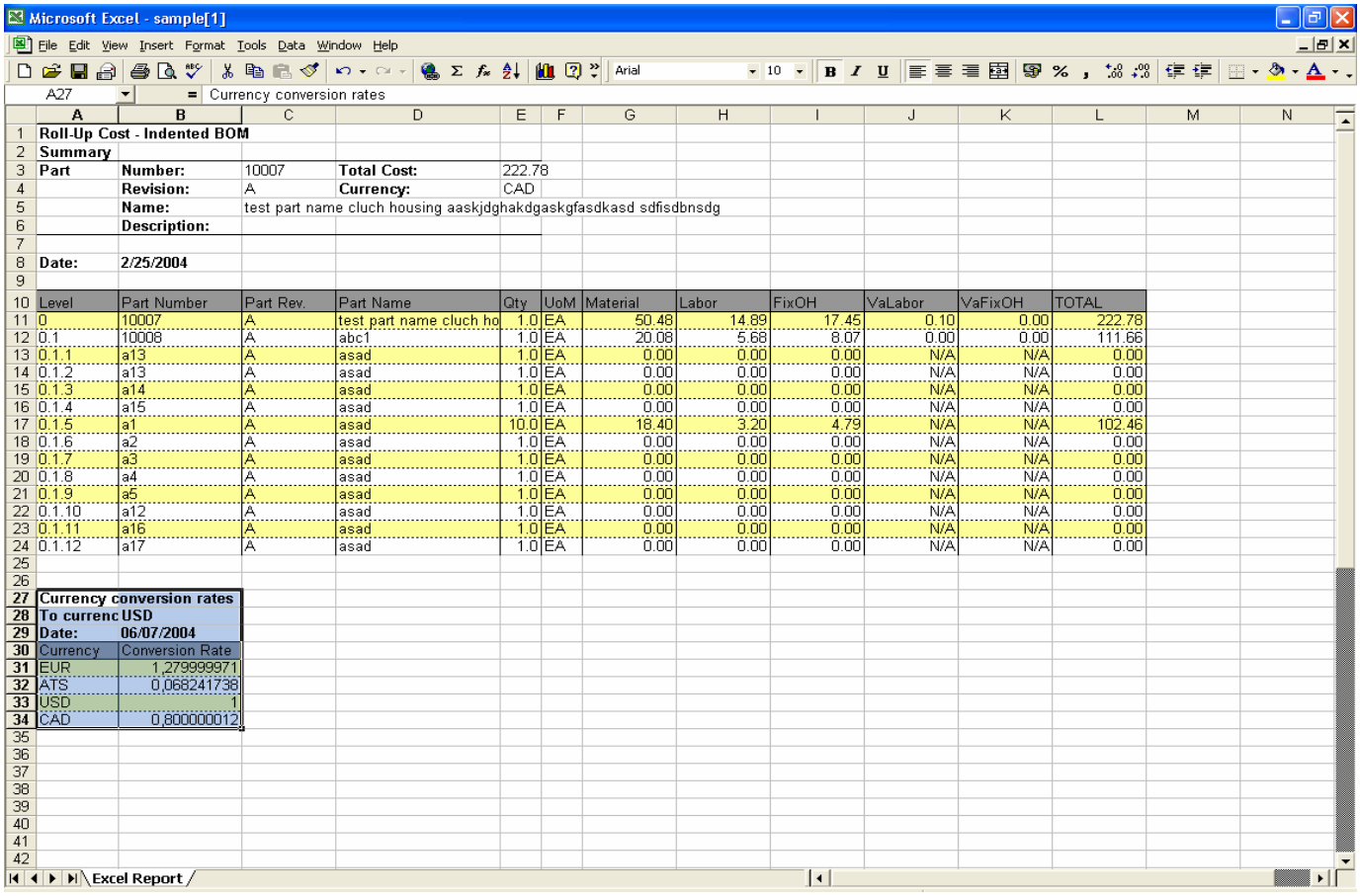
Reporting format supported are PDF and Excel, and are highly customizable and configurable.

Using *Roll-up Definition* form, detailed costs can be shown or hidden in generated report, as well the target currency for the report. The additional information is appended to the report, like part number, revision and name, the currencies rates and date.

PDF Report example



Excel report example



Microsoft Excel - sample[1]

File Edit View Insert Format Tools Data Window Help

A27 = Currency conversion rates

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	**Roll-Up Cost - Indented BOM**													
2	**Summary**													
3	**Part**	**Number:**	10007	**Total Cost:**	222.78									
4		**Revision:**	A	**Currency:**	CAD									
5		**Name:**	test part name cluch housing aaskjdghakdgaskgfasdkasd sdfisdbnsdg											
6		**Description:**												
7														
8	**Date:**	**2/25/2004**												
9														
10	Level	Part Number	Part Rev.	Part Name	Qty	UoM	Material	Labor	FixOH	VaLabor	VaFixOH	TOTAL		
11	0	10007	A	test part name cluch ho	1.0	EA	50.48	14.89	17.45	0.10	0.00	222.78		
12	0.1	10008	A	abc1	1.0	EA	20.08	5.68	8.07	0.00	0.00	111.66		
13	0.1.1	a13	A	asad	1.0	EA	0.00	0.00	0.00	N/A	N/A	0.00		
14	0.1.2	a13	A	asad	1.0	EA	0.00	0.00	0.00	N/A	N/A	0.00		
15	0.1.3	a14	A	asad	1.0	EA	0.00	0.00	0.00	N/A	N/A	0.00		
16	0.1.4	a15	A	asad	1.0	EA	0.00	0.00	0.00	N/A	N/A	0.00		
17	0.1.5	a1	A	asad	10.0	EA	18.40	3.20	4.79	N/A	N/A	102.46		
18	0.1.6	a2	A	asad	1.0	EA	0.00	0.00	0.00	N/A	N/A	0.00		
19	0.1.7	a3	A	asad	1.0	EA	0.00	0.00	0.00	N/A	N/A	0.00		
20	0.1.8	a4	A	asad	1.0	EA	0.00	0.00	0.00	N/A	N/A	0.00		
21	0.1.9	a5	A	asad	1.0	EA	0.00	0.00	0.00	N/A	N/A	0.00		
22	0.1.10	a12	A	asad	1.0	EA	0.00	0.00	0.00	N/A	N/A	0.00		
23	0.1.11	a16	A	asad	1.0	EA	0.00	0.00	0.00	N/A	N/A	0.00		
24	0.1.12	a17	A	asad	1.0	EA	0.00	0.00	0.00	N/A	N/A	0.00		
25														
26														
27	**Currency conversion rates**													
28	**To currenc**	**USD**												
29	**Date:**	**06/07/2004**												
30	Currency	Conversion Rate												
31	EUR	1,279999971												
32	ATS	0,068241738												
33	USD	1												
34	CAD	0,800000012												
35														
36														
37														
38														
39														
40														
41														
42														

Excel Report

3. Conclusions

3.1 The key benefits of Costed BOM application are:

Predict the manufactured cost of an item

–Roll up detailed Item costs and Item total cost

Configurable roll-up algorithm:

– Used decimals
– Include/exclude detailed costs
– Set part total cost and set final part
– Currency conversion rates

Reports customization:

–Html/PDF/Excel reports
–Indent/ flat reports type
–Currency target selection

3.2 The key benefits of Costed BOM architecture are:

Java based architecture:

–Platform independent implementation
–JSP/Servlets web presentation layer: worldwide accessible application

Cost information persistency:

–Database persistency
–PDM persistency

BOM structure provider:

–TeamCenter AS
–Others PDM systems