



MAGNUS PLAYER USER GUIDE

Table Of Contents

1. INTRODUCTION

1.1	Introduction to Management Games	3
1.2	General Description of the Game	
1.2.1	Organization	4
1.2.2	Method	4-5
1.2.3	Final Adjudication	6
1.3	The Login Screen	7
1.4	The MAGNUS PLAYER Interface	8

2. DECISION-MAKING IN MAGNUS

2.1	Making Decisions (Marketing)	9-11
2.2	Making Decisions (Production)	12-13
2.3	Making Decisions (Finance)	
2.3.1	Sources	14-15
2.3.2	Uses	15
2.3.3	Reconciliation	16

3. ANALYZING INFORMATION IN MAGNUS

3.1	Administrative Notice	17-19
3.2	The Management Reports	
3.2.1	Production Report	19-21
3.2.2	Total Market Report	21-22
3.2.3	Sales Report	22-23
3.2.4	Account Report	23-25
3.2.5	Balance Sheet	26
3.3	Other Sources of Information	26-27

4. CONCLUSION

4.1	Acknowledgements	
4.1.1	First Acknowledgements	28
4.1.2	Second Acknowledgements	28
4.1.3	Third Acknowledgements	28-29
4.2	Reports and Publications on MAGNUS	29-30
4.3	Contact Information	30
Appendix I	Sample Management Reports	31-35
Appendix II	Some Explanatory Notes	36
Appendix III	LAN Player's Interface	37-40

1. Introduction

Thank you for using MAGNUS Business Simulation Game. This manual will provide you with detailed instructions on the various aspects of playing MAGNUS.

1.1 Introduction to Management Games

A management game is designed to provide business students an opportunity to learn and practise the art and science of corporate planning and managerial decision-making. It aims at giving something close to practical experience, because the participants are put in a situation that resembles real life. It also gives theoretical understanding because the model uses pure, general, theoretical functions to describe business relationships. The game is a simulator of the market place where participants representing companies put their decisions to test.

The management game at the University has been in existence since 1973 and has undergone many revisions. One of the major revisions involves an expansion of the production function for the companies in the simulated environment. Another one isolates the display characters from the programme codes to cater for multi-lingual localization. A third revision adds more information items for purchase by a competitor company. Management Game - National University of Singapore, or **MAGNUS** as it is now called, runs in a PC network under the Windows™ environment. It consists of a Game Administration System, and a Player's Interface for the participants. There is also a web interface for the Players. This manual is written specifically for the Players using the web interface. Similar screenshots of the Player's interface in the LAN version are compiled in Appendix III. There is a separate guide for the Game Administration System.

The following sections describe the essentials of the simulation provided by **MAGNUS 5.0** and above to guide the decision making by the participants. It should be noted that a management game cannot be a substitute for practical business experience; neither can it be a substitute for elementary theoretical studies. However, it is hoped that the game can effectively and in an exciting way supplement both.

1.2 General Description of the Game

1.2.1 Organization

The basic game is a contest between a number of teams (from 3 to 6) competing over a specified number of trading periods to be decided in advance. A number of such games may be played simultaneously and independently of each other.

1.2.2 Method

Each game is distinguished by a unique description, e.g. 'Game JK' and within each game a team is allotted its Company Number, e.g. Game JK Company 3. At the commencement of each trading period, the Game Administrator will outline the economic climate the market operates in. The scenarios described will have specific parameter values announced in an administration notice, accessible from the Parameters button on the Player's Interface (see Section 1.4).

For each of the trading periods a company is required to submit a set of decisions. These decisions relate to (i) selling prices and industrial contract option, and (ii) allocation of cash resources; they are described in detail in Section 2. The Game Administrator would normally specify the date by which decisions should be submitted for each period. Before the deadline, or when the simulation is run, whichever is later, players are free to scan the environment, analyse their positions, purchase competitors' information, and modify their decisions.

All companies start from the same opening position contained in a Management Report (Appendix I). For each period, the computer will process the decisions of all the companies in one game and will produce an updated version of the Management Report which includes Production and Sales Reports, Profit and Loss account and Balance Sheet. These are described in detail in Section 3.2.

All companies manufacture and sell two products --a consumer product, sold to consumers for direct consumption and an industrial product, sold to industries and factories for use in further production. Both products are not seasonal in demand.

One unit of consumer product requires 1 unit each of raw materials, plant capacity and labour to produce on regular shift. The industrial product is sold

only through contract order. It is considered only a semi-finished product and requires a lower amount of plant capacity and labour for production than the regular consumer product. However, unused industrial product will be reprocessed during an additional shift to become the consumer product. The resultant production cost is thus higher than that of the consumer product made directly during the regular shift.

The total market for the consumer product consists of a number of 'areas', each company having a 'home area' which corresponds to that company's number. In this area a company has a certain marketing advantage. In addition to the home areas there is also a common area wherein all the companies compete on equal terms. Thus, in a game between five teams, Areas 1 to 5 are home areas for companies 1 to 5 respectively and Area 6 is the common area. Similarly, if a game is composed of three teams only, then Area 4 will be the common area.

The total consumer market for each period is calculated by area and in total, the program taking into account:

- The economic situation as indicated by the Game Administrator at commencement.
- Marketing expenditure by all companies
- Research and development by all companies
- Selling prices of all companies

It is expressed as the total number of orders taken by all companies. The share of each market (i.e. orders taken) allotted to each company is calculated by reference to that company's decisions in relation to the decisions of its competitors.

Orders taken are then filled from (i) inventory and (ii) current production on a first-in-first-out basis. Sales in away areas have to be covered by an appropriate transport allowance. If any orders cannot be filled by reason of lack of production or (in away areas) lack of transport, penalties are incurred.

Thus the whole basis of play can be summarized as an exercise in balancing production levels with marketing levels, having proper regard to the profit position and the preservation of liquid resources.

1.2.3 Final Adjudication

The winner of each game will be selected from the companies in the game using the following measures at the end of a round:

- (1) Average Return on Investment;
- (2) Accumulated Profit;
- (3) Management Effectiveness:
 - (a) Regular Demand Sufficiency
 - (b) Contract Strategy Effectiveness
 - (c) Financial Management Effectiveness

Regular demand sufficiency measures a company's ability to satisfy demand generated. Contract strategy effectiveness measures a company's ability to win industrial contracts and financial management effectiveness measures the ability to control a company's cash flows.

The weightage on each measure will be announced by the Game Administrator prior to commencement of the game.

1.3 The Login Screen

Before you begin playing the game, you will have to log-in with your Company ID and Password at the login screen (Fig 1.1). Your Company ID is a combination of your Gamecode and Company Number, which should have been assigned to you by your administrator. For example, if your Gamecode is 'G5' and your company number is '3', your Company ID will be 'G5C3'. A default password will only have been assigned to you by your administrator. You are advised to change your password the first time your login.

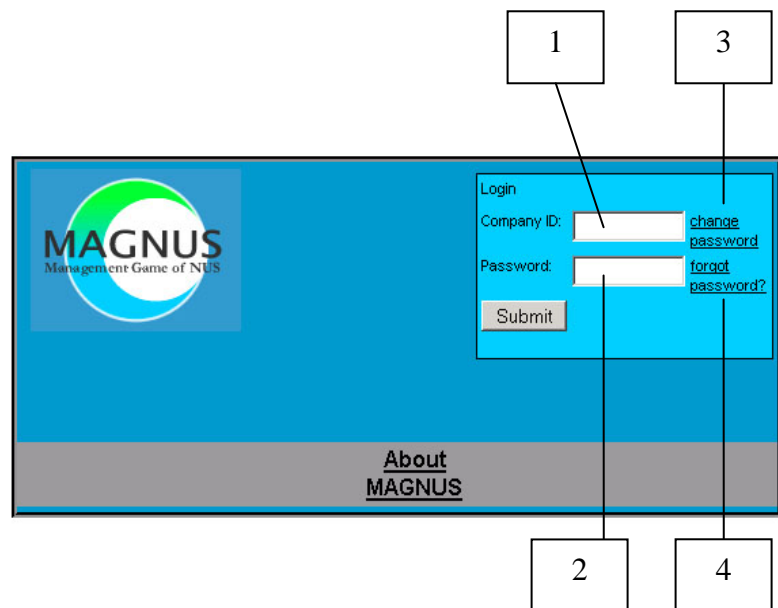


FIGURE 1.1: MAGNUS Login Screen

Number	Elements	Description
1	Company ID input field	Text box to input your Company ID
2	Password input field	Text box to input your login password.
3	Change Password link	This link will bring your to another screen, which will allow you to change your password.
4	Retrieve Password link	This link will allow you to retrieve your password if you have forgotten it.

1.4 The MAGNUS PLAYER Interface

Below is a screenshot of the MAGNUS Player interface, which contains various screens displaying your company information and different areas for you to input your decisions.

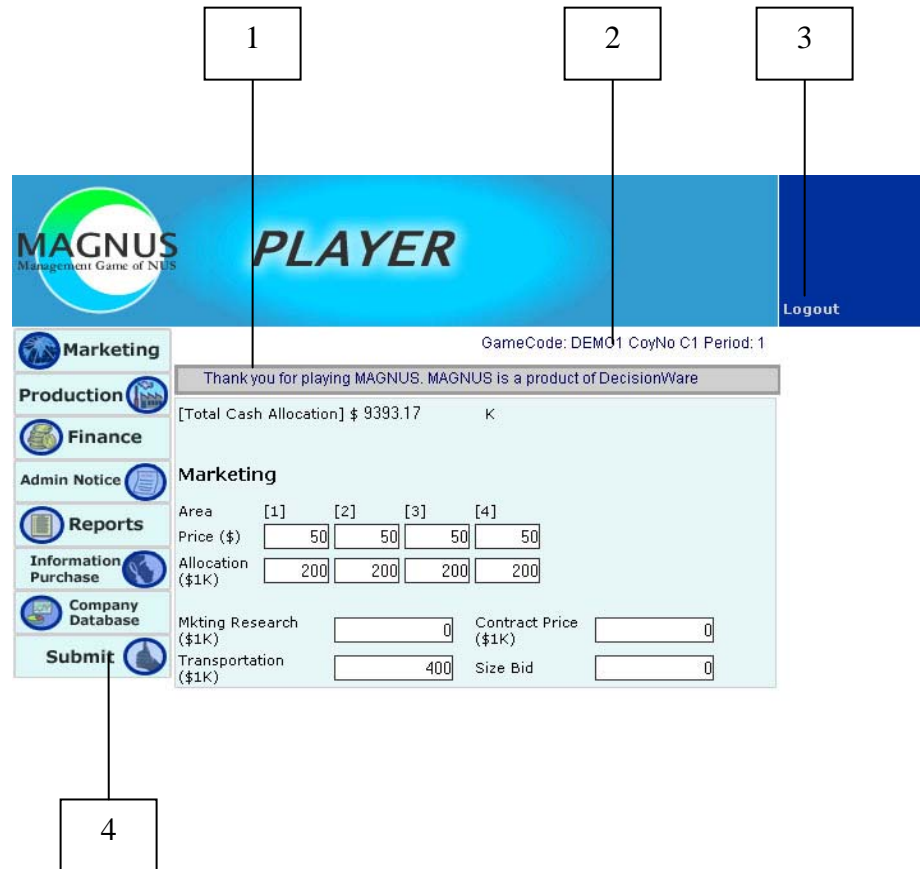


FIGURE 1.2: MAGNUS Player Interface

Number	Elements	Description
1	Announcement Info Bar	This panel displays the latest announcements set by the administrator.
2	Game Info	The area displays the your GameCode, Company Number and Current Period.
3	Logout	Clicking this link logs you out from MAGNUS Player and takes you back to the Login Screen.
4	Functions sidebar	This area contains the various buttons which will take you to the different function screens upon clicking them.

2. Decision making in MAGNUS

We will begin by going through the various screens where you will need to input decisions and the important points to note when making decisions.

2.1 Making Decisions (Marketing)

[Total Cash Allocation] \$ 9393.17 K

Marketing

Area	[1]	[2]	[3]	[4]
Price (\$)	50	50	50	50
Allocation (\$1K)	200	200	200	200
Mktng Research (\$1K)				Contract Price (\$1K) 0
Transportation (\$1K)			400	Size Bid 0

FIGURE 2.1: Marketing Screen

Consumer Market Prices (a)

The selling price per unit of consumer product must be decided for each market area. These must be in whole numbers. The maximum and the minimum will be specified by the Game Administrator in the Administration Notice. If a company does not wish to sell in any area, \$99 should be entered on the decision against the price for that area.

Marketing (b)

The amount to be spent on marketing (advertising, sales-men, etc.) must be allocated in each area and shown on the form in units of \$1,000; the maximum in any one period is stipulated in the Administration Notice. The effect of this expenditure on a company's market share is spread over several periods on a moving average basis so that increases or decreases will have gradual, rather than immediate, effect. Over-marketing will incur a penalty in the form of a write-off of goodwill against profits. Orders unsatisfied are not carried forward to the next period but will be redistributed amongst competitors. (Section 3.2.3 -- additional

Contract Price
(c)

sales). If the marketing expenditure for an area is excessively low, zero sales may result.

The number of units for which contract tenders for industrial product are invited will have appeared in the Administration Notice.

The following rules apply:

- (1) A company may elect not to tender in which case these columns may be ignored on the decision form or entered as 99 on the entry interface.
- (2) A company may elect to tender a part of or the whole contract.
- (3) A company must produce enough industrial product to cover the entire contract it bids for, subject to its production capacity. If it does not win the contract or is awarded part of the contract, then the remaining stock is reprocessed further at the end of the period to become the consumer product.
- (4) The contract price must not be lower than the minimum contract price set by the Game Administrator.
- (5) The contract price must also not be higher than the lowest market price for consumer product set by the same company.
- (6) The contract awarded to a bidding company will depend on the price it sets and its contract image.
- (7) Contract will be awarded to bidding companies starting from those with the lowest effective contract price until all the contract has been satisfied. If total bidding size is more than total contract offered, allocation is prorated among successful companies. Contracts will be apportioned to companies with the same effective contract price.
- (8) It is possible that at any period, contract may not be completely

satisfied or even at all satisfied.

(9) Contract sales do not involve any expenditure on marketing or transport.

Contract Size
(d)

The contract size is the size of the contract the company is bidding.

Mkt Research Fee
(e)

This is the consultancy fee for marketing research. An investment will increase the accumulated market carried forward by a percentage between 0.07 and 0.12% for each \$1,000 allocated. Thus an investment in one period will enhance the marketing effort commencing with the following period.

Transportation
(f)

There is no transport cost in the home area. Transport cost is higher in a competitor's area than in the common area. Both costs are set by the game administrator. The amount of cash allocated for transport must be calculated from the expected sales figure and entered on the Decision Form in \$000's. If insufficient cash is allocated, an emergency fund is made available through the emergency loan wherein the cost of transport for each unit of goods delivered is charged as twice the normal costs.

If, however, more cash has been allocated for transport than is required to deliver the number of consumer units sold, the excess allocation is not wasted but is reabsorbed into the cash balance.

2.2 Making Decisions (Production)



[Total Cash Allocation] \$ 9393.17		K	
Production			
	Units	Unit Cost	
g	Industrial Product	<input type="text" value="0"/> \$ 16	
	Consumer Product	<input type="text" value="196526"/> \$ 19	
h	Fixed Cost	\$ 2265.994 K	
i	Variable Cost	\$ 3733.994 K	
	Total Cost (FC+VC)	\$ 6000 K	
	Production Research	\$ <input type="text" value="0"/> K	
	Plant Maintenance	\$ <input type="text" value="15"/> K	
i	Resource Mgt	Current	Adjustment
	Plant (units)	290 K <input type="text" value="80"/> K	<input type="text" value="80"/> K
k	Labor (persons)	30000 <input type="text" value="100"/> x10 Units	<input type="text" value="100"/> x10 Units
l	Raw Materials	300 K (+) <input type="text" value="250"/> K	<input type="text" value="250"/> K

FIGURE 2.2: Production Screen

Industrial and Consumer Production (g)

(1) Industrial Product has to be produced in order to fulfill the Contract bid. Unsold Industrial Product will be converted to Consumer Product.

(2) Any excess Consumer Product will be stored in a warehouse for a maximum of 2 periods.

The cash allocation to production is subject to the following limits:

(3) The minimum is \$50,000 plus the figure of 'Fixed cost estimated next period', hereby denoted as FC, appearing under cost analysis in the management report from the last period.

(4) The maximum is the estimated total cost of production derived as:

$$FC + VC * MINU$$

where VC and MINU can be found in the management from the last period. VC is the 'Unit variable cost (consumer product) estimated next

period' appearing under cost analysis, and MINU is the minimum of 'units of plant, raw materials and labour for next period' appearing under capacity analysis.

Production Research
(h)

This is the consultancy fee for production research. An investment will reduce the variable cost per unit for the following period by 0.005% for each \$1,000 allocated. This will be reflected in the variable cost estimated next-period under cost analysis in the management report. The continuing benefit will be halved in each subsequent period.

Plant Maintenance Expenditure
(i)

Plant maintenance should slow down depreciation. However, there is a penalty for over-maintenance which would reduce plant capacity.

Plant Adjustment
(j)

A positive number here indicates plant investment in units and a negative number represents sale of plant in units. Sale is immediate whereas purchased plant units will only be available at the beginning of next period. The Game Administrator will notify in the Administration Notice the sale price (a) and the unit cost of plant (d). There is an upper limit on the unit of plant that can be sold in a period. Each company must also maintain a minimum number of units of plant capacity in each period.

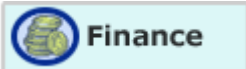
Labour Force Adjustment
(k)

This is in number of persons. A positive number indicates hiring and a negative number indicates firing. One person is equivalent to 10 labour units.

Raw Materials Adjustment
(l)

Raw materials available must be sufficient to produce the planned amount of consumer and industrial products. They are depleted after production. Hence an adjustment upwards is almost always required.

2.3 Making Decisions (Finance)



(Values here are always expressed in \$,000s.)

2.3.1 Sources

m
n
o

Finance		
Funds Statements	<input checked="" type="radio"/> Sources	<input type="radio"/> Uses <input type="radio"/> Reconciliation
Sources of Funds		
Plant Sale	\$ 0	K
Loans Obtaining	\$ <input type="text" value="0"/>	K
Cash Per Last Report	\$ 19265.19	K
Total Cash Available	\$ 19265.19	K
Outstanding Loan	\$ 3805354	

FIGURE 2.3: Finance Sources Screen

Proceeds from Plant Sale
(m)

This is the amount of cash obtained from sale of plant.

Loans Obtaining
(n)

This is the amount of loan the player may wish to take out.

Long-term loans are on offer throughout on the following terms:

There is a maximum on the amount that may be borrowed by one company in one period.

There is a maximum on the total amount that may be borrowed by one company in one game.

This is inclusive of the loan outstanding at the commencement of the game. Any application outside these limits will be treated as emergency loans.

Interest will be charged each period at rates notified by the administrator. It is deducted from the cash balance at the end of the current period.

Emergency loans incurred in any one period will be automatically absorbed in the loan outstanding at the end of the period; interest for

emergency loans, however, is computed at the higher rate of emergency loans.

Cash available per Last Report
(o)

This is the same figure of cash available as shown in the Balance Sheet from the last period, rounded down to \$,000's.

2.3.2 Uses

[Total Cash Allocation] \$ 9393.17 K

Finance

Funds Statements Sources Uses Reconciliation

Uses of Funds

p	R & D	\$	<input type="text" value="30"/>	K	Marketing	\$ 1400	K
q	Transport	\$	<input type="text" value="400"/>	K	Production	\$ 6000	K
r	Loans Repaying	\$	<input type="text" value="0"/>	K	Plant Investment	\$ 800	K
s	Plant Maintenance	\$	<input type="text" value="15"/>	K	Information Fees	\$ 0	K
					Consulting Fees	\$ 0	K
					Income Tax Exp.	\$ 748.17	K

FIGURE 2.4: Finance Uses Screen

Research and Development
(p)

This is the amount of R&D a company may wish to spend. Limits of allocation will be specified by the Game Administrator. A company's level of investment will affect its production costs by improving the efficiency of its factory and thus reduces variable cost. R & D will be taken into account in assessing a company's share of the market. The value is applied on a moving average basis throughout the game and has a forward effect of one period.

Loans Repaid
(q)

Loans may be repaid at any time. Repayment may be in whole or in part.

Plant Investment
(r)

This is the cash allocation for plant investment.

Income Tax Expenditure
(s)

The income tax expense for the previous period (as quoted in the last report) is displayed here for information.

2.3.3 Reconciliation

[Total Cash Allocation] \$ 9393.17 K			
Finance			
Funds Statements	<input type="radio"/> Sources	<input type="radio"/> Uses	<input checked="" type="radio"/> Reconciliation
Cash Reconciliation			
Total Cash Available	\$ 19265.19	K	
Total Cash Allocated	\$ 9393.17	K	
Balance	\$ 9872.01	K	

Total Cash Available
(t)

Total Cash Allocation
(u)

FIGURE 2.5: Finance Reconciliation Screen

This is the total of items (m), (n) and (o) described above. Should the total cash available exceed the total cash allocation, the surplus will attract investment interest at a rate notified by the Game Administrator.

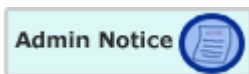
Should the total cash allocated exceed the total cash available, the excess will be automatically covered by an emergency loan.

This is the total of items shown in the *Uses* screen.

3. Analyzing Information in MAGNUS

There is a wealth of information available to assist you in making decisions. We will go through the various sources of information available and provide a brief explanation of the information available.

3.1 Administrative Notice



The list of parameters, also known as Administrative Notice, informs the players of the values of certain environmental variables that have been set for that period.

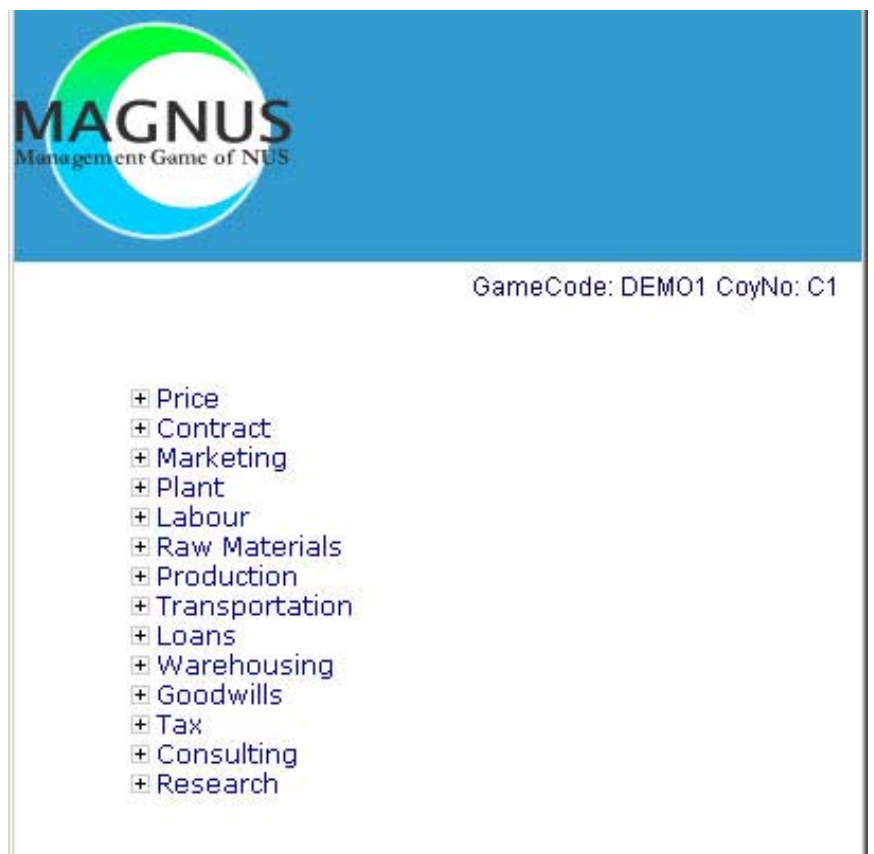


FIGURE 3.1: Administrative Notice

Clicking on each link will list the environment variables and its respective values for that particular period.

<i>Price</i>	This displays the minimum and maximum price that a company can set for a consumer product.
<i>Contract</i>	This displays the minimum contract price that a company has to bid and the size of the contract on offer. A company will not be allocated a contract larger than that on offer.
<i>Marketing</i>	This displays the maximum amount of money that can be spent on marketing in a particular area.
<i>Plant</i>	<p>The values displayed are:</p> <ul style="list-style-type: none"> - Unit Cost of Operating Plant in production - Minimum Plant Capacity - Normal Depreciation Rate of Plant (See Production Report in Section 3.2.1 for more details) - Cost of purchasing 1 Unit of Plant - Price of selling 1 Unit of Plant - Maximum number of Plant units that can be sold in 1 period
<i>Labour</i>	<p>The values displayed are</p> <ul style="list-style-type: none"> - Unit cost of labour in production - Unused labour cost factor/unit product - Labour hiring cost factor - Labour firing cost factor <p>These various cost factors are only indicators reflecting the labour market situation. These are not linear costs.</p>
<i>Raw Materials</i>	<p>The variables displayed are:</p> <ul style="list-style-type: none"> - Unit Cost of Raw Materials - Cost Factor of storing excess Raw Materials - 1 time cost of ordering Raw Materials
<i>Production</i>	This displays the Production Factor for Industrial Product and the Reprocessing Factor. The Production Factor represents the relative cost of producing an Industrial Product compared to a Consumer Product. Producing an Industrial Product will cost less than producing a Consumer Product. The Reprocessing Factor represents the additional relative cost of converting an

Industrial Product to a Consumer Product.

Transportation

This displays the cost of transporting 1 unit of Consumer Product to the Common Area and the Competitor's Area.

Loans

This displays the maximum loan amount per period and the various loan interest rates.

Investment

This displays the rate of investment of the company's excess funds.

Warehousing

This displays the cost of storing unsold finished goods.

Goodwills

Goodwill is an intangible asset to reflect the market image of each respective company. This value indicates how a reduced goodwill affects the market demand.

Tax

This displays the current tax rate.

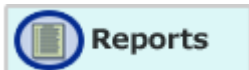
Consulting Fees

This displays the maximum amount of money that can be spent on Production and Marketing Consultancy.

Research and Development

This displays the maximum and minimum amount of money that can be spent on R & D.

3.2 The Management Reports



The Management Reports (Appendix I) will be ready after the effects of each period's decisions have been evaluated. Each company in the game will receive such a set of reports. The initial reports are titled 'PERIOD 0' and describe the starting position on which the first set of decisions (for PERIOD 1) will be taken. There are a total of 6 reports. The first report, the Decision Report, details all the decisions made in the previous period. The other reports are Production, Total Market, Sales, Accounts and Balance Sheet.

3.2.1

Production Report

There are four segments in this report: Current Production, Cost Analysis, Capacity Analysis and Stock Analysis.

1) Current Production

These are the number of units of industrial and consumer products produced. They are determined from the sum of money allocated to production, availability of raw materials, plant capacity and labour. Following the decision to bid for industrial contract on the current period's decision form, the industrial product will be produced first.

2) Cost Analysis

Fixed Costs

The fixed cost is determined by the following factors:

- (1) the level of R & D,
- (2) the plant capacity,
- (3) the firing/hiring costs of labour,
- (4) the ordering cost of raw materials.

Unit Variable Costs

The variable cost per unit is determined from the costs of raw materials, labour and plant with considerable effect from:

- (1) the level of R & D,
- (2) the production consultancy obtained last period.

Costs are reported for both industrial and consumer products where applicable. Total variable costs, total costs and unit total costs are also reported. Fixed costs and variable costs estimated for next period are given.

3) Capacity Analysis

Production capacity is measured in units of plant, raw materials, and labour available.

Current Period

These figures will have been previously given as the capacity for the next period in the last period's report unless there is a penalty due to plant over-maintenance, or there is a sale of plant.

Next Period

This represents the maximum production capacity available in next period in units of plant, raw materials and labour. It takes into account of labour hired or fired and raw materials purchased in the current period. Plant capacity is adjusted by the following:

- (1) depreciation at the rate specified in the Administration Notice and adjusted by plant maintenance,
- (2) investment in plant in the current period.

4) Stock Analysis

Stock brought forward is shown in two categories, representing aging of stock by period of production. The amount brought forward from current period -2 (shown as amount b/f (-2)) is written off before sales allocation.

The next three items are stocks left over from regular production, reprocessing of remaining (unsold) industrial products and stock bought in. A company must hold a minimum (units) of 10 percent of its orders taken in the current period excluding additional sales. Where there is insufficient stock left from production, additional units are bought in at the end of the period. This is done automatically on the company's behalf. Stock from own production is valued at actual cost and any bought in is valued at average selling price plus a further amount set by the Game Administrator.

Stock to be carried forward is again shown in two categories, after subjecting it to revaluation to market value if it is lower than cost. For this purpose, market value is calculated as the true average manufacturing price of the total sales of all companies during the period.

3.2.2

Total Market Report

Orders

This is the number of units of consumer product for which orders are received by all companies in each area and in total. A unit is one manufactured article and orders are calculated for each area by reference to:-

- (1) The economic situation as indicated by the Game Administrator in the Administration Notice.
- (2) The lowest price set by any company in that Area.
- (3) The level of marketing effort accumulated by all companies over a number of periods.
- (4) The level of investment in research and development accumulated by all companies from commencement.

Sales This is the number of units of consumer product actually sold by all companies, including 'additional sales', by areas and in total.

Expenditure The total marketing expenditure by all companies in the period.

Prices by Company The prices charged by each company in each area in the period.

3.2.3

Sales Report

The sales report comprises of the Consumer Market Sales and Industrial Contract Sales sections.

1) Consumer Market Sales

Orders The orders received for consumer product by this company by area and in total, i.e. the market share in units. This is a reflection of the company's effort in relation to competitors in price, plus the accumulative effect of marketing, research and development, and investment in marketing consultants and the company's marketing image. Where the total orders allotted exceed the ability to supply, the shortfall is spread proportionately over the areas, i.e. sales cannot be specifically allotted to one area.

It should be noted that there is a cut-off point whereby a company may receive no orders in an area if its price is appreciably in excess of the average of all companies in that area, or if the marketing allocation is excessively low.

Price sensitivity and the economic situation may be varied by the Game Administrator.

Sales The actual sales achieved for consumer product (i.e. units sold and delivered) in each area and in total. Where the total orders received are more than the total of inventory brought forward plus current production, the sales in each area will have been scaled down proportionately.

Additional Sales These are sales arising from orders taken by other companies unable to fulfill them. These surplus orders in each area are awarded to the remaining companies based on their relative market shares, subject to those companies being able to supply and provided that the price is not greatly in excess of the companies which have unfilled orders. If transportation for this portion of sales

is unallocated for, emergency transport will result.

Market Image

This factor represents a company's marketing competence. It starts at 1 for all companies and is increased by 0.1 for each period in which a company fulfils all its orders. At the end of any period in which a company fails to fulfil all its orders the factor is reduced in proportion to the shortfall on orders. When the company has subsequently fulfilled all its orders for two consecutive periods, the penalty will be cancelled.

Market image is taken into account in calculating market share as set out above. It is not affected by a company's performance in relation to additional sales.

2) Industrial Contract

Total Contract Size

This is the number of units offered by contract.

Total Sales

This is the actual quantity of the industrial product sold through contract. The price bidden by each company for the contract is shown. The quantity bidden, the actual amount sold by this company and the revenues generated from contract sales are also shown.

The amount of contract awarded will depend on each bidding company's Contract Image (see below).

Contract Image

This factor represents a company's reputation as a successful contractor. It starts at 0 for all companies and is increased by 1 when each contract (or share thereof) is obtained and reduced by 1 when the company loses a contract. It will not be reduced below 0. It is applied as a reduction of the company's tender price for the purpose of awarding any contract available in the following period.

3.2.4

Account Report

1) Profit and Loss Account

This summarizes the trading results for the current period.

Sales Revenue

The total revenue from sales in the current period, all of which is at the end of the period. It includes revenue from contract sales, if any.

<i>Investment Income</i>	This is an addition to net profit calculated on surplus cash in any period, where the total cash available exceeds the total cash allocated for expenditure per decision entry. The rate of interest will be notified by the Game Administrator. Any such interest earned will be considered to be a cash increment.
<i>Costs of Goods Sold</i>	This is divided into cost of industrial goods and cost of consumer goods sold. The latter is calculated by assuming sales to have been made firstly from inventory brought forward, and secondly from current production.
<i>Additional Costs</i>	This includes cost of reprocessing, cost of excess raw materials arising from storage expenditure, and cost of unused labour.
<i>Plant Maintenance</i>	This is the expenditure allocated to plant maintenance.
<i>Transport</i>	This is calculated from the number of units sold in each area (other than the 'home' area), multiplied by the charges set by the Game Administrator. If this calculation is less than the cash allocated to transport in the decision entry the excess allocation will have been reabsorbed into the cash balance. If the calculation is greater than the amount allocated then the charge will, of course, be limited to the allocation.
<i>Emergency Transport</i>	When insufficient transport is allocated an emergency transport fund is made available through emergency loan at a hire rate twice the normal transport rate.
<i>Marketing Expenditure</i>	This is the total cash allocations spent on marketing in all the areas.
<i>Warehousing</i>	This calculates the warehouse cost, made up of the fixed charge and variable charge per unit of stock.
<i>Research and Development</i>	This is the cash allocation on Research and Development.
<i>Interest on Loans</i>	This is calculated on the amount of loan outstanding at the beginning of the period plus any fresh loan acquired in the current period and minus any loan repayments, at the rate stipulated by the Game Administrator.
<i>Plant Depreciation</i>	The value of plant in the company's balance sheet stands at certain value per unit of capacity. Depreciation is calculated each period on a straight line basis

at a certain percentage and reduces both the capital value and plant capacity for the next period. It is assessed at the end of a period so that the effect is felt in the next period, i.e., it is reflected in the calculation of capacity estimated for next period. Plant maintenance has some effect on offsetting plant depreciation.

Loss on Sale of Plant

This is calculated as:

No. of units sold x (unit purchase cost per plant capacity - unit selling price), where purchase and realized price are as stipulated by the Game Administrator.

Goodwill Written-Off

This is one of the penalties incurred by over-marketing. It is assumed where a company takes orders but is unable to satisfy them -- for reasons of under production -- the company's reputation will have suffered.

This penalty is calculated at a certain factor per unit of the shortfall. This penalty ceases when the value of goodwill is reduced to nil.

Inventory Written-Off

This includes the write-off of stock brought forward from period before last and the write-down of all stocks, except stocks bought, to current market value whenever applicable.

Consultancy Fees

The cash allocation per decision for the period.

Information Fees

The cash allocation per decision for the period.

2) Income Total

The total income which is the sum of total sales revenue and investment interest.

3) Expenditure Total

The total of all expenditure.

4) Net Profit

Income Total – Expenditure Total

5) Income Tax Expenditure

Income tax incurred due to net profit.

6) Profit C/F

Net Profit – Income Tax Expenditure

7) Return on Investment

This is calculated as the Profit C/F divided by the Total Assets.

3.2.5 Balance Sheet

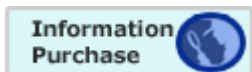
1) Assets

<i>Goodwill at Written-down-Value</i>	This is the equivalent value of company's reputation after writing-off for unsatisfied order.
<i>Plant at Written-down-Value</i>	This is the value of plant after depreciation.
<i>Stock</i>	The total value of stock to be carried forward as shown in the stock analysis in the Production Report.
<i>Cash</i>	The amount of cash on hand for allocations in the next period.

2) Liabilities

<i>Share Capital</i>	The amount of share capital. This figure remains unaltered throughout.
<i>Unappropriated Profit</i>	The accumulated profit (loss) after provision for tax as above.
<i>Loans Outstanding</i>	This represents loans currently outstanding.
<i>Provision for Income Tax</i>	The income tax to be paid by the company. When positive it must be cleared by cash allocation on the decision form. When negative (i.e. accumulated tax losses) it is carried forward and will be offset against any provision from future profits.

3.3 Other sources of Information



Players can purchase information about their competitors. The competitors' company information available for purchase is only for the previous period, and it is organized into 4 different areas – Account, Production, Sales and Decision.

Players can select and purchase as many of the information items available, as long as they have the cash available to purchase these items. The price of each information item can be set by the Administrator.



Instead of using the Management Reports, players can also access their company information their company information using this function.

In addition, players can view their Company's Consumer Market Share in a graphical format. By selecting View Data → Sales → Market Share on the menu, they will be able to view the following:

- i) A Pie Chart displaying the market share distribution for the last period.
- ii) A Bar Chart displaying the company's market share in each area for the last period.
- iii) A Bar Chart displaying the company's total market share for all the periods.

4. Conclusion

Thank you for using MAGNUS! We hope that you have found MAGNUS useful and enjoyable.

4.1 Acknowledgements

4.1.1 First Acknowledgements

MAGNUS 2.0 is an expansion of the original management game model that was created in 1973 at the former Nanyang University by a number of people including Mr Ang Kong Beng of the then School of Accountancy and Dr Thio Hoe Thong of the then Computer Centre. Many game administrators from AIESEC Singapore, the local chapter of AIESEC (International Association of Students in management and Economics), which has been organising the game since its inception, have offered precious suggestions and improvements over the original model. Special thanks are due to Mr Venkata K Rao of the Department of Information Systems and Computer Science (DISCS) at NUS for his clarification on certain accounting principle for use in the game; and to Mr Thomas Yong, the 1987 Game Administrator, for his painstaking checking and testing of the revised model and careful review of this manual. Current implementation of **MAGNUS 2.0** in Pascal has been undertaken in various stages by project students in DISCS. The latest revision has been supported by NUS research grant RP611/86.

4.1.2 Second Acknowledgements

Various revisions and extensions of **MAGNUS** has been undertaken by various students in the Final and Honours year of the Department of Information Systems and Computer Science at the National University of Singapore. **MAGNUS 3.0** and above are written in Visual Basic and now completely implemented on Windows™ network.

4.1.3 Third Acknowledgements

MAGNUS has always been under regular reviews and improvements. With the rapid developments in the global business operations and to continue providing training in the world accented with constantly-evolving information and communication technology, **MAGNUS** has to move from a pure academic support environment to a commercial one where more concerted effort can be rendered. DecisionWare Simulations and Games hereby acknowledges the works of Dr Yeo Gee Kin of the School of Computing, National University of

Singapore and Dr R S Wickramasuriya, previously of the Department of Decision Sciences, National University of Singapore, who were the authors of the earlier editions of this Manual. A more complete history of **MAGNUS** can be found in Reference 15 of the Reports and Publications on **MAGNUS**.

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4.3 Contact Information

For more information on MAGNUS,
Please visit www.decisionswaresim.com or
Email us at enquiry@decisionwaresim.com

Sample MAGNUS Reports

Company Sales Report

Round 1 Game Code G1 Period 4 Company 1

Consumer Market Sales

Area	(Units)			(\$)		
	Orders	Sales	Additional Sales	Marketing	Revenue	Delivered Unit Cost
1	36,954	36,954	0	208,000	2,143,332	35.08
2	38,863	38,863	0	208,000	2,292,917	37.08
3	31,068	31,068	0	208,000	1,833,012	37.08
4	34,162	34,162	0	208,000	2,015,558	37.08
5	30,126	30,126	0	250,000	1,717,182	36.08
Total	171,173	171,173	0	1,082,000	10,002,000	

Market Image 0.82

Industrial Contract Sales

Total Contract Size	70,000				Total Contract Sale	50,000
Company	1	2	3	4		
Price Bidded (\$)	99	39	99	40		
For Your Company						
Quantity bidded				0	Contract Revenue (\$)	0
Quantity Awarded				0	Contract Image	2.00

Sample MAGNUS Reports

Production Report

Round 1	Game Code G1	Period 4	Company 1
CURRENT PRODUCTION	(Units)		
Industrial Product	0		
Consumer Product	188,704		
COST ANALYSIS	(\$)		(\$)
	Current Production	Estimated Next Period	
Fixed Cost	2,172,325	2,311,445	
Unit Variable Cost			
Industrial Product	.		16.00
Consumer Product	18.86		18.68
Total Variable Cost			
Industrial Product	0		
Consumer Product	3,559,575		
Total Cost	5,731,900		
Total Cost Per Unit			
Industrial Product	.		
Consumer Product	30.38		
CAPACITY ANALYSIS	(Units)	(Units)	(Units)
	Plant	Raw Materials	Labour
Current Period	188,705	426,667	210,000
Next Period	296,034	552,963	320,000
CONSUMER PRODUCT STOCK ANALYSIS	(Units)	(\$)	
Stock B/F (-2)	0	0	
Stock B/F (-1)	30,373	1,728,224	
Regular Production	47,904	1,455,088	
Reprocessed	0	0	
Stock Bought	0	0	
Stock C/F (-1)	0	0	
Stock C/F (0)	47,904	1,300,898	

Sample **MAGNUS** Reports

Account Report

Round 1	Game Code	G1	Period	4	Company 1
PROFIT & LOSS ACCOUNT			(\$)		(\$)
Sales Revenue			10,002,000		
Investment Interest			552,658		
Income Total				10,554,660	
Cost of Industrial Goods Sold			0		
Cost of Consumer Goods Sold			6,005,036		
Cost of Reprocessing			0		
Cost of Excess Raw Materials			1,673,177		
Cost of Unused Labour			15,333		
Plant Maintenance			200,000		
Transport			238,312		
Emergency Transport			0		
Marketing			1,082,000		
Warehousing			51,916		
Research and Development			500,000		
Interest on Loan			96		
Plant Depreciation			186,705		
Loss on Sale			0		
Goodwill Written-Off			0		
Inventory Written-Off			0		
Consultancy Fees			200,000		
Information Fees			0	10,152,580	
Expenditure Total					
Net Profit				402,084	
Income Tax Expenditure			132,687		
Profit C/F				269,397	
Return On Investment		1.17			

Sample **MAGNUS** Reports

Balance Sheet

Round 1 Game Code G1 Period 4 Company 1

Assets

Goodwill at Written-Off	548,277
Plant at Written-Off Value	2,960,342
Stock	1,300,898
Cash	18,179,300
Total	22,988,820

Liabilities

Share Capital	18,000,000
Unappropriated Profit	4,855,169
Loan Outstanding	967
Provision for Income Tax	132,687
Total	22,988,820

Sample **MAGNUS** Reports

Total Consumer Market Report

Round 1 **Game Code** G1 **Period** 4

Consumer Market Sales

Area	(Units)		(\$)				
	Orders	Sales	Marketing	Price By Company			
				1	2	3	4
1	222,882	222,882	823,000	58	53	57	49
2	222,446	222,446	823,000	59	54	57	49
3	222,882	222,882	823,000	59	53	53	49
4	218,483	218,483	828,000	59	53	57	50
5	280,802	280,802	1,030,000	57	45	53	46
Total	1,167,495	1,167,495	4,327,000				

Some Explanatory Notes on MAGNUS Results

(Refer to data from sample reports in Appendix I)

1. Capacity Analysis

	426667	Units	(Raw Materials Current Period)
-	171173	Units	(Consumer Product Produced)
-	0	Units	(Industrial Product Produced)
+	297469	Units	(Ordered)
<hr/>			
=	552963	Units	(Raw Materials Next Period)

2. Stock Analysis

	30373	Units	(Stock B/F)
+	188704	Units	(Production)
-	171173	Units	(Sales)
-	0	Units	(Additional Sales)
<hr/>			
=	47904	Units	(Stock from Regular Production)

2. Delivered Unit Cost

Unit stock value = $1\,728\,224 \div 30\,373 = \56.90

Unit production cost = \$30.38

Total sales in all areas = 171 173 units. 30 373 units are satisfied from STOCK B/F. This is 17.74%.

Consider Area 3.

Assuming 17.74% of these are satisfied from STOCK B/F and the rest from current production, we have,

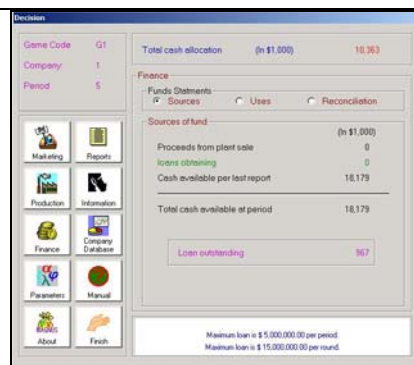
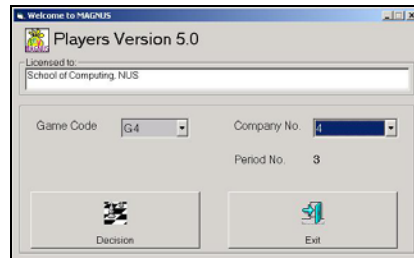
	\$56.90	× 0.1774	(From STOCK B/F)
+	\$30.38	× 0.8226	(From Current Production)
+	\$ 2.00		(Unit Transport Cost)
<hr/>			
=	\$37.08		(Delivered Unit Cost in Area 3)

MAGNUS Player's Interface (LAN Version)



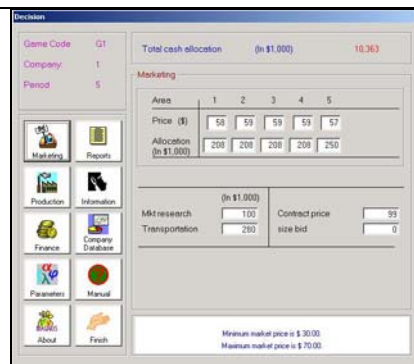
The Opening Window

The opening window presents to MAGNUS players language options first and then asks for their game code and company number.

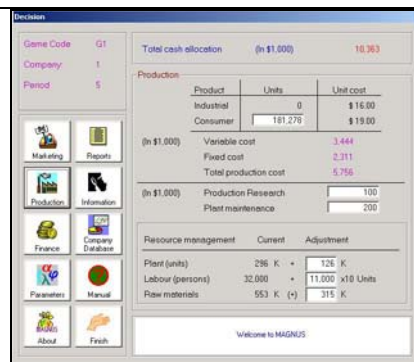


Making Decisions

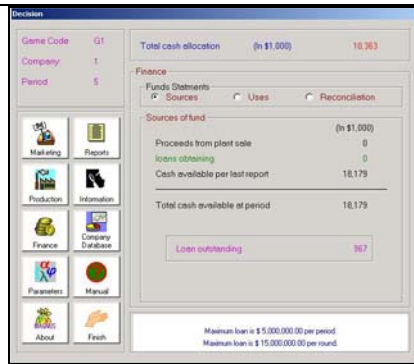
This is the main window for the players. A status bar in the bottom reflects where the current cursor position is at and displays any relevant information. Also consistent throughout the screens is the display of the Total Cash Allocation up to the current period in the top right corner of each screen.




On the Marketing screen, decisions and information pertaining to pricing of products, contract bidding volume, marketing research allocation, transportation of products are entered, altered or updated.

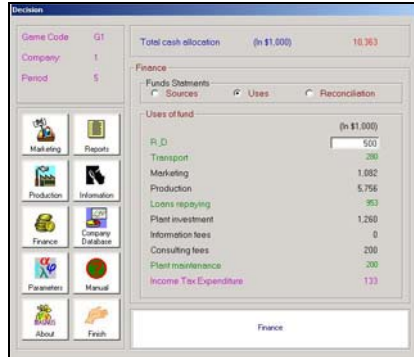


On the Production screen, decisions and information regarding production issues can be entered, altered or updated. Such issues include number of units to produce, production consultancy, plant maintenance allocation, and management of production resources like labour, plant and raw materials.

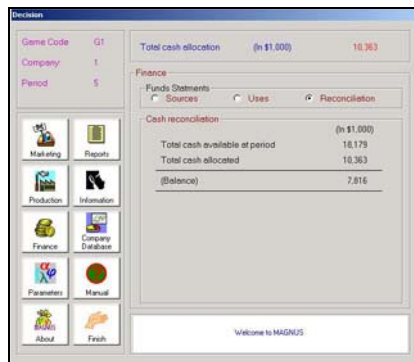


 Finance screens show the sources of funds, uses of funds and budget reconciliation.

On the Finance Sources screen, the player may enter the amount of loan to be obtained.




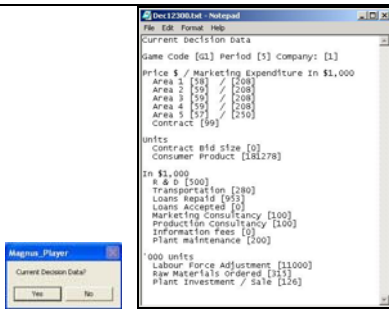
On the Finance Uses screen, the player is shown the allocation of funds in the primary areas of decision entries, which include production, marketing, R&D, etc. He may change those entries displayed in green.



On the Finance Reconciliation screen, the subtotals of the Uses and Sources, as well as their difference are shown. This shows the availability of cash for the next period.

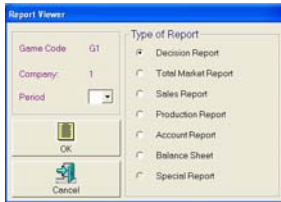


 On-line Environment Parameters
There is also an Administrative Notice button on every window that brings to where the player can view the administrative notice for the current period. A click on any item opens up the data window to show the assigned value(s).



Report Viewer

Players can choose to view the current decision.



Reports will be generated for each company at the end of each simulation run. From the Report Viewer, players can select any report for viewing in another window or printing it. Usually, players can only view or print reports for their own companies. At times, Administrator may also make special reports available.

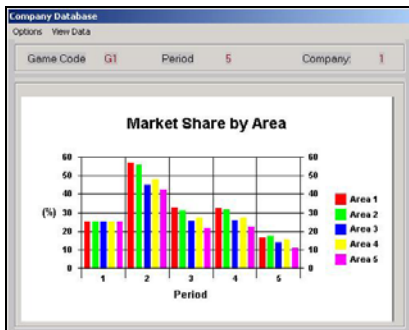
Company Sales Report						
Round	Game Code	G1	Period	4	Company	1
Consumer Market Sales						
		(Units)				
Area	Orders	Sales	Additional Sales	Marketing	Revenue	Delivered Unit Cost
1	36,954	36,954	0	208,000	2,143,332	35.08
2	38,863	38,863	0	208,000	2,292,917	37.08
3	31,068	31,068	0	208,000	1,830,012	37.08
4	34,162	34,162	0	208,000	2,015,558	37.08
5	30,126	30,126	0	250,000	1,717,182	36.08
Total	171,173	171,173	0	1,082,000	10,002,000	

	Period 0	Estimated Next Period
Fixed cost	\$ 1,502,633	\$ 1,936,464
Industrial product variable cost	\$ 0.00	\$ 16.00
Consumer product variable cost	\$ 19.00	\$ 19.00
Plant capacity (units)	200,000	250,000
Raw materials (units)	200,000	250,000
Labour force (units)	250,000	250,000
Stock h/t period -2 (units)	4,000	60,000
Value of stock h/t period -2	\$ 100,000	\$ 1,500,000
Stock h/t period -1 (units)	60,000	
Value of stock h/t period -1	\$ 1,500,000	

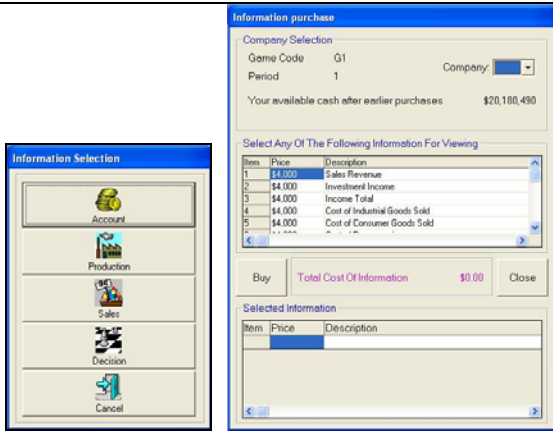


Data Analysis

Similarly, the Database button on every menu will bring the player to where he can view statistical data of the game. These include accounting data, production data, contract prices by all companies, consumer prices set by all companies on all areas, marketing expenditures, for the past periods.



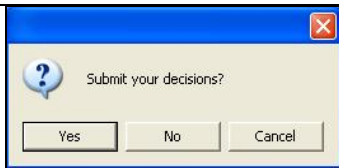
Graphs and charts are available for some of the statistical data.



Information Purchase

Players have the option to purchase information concerning their competitors. This information reveals the competitor's performance for the last period. With the additional information, players can make better judgment in their decisions.

The cost of this information will be determined by the game administrator. There is no limitation how much information the player wishes to purchase. Players are allowed to buy any number of company's information as they desire, but the more information they buy, the more they pay and this will affect their profit.



Submit Decision

The Submit button is used for two purposes: to submit decision and to quit the interface.

