Chapter 5

Feasibility analysis software

1. Software configuration

Feasibility analysis software is Microsoft Excel based application program designed for figuring out how the project status looks like. Such analysis encompasses three sections. These are Market analysis, Capacity analysis, and cost/financial analysis. Three analyses are separately working. This is because feasibility analysis actually is to be considered step by step.

Sequentially, market analysis is to be firstly performed and considered whether such project has feasible potential in terms of marketing view. If yes, engineering feasibility analysis, in other word capacity analysis, will subsequently be done through manual input data from market analysis model. Again, if yes, output from engineering analysis will likewise be used through manual input for cost/financial analysis model. By software features, twenty files (e.g., cap-anl.xls, market.xls, input.xls, output.xls, sense1.xls, sense2.xls, ..., sense16.xls) are to be used whereas cap-anal.xls is capacity analysis model, market.xls belongs to marketing analysis, and the rest take account of cost/financial analysis.

By that, input.xls acts as a part for incoming data and output.xls consequently yields finance output data like, project financial statements, project indicators and so on. The rest fourteen files cater sensitivity analysis whose results also appear on output.xls. Conceptually, this software works on the following scheme (Figure 5.1)

As can be seen from Figure 5.1, three models characterize the software and utilize data from project database. First of all, marketing model retrieves marketing data from database and provides market intermediate variables (e.g., product prospects, forecast, price, sale revenue) for the capacity analysis model, while manufacturing cost analysis likewise uses manufacturing data from project database, figures out costing information, and material requirement, and passes such manufacturing intermediate variables toward financial analysis model.

After that, financial analysis model retrieves financial data from project database and incorporate such obtained intermediate variables from such previous two models. Consequently, project output variables come out in terms of financial statements, Net present value, and sensitivity.

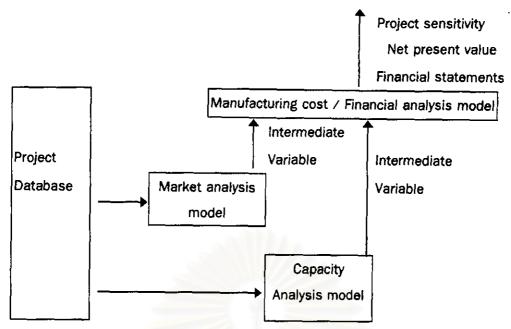


Figure 5.1 Conceptual model for feasibility program

According to detailed software configuration, IdefO diagram and description will be used as to graphical presentation as Node AO, A-O, A2, A3. For user manual will be shown in appendix A, while example of software application and its displays that deployed China project data are demonstrated in all worksheets of Market.xls, Capa-anal.xls, Input.xls and output.xls in appendix B. For the rest of files are sensitivity analysis files whose displays have exactly the same format as "input.xls" and "output.xls" do. It needs not to print them all.

1.1. **idefO diagram** Comprehensive software configuration can be further illustrated as from NodeA-O, AO, A2, A3

1.2 Text description

Node A-O, named "Perform financial feasibility analysis", is decomposed into four sub-activities (Perform market analysis, Perform capacity analysis, Perform manufacturing cost analysis, and Perform financial analysis) as Node AO. Hierarchically, sub-activity "Perform manufacturing analysis" is exploded into five sub-sub-activities (Perform material cost, Perform labor cost, Perform factory overhead cost, Perform depreciation, and amortization cost, and Perform total production cost) as Node A2.

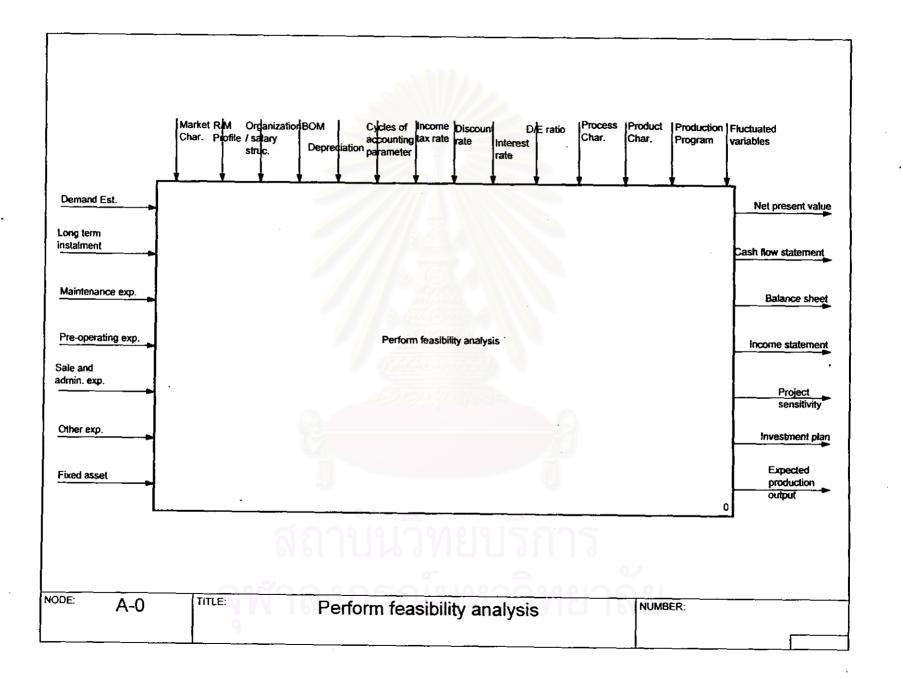
According to Node AO, sub-activity "Perform financial analysis" is decomposed into four sub-sub-activities (Prepare income statement, Prepare cash flow statement, Prepare balance sheet, and Perform project indicators) as Node A3.

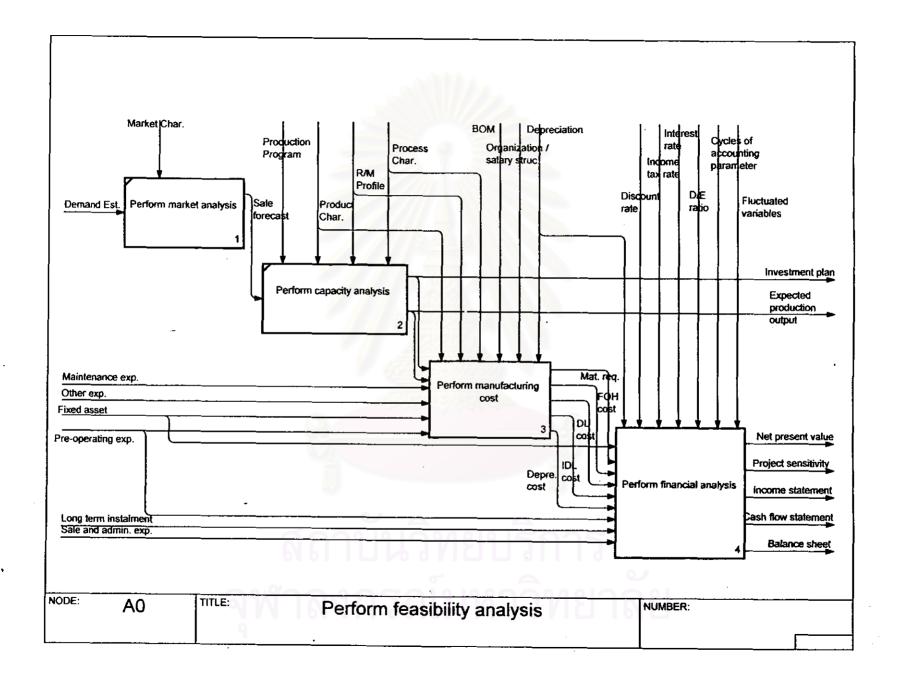
2. Software procedure

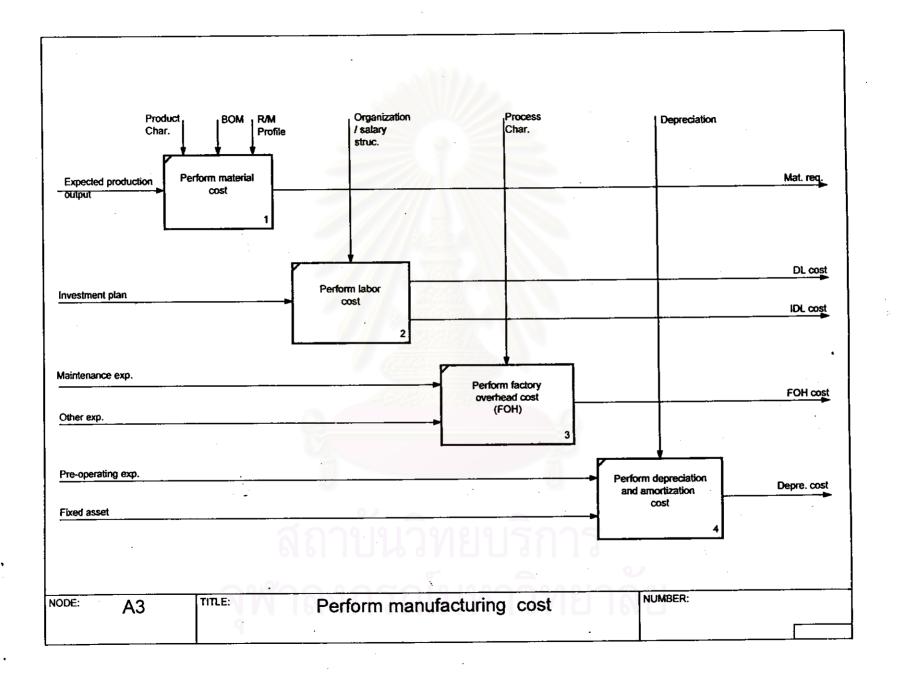
After knowing software configuration that pictures how models of this software get related to one another, software procedure is consequently elaborated to clarify how its system works. In consistency with conceptual model, Figure 5.2 illustrates the procedures comprising three separated steps. As from figure 5.2 in step 1, program start and input, the user manually inputs the input and control variables (1) into marketing model. Output variables (1) are subsequently generated. The user can consider whether such market outputs are feasible enough to carry on the following capacity analysis.

If so, input and control variables (2) are manually put into capacity analysis model. That brings about output variables (2). By now, the user is likewise to figure out whether such engineering output are feasible. If so, the user is coming up with the last model (3) through manually inputting the input and control variables (3). Additionally, output variables from model (1), and (2) are manually inputted and analyzed by financial analysis. In consistent with software IdefO modeling (Node A-O, AO, A2, and A3), Table 5.1, 5.2, 5.3, and 5.4 elaborates all input variables, control variables, intermediate variables, output variables, and numerical relationships among such relevant variables of step 1, 2, and 3 respectively.

Incidentally, please note that methodology in table 5.1, and 5.2 are summarized as readily mentioned in demand/sale forecast estimation of Chapter "Market opportunity analysis" and in capacity and technical analysis of chapter "Manufacturing implication analysis". By their terminology, input variables and control variables mean the required data for each step. The difference among them are readily mentioned in literature review in regard to idefo. Intermediate variables are the outputs incurred during each step and consequently generate the output variables. Lastly, output variables are output that has been readily figured out as numerical relationships among input variables.







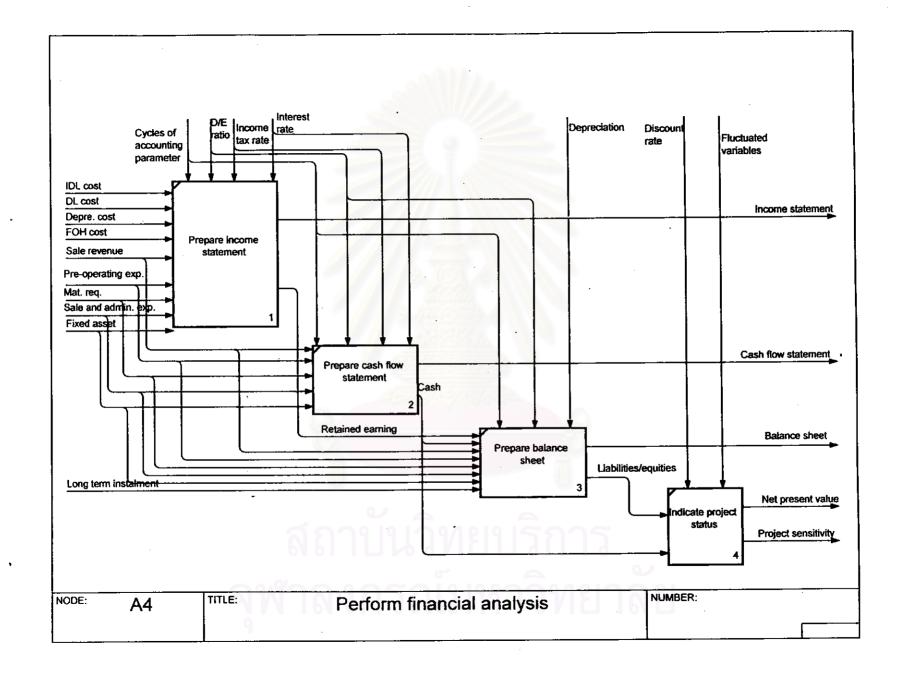


Table 5.1 (input, control, intermediate, and output variables, as well as numerical relationships in step 1 Market analysis (Based upon Node AO)

Input variables	Control variables	Output variables	Intermediate variables
Demand estimation	Market characteristic	Sale forecast	-
	Market place comparison	-•	
Numerical relationships			
Sale forecast = Demand	estimation * Market share * 1	arget market area *	
%product portfolio* Powe	r(market growth, number of y	ear)	

Re. Market characteristic: Product group, product portfolio, and its percentage, Market place comparison, Target market area, Market growth, and Market share.

Table 5.2 Input, control, intermediate, and output variables, as well as numerical relationships in step 2 Capacity analysis (Based upon Node AO)

Input variables	Control variables	Output variables	intermediate variables
Sales forecast	Production program	Investment plan	Expected capacity
	Product characteristic	Expected production output	Expected production
li.	Raw material profile		Output
	Process characteristic		
Numerical			'
relationships			
Expected capacity	(Down stream process) = '	Tool arrangement * Good yield	
* Working hour per	month * Machine utilization	n * Cycle rate	
Expected capacity	(Optional down stream	= Cycle rate * Good yield *	
process)			•
Working hours per i	month * Machine utilization		
Expected capacity	(Upstream process) = Outp	out rate * Good yield * Working	hours per month *
Machine utilization	/ %AVG utilized forming are	ea	
MIGORIALO GENERALONI			

Re. Product characteristics: Tool arrangement, output rate, cycle rate, product weight, and %AVG.

utilized forming area

Process characteristics: Utility requirement, Good yield, machine utilization, and working hours

per month.

Raw material profiles: Raw material type, BOM, and raw material price

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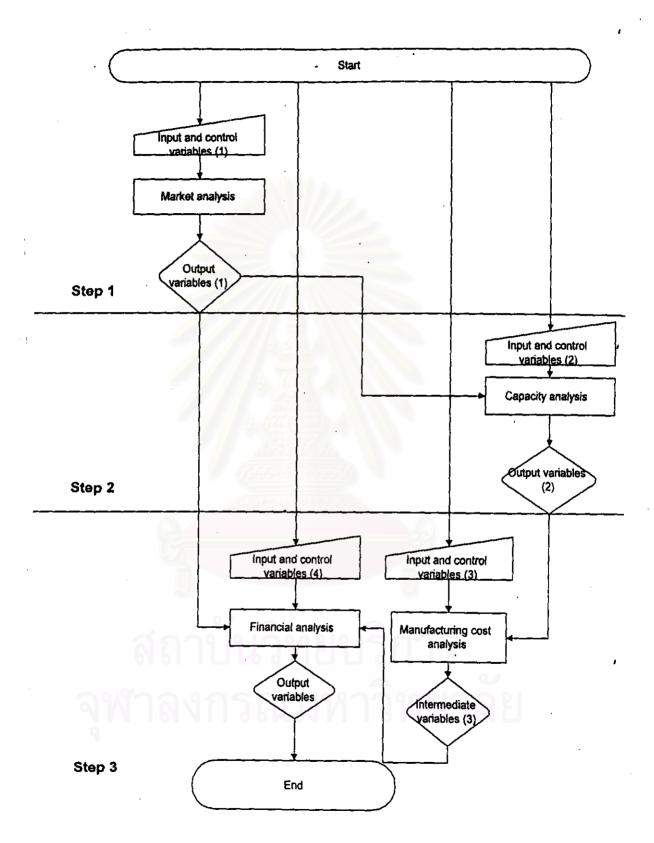


Figure 5.2 Software procedures

Table 5.3 Input, control, intermediate, and output variables, as well as numerical relationships in step 3 manufacturing cost analysis (Based upon Node AO)

Input variables	Control variables	Output variables	Intermediate variables
Other expenses	Process characteristics	-	Factory overhead cost
· Fixed asset	Raw material Profile		Direct labor cost
Maintenance Expenses	Product characteristics		Depreciation cost
Pre-operating Expenses	Build of Material		Material requirement
•	Organization/salary structure		Total production cost
	Depreciation		Material cost
Numerical relationships	<u>.l</u>	·	
Material requirement ≈ BO projection	M * Product weight * Production	n program * Sale	
Material cost = Material re	quirement * Raw material price		
Direct labor cost = Average / hours per year	e salary * Number of employees	* Annual adjustn	nent * Working days
	ge salary * Number of employed	es * Annual adjus	tment * Working days
/ hours per year			
Depreciation cost = Invest	ment on fixed asset and pre-op	perating	
expenses / depreciation p	eriod		
Factory overhead cost = U	tility cost + Maintenance cost	+ Insurance cost	
+ Indirect labor cost	ACOMO NO MARIO DE LA COMO DE LA C		
Utility cost = Utility require	ment * Working hours / days		•
per year			
Maintenance cost = 2% o	Machine and equipment		
Insurance cost = 0.5% of	Machines, buildings, and	N. P.	
equipment			

Total production cost = Material cost + Labor cost + Factory overhead cost + Maintenance cost +

Depreciation cost

Table 5.4 Input, control, intermediate, and output variables, as well as numerical relationships in step 3 Financial analysis (Based upon Node AO)

Input variables	Control variables	Output variables	Intermediate
			variables
Material requirement	Depreciation period	Balance sheet	
Factory overhead cost	Cycle of Accounting parameters	income statement	}
Direct labor cost	Fluctuated sensitivity variables	Cash flow statement	
Depreciation cost	D/E ratio	Net present value	
Fixed asset	Discount rate	Sensitivity	<u> </u>
Pre-operating expenses	Interest rate		<u> </u>
Long term loan	Income tax rate		-
installment			}
Sales and administration			}
Sales revenue		,	}
Numerical relationships	///// .		'
Stock = material requirem	ent * Cycle of material / 12		
Output = Sale projection	- Stock		
Material purchase = Stock	+ Material requirement		 -
Cost of goods sold = Begi	nning stock + Material purchase	+ Direct labor cost + le	ndirect labor cost
Factory overhead cost + D	epreciation cost - Ending stock		r
Account payable = Materia	al purchase * Cycle of account pa	ryable / 12	
Account receivable = Sale	s revenue * Cycle of account rec	eivable / 12	
Cash collection ≈ Sales re	evenue - Account receivable		
Cash payment = Material	purchase - Account payable	771	
Working capital requireme	nt = Material stock + Account rec	ceivable - Account	
payable	<i>v</i> a	3	
Long term loan ≈ (Fixed a	asset + Pre-operating expenses) * D/E ratio	
Total investment = Long to	erm Ioan + 8ank overdraft +		,
Equity	ากรถเบาหา	าทยาล	61
Draw down = Long term	LILLOONOOALALL	9 1 1 D 1 1 0 1	
loan	· 	 	-, -, -, -, -, -, -, -, -, -, -, -, -, -
Ending balance of equity =	Beginning balance of equity + D	raw down	
	m loan = Beginning balance of lo	ng term loan + Draw d	own - Long term
oan installment		· 	
Bank overdraft ≈ Working	capital requirement		
Equity = (Fixed asset + P	re-operating expense) * D/E		

ratio

Gross profit = Sales revenue - Cost of goods

sold

Earning before interest and income tax = Grosa profit - Selling and

administration expenses

interest expenses = Interest rate * Loan

Earning before income tax = Earning before interest and income tax - Long term interest expense - Short term interest expense

Net profit (loss) = Earning before income tax - Income

ltax

Ending balance of ratained earning = Beginning balance of retained earning + Net profit (Loss)

Total cash in = Long term loan + Bank overdraft + Cash collection

Total cash out = Investment + Material purchase + Direct labor cost + Factory overheed cost +
Selling and administration expense + Long term loan installment + Bank overdraft + Long term loan
interest expense + Income tax

Ending balance of cash = Net cash in/out + Beginning balance of cash

Total current asset = Ending balance of cash + Account receivable + Stock

Total current liabilities = Bank overdraft + Account payable

Total long term liabilities = Ending balance of long term

loan

Total common equity = Ending balance of equity

Net discount value of earning = (Net cash - Total liebilities and equity) / Power (1.1, Number of year)

Net present value = Net discount value of earning in year 0 to year 10

Sensitivity = Fluctuated net present value caused by fluctuated variables (e.g. Sale revenue, Currency exchange)

3. User interface

3.1 Getting started As mentioned previously, this financial feasibility analysis software is Microsoft Excel based application program. This manual assumes the user already knows how to use Microsoft Excel accordingly. For general information, see the Microsoft Excel User's Guide.

- 3.2 Installation As stated earlier, this software has eighteen worksheet files of Excel. Like other worksheet files, most of them are ordinarily installed by DOS commands (e.g., copy, move) or using commands in Explorer folder of Window 95.
- 3.3 Working with application program In using such program, the recommended procedures can be addressed as follow.
- 3.3.1 To run the program through opening its file "input.xls". And then the question "This document contains links. Re-establish links? "appears on the display. Press "Yes" button as figure 5.3. To be able to come up the menu of the program, select worksheet "main menu". At this step, eight buttons, named "Open program", "Close program", "Market analysis input data", "Market analysis output data", "Capacity analysis input data", "Capacity analysis output data", "financial analysis", and "financial analysis output data" do appear on the spread sheet as figure 5.4. At first, press button "Open the program", all files are then to be automatically opened.
- 3.3.2 To run Market analysis, press button "Market analysis input data". Manually, Input data at worksheet "Demand-est" at table "Market Characteristic" and table "Market place comparison". After that, output of market analysis come out through pressing button "Market analysis output data" at worksheet "Sale-forecast" as figure 5.5.
- 3.3.3 To run Capacity analysis, press button "Capacity analysis input data". Manual input must firstly be done at worksheet "Product-char" and then worksheet "Sale-forecast" whereas product characteristics are to be completed before filling up the rest of tables. After returning to main menu, the outputs of capacity analysis are presented through pressing button "Marketing analysis output data". The window display will display worksheet "inv-plan". By the way, Table 5.5 dictates sort of input information /data for file mkt-anal.xls and capa-anal.xls.

Table 5.5 The Identified worksheets of file mkt-anal.xls and capa-anal.xls.

File/Worksheet		Sort of input information / data
Mkt-anal.xls	Mkt-char	Product portfolio , Market share, Product mix, Demand
		Estimation, Product group, and Market size comparison
Capa-anal.xls	Product-char	Process characteristic, Production program, and product
		Characteristic.

3.3.4 To perform manufacturing cost analysis and financial analysis,

press button" financial analysis input data" Once program is ready to work, the user can input or edit data relevant to the financial analysis through all identified worksheets of file "input.xls". Table 5.6 identifies the worksheets in file "input.xls" and their sorts of input information of the project.

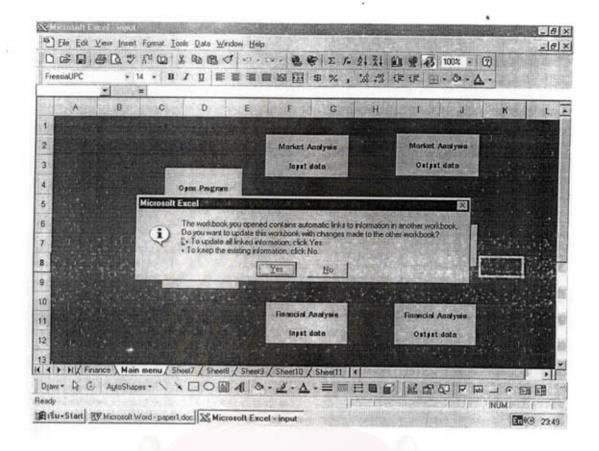


Figure 5.3 Window display of to establish the linkage among file Input.xis worksheet Main menu and the others

After inputting all required project data, return to worksheet "main menu" of file "input.xls" and click button "Net present value and sensitivity". Worksheet "indicators" of file "output.xls" will subsequently appear as figure 5.6. And, user can see Net present value (NPV) and Sensitivity tables.

Just in case, user who 'd like to see the financial statements of project can select worksheet "financial statement" of file "output.xls". Its window display can be seen as figure 5.7.

User who 'd like to print out any outputs or inputs can do any places like by using printing command of Microsoft Excel.

Lastly, user 'd like to close the program. Get back to worksheet "main menu" of file "input.xls" and click button "close". Such program files, except file "input.xls", are then automatically closed. Eventually, close file "input.xls" and question "Save the changes" appears on the spread-sheet. Press "Yes" button, if the user 'd like to save the changed data. Or, press "No" button, if the user would not like to save any changes.

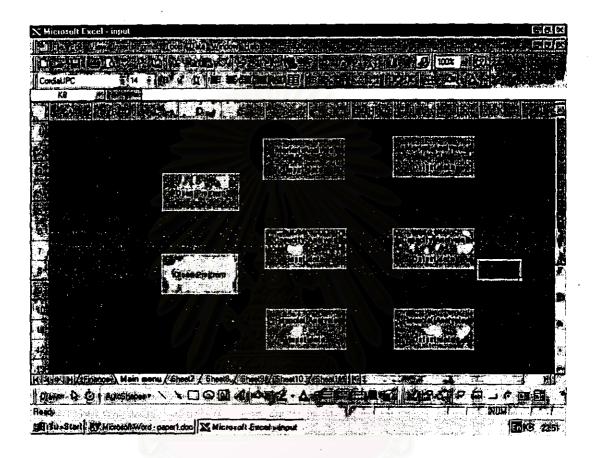


Figure 5.4 Window display of file input.xls worksheet Main menu

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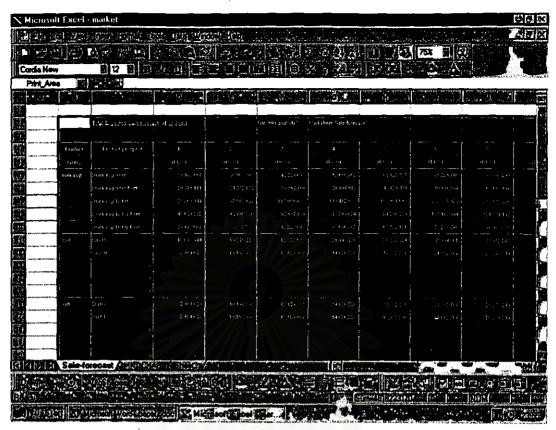


Figure 5.5 Window display of file Mkt-anal.xis worksheet sale-forecast.

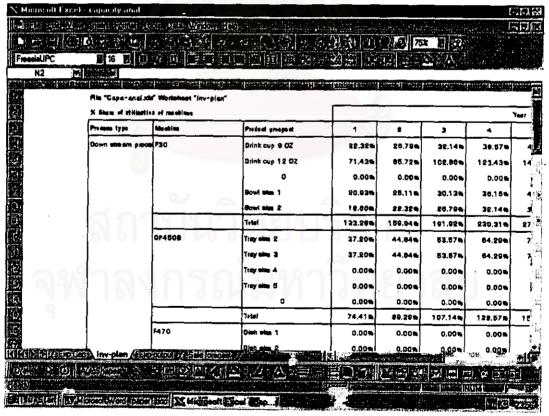


Figure 5.6 Window display of file capa-anal.xls worksheet Inv-plan.

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	3. Raw meterial price	24,983,795	19,377,240	15,455,835	0,184,160	2,667,812		
	4, Currency (RMB egain	et (253) 1,834,624	7,861,116	16,466,836	18,000,291	25,009,070		
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Figure 5.7 Window displays of worksheet indicators file output.xis

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Figure 5.8 Window display of worksheet financial statement file output.xis

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Table 5.6 The identified worksheets of file input.xis .

1No deshara	Sort of input Information / data
Worksheet	Sort of hiper information / duta
1. Finance	Financial conditions: Interest rate, Income tax rate, Installment,
	and so on.
2. Capital	1. Investment onto various sorts of assets and expenses.
	2. Cycle conditions for current objects (e.g. material, A/C
	payable)
3. Management	Organization chart
	Salary
4. Engineering	Production program
	Build of material (BOM)
	Material price
	Utility fee
	Production line arrangement in consistency with investment plan
	(Table 4.15)
5. Market	Expected actual production
	Expected sale price
	Product prospects

3.4. Handling errors and cautions

- **3.4.1** Market analysis model By program constraints, this program allows four product groups and their five product portfolio each. The user can not add more than this.
- 3.4.2 Capacity analysis model As a precaution, please note that this analysis is solely designed for three different type of processes (extrusion, thermoforming, and printing process) whereas four different types of thermoforming machine, two different types of extrusion machine, and two different types of printing machine are allowed. Besides, five different types of product are correspondingly allowed for each type of machines.

Just in case, product prospects for one machine are more than five, put the same machine type to the available spread-cell in the table with the rest product prospects. Incidentally, insert or delete any column or cell are absolutely not allowed for this program because they will bring about distortion of linkage among file.

3.4.3 Manufacturing cost and financial analysis — Accidental input errors can take place but it is not serious because it can be immediately solved by replacing incorrect input data at file "input.xis". Seriously, please note that available

formula at any spreadsheet cells in file "output.xls" are not allowed to be changed. The role of file "output.xls" is solely to display the project results.

Likewise, positions of any cells in input.xls and output.xls are fixed due to complicated cell links among related files and user is then to fill out the input data at the determined places. That actually means "insert row or column" and "delete row or column" commands of Microsoft Excel are not allowed to be used.

Correspondingly, sensitivity analysis files automatically work and the user is not allowed to deal with because all sensitivity results are sent to file "output.xls". The user can thus see through both all sensitivity analyses table and their graphs as well as net present value there. Table 6.2 in Appendix B illustrates sensitivity files, their fluctuated variables and scale of fluctuation.

4. Data description for example practice and its meaningful project indicators

In example practice, Table 5.7 concludes the company's reference sources of the relevant input information of China project. In reality, some of them mainly came from historical performance data of the company, for example, accounting department, production, and so on. Besides, some of them have been obtained by both formal and informal accessibility of project staff in China, like personal connection to local government officers., etc.

For better understanding, example of application is further elaborated in Appendix B. On account of a number of input, control, and output variables, it is recommended that some of them is exemplified to clarify how such figures get related to one another in terms of numerical relationship.

In summary for example practice that deployed China project, the meaningful financial results are described as refers to Appendix A. As for additional comment on China project's financial status will be wholly mentioned in Chapter 6.

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5. Meaningful financial indicators for China project

5.1 Net Present Value

Ten year net present value for China project : 13,770,704 RMB.

Table 5.7 The relevant input information of China project

[TM, 1996]

Workbook	Worksheet	Variable	Source of variable
Mkt-anal	Mkt-char	Product group, product mix, Market share, demand estimation And, market place comparison	Market survey, and analysis
Capa- anaí	Product- char	Process characteristic, product Characteristic, and production Program	Historical data from mother company, and vendor
Input	Finance	Income tax	The Preferential Treatments for foreign Enterprises in open cities of China Information from government officer
		Loan profile	Reference from financial department
		Import tax	Information from government officer
		Depreciation for land and buildings	Provisions of land administration in Shanghai [Pennells, 1994]
		Depreciation for other assets Sale and administration expense	Reference from accounting department Reference from sale, personnel, and delivery department
		Cycle of material, A/C payable and receivable	Reference from accounting department
		Pre-operating expense	China project budget plan
	Manage- ment	Salary, organization chart	Table 4.15 Survey report in Shanghai
	Engineering	вом	Reference from production department
	4 104	Utility	Survey report in Shanghai
		Raw material	Survey report in Shanghai
		Production line arrangement	Table 4.15 Machine operation manual
	Market	Sale revenue	1. Table 4.17
		Expected price	2. Market analysis

5.2 Sensitivity

Table 5.8 Sensitivity

analysis

Fluctuated variable	Range of fluctuation						
	-20%	-10%	0%	+10%	+20%		
1. Sale revenue	-12,868,966	450,869	13,770,704	27,090,538	40,410,373		
2. Long term interest rate	15,700,653	14,735,678	13,770,704	12,805,729	11,840,754		
3. Raw material price	24,983,795	19,377,249	13,770,704	8,164,158	2,557,612		
4. Currency (RMB/US\$)	1,931,529	7,851,116	13,770,704	19,690,291	25,609,878		

Project Sensitivity

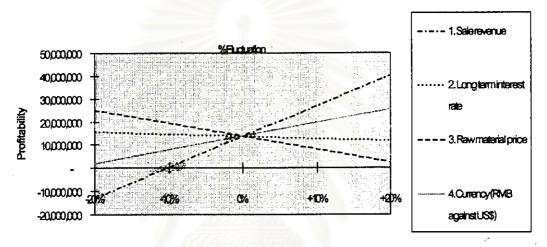


Figure 5.8 Sensitivity of financial status for China project

4.3 Projected financial statements

Four-year Income statement, Cash flow statement, and Balance sheet for China project are exemplified as Table 5.9, 5.10, and 5.11 respectively. Such software actually generates 10-year financial statement as can be seen in Appendix A.

Table 5.9
Income_statement

Item	YRO	YR1	YR2
	RMB	RMB	RMB
1. Total sales	_	30,105,936	43,008,480
Less:			
2. Cost of goods sold	- '	17,506,291	22,954,946
Gross profit	-	12,599,645	20,053,534
Less: 3. Selling & administration expense		2,162,723	2,594,156
Earning before interest & tax		10,436,921	17,459,378
Less:			ļ
5. Interest expense (Long term loan)	1 -	2,292,550	2,292,550
6. Interest expense (Bank overdraft)	-	694,298	991,855
Earning before tax		7,450,073	14,174,973
Less:			Î.
7. Income tax	<u> </u>	1,192,012	2,267,996
Net profit (Loss)) <u>111</u> 2 (4)	6,258,061	11,906,978
Retained earning :	101/4		,u
Beginning Balance		-	6,256,061
Net profit (Loss)	196	6,258,061	11,906,978
Ending balance	-	6,258,061	16,165,039

Table 5.10 Cash_flow

statement

Item	YRO	YR1	YR2
	RMB	RMB	RMB
Cash in :			
1. Equity	28,656,876	-	- (
2. Long term loan	28,656,876	_	- `
3. Bank overdraft	-	3,857,212	5,510,304
4. Cash collection	SAGMY.	27,597,108	41,933,268
Total cash in	57,313,753	31,454,320	47,443,572
Cash out :			
1. Investment cost	57,313,753	-	-
2. Material purchase	-///-	8,626,435	13,107,700
3. Direct labor	///	1,078,920	1,186,812
4. Indirect labor	//k@A	889,920	978,912
5. Factory overhead	V A TON	1,571,845	1,571,845
6. Selling & administration	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2,162,723	2,594,156
expense	2440000		
7. Long term loan installment			-
8. Bank overdraft		3,857,212	5,510,304
9. Long term loan interest		2,292,550	2,292,550
expense			
10. Bank overdraft interest	<u> </u>	694,298	991,855
expense			
11. Income tax	-	1,192,012	2,267,996
Total cash out	57,313,753	22,365,916	30,502,130
Net cash In/Out	<i>3</i> 3 √ 1 C	9,088,404	16,941,442
Beginning balance	-05010		9,088,404
Ending balance	361211	9,088,404	26,029,846

Table 5.11

Balance sheet

ltem	0	1	2
	RMB .	RMB	RMB .
Current assets :			
1. Cash in hand	-	9,088,404	26,029,846
2. Account receivable	-	2,508,828	3,584,040
3. Inventories	<u></u> A111	2,132,606	3,046,580
Total current assets	- \\\\	13,729,838	32,660,466
Fixed assets :			
1. Land	2,214,000	2,169,720	2,125,440
2. Factory & office building	4,214,000	4,003,300	3,792,600
3. Machines	31,415,753	28,274,177	25,132,602
4.Tools	11,000,000	8,800,000	6,600,000
5. Factory equipment	4,821,000	4,338,900	3,856,800
6. Laboratory	329,000	296,100	263,200
7. Office equipment	940,000	752,000	564,000
8. Vehicle	1,500,000	1,200,000	900,000
9. Pre-operating expenses	880,000	792,000	704,000
Total fixed asset	57,313,753	50,626,197	43,938,642
Total asset	57,313,753	64,356,035	76,599,108
Current liabilities :			
Bank overdraft	_	-	-
Account payable	, -	784,221	1,120,316
Total current liabilities	19179/1	784,221	1,120,316
Long term liabilities :		D 0 1 1	0 7
Long term loan	28,656,876	28,656,876	28,656,876
Total long term liabilities	28,656,876	28,656,876	28,656,876
Equities :			
Retained earnings	-	6,258,061	18,165,039
Common equity	28,656,876	28,656,876	28,656,876
Total equities	28,656,876	34,914,938	46,821,915
Total liabilities & equities	57,313,753	64,356,035	76,599,108