Technical University of Denmark

Optimal decision-making in the Global Management Challenge

Application of Operations Research in Value-Based Management

Master Thesis

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To my parents

Abstract

Value-Based Management is a management approach that aligns overall business' activity toward its fundamental goal, which is building wealth of its owners. The concept has gained Worldwide recognition and has been acknowledged as a successful driver of firm's stock performance. High demand for Value-Based Management services has driven the development of different VBM frameworks, to mention *Economic Value Added* developed by Stern Steward & Co., McKinsey's *Economic Profit* and PricewaterhouseCoopers' *Shareholder's Value Added*. Although they differ in technicalities, they all suggest that the ultimate measure of firm's success is the excess of firm's profit over the cost of capital committed.

The thesis shows how optimization can be used to build shareholders' wealth. Within the Global Management Challenge tournament as a stock-market environment, the author builds optimization models aiming at maximization of Economic Value Added - World's most renowned VBM metric.

Acknowledgements

Writing the thesis has been a true journey into the unknown. I therefore would like to express my sincere gratitude to Professor Jens Clausen for giving me freedom in my research under his inspiring supervision and insightful advice that gave it the final shape.

The thesis would not be the same without love and support of my fiance Amelia Górniak, who has patiently been there for me throughout the entire journey. Thank you.

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Chapter 1

Introduction

1.1 Introduction

Global Management Challenge is the largest strategic management tournament, in which more than 400 000 individuals have participated in 23 countries Worldwide.

The competition is based on complex management of a joint-stock company in simulated conditions of European Union and NAFTA. The business is of international character and is exposed to global trends and macroeconomic conditions. The teams compete at a virtual stock-exchange, on which their firms are quoted. Their performance is evaluated based on the share price quoted at the last quarter of the simulation.

Although both in Global Management Challenge and in real life, the stock price is characterized by stochastivity, certain managerial activities have proven to have positive impact on stock performance. We have experienced rapid development of Value-Based Management approaches, which combining multidisciplinary knowledge provide management with proper tools and methodologies to build firm's value. One of such frameworks is Economic Value Added, developed by Stern Stewart & Co.

The goal of the thesis is utilizing optimization to maximize Value-Based Management metrics, aiming at achieving a victory in Global Management Challenge.

1.2 Main Concepts

1.2.1 Value-Based Management

Value-Based Management is a management concept that enables companies to gain better performance by systematically managing value creation. It is a framework and a mindset that help companies develop strategies, allocate resources and accomplish performance targets that lead to maximization of shareholder wealth.

Timothy Koller in McKinsey Quarterly writes: "Value-Based Management is a management approach that aligns firm's overall aspirations, analytical techniques and management processes to focus management decision making on the key drivers of value."[1]

Value-Based Management promotes new measurement system. The ultimate measure of success is the economic profit, being the return on capital in excess of the cost of that capital. Moreover, VBM introduces a series of adjustments to accounting profit in order to reach firm's true profit, which is then diminished by the cost of capital engaged in generating the profit.

Secondly, VBM promotes comprehensive management system that consists of policies, methodologies and tools that support decision making at all levels of organization. The system should cover all operational areas of the firm, streamlining day-to-day scheduling, resource allocation etc. It should also enhance strategic management with value creation as firm's paramount goal.

Thirdly, VBM postulates binding firm's compensation system with performance of an individual. The performance ought to be measured by clear metrics that are aligned with firm's ultimate goal. Participation in the wealth provides incentives that build motivation among staff to undertake value-building initiatives.

Lastly, when implemented, VBM clears and aligns goals of all firm's divisions. By outlining value creation as everyone's goal, providing consistent measurement system and binding it with relevant compensation, VBM provides common language for firm's employees and most importantly a mindset that drives the staff to work in the best interest of firm's owners.

1.2.2 Global Management Challenge

The Global Management Challenge - Strategy and Management Simulation is based on a realistic business situation, in which a number of virtual companies, managed by participating teams, compete against one another in a common business environment. A sophisticated and comprehensive computer model simulates the interactions of various parts of each company, the competitive relationships between them and the background economic situation.

Although rules of the game seem fairly simple i.e. maximizing firm's share price, the ultimate success depends on so many factors, that it requires a holistic, comprehensive approach. Efficient management requires sound understanding of both the competitive environment, in which the company operates and firm's current market position, as well as firm's operational anatomy. Only deep expertise in those areas, enables creation of successful strategy, which supported by streamlined operational effectiveness may lead to the ultimate victory.

Figure 1.1: Tournament timeline

The communication with the simulator is held through two documents:

- Quarterly Management Report which shows company's performance in the quarter just completed,
- Decision Sheet, which provides an interface to the simulation engine, allowing decisions to be passed to the simulator.

The team starts managing the company in a certain point in time. In order to gain understanding of firm's current situation, the team receives five historical management reports, which directly precedes the starting point.

After the team gets familiar with the firm's history it has to make five consecutive decisions, at end of which firm's share price is taken as overall performance indicator. Decisions are made in between quarters, so there is no current - rather last and next quarters.

Figure 1.2 depics stock activity of four firms competing in Global Management Challenge. The simulation starts before the fourth quarter of 2005. At that point in time, the teams recieve four identical history management reports for five quarter from third quarter of 2004 through third quarter of 2005. As the figure illustrates, their performance is identical. Starting from fourth quarter of 2005,

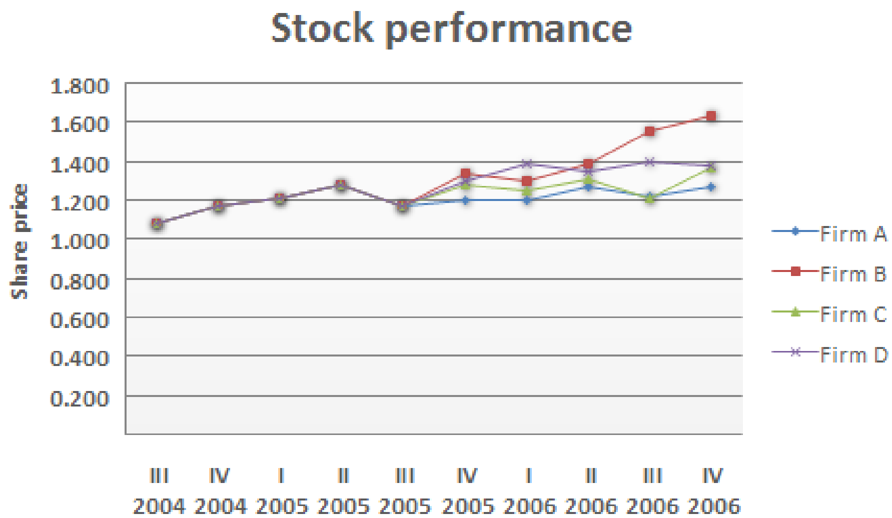


Figure 1.2: Stock performance

the teams take over control of the firms, which is expressed through differentiation of stock prices. Through five consecutive decisions, they compete for the highest price of shares at the end of 2006. In this case, firm B has won the simulation.

When a team submits a decision sheet, its decisions are simulated against decisions taken by other teams in a group within the business environment generated for the round. The results of the simulation are passed back to the team in the form of management reports.

Figure 1.3 presents a decision sheet that is used for passing decisions to the simulator. Figures 1.4 and 1.5 depict two page management report.

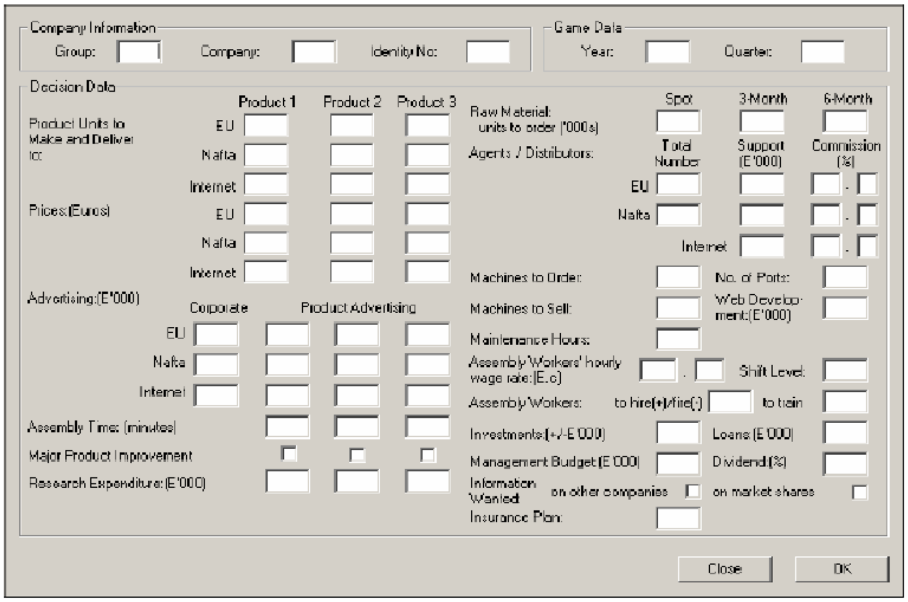


Figure 1.3: Management decision sheet

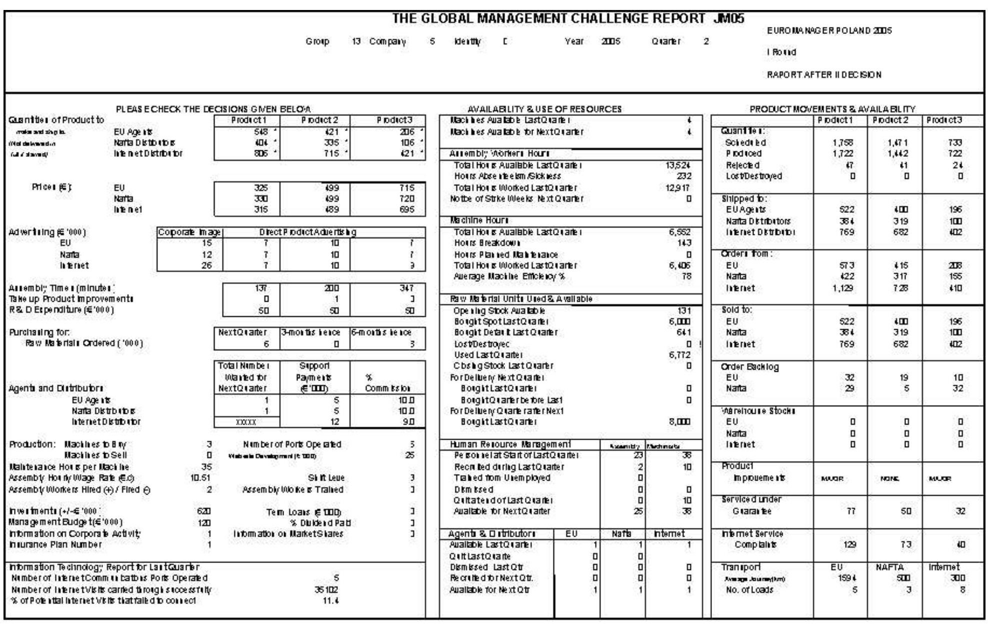
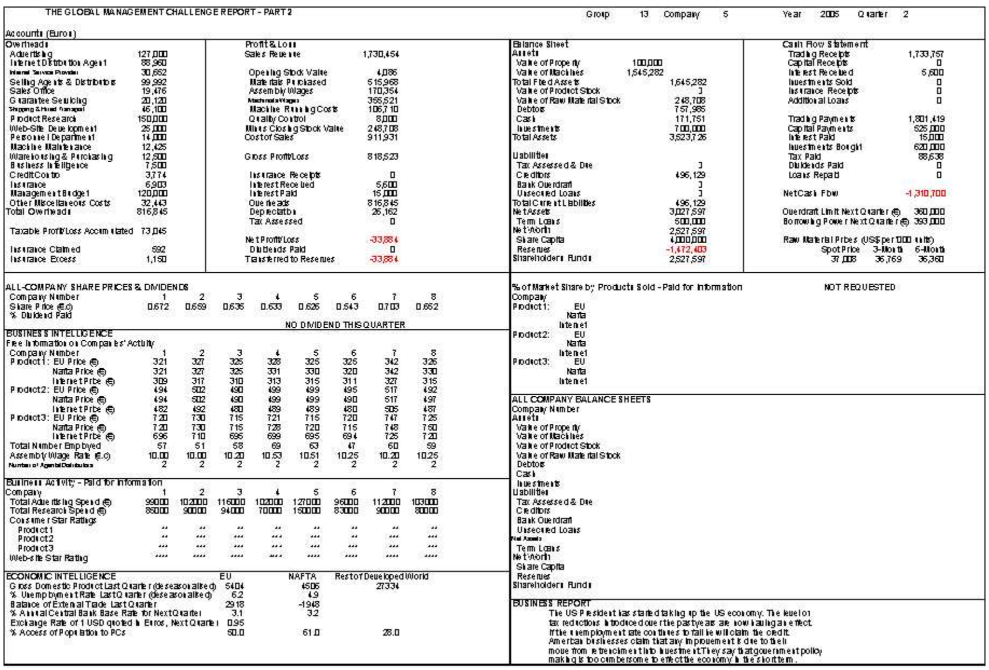


Figure 1.4: Management Report, side 1



THE GLOBAL MANAGEMENT CHALLENGE REPORT - PART 2 — Group 13 — Company 5 — Year 2005 — Quarter 2

Accounts (Euros)

Overheads	
Advertising	127,000
Internet Distribution Agent	88,960
Internet Service Provider	30,652
Selling Agents & Distributors	99,992
Sales Office	19,476
Guarantee Servicing	20,120
Shipping & Hired Transport	46,100
Product Research	150,000
Web-Site Development	25,000
Personnel Department	14,000
Machine Maintenance	12,425
Warehousing & Purchasing	12,500
Business Intelligence	7,500
Credit Control	3,774
Insurance	6,903
Management Budget	120,000
Other Miscellaneous Costs	32,443
Total Overheads	816,845
Taxable Profit/Loss Accumulated	73,045
Insurance Claimed	592
Insurance Excess	1,150

Profit & Loss	
Sales Revenue	1,730,454
Opening Stock Value	4,086
Materials Purchased	515,968
Assembly Wages	170,354
Machinists Wages	355,521
Machine Running Costs	106,710
Quality Control	8,000
Minus Closing Stock Value	248,708
Cost of Sales	911,931
Gross Profit/Loss	818,523
Insurance Receipts	0
Interest Received	5,600
Interest Paid	15,000
Overheads	816,845
Depreciation	26,162
Tax Assessed	0
Net Profit/Loss	-33,884
Dividends Paid	0
Transferred to Reserves	-33,884

Balance Sheet		
Assets		
Value of Property	100,000	
Value of Machines	1,545,282	
Total Fixed Assets		1,645,282
Value of Product Stock		0
Value of Raw Material Stock		248,708
Debtors		757,985
Cash		171,751
Investments		700,000
Total Assets		3,523,726
Liabilities		
Tax Assessed & Due		0
Creditors		496,129
Bank Overdraft		0
Unsecured Loans		0
Total Current Liabilities		496,129
Net Assets		3,027,597
Term Loans		500,000
Net Worth		2,527,597
Share Capital		4,000,000
Reserves		-1,472,403
Shareholders Funds		2,527,597

Cash Flow Statement	
Trading Receipts	1,733,757
Capital Receipts	0
Interest Received	5,600
Investments Sold	0
Insurance Receipts	0
Additional Loans	0
Trading Payments	1,801,419
Capital Payments	525,000
Interest Paid	15,000
Investments Bought	620,000
Tax Paid	88,638
Dividends Paid	0
Loans Repaid	0
Net Cash Flow	-1,310,700
Overdraft Limit Next Quarter (€)	360,000
Borrowing Power Next Quarter (€)	393,000

Raw Material Prices (US$ per 1000 units)

Spot Price	3-Month	6-Month
37,008	36,769	36,360

ALL-COMPANY SHARE PRICES & DIVIDENDS

Company Number	1	2	3	4	5	6	7	8
Share Price (€.c)	0.672	0.659	0.635	0.633	0.626	0.543	0.703	0.652
% Dividend Paid								

NO DIVIDEND THIS QUARTER

BUSINESS INTELLIGENCE

Free Information on Companies' Activity

Company Number		1	2	3	4	5	6	7	8
Product 1:	EU Price (€)	321	327	325	328	325	325	342	326
	Nafta Price (€)	321	327	325	331	330	320	342	330
	Internet Price (€)	309	317	310	313	315	311	327	315
Product 2:	EU Price (€)	494	502	490	499	499	495	517	492
	Nafta Price (€)	494	502	490	499	499	490	517	497
	Internet Price (€)	482	492	480	489	489	480	505	487
Product 3:	EU Price (€)	720	730	715	721	715	720	747	725
	Nafta Price (€)	720	730	715	728	720	715	748	750
	Internet Price (€)	696	710	696	699	695	694	725	720
Total Number Employed		57	51	58	69	63	47	60	59
Assembly Wage Rate (€.c)		10.00	10.00	10.20	10.53	10.51	10.25	10.20	10.25
Number of Agents/Distributors		2	2	2	2	2	2	2	2

Business Activity - Paid for Information

Company	1	2	3	4	5	6	7	8
Total Advertising Spend (€)	99000	102000	116000	102000	127000	96000	112000	103000
Total Research Spend (€)	85000	90000	94000	70000	150000	83000	90000	80000
Consumer Star Ratings								
Product 1	**	**	**	**	**	**	**	**
Product 2	**	***	***	***	***	**	***	***
Product 3	***	***	***	***	***	***	***	***
Web-site Star Rating	****	****	****	****	****	****	****	****

ECONOMIC INTELLIGENCE	EU	NAFTA	Rest of Developed World
Gross Domestic Product Last Quarter (deseasonalised)	5404	4506	27334
% Unemployment Rate Last Quarter (deseasonalised)	6.2	4.9	
Balance of External Trade Last Quarter	2918	-1948	
% Annual Central Bank Base Rate for Next Quarter	3.1	3.2	
Exchange Rate of 1 USD quoted in Euros, Next Quarter	0.95		
% Access of Population to PCs	50.0	61.0	28.0

% of Market Share by Products Sold - Paid for Information — NOT REQUESTED

Company
Product 1: EU / Nafta / Internet
Product 2: EU / Nafta / Internet
Product 3: EU / Nafta / Internet

ALL COMPANY BALANCE SHEETS

Company Number
Assets
Value of Property
Value of Machines
Value of Product Stock
Value of Raw Material Stock
Debtors
Cash
Investments
Liabilities
Tax Assessed & Due
Creditors
Bank Overdraft
Unsecured Loans
Net Assets
Term Loans
Net Worth
Share Capital
Reserves
Shareholders Funds

BUSINESS REPORT

The US President has started talking up the US economy. The level of tax reductions introduced over the past years are now having an effect. If the unemployment rate continues to fall he will claim the credit. American businesses claim that any improvement is due to their move from retrenchment into investment. They say that government policy making is too cumbersome to effect the economy in the short term.

Figure 1.5: Management Report, side 2

Chapter 2

The Global Management Challenge

2.1 Business environment and economic background

The company operates in direct competition with a number of other companies, which manufacture and sell the same products in the same geographic areas. The company can make up to three products, which are not specifically defined. They are three different, but related types of consumer durables, which are generally thought to be desirable by the public.
The market is divided into two geographic areas for traditional trade:

- European market, where the trade is conducted in EUROs,
- North American Free Trade Area (NAFTA market), where the trade is conducted in US Dollars.

At the same time, the company is able to reach these areas and the rest of the world through the Internet. The company is in direct competition in all areas from other companies taking part in the simulation. There are also other companies involved in the competition, which means the market is wider than the one possessed by companies taking part in the simulation.

2.1.1 Economic Background

The sales in different geographic regions are affected by relevant demographic indicators, which constitute the nature and trends of the markets. All markets are affected by normal economic cycles of growth and decline; they cannot however be considered to reflect any present day situations, neither in economic nor political aspects. In other words, the world in the simulation is artificial, but based on economic principles.

2.1.2 Currency

All monetary decisions are taken in EUROs, even though trade is conducted in US Dollars in NAFTA and Internet. Therefore, the trade in the latter two markets is affected on EURO - Dollar exchange rate.

2.1.3 World Events

The company may be affected by significant world events e.g. cataclysms such as volcano eruptions or earthquakes, political upheavals or war, economic turbulence etc. Such events affect the entire economy, therefore having equal impact on all companies. Depending on company's risk exposure, the impact might be very serious, e.g. shortage of raw material or damage of company's machines.

External disruptions affect companies equally, but individual companies may deal with it differently, depending on the existence of relevant contingency plans incorporated into corporate strategy. It is management duty to conduct risk assessment and create adequate hedging strategies, that would safeguard company's core business.

2.2 Production and distribution

The production department is responsible for making and distributing products as effectively as possible, meeting the quality requirements set by the marketing department. The departments tactics have to be therefore aligned with company's marketing strategy both in the long- and short-term perspective. The three products that the company produces and sells are made in its own factory and of the same raw material. The production process comprises of two consecutive steps. Firstly, raw material is transformed into components on machines, each operated by four unskilled machinists, who are able to work shift-wise. Secondly, components are assembled and packed into finished products by skilled assembly worker, who only work single shift.

2.2.1 Raw material

All three products use the same basic raw material, in the following quantities:

	Product 1	Product 2	Product 3
Raw material content per product	1 unit	2 units	3 units

Table 2.1: Raw material content per product

Raw material can be purchased in US dollars on the spot for immediate delivery, or can be ordered at the future market for three or six months delivery. Generally, material purchased at the future market is cheaper than the one on the spot, however advance transactions require estimates of the production volume and carry the risk of market failure in which the spot price drops below the past future price leading to losses. Reasonable raw material supply management emerging from accurate estimates of production volume leads to significant money savings. On the other hand, inaccurate forecasts or insensible buying lead to left-over of raw material. which procures additional warehousing expenses.

Raw material not utilized during the last quarter remains stored for the next quarter. The factory has its own warehouse in which it can store up to 2000 units of raw material facing a fixed administrative cost of maintaining the warehouse of € 12 500 per quarter. However in case the raw material stock exceeds the 2000 unit limit, the factory has to use a commercial storage, which charges € 2,50 for every single unit of raw-material, adding extra 70% to the raw material cost. Raw material purchased at the future market procures no storage costs as the delivery is done at the contract's matirity. Obviously, too optimistic forecasts leading to a stock of raw material spoils the advantage gained through the use of future market.

In case of shortage of raw material caused by erroneous estimates of production needs, required raw material is purchased automatically to satisfy the production plan. The purchase however is made at a premium price of an extra 10% of the last quarter spot price.

A transaction at the future market is made in US dollars using the rate from the last quarter and is invoiced immediately. The resulting liability is then divided into two even parts, which are covered in next quarter and the one after next. Both payments are made at the exchange rate quoted at the quarter before the transaction, therefore preserving the initial exchange rate. Additionally, raw material purchased at the future market for the future delivery is interpreted as firm's assets in next quarter's balance sheet (accrual approach).

2.2.2 Machining

The machining process is made on machines, each operated by four unskilled workers. The production capacity of the machining-shop depends on the number of machines that are possessed by the company and number of shifts , that machinists are decided to work. The capacity can be diminished by catastrophic events or machine failures, against which the company can insure.

Each type of product has its minimal machining time, which are presented in Table 2.2. These times

	Product 1	Product 2	Product 3
Minimum machining time per product	60 minutes	75 minutes	120 minutes

Table 2.2: Minimum machining time per product

suppose 100% new machine efficiency. As the machines get older, their efficiency drops, thus the machining times elongate. The process can however be slowed down by scheduled machine maintenance.

$$t = \frac{T}{e}$$

t - real machining time

T - minimum machining time per product (table 2.2)

e - machine efficiency

Shift level	Quarterly cummulative machine hours per shift	Unskilled workers needed
1	588	4
2	1092	8
3	1638	12

Table 2.3: Machine hours available for a single machine per shift

The machining process can be performed shift-wise, meaning that depending on production demand and a number of available machines, or management's strategy, the machines can operate at different shift levels providing different production capacity. The general principle is that the more shifts, the more expensive is the production, so by increasing the number of machines we can reallocate the production among more peers. However, purchasing new machines requires new capital and imposes additional operational costs, which leads to a trade off between the two. The costs and an optimal magnitude of production will be covered later in the report.

Machine maintenance and repair

Exploitation of machines leads them to use up. The process is inevitable, but can be slowed down by regular preventive maintenance. As a consequence, machines' efficiency decreases, lengthening machining processes required to produce a single product. The firm decides on its machines' maintenance on a quarterly basis.

Machine maintenance is carried out by external contractors, who, when scheduled, charge hourly rate according to Table 2.4.

Maintenance cost per machine, per hour	€ 85
Emergency maintenance cost per machine, per hour	€ 175

Table 2.4: Machine maintenance costs

In case of machine brake downs, whose repair time exceeds scheduled maintenance, the firm hires contractors who charge for their work at emergency rates.
The maintenance time scheduled for every machine should be subtracted from total hourly capacity of firms machine plant.

2.2.3 Assembling

The second stage of the production process is assembling, in which components are assembled into finished products and packed for shipping. Assembling is done by skilled assembly workers, who only work single shift.
Table 2.5 presents the minimum assembly time per unit. As the time a worker spends on assembly lengthens, the quality of the finished product increases, ipso facto building customers' satisfaction. At the same time, however, lengthening the assembly time of a single product decreases assembly-shop capacity and increases single item production cost, which shrinks the profit margin. Furthermore, too scant assembly time leads to an increase in rejections of finished products due to not meeting quality standards. Nevertheless, good quality of products brings customers' value, so generally is desirable and should be aligned with quality requirements set by the marketing department.

	Product 1	Product 2	Product 3
Minimum assembly time per product	100 minutes	150 minutes	300 minutes

Table 2.5: Minimum assembly time per product

After deciding on the time that should be spent on assembling a single unit of particular product, the assembly shop output depends on the number of assembly workers that are employed. The total assembly time, computed by multiplying planned product mix by corresponding assembly time of each product cannot exceed total assembly hours available. The available hours can be furthermore diminished by absenteeism due to strikes or illnesses. Assembly workers work only single shift with the maximum of 588 hours per quarter, which accounts for Monday-Sunday working dimension.

Generally the following condition has to hold:

$$\sum_i a_i x_i \quad \leq nA$$

a_i - assembly time for product i

x_i - scheduled production for product i

n - number of assembly workers employed by the company

A - maximum production time assembly worker can work

2.2.4 Quality and warranty

The firm owns a quality control department, which safeguards that products leaving the factory meet firm's quality standards. The products' quality is mainly influenced by the time firm's skilled workers spend on assembling and packaging of its products, but some unexpected faults can exhibit due to haphazard events such as undiscovered sub-standard raw material used in production.

The company offers one year warranty for its products. Inevitably some product sub-quality will remain undiscovered by the quality control and they will exhibit faults after being purchased. In such cases, servicing of products under guarantee is performed by firm's distributors, who charge the company according to fees listed in Table 2.6.

	Product 1	Product 2	Product 3
Retail servicing cost, per unit	€ 60	€ 150	€ 250

Table 2.6: Retail servicing cost

It is possible that due to undiscovered design errors or sub-standard materials, faults are exhibited on large scale. Because of the scale, only 75% of normal costs are charged by servicing unit. In such cases, losses are included to the quarterly insurance claim.

Products that failed quality control are rejected and sold for scrap at prices given in Table 2.7.
The quality control department has a fixed quarterly cost of € 8 000.

	Product 1	Product 2	Product 3
Scrap Price, pre unit	€ 40	€ 80	€ 120

Table 2.7: Scrap price for rejected products

2.2.5 Production scheduling

The schedule of production is prepared for every product in every market for the entire upcoming quarter. The schedule should reflect sale forecasts of the marketing department and production capacity of the factory.

The production schedule should satisfy the demand forecast rendered by the marketing department diminished by any products left on stock and increased by outstanding backlog of orders from last quarter. It should also consider leaving some capacity margin as some products may be rejected by the quality control department and as a consequence remade to meet the schedule.

2.2.6 Delivery, distribution and warehousing

The quantities of products delivered to EU, NAFTA and Internet distribution units are stored in warehouses provided by the units, who additionally charge for the storage. Table 2.8 lists the storage costs charged.

	EU	NAFTA	Internet
Cost of storage per product unit	€ 3,50	€ 3,50	$ 4,00

Table 2.8: Product storage costs charged by agents and distributors

Delivery to the agents and distributors is made in standard-sized containers provided by hired transportation firm. The capacity of a container is expressed in terms of quantity of products it is able to accommodate, as shown in Table 2.9.

	Product 1	Product 2	Product 3
Container capacity in terms of products	500	250	125
Standardized product sizes	1	2	4

Table 2.9: Container capacity

A single container can accommodate 500 units of product 1, 250 of product 2 and 125 of product 3. In other words, one can assume that the container capacity is 500 standardized units, whereas product 1 occupies 1 unit, 2 - 2 units and 3 occupies 4 units of single container's capacity. Different mixes of products are possible but no matter what the container's load is, the carrier charges full-rate fee.

Daily all-in hire cost of container	€ 650
Distance to NAFTA shipping port	250 km
Cost of container hire across North Atlantic	€ 8 000
Distance to Internet Distribution Agent	150 km
Legal distance limit per day on each vehicle	400 km

Table 2.10: Transportation parameters

Routes to Internet distribution agent and to NAFTA shipping port are of fixed length of 250 and 150 km respectively. Routs to Europe distribution agents are made as round trips and their lengths depend on the number of agents hired. The transportation costs within the NAFTA region are covered by NAFTA distributor.

2.2.7 Internet trade infrastructure

The online trade is made possible by the firm's web-site. The volume of online trade is seasonal, nevertheless the firm's IT infrastructure should be able to serve the peek loads, which is crucial to the firm's internet marketing image.

Access to the Internet is provided through a broadband network by an Internet Service Provider. The network capacity is expressed in terms to Internet "access ports", which the firm may purchase. The number of internet ports should reflect firm's internet traffic forecasts. Changes in the number of ports requires one quarter notice. Table 2.11 lists Internet operations parameters.

% of value of Internet sales as ISP's fee	3%
Initial cost of launching Internet operations	€ 7 500
Quarter cost per Internet access port	€ 1 000
Cost of closing down Internet operations	€ 5 000

Table 2.11: Internet operations parameters

Apart from proper connection bandwidth, the web-site requires constant development and maintenance outlays. Regular web-site disbursements, that are higher than competitors' build positive image on the Internet market thus bringing competitive advantage. Firm's efforts appraisal is available as web-site star placed in management's report.

2.2.8 Management

Efficiency of production depends on mid-level management, which manages day-to-day factory operations. Reasonable management budget has positive impact on the quality of production management and indirectly on the factory's ability to meet production schedule.

2.3 Marketing

Firm's marketing department is responsible for building demand for and selling company's products in competitive markets. To accomplish the goal, it has to gain deep understanding of the markets, their trends and seasonal characteristics, their price sensitivity of demand etc. As a result of the analysis the marketing department builds short term and long term strategic plans which should construct the firm competitive edge against rival companies.

The firm sells its products in three markets: European Union, NAFTA and Internet. The Internet reaches the entire world so to some extend it interferes sales both in European Union and in NAFTA markets.

The company's wholesale trade is done through agents and distributors, who supply retailers in EU and NAFTA markets. The retailers sell company's products to the public. The trade on the Internet is held directly with customers through company's Internet website. Products purchased on the Internet and packed and shipped for delivery by company's Internet distributor.

The demand for company's products has seasonal nature and is driven by general market trends. These drivers are additionally influenced by marketing activities of company's marketing department and rival companies'. In order to produce and sell efficiently, the marketing department prepares demand forecasts, which are then used by production department for production scheduling. The demand forecasts should rely on economic and market information that is available in management report free of charge. The section containing free of charge information is shown in Figure 2.1.

BUSINESS INTELLIGENCE
Free Information on Companies' Activity

Company Number	1	2	3	4	5	6	7	8
Product 1: EU Price (€)	325	325	325	325	325	325	325	325
Nafta Price (€)	325	325	325	325	325	325	325	325
Internet Price (€)	310	310	310	310	310	310	310	310
Product 2: EU Price (€)	490	490	490	490	490	490	490	490
Nafta Price (€)	490	490	490	490	490	490	490	490
Internet Price (€)	480	480	480	480	480	480	480	480
Product 3: EU Price (€)	715	715	715	715	715	715	715	715
Nafta Price (€)	715	715	715	715	715	715	715	715
Internet Price (€)	695	695	695	695	695	695	695	695
Total Number Employed	61	61	61	61	61	61	61	61
Assembly Wage Rate (€.c)	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Number of Agents/Distributors	2	2	2	2	2	2	2	2

Figure 2.1: Free of charge Business Intelligence information

Columns 1 - 8 represent rival companies that operate in the market. Intersecting cells represent respective information that is quoted in the first column. These include:

- product prices in different markets,
- workforce (aggregated number of skilled and unskilled employees),
- aggregated number of agents and distributors.

ECONOMIC INTELLIGENCE	EU	NAFTA	Rest of Developed World
Gross Domestic Product Last Quarter (deseasonalised)	5344	4436	27334
% Unemployment Rate Last Quarter (deseasonalised)	6.3	5	
Balance of External Trade Last Quarter	2831	-1995	
% Annual Central Bank Base Rate for Next Quarter	3.3	3.2	
Exchange Rate of 1 USD quoted in Euros, Next Quarter	0.97		
% Access of Population to PCs	50.0	60.0	28.0

Figure 2.2: Free of charge economic intelligence information

The report also contains free of charge macroeconomic indicators, as shown in Figure 2.2. These include:

- Gross Domestic Products of EU and NAFTA,
- Unemployment rates,
- Trade balance,
- Central Banks' annual interest rates,
- Exchange rate,
- Population's access to Internet,

which to some extend describes target economies.

The marketing department can purchase additional information, which helps gain deeper understanding of target markets. The business activity report (depicted in Figure 2.3) contain detailed information about competitors' advertising and Research & Development spending. It also shows subjective customer satisfaction levels expressed using star ratings, where one star is the lowest and five stars is the highest.
The information may serve as benchmark for company's managerial tactics.

Business Activity - Paid for Information								
Company	1	2	3	4	5	6	7	8
Total Advertising Spend (€)	99000	102000	116000	102000	127000	96000	112000	103000
Total Research Spend (€)	85000	90000	94000	70000	150000	83000	90000	80000
Consumer Star Ratings								
Product 1	**	**	**	**	**	**	**	**
Product 2	**	***	***	***	***	**	***	***
Product 3	***	***	***	***	***	***	***	***
Web-site Star Rating	****	****	****	****	****	****	****	****

Figure 2.3: Business activity report

The marketing department can additionally purchase market share information, which indicates company's participation in the market measure by the volume of trade. The report, as shown in Figure 2.4, provides market share by product, by market for each company, as a percentage of the entire stake. An important observation is that row-wise market shares do not sum up to 100%, which indicates that there's additional competition in the market. The report also indicates market's competitiveness determined by aggregated market share of largest players. Depending on the magnitude of the indicator, the marketing department should adopt relevant marketing strategy, as described in Porter's "Five Forces".

% of Market Share by Products Sold - Paid for Information									
Company		1	2	3	4	5	6	7	8
Product 1:	EU	4.6	5.4	4.0	4.9	3.5	4.3	2.3	1.2
	Nafta	4.6	5.1	4.1	5.7	3.4	6.0	5.5	5.7
	Internet	8.3	7.0	9.4	8.8	9.6	8.0	9,1	6.0
Product 2:	EU	4.6	5.0	4.1	5.1	4.6	5.0	4.1	5.1
	Nafta	4.1	5.5	4.4	4.8	4.1	5.5	4.4	4.8
	Internet	7.2	7.6	10.4	5.4	6.9	8.7	5.5	8.0
Product 3:	EU	4.4	7.4	6.4	5.9	4.4	7.4	6.4	5.9
	Nafta	4.7	5.4	8.3	7.6	4.2	5.3	8.1	6.7
	Internet	7.2	6.4	6.4	9.4	9.2	10.0	6.0	5.6

Figure 2.4: Market share intelligence report, paid information

Relying on the above business information, conclusions drawn from company's history, supported by microeconomic principles, the marketing department prepares a detailed marketing plan, which contains:

- Pricing policy,
- Product quality and design policy,
- Advertising policy,
- Agency and distributors policy,

- Internet trading policy and
- Availability policy.

The plan should be then confronted with other functional departments and against management's corporate strategy.

2.3.1 Pricing

As part of the its quarterly plan, the marketing department decides on the prices at which the company's products are going to be sold in different markets as shown in Figure 2.5.

Prices (€):	Product 1	Product 2	Product 3
EU	325	490	715
Nafta	320	485	710
Internet	310	480	695

Figure 2.5: Product prices per market

The price is the amount that the company is going to charge it agents and distributors for each unit delivered. It is also intended as a guide to price that should be charged by retailers. The prices for the Internet are directly applied to online customers. Additionally, the customers are charged delivery fees, which depend on the distance and are beyond the scope of company's decisions.

The agents and distributors are compensated in two ways: through a quarterly-fixed support payments and a commission, which is a linear function of the volume of sale. Everything else being equal, a reasonable level of commission, serving as a motivation factor, should drive company's sales.

All prices are set in Euros, regardless where the products are sold. In case of NAFTA and Internet, where the prices are quoted in USD, the Euro prices are transformed into USD using the exchange rated in management report. Since exchange rate fluctuate, the marketing department should revise its pricing quarterly to encompass potential exchange rate changes.

Price sensitivity of demand varies by market and product. In general demand for cheaper products is more prone to increase as price decreases, whereas demand for luxury products (product 3) is more price-resistant. However, slope of demand curve should be determined individually for every product in every market.

2.3.2 Product Quality

Quality of products is one of the fields, the company competes in. Good quality of products enhances marketing efforts by supporting product and corporate image. It also encourages customers loyalty. It can therefore be a differentiating factor in the market thus serving as company's competitive edge.

On the other hand however, high quality of products, achieved by extending assembling time, increases direct costs thus shrinking product profit margin. Lowering quality of products decreases operational costs enabling cheaper production and higher production capacity within available assembly resources. Lower production costs enable lower consumer prices, which according to economic principles should drive consumers' demand.

The two scenarios are known as Cost Leadership and Differentiation strategies, which have been introduced by Michael Porter among other generic strategies.

Quality savings may lead to serious product faults that turn out after purchase. Apart from bad influence on corporate image, faulty products impose additional costs due to product guarantee repair service.

Table 2.5 presents minimum assembly time per product.

2.3.3 Research and Development

Besides quality, innovation is one of the main fields of rivalry among competing firms. Innovative products provide differentiation from the market. It may be a new product design, new functionality or better usability - new features that attract new customers. It can also be production-wise innovation e.g. new material or process, which significantly reduces production costs. The improvements create competitive advantage which, everything else being equal, drive company's revenues.

The research and development (R&D) department is responsible for introducing innovative improvements to company's products. Every quarter the management decides on the magnitude of support it is willing to spend on R&D efforts. Their fruitful is unknown, but generally the more the company spends on innovation, the more probable success will be.

R&D expenditure is a long term, cumulative investment. In a short run there is no guarantee that the department would come up with an innovation, however the likelihood increases as the time horizon lengthens.

Product	Product 1	Product 2	Product 3
Improvements	MINOR	NONE	MAJOR

Figure 2.6: Quarterly Research and Development activity report

The results of efforts of R&D department are reported quarterly in management report, as in Figure 2.6. In the quoted quarter, the R8D department has introduced a minor improvement to product 1, no change to product 2 and a major improvement to product three. A minor improvement is implemented automatically and has immediate positive influence on sales. A major improvement is a technological breakthrough, which when incorporated, causes existing company's products obsolete. After a major improvement is decided to be implemented, existing stocks of old products are sold off at valuation price, which may be below production costs. In case a company has significant amount of existing products, the management may decide to stall the implementation, waiting for the stocks to empty, or to build up marketing campaign before the release. A major improvement usually drives consumers' demand.

Product innovativeness has strong positive influence on consumers' satisfaction ratings. Modern product line synergizes marketing efforts in building positive corporate and product images, thus driving demand.

2.3.4 Advertising

Advertising is company's main communication channel with its customers.

The company can use advertising in two purposes:

- Product image advertising and
- Corporate image advertising.

The former works short-term, building direct and immediate demand for particular product. Product advertising are usually Below-The-Line activities such as TV commercials or newspaper advertisements with scale depending on available funds.

The latter focuses on building corporate brand in particular region, regardless of products, aiming at creating customer loyalty and favor. Branding efforts are usually long term and cumulative, needing steady, long term investments in order to be effective.

Strong brand attracts people to visit company's Internet website. This type of advertising is the main driver for the company's internet website traffic. Advertising targeted on the Internet, should be however supported by constant development and improvement, and appropriate traffic capacity of Internet website.

Firm's last quarter advertising expenditures are reported in management report as shown in Figure 2.7.

Advertising (€ '000)	Corporate Image	Direct Product Advertising		
EU	7	20	15	30
Nafta	7	20	15	30
Internet	26	5	5	5

Figure 2.7: Quarterly advertising spending

2.3.5 Markets

The company operates in the following markets:

- European Union,
- North American Free Trade Area,
- Internet.

Selling is done in two ways:

- Through retailers who sell company's products to customers,
- Directly to customers world-wide through the Internet.

World's statistics are presented in Table 2.12.

Demography	Area (sq. km)	Population (millions)
European Union (EU)	3 228 000	368
North American Free Trade Area (NAFTA)	21 457 000	278
Rest of developed World	44 120 000	2 486

Table 2.12: World statistics

European Union

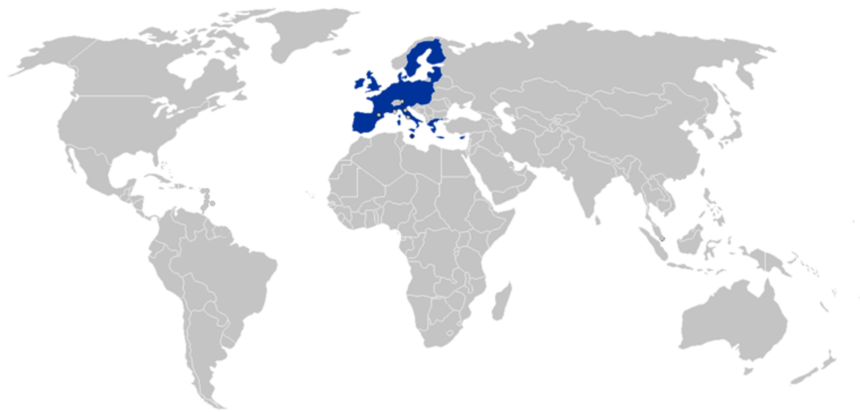


Figure 2.8: World map, European Union depicted with blue

In European Union agents are hired to sell and distribute company's products. An agent is responsible for operating within a certain radius, so hiring additional agents extends company's reach. An agent is compensated by support payment, which covers basic operational expenses (e.g. accounting) and a commission, calculated as a percentage of agents sells, which constitutes agent's main source of income. The more he or she sells, the more he or she earns, so a reasonable level of commission should motivate an agent to sell more, increasing company's revenues.

North American Free Trade Area

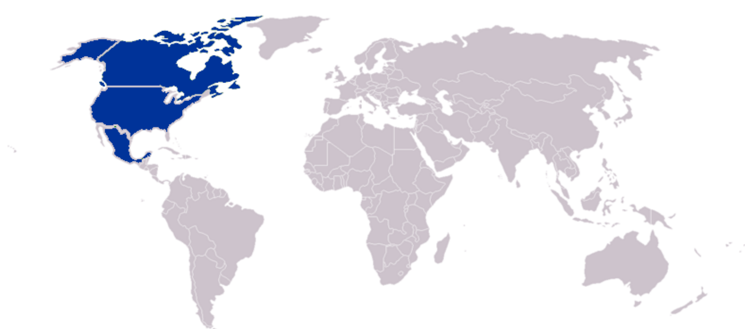


Figure 2.9: World map, North American Free Trade Area depicted with blue

In NAFTA the company operates through distributors, each of which has its own network of retailers. In general NAFTA is more difficult to penetrate than EU due to longer distances, smaller population and as a consequence lower population density. Furthermore, shipping products to NAFTA implies additional transportation and warehousing costs, which shrinks products profit margins. There's also the EURO-Dollar exchange rate risk. On the other hand, the NAFTA market with nearly three hundred million citizens is a large market, which may be seen as an opportunity.

Similarly to EU, NAFTA distributor is compensated by fixed support payment, which should cover basic operation costs and variable commission, calculated as a percentage of distributor's turnover. Raising distributor's commission should increase his motivation for selling.

The Internet

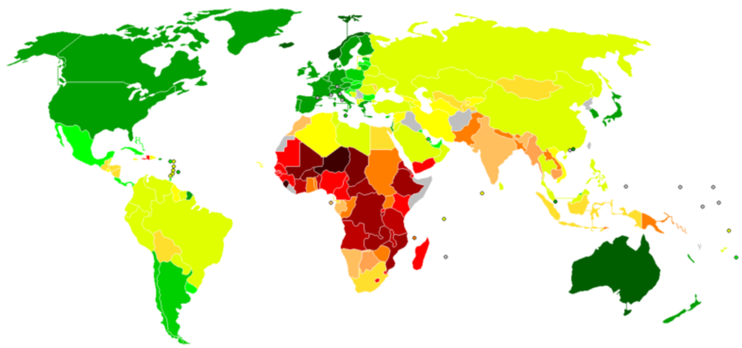


Figure 2.10: World map, development depicted with color intensity

The Internet provides a gateway for the global market of over 3 billion consumers (i.e. developed World only). The astonishing market is available partly only, due to limited access to the Internet of global citizens. The following table shows the effective market size of the Internet trade.

	EU	NAFTA	Rest of developed World
Population (million)	368	278	2 486
Access to the Internet (%)	50,0	61,0	28,0
Market size (million)	184	169,6	696

Table 2.13: Market size estimation

From the above calculation one can easily see, that the Internet market is of the size of 1 billion people. However, the Internet overtakes the traditional trade done through agents and distributors in EU and NAFTA markets.

The lack of middlemen (agents, distributors, retailers) in online trade reduces final costs of products, which leads to attractive consumer prices charged for the products on the Internet.

Apart from normal demand driving factors as product price, quality or innovation, attractiveness of company's e-commerce website, its traffic capacity and corporate image play important roles in online trade. Statistics for last quarter's online traffic are provided in management report as depicted in Figure 2.11.

Information Technology Report for Last Quarter	
Number of Internet Communications Ports Operated	5
Number of Internet Visits carried through successfully	35102
% of Potential Internet Visits that failed to connect	11.4

Figure 2.11: Quarterly Information Technology report

Packaging and dispatching of purchased products is carried out by Internet distributor, that the company hires. A single distributor handles entire online trade, for which the company pays him/her support payment (EU and NAFTA equivalent) and a commission. The magnitudes of these payments, which are subject to management decision, have no direct influence on online sells, rather influence distributor's efficiency and care.

2.3.6 Product availability

Every quarter EU agents, NAFTA distributors and Internet distribution agent order numbers of products. The company does not know exact numbers in advance, instead, relying on market expertise and historical data reported in management reports as shown in Figure 2.12, it makes estimates on what the demand would be. Following the estimates, the marketing department passes the figures to production department, which translates the forecasts to feasible production schedule. Manufactured goods are then shipped to middlemen, according to the plan delivered by marketing department.

Orders from:	Product 1	Product 2	Product 3
EU	594	397	232
Nafta	478	311	177
Internet	1,177	716	460

Figure 2.12: Last quarter orders report

Figures passed to production department should be previously updated by adjustments incorporating

- Adding orders backlog and
- Subtracting warehouse stocks,

which are reported by in management report.

Order Backlog	Product 1	Product 2	Product 3
EU	0	69	25
Nafta	0	29	15

Figure 2.13: Last quarter orders backlog report

Order backlog arises in case orders exceed product quantity delivered. The unsatisfied orders are passed to next quarter in the form of backlog. Usually 50% of uncompleted orders are abandoned, the other half is reported in the management report as shown in Figure XXX. On the Internet, orders that cannot be satisfied immediately, are definitely lost, therefore there's no backlog reported in the management report.

Warehouse Stocks	Product 1	Product 2	Product 3
EU	292	32	5
Nafta	464	40	0
Internet	124	12	11

Figure 2.14: Last quarter warehouse stocks report

Any overestimates of demand result in unsold products that have to be warehoused. The company is charged for commercial storage of its products.

2.4 Finance and accounting

Finance department is responsible for managing company's assets according to strategy established by senior management. That includes managing firm's capital structure, financing sources, equity and debt, investments, taxation, dividends, fixed assets etc. The department is also responsible for controlling as well as monitoring and maintaining firm's liquidity. It must work closely with firms' management to maximize company's share price, against which performance is measured. The stock price at the end of the simulation is the ultimate criterion by which companies' performance is judged.

ALL-COMPANY SHARE PRICES & DIVIDENDS

Company Number	1	2	3	4	5	6	7	8
Share Price (€.c)	1.215	1.551	1.210	1.401	1.641	1.132	1.254	1.012
% Dividend Paid		2		3	2	3	4	3

Figure 2.15: Quarterly stock price report

The company is financed with shareholders' capital consisting of shares with the initial value of € 1. Company's shares are quoted on Stock Exchange; its share price is reported quarterly in management report. The share price is influenced by numerous factors, from which the main are:

- Firm's net worth,
- Profitability,
- Dividend performance,
- Liquidity,
- Ability to pay interest charges,
- Use and availability of resources,
- Marketing and selling capability,
- Ability to satisfy orders promptly.

2.4.1 Dividends

A dividend is a distribution of profits to firm's shareholders. A person or business that owns company's shares is eligible to receive a portion of company's earnings according to his share in company's equity.

Every odd quarter, the management needs to decide on the magnitude (percentage) of the payment. The residual of firms earnings after dividends are paid, become firm's retained earnings, that can be used to finance firms operations or investments.

A firm that has negative reserves must not distribute any dividends. Any profits generated by the company, are firstly used to cover company's negative reserves.

2.4.2 Investment

An investment is a sacrifice of today's consumption for the sake of future profits. A company invests its capital in order to receive future cash inflows.

Cash at hand yields no interests, instead due to inflation it looses value. In case a company has more cash than it needs for its operations in the upcoming quarter, it should invest the money at EU Central Bank base rate. The quarterly-binding base rate is quoted in Economic Intelligence section of last quarter's management report.

2.4.3 Debt

The second way a company can use to finance its operations is debt. A debt is an obligation to repay a sum of principal amount and interest payment.

A firm willing to finance its operations with debt has a variety of choices:

- Term loans,
- Flexible bank loans (overdraft),
- Unsecured loans.

Term loans are granted by investment institutions that are willing to commit their capital to the company in long term. The money is credited immediately and is available as cash or in case of any overdraft or unsecured loans, used to repay the obligations. The loans are long term and cannot be repaid during the simulation. The term loans are available at fixed annual rate of 12%.

Additional financing source is also available in the form of a flexible bank loans (overdraft). The maximum amount of overdraft is set by the bank based on firm's short term assets and liabilities shown in the company's balance sheet. The loan is available at EU Central Bank's base rate (e.g.

3%) augmented by 4%.

If the company needs more funds that its overdraft limit permits, it can continue to be funded by loans provided by finance houses, without security. Unsecured loans are continued to be granted even though a company is considered insolvent. Unsecured loans are available at EU Central Bank's base rate (e.g. 3%) augmented by 10%.

Flexible bank loans and unsecured loans are issued and repaid automatically as the firm's cash needs require. Overdraft is used in the first place. When the needs exceed the limits, unsecured loans are used to meet firm's needs. The debt is repaid in the reverse order - unsecured loans are repaid first, followed by the overdraft.

2.4.4 Fixed assets and depreciation

Fixed asset is a tangible or intangible capital such as property or patent, which is used in operations of a business, which is not intended to be consumed or converted into cash in the ordinary course of action in the nearest accounting period.

Company's fixed assets consists of property and machines owned by the firm. The value of firm's property is fixed and unchanging. As the machines get older, their value depreciates by the decreasing balance method at a quarterly rate of 2,5%. Depreciation is tax deducible.

2.4.5 Taxation

Company tax is levied on company's profit at 30% rate. An assessment of tax pending is made at the end of a calendar year . Any tax assessed is immediately deduced from company's net profit and is then entered as a liability on company's balance statement. Losses are accumulated from previous years and are offset against future profits.

2.4.6 Insurance

The company is exposed to risk from various random events, which can disrupt its operations. The events might be:

- Some or all of the raw materials held in your own warehouse can be accidentally destroyed by careless handling, theft, flooding or fire.

- Similar risks can destroy all or part of stocks of raw material in transit or in your own local warehouse.
- Key assembly workers, can suffer from serious home or workplace accidents which might disrupt your production capacity.
- Machines can suffer from catastrophic breakdown which takes them out of production for periods of time.
- Badly designed products can be distributed or sold which later are found to be environmentally dangerous, and need to be withdrawn for modification.

These events can be identified in management reports by "!" alongside relevant figures.

To hedge against such events, the company can purchase insurance, which in case of disruption covers company's losses. The degree of participation in losses of the insurance company depends on insurance plan, chosen by the insuring company. The higher the insurance level, the higher quarterly insurance premium, that the insuring company has to pay.

Insurance premium is calculated as a percentage of company's assets, taken from last quarter's balance statement:

- Property,
- Machines,
- Material stocks,
- Product stocks.

The value is then multiplied by a percentage, relevant to the loss the company is willing to accept itself, according to calculations conducted in Table 2.14 (suppose company has 3,34 million in relevant assets).
Global disruptive events are relatively rare, but when happening may cause serious losses. Another risk factor is the quality of management, which depends on management budget. Good management cares about working environment minimizing the risk of management-related losses.

Insurance plan number	Insurance excess		Insurance premium	
	[%]	[€]	[%]	[€]
0	100%	€ 3 344 583	N/A	N/A
1	0,10%	€ 3 344	0,60%	€ 20 067
2	0,20%	€ 6 689	0,35%	€ 11 706
3	0,30%	€ 10 033	0,20%	€ 6 689
4	0,40%	€ 13 378	0,10%	€ 3 344

Table 2.14: Insurance excess and premium, according to insurance plan

2.5 Human resource management

Human Resources (HR) department is responsible for ensuring that the company has sufficient number of employees to function properly, that the workforce is adequate to the production strategy, and that the staff is well motivated and efficient. Employees are found in competitive labor market, in which the HR competes with other firms to hire required number of staff of highest quality. Proper supply of workforce is essential for the company to operate successfully. HR department should therefore monitor the labor market and company workforce needs so that management's strategy has suitable resources to be successfully accomplished.

Company's workforce consists of four kinds of employee:

- Unskilled machinists,
- Skilled assembly workers,
- Ancillary workers,
- Senior management.

The HR should be familiar with the labor market; its labor market expertise should serve as an important input when building expansion strategy. After the strategy is established, the HR department should take adequate steps so that required supply of staff is provided on time.

All employees may leave due to retirement, sickness or because they have gone to work for rival companies, that offered better employment conditions. The reasons for leaving are usually:

- Low average earnings,
- Excessive overtime working,

- Colleagues being dismissed,
- Poor quality of products,
- Poor management.

	Recruitment	Dismissal	Training
Unskilled machinists	€ 1 000	€ 2 000	n/a
Skilled assembly workers	€ 2 000	€ 5 000	€ 8 500

Table 2.15: Human Resources recruiting costs

2.5.1 Unskilled machinists

Every machine owned by the company requires four unskilled machinists to be operated per shift. Unskilled workers are hired and dismissed automatically, depending on company's current requirements which result from the number of machines that are owned by the company and the level of shifts decided for the quarter.

When a decision is made to sell a machine, the workers used to operate it are no longer needed. Due to the labor union agreement, dismissal of the surplus of unskilled workforce has to be done in two equal stages spanned over two upcoming quarters. As a result, in the next quarter half of the workforce being dismissed still is paid their normal salary.

2.5.2 Assembly workers

Skilled workers assembly components, produced on machines, into finished products ready to sell. The assembly process requires specific knowledge, that is provided to new employees during intensive initial training. Assembly workers are recruited from the competitive labor market. The firm compete with other firms to possess required workforce. The success of recruitment effort highly depends on current unemployment rate and conditions offered. If unemployment is low and conditions are relatively unattractive, the recruitment campaign may be unfruitful.

Addressing the above scenario, the company may decide to transform some of its unskilled staff into skilled assembly workers, by providing adequate professional trainings. Trainings take place in company's own school placed in the factory, which limits the number of people to nine per quarter. The trainings impose additional recruitment costs of € 8 500 per worker, which is more than four time more expensive than regular recruitment. However, this method of recruitment gives the certainty that required number of assembly workers is available in the quarter after next.

2.5.3 Ancillary staff

Ancillary staff works within the context of their corresponding departments. These include:

- Clerical staff,
- Accountants,
- Buyers,
- Warehouse staff,
- Researchers,
- Junior management,
- Etc.

Their duties result from functional roles of the department they belong to and their salary is included in fixed operational costs of the business unit.

2.5.4 Senior management

Company's senior management consists of a board of directors - besides CEO, executives responsible for firm's functional aspects:

- Marketing,
- Production and distribution,
- Finance and accounting,
- Human Resources.

Senior management is responsible for outlining firm's strategy and managing firms operations transforming the strategy into action.

Senior management is compensated by management budget, decided in each quarter. The budget influences its effectiveness in day-to-day management and achieving its goals.

2.5.5 Pay and workload limits

Besides recruitment, Human Resources department is responsible for controlling the cost of company's workforce simultaneously maintaining it motivated. Every quarter, the management decides on the level of wages paid to the company's workers. Basically, wage rate of a machinist is 65% of assembly worker's rate. Apart from wage rate itself, the workload (overtime and shift level) has significant impact on company's cost of workforce. Table 13 shows single employee's work limits.

Shift level	Hours per worker at basic rate	Hours per worker at Saturday rate (Basic pay + 50%)	Hours per worker at Sunday rate (Basic pay + 100%)	Machinists Shift premium
1 (single)	420	+84	+84	0
2 (double)	420	+42	+84	1/3
3 (triple)	420	+42	+84	2/3

Table 2.16: Employees' workload limits, according to shift level

When working single shift, an employee can work 420 hours quarterly for a basic salary rate. Any excess of this limit within available 168 hours is charged additional 50% or 100% of the basic rate. When the management decides to introduce additional shifts (applies to machinists only), basic pay is augmented by relevant shift premium, shown in table 13. The shift premium applies to the basic pay of all machinists. As a result, the basic pay of a machinist working 3 shifts, compensated by 2/3 shift premium is nearly 10% higher than a basic rate of an assembly worker.

Chapter 3

Value-Based Management

The following chapter describes the concept of Value-Based Management. It introduces the reader to financial statements analysis and valuation in order to gain necessary background for VBM. It then provides detailed explanation of the concept of Economic Value Added and guides through the technicalities of the metric.

3.1 Economic Value Added - Introduction

Economic Value Added arises from microeconomics and finance theory. The concept relies on the work of Nobel Price winners - Merton H. Miller from the University of Chicago and Franco Modigliani from MIT. Miller and Modigliani promote economic model of a firm and *discounted cash flows* for valuation of current wealth throughout managerial decision process. Joel M. Stern states that the findings of Modigliani and Miller "constitute the basis for development of the concept of Economic Value Added, which provides a practical solution for performance measurement and management compensation system, driving managers toward behavior that is convergent with shareholders' interest."[2]. The concept has been clearly defined and popularized by *Stern Steward & Co*, who registered *EVA* as its trademark.

Residual income used in accounting is the *Net Operating Profit After Tax*, also known as the *bottom line*. According to accountants, it is the ultimate measure of company's operational profit. Value-Based Management and Economic Value Added theory in particular criticize the approach, claiming that firstly it distorts the true profit generated by company (Stern Steward names over 120 distortions of profit expressed through NOPAT), secondly, neglects certain costs of capital providers. The theory claims, that in order to capture the true profit of a company, one needs to incorporate economic principles to the measurement methodology, more specifically incorporate the opportunity cost of capital providers. Peter Drucker in his article in Harvard Business Review from 1995 writes: "Economic Value Added relies on principles, we have known for long: what we call profit, money that is left (...), isn't usually any profit. As long as an enterprise does not generate cash that exceeds its cost of capital, it generates loss. It does not matter that it pays taxes as if it generated true profit. Such enterprise still returns to its environment less than it takes in the form of resources. (...) It doesn't add wealth, rather it destroys it."[3]

Economic Value Added as a measure of company's performance measures company's residual income. For the income to be positive, company's operational profit must compensate risk incurred by capital providers. Consequently, when operational profit equals expected rate of return, company's residual income equals zero.

3.2 Financial statements

Publicly traded companies are obliged to publish certain information to its shareholders and/or general public. The information should provide its addressee with information about firm's current financial condition. In order to maintain consistency, governments impose certain accounting rules for preparing the statements. These are called Generally Accepted Accounting Principles (GAAP). Since there were differences in GAAPs between countries, international comparison of companies has been problematic. Addressing the inconsistencies, International Accounting Standards Board has developed International Financial Reporting Standards, which have already been adopted by many countries (including European Union and Australia). The United States Federal Accounting Standards Board has made a commitment to converge US GAAP toward IFRS [4].

International Financial Reporting Standards provide a number of financial reports for describing firm's state from different angles in generally acknowledged formats. The four main financial statements are:

- Balance sheet,
- Profit & loss statements,
- Cash flow statements and
- Shareholders' equity statements.

If a company has extraordinary items that affect the balance sheet or the shareholders equity position it will usually include an Other Comprehensive Income Statement, which describes the adjustments to be made. Examples of Other Comprehensive Income include revaluation of corporate assets away from their stated cost, as well as accruals for liabilities.[5]

Investors considering the purchase of firm's stock have rather limited information about the firm. Therefore investors' decisions are based on financial statements.

3.2.1 Balance Sheet

Balance Sheet is a statement of the book value of the business, providing a report of firm's financial position. It is a report prepared at the end of an accounting period, serving as a snap shot of firm's financial condition at a given point in time. Figure 3.1 depicts an example balance sheet.

A balance sheet consists of three parts:

Balance Sheet		
Assets		
Value of Property	100 000	
Value of Machines	1 046 444	
Total Fixed Assets		1 146 444
Value of Product Stock		0
Value of Raw Material Stock		4 086
Debtors		761 288
Cash		1 482 451
Investments		80 000
Total Assets		3 474 269
Liabilities		
Tax Assessed & Due		88 638
Creditors		324 150
Bank Overdraft		0
Unsecured Loans		0
Total Current Liabilities		412 788
Net Assets		3 061 481
Term Loans		500 000
Net Worth		2 561 481
Share Capital		4 000 000
Reserves		-1 438 519
Shareholders Funds		2 561 481

Figure 3.1: Balance Sheet

Assets constituted by things that the company owns that has some value. They can be either converted to cash (i.e. sold) or used by the company to provide services or make products that can be sold. These can be tangible assets: property, machines, inventory; or intangible: trademarks, brands, patents. Furthermore, there are current assets i.e. assets easily convertible to cash e.g. inventories, accounts receivables, short-term investments; and non-current or fixed assets i.e. assets not intended for resale e.g. property, real estate, goodwill, long-term investments etc.

Liabilities constitute company's obligations toward others. These can be bank loans, rent, money owed to suppliers for materials, payroll a company owes to its employees, taxes owed to the government. Liabilities also include obligations to provide goods or services to customers in the future.[6]. Similarly to assets, liabilities can be current i.e. debt and obligations that a company is expected to pay within 12 months e.g. accounts payable, tax, short-term bank loans; and non-current, or fixed i.e. debt and obligations that a company is expected to pay beyond 12 months e.g. mortgage bonds, lease obligations, provisions.

Shareholders' equity is the capital that would be left over if all assets were sold and all liabilities were paid off. The capital belongs to shareholders, or owners of the company. It is also known as the net assets, or net worth of the company. Share capital, capital reserves and retained earnings constitute shareholders' equity.

For every balance sheet relation 3.1 must hold.

$$\text{ASSETS} = \text{LIABILITIES} + \text{SHAREHOLDERS' EQUITY} \tag{3.1}$$

In other words, the assets have to balance firm's liabilities and shareholder's equity. It is called the basic accounting equation.

3.2.2 Profit & Loss Statement

Profit & Loss statement, or Income Statement in the US, provides a statement of results of firm's operations expressed in terms of profit and loss in quoted accounting period. Figure 3.2 depicts an example income statement.

Income Statement	
Sales Revenue	1 713 995
Opening Stock Value	38 023
Materials Purchased	215 334
Assembly Wages	162 092
Machinists Wages	338 278
Machine Running Costs	107 058
Quality Control	8 000
Minus Closing Stock Value	4 086
Cost of Sales	864 699
Gross Profit/Loss	849 296
Insurance Receipts	22 676
Interest Received	659
Interest Paid	15 000
Overheads	723 870
Depreciation	26 832
Tax Assessed	0
Net Profit/Loss	106 929
Dividends Paid	0
Transferred to Reserves	106 929

Figure 3.2: Income Statement

A profit & loss statement shows how much revenue has a company generated over a specific time period. It also shows the costs and expenses associated with earning the revenue.[6]. It therefore enables investors and creditors to evaluate past performance of the company, predict future performance and assess the risk of achieving future cash flows.[7]

A P&L statement has also some limitations. The statement depends on the accounting method used (inventory statements may differ depending on using Last In First Out or First In First Out reporting methods).

An important remark is that profit and loss statements should not be understood as statement of company's cash at hand. The statement uses memorial accounting and reports any accruals as capital actually possessed. Since most businesses uses delayed payment i.e. paying for good or services with some-day delay; the statement may report funds, which the company hasn't received yet. Obviously, it carries the risk of counter party payment default.

P&L statement carry significant information, which enables financial analyst to evaluate firm's performance. The statement starts with Gross Revenue, which represents all inflows or enhancement of enterprise' assets due to its operations i.e. selling products or services. The amount carry no information about any expenses. The second main section on a P&L statement represents company's expenses. These can be:

Cost of goods sold represents firm's expense incurred through production of goods or performing a service. These costs are considered variable, since they are directly dependent on the magnitude of production,

General and administration expenses represent costs incurred through business management and administration. These costs are considered fixed, as they do not directly depend on the magnitude of production. These costs include salaries, insurance, rent, lease, etc.,

Selling expenses represent firm's expenses incurred in order to sell products. These include distributors' support payment and provisions, advertising, transport and shipment etc.,

Research & Development represents expenses incurred through firm's R&D activities,

Depreciation represents costs associated with depreciating assets.

The expenses are followed by non-operational gains or expenses. These cash flows result from other than primary business activities (e.g. interests received and paid, rent etc.).

3.2.3 Cash flow statement

Cash flow statement shows firm's inflows and outflows of cash or cash-equivalents in a period under query. The statement reports how changes to the balance sheet due to activities represented in P&L affect current firm's cash condition.
The statements breaks the changes down to three sections

- operating activities,
- investing activities and
- financing activities.

Income statement item	Acronym spelled out	Alternative terminology
Revenues		Sales, Income, Turnover
− CoGS	Cost of Goods Sold	Cost of sales
EBITDA	Earnings before I+T+D+A	Gross margin or profit, Operating margin
− Depreciation		
− Amortization		
EBIT	Earnings before I+T	
− Interest		Financial income, Financial expense
EBT	Earnings before Taxes	Pretax net income
− Taxes		
E	Earnings	Net income

Table 3.1: Financial terminology with explanation[7]

Cash Flow Statement	
Trading Receipts	1 719 241
Capital Receipts	0
Interest Received	659
Investments Sold	0
Insurance Receipts	22 676
Additional Loans	0
Trading Payments	1 545 339
Capital Payments	0
Interest Paid	15 000
Investments Bought	0
Tax Paid	0
Dividends Paid	0
Loans Repaid	0
Net Cash Flow	182 237

Figure 3.3: Cash flow statement

Operating activities report changes imposed by production, sales and delivery of company's products accounting counter party payments. Activity section of a Cash flow statement would report:

- Net income from income statement,
- Depreciation,
- Tax,
- Wages.

Investing activities report purchases or selling of long-term assets. These are:

- Capital expenditures, e.g. purchases of equipment,

- Investments.

Financing activities report flux of cash to/from investors such as banks and shareholders. These are:

- Dividend activities,
- Issuing and purchasing of new stock,
- Issuing and purchasing of debt.

3.2.4 Shareholders' equity statement

Shareholders' equity statement, also known as the statement of retained earnings, reports changes to enterprise' equity in accounting period under query. It breaks down changes affecting the account, such as profits or losses from operations, dividends paid, and any other items charged or credited to retained earnings.[8] The statement has to be consistent with P&L and balance sheet statements, thus equation 3.2 must hold.

$$\begin{aligned} \text{Ending Retained Earnings} = \; & \text{Beginning Retained Earnings} + \text{Investments} \\ & - \text{Dividends paid} + \text{Net Income} \end{aligned} \tag{3.2}$$

3.3 Valuation

Investments are one of the main functional areas within enterprise operations. Within a free market, they are the necessary condition of enterprise growth. No matter if it is an enterprise developing new product line, or an investment fund speculating on a stock market, in both cases it is a commitment of cash. According to the definition, it is the current sacrifice for the sake of future profits. Furthermore, it is a sacrifice of certainty for uncertain tomorrow. Investment is resignation of current consumption. In other words, when an investor makes an investment, he or she commits capital, preventing it from any other utilization. The reason he does it, is because he believes rightly or wrongly that he will receive more cash in the future. The time value of money, however, prevents from the ability of simple comparison between money as of today and money in the future.

Since an investment freezes cash, its value depends on the magnitude of future cash flows that the investor acquires right to. Free cash flow is an amount left over from company's operating activities. That residual cash is the source of capital returned to capital providers. Free cash flow enables companies to pay interest and principal on loans, distribute dividends and buy back shares. These are the ways companies return cash to their capital providers. Consequently, expectation of cash flows will be the paramount determinant of company's value from capital markets perspective.[9] Table 3.2 provides the calculation path for arriving at company's free cash flow.

EBITDA
− Depreciation and amortization
− Taxes
Net Operating Profit After Tax (NOPAT)
+ Depreciation and amortization
− Capital expenditures
− Changes in the working capital requirement (WCR)
Free cash flow

Table 3.2: Calculation of free cash flow

Valuation estimates the worth of right to future cash flows generated by an investment. It is a function of three main factors: magnitude, time and uncertainty. The magnitude carries information about the size of future cash flows. The number however means little unless one knows the time horizon of an investment, due to the nature of cash [1]. Even though magnitude and timing are known, there is the risk of an investment not going according to the plan. Only by knowing the magnitude, timing

[1] Time value of money.

and uncertainty one can perform a comprehensive valuation.

3.3.1 Discounted Cash flow

The above insights are captured in the discounted cash flow (DCF) valuation model. With this approach, expected future cash flows are discounted at a discount rate that reflects both uncertainty of an investment and time an investor is expected to wait. The model is represented by formula 3.3.

$$\text{Value} = \sum_{t=1}^{n} \frac{\text{CF}_t}{(1+r)^t} \tag{3.3}$$

n - life of the investment

CF_t - projected cash flow in period

r - riskiness of the cash flow

DCF states, that the value of an investment is the sum of discounted future cash flows, with the discounted value of each cash flow being a function of nominal magnitude, risk and timespan of the investment. The discount rate is the return an investor would expect to receive if he committed the capital elsewhere bearing similar risk.

Expected future free cash flows are discounted using formula 3.3 in order to arrive at investment's Net Present Value.

3.3.2 Net Present Value

Net Present Value (NPV) is one of the fundamental decision criteria for many companies. It counts among discounting investment valuation methods. It takes under consideration any inflows and outflows generated by an investment spanned over the entire investment's timespan.

$$\text{NPV} = \sum_{t=1}^{n} \frac{\text{CF}_t}{(1+\text{r})^t} - \text{I}_0 \tag{3.4}$$

r - investor's expected rate of return
n - investment timespan
CF_t - expected cash flow in period t
I_0 - initial capital expenditure

3.3.3 Internal Rate of Return

Another of the most frequently used discounting valuation methods is the Internal Rate of Return (IRR). IRR is such rate of return, which balances capital expenditures with discounted value of future free cash flows generated by the investment. Thus, the Internal Return Rate is a rate at which investment's Net Present Value equals zero.

$$\mathrm{PV(Capital\ expenditures)} = \mathrm{PV(Free\ cash\ flow)}$$

Formula 3.5 represents the Internal Rate of Return valuation model.

$$\sum_{t=0}^{n} \frac{\mathrm{CF}_t}{(1+\mathrm{IRR})^t} = 0 \tag{3.5}$$

n - life of the investment
CF_t - expected cash flow in period

In practice, Internal Rate of Return of an investment is its return rate. If IRR exceeds cost of capital engaged, then the cash surplus is accumulated by the company, increasing its economic value. Consequently, it is the wealth generated for the firm's shareholders.

The following example demonstrates calculation of NPV for a 5-year investment, with an initial capital requirement of € 1000 and working capital requirement constant over 5 year of € 1500. Table 3.3 illustrates the problem.
Applying formula 3.4:

$$\mathrm{NPV} = \frac{500}{(1+0,1)^1} + \frac{600}{(1+0,1)^2} + \frac{700}{(1+0,1)^3} + \frac{800}{(1+0,1)^4} + \frac{2400}{(1+0,1)^5} - 2500 = 1012,9$$

	Year 0	Year 1	Year 2	Year3	Year 4	Year 5
EBITDA		500	600	700	800	900
− Capital Expenditures	− 1000					
− Changes in the WCR	− 1500					1500
Free cash flow	− 2500	500	600	700	800	2400

Table 3.3: Free cash flow example

The Net Present Value of the investment is € 1013, which means that it is expected to generate return greater than its cost of capital. It is the wealth generated for the shareholders.

Solving equation 3.5 for the above example, the IRR rate equals 21,2%. Provided the hurdle rate is equal to discount rate used in NPV calculation, IRR analysis leads to the same conclusion, namely that the investment generates free cash flows that exceeds cost of that capital.

3.4 Value-Based management

Value based management instills a mind-set, where everyone in the organization learns to prioritize decisions based on their understanding of how those decisions contribute to corporate value.[9]

Both the NPV and IRR analysis are forward-looking i.e. they rely on expectations of the future, not on what company has delivered in the past. The approach seems reasonable, since investors commit their capital to NPV positive initiatives. It however lacks appropriate performance metrics that would evaluate management's progress in achieving its goals.

Management is evaluated and rewarded based on its results (backward-looking), while capital markets perform valuation of businesses and investments on the basis of expectations of the future (forward-looking). These opposite-looking approaches cause the risk of management being compensated for irrelevant from the value-creating perspective activities, that it undertakes. To address the threat, *companies should adopt performance measurement techniques that are conceptually linked with the free cash flow model of valuation. In other words, corporate managers should be evaluated in a manner that is consistent with the way that the capital markets will evaluate their firms.*[9] One of such metric is Market Value Added (MVA).

3.4.1 Market Value Added

Market Value Added is by some VBM practitioners considered the most important of all value-based metrics. MVA is calculated according to formula 3.6.

$$\text{MVA} = \text{market value} - \text{invested capital} \tag{3.6}$$

Market value added is the difference between market value and the total capital invested in the enterprise. The former of the two is a market value of all capital claims held against the enterprise, namely it is the market value of its debt and equity. The latter, is the capital invested in the business by its capital providers. Both of these values should be of the same point in time.

MVA is considered the ultimate measure of value created since it provides the difference between the inflow and outflow of cash i.e. between capital that has been committed by investors and the amount that they can receive when selling the enterprise for its current market value. In this matter, Market Value Added is the accumulated amount by which the firm has increased or decreased shareholders' wealth.[2]

An important remark regarding stock valuation is that stock prices only reflect market's expectations toward the joint-stock company. The price depends mainly on financial results that investors expect it to achieve. Former financial results do matter however, in a way that they act as expectations stimulating factor toward future results. Consequently, valuation of a joint-stock company is a function of cash, that investors count on, rather than capital that has been committed. Al Ehrbar captures this approach by saying that on stock-exchange no one asks *"What have you done for me lately?"*, but rather *"What are you going to do for me tomorrow?"*. Market value in that sense captures market assessment of management's efficiency in utilizing resources. It also reflects market's assessment of management's strategy and efforts in ensuring future enterprise prosperity.

Obviously, a firm is value creator, when its enterprise value which is capital market expectation of its future free cash flows discounted at the cost of capital exceeds that capital i.e. MVA is positive. The firm destroys value if its market value is lower than capital invested. This relation is presented in figure 3.4.

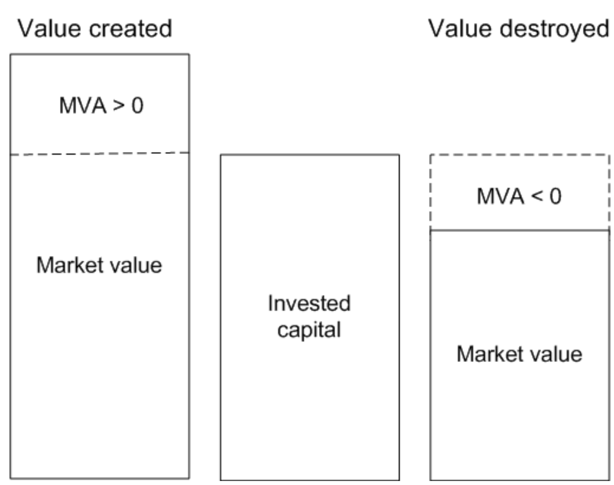


Figure 3.4: Positive and negative Market Value Added[15]

As an expectation of future cash flows, Market Value Added constitutes stock market's assessment of firm's value i.e. its Net Present Value. It is the present value of future cash flows, discounted using firm's cost of capital. Not surprisingly, from capital market perspective, the profits should represent gains incorporating cost of capital committed in the investment.

Market Value Added is therefore the current value by which future profit exceed their cost of capital. In other words, the profit captured by MVA is of economic nature i.e. is the difference between operating profit and the cost of capital. The insight is exactly captured by Economic Value Added. The MVA-EVA relation is captured by equation 3.7. [16]

$$\text{MVA} = \sum_{t=1}^{\infty} \frac{\text{EVA}_t}{(1+\text{WACC})^t} \tag{3.7}$$

3.4.2 Economic Value Added

Wealth is created when operating profitability of a firm exceeds cost of capital engaged. The ability and magnitude of wealth created is measured by Economic Value Added. EVA enables performance evaluation over period of time, simultaneously being aligned with the manner in which capital markets evaluate businesses. It is calculated using formula 3.8.

$$\text{EVA} = \text{NOPAT} - \text{CC} \tag{3.8}$$

NOPAT - Net Operating Profit After Tax

CC - Capital Charge

Economic Value Added is the difference between after-tax profit the company has generated from its ongoing operations and capital charges, which charges invested capital with an economic cost of that capital.

The economic nature of EVA constitutes its fundamental premise toward creation of shareholders' wealth. "The principal difference between EVA and more conventional profit measures is that EVA is an "economic" as opposed to an "accounting" profit. It is based on the idea that for a business to earn what economists call "rents" (i.e. abnormal returns on investment), revenues must be sufficient to cover not only all operating costs but also all capital costs (including costs of equity finance). Without the prospect of economic profits, there can be no wealth creation for investors."[9]

Firm's market value is established by capital markets by augmenting invested capital with present value of firms future prospects (formula 3.9).

$$\text{Market value} = \text{invested capital} + \text{present value of future EVAs} \tag{3.9}$$

By combining equations 3.6 and 3.9 one arrives at formula 3.7, that is

$$\text{Market value added} = \text{present value of future EVAs}$$

Consequently, when companies implement strategies or invest in projects that are expected to deliver increased streams of future EVAs it results in increase in MVA and excess return i.e. creation of shareholder wealth.

3.5 EVA technicalities

Economic value added is firm's net operating profit reduced by cost of capital involved. This insight is expressed with the formula

$$\text{EVA} = \text{NOPAT} - \text{invested capital} \times \text{WACC}$$

It is therefore, firm's profit incorporating the opportunity cost i.e. cost of lost opportunities.

3.5.1 Net Operating Profit After Tax

NOPAT, company's operating profit, net of tax, measures profits the company has generated from its ongoing operations. Table 3.4 shows the way to arrive at NOPAT.

Operating income
+/− Equity income or loss
+ Other investment income
− Income taxes
− Tax shield on interest expense
Net Operating Profit After Tax (NOPAT)

Table 3.4: Calculation of NOPAT

According to Stern Stewart, NOPAT carries long number of distortions due to its accounting origin. Generally Accepted Accounting Principles impose accounting mindset, which leads to misrepresentation of company's financial results in terms of economic principles. Addressing that, NOPAT requires adjustments, which streamline calculations, revealing firm's true economic profit.

Stern Stewart claims that they know more than 120 adjustments that need to be incorporated to calculations when seeking for firm's operating profit.[2] Applicability of those adjustments depends on the nature of business in question. Different approach should be adopted when dealing with high-tech venture capital start-up, than with large enterprise operating within well-established market. There are however publicly acknowledged adjustments that should be universal to all enterprises.

Research and development

Research and development expenses are investments in future products and processes. Generally Accepted Accounting Principles impose R&D expenses to be immediately recognized as operational costs. It has tremendous effect in case of high-tech companies, which commit much capital in innovation. Recognizing research and development expenses as operational costs reduces their accounting value to nil, neglecting the invaluable asset.

EVA practitioners suggest capitalizing research and development costs (recognizing them as an asset in the balance sheet) and amortizing them throughout a reasonable period. Work of Baruch Levy suggest that amortization period varies from three to four years in case of scientific instruments, up to at least eight years in case of pharmaceutical industry.

Strategic investments

Strategic initiatives are investments, which in the long-run are thought to build firm's competitive advantage. Using standard approach, although in the long-run the project may be profitable, the investment's capital requirement and long return horizon may decrease current EVA generated by the company, leading the project to be rejected.

Stern Stewart suggests that instead of charging strategic investments with the cost of capital from day one of the project, firms should move the investments into special accounts, which would not participate in calculation of Economic Value Added. The account should then be augmented by the accrued cost of capital until the investment is finished.

Costs recognition

Generally Accepted Accounting Principles impose certain expenses to be recognized as costs immediately when incurred, even though their effect is long-term. Advertising and firm's marketing efforts are examples.

Analogically to R&D expenditures, EVA practitioners suggest capitalizing the expenses and amortizing them over appropriate time period.

Amortization

In some cases it is advised to apply progressive amortization method, which is more close to assets real depreciation.

Restructuring deductions

Restructuring deduction is accounting acknowledgment of firm's loss due to an unsuccessful investment. GAAP requires any restructuring deduction to be acknowledged as loss. For this reason, investments generating no accounting profit may be kept alive even though they destroy value from economic perspective (i.e. the profit they generate does not exceed cost of capital committed).

Applying EVA perspective, restructuring is considered an opportunity that should be used, whenever available, since it focuses on the ultimate, shareholders' profit (as opposed to accounting profit).

Balance sheets adjustments

Earnings generated by companies are distributed to shareholders in the form of dividends or are kept by the companies as retained earnings. The capital retained is either kept as cash reserve or in the form of liquid financial instruments, that can be easily converted to cash. The capital does not participate in firm's operating activities, therefore is not expected to generate operating profit.

EVA approach suggests valuating them using lower capital cost related to financial investments, instead of using firm's weighted-average cost of capital used for financing of operating activities. Furthermore, EVA practitioners suggest subtracting return from capital investments from firm's operating profit after tax.

3.5.2 Corporate finance

A company willing to expand its operations needs capital for the investment. When deciding on its financing, the corporate finance specialist can choose from an array of alternatives, which ultimately reduce to:

- equity,
- debt.

The combination of the two above constitutes firm's capital structure. Brealey and Myers define firm's capital structure as the structure of securities issued by an enterprise distinguished between debt and equity securities.[11] Firm's capital structure is therefore expressed by the right side (liabilities) of its balance sheet, as depicted in figure 3.6. Firm's debt can be either short-term i.e. bank loans or money market instruments, or long-term i.e. fixed- or floating-rate bonds or bank loans. Firms equity is constituted by its seed capital (capital brought when an enterprise is born), reserves and retained earnings (profit generated in previous periods, that has not been distributed in the form of dividends).

According to Modigliani and Miller the most important characteristic of debt as a component of enterprise capital structure, is so called *Tax Shield* that debt provides. Interest rate on debt are financial costs, which decrease firm's taxation base.[12] Another significant distinction of debt is the risk of default. Debt's interest rate and payment date impose the risk of company being unable to cover the payment. Financial benefits due to the tax shield can be smoothed away by the cost of bankruptcy in case of debt repayment default.[13]

	Debt	Equity
Financing horizon	The capital is provided by creditors for explicitly time defined in an crediting agreement.	Capital is provided by shareholders without return date defined.
Payments	Interests payments and repayment of principal are made to creditors according to credit agreement.	Dividends are paid to shareholders according to firm's financial capabilities (net profit)
Taxation	Interests payments are firm's financial costs, decreasing taxation basis for Corporate Income Tax.	Dividends are paid from after-tax profit, generated by the firm, thus are not costs decreasing taxation basis for Corporate Income Tax.
Control	Creditors have no control over the enterprise, unless differently stated in credit agreement.	Shareholders have voting right - they participate in making most important decisions.
Bankruptcy risk	Default in payment of interest or principal may be the basis for firm's bankruptcy.	Default of payment of dividends may not be the basis for firm's bankruptcy.

Table 3.5: Debt and equity comparison[15]

The subject of mutual relations of benefits and detriments of debt vs. equity and the seek for optimal capital structure of an enterprise is known as the *trade-off theory of capital structure*. [14] The theory relies on the model proposed by Modigliani and Miller.[12] According to the theory, for every enterprise, there exists an optimal debt - equity ratio, for which value of the enterprise is maximized. In that case, balance of benefits due to the tax shield and costs due to the risk of bankruptcy reaches optimality.

Enterprise' capital structure can be defined with a number of financial indicators. The fundamental is the financial leverage ratio, which defines ratio between debt and equity in corporate capital structure. The ratio, also known as the debt-equity ratio, has been used by Modigliani and Miller in their model.[12] Leaving capital structure optimality aside, changes in the structure cause different capital markets' reactions. General capital transactions and their influence on capital markets are compiled in figure 3.5.

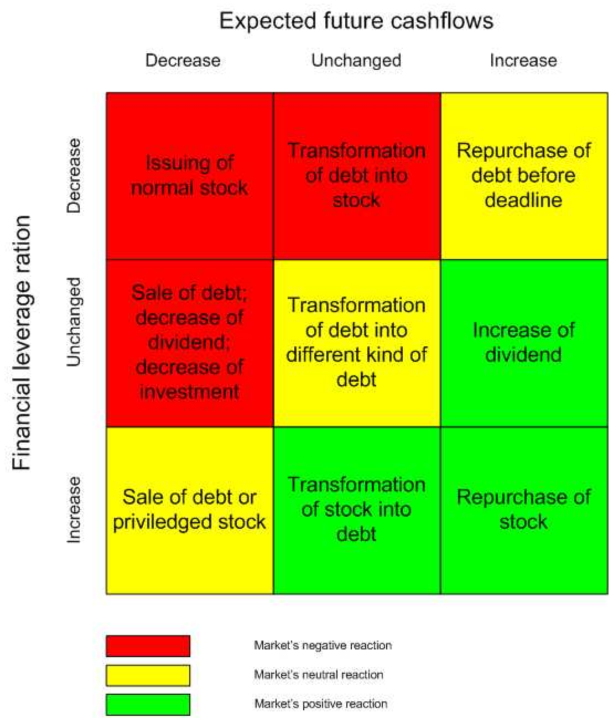


Figure 3.5: Financial markets' reactions for capital transactions[15]

3.5.3 Invested capital

Invested capital represents all of firm's interest-bearing financing, that is:

- Equity,
- Short-term debt,
- Long-term debt,
- Other long-term liabilities.

The above financing according to the balance equation of accounting (equation 3.1) is materialized or balanced in the form of company assets. This equality is depicted in figure 3.6. Company's assets (Cash, WCR and Fixed assets) are balanced by company's liabilities and equity (debt and equity).

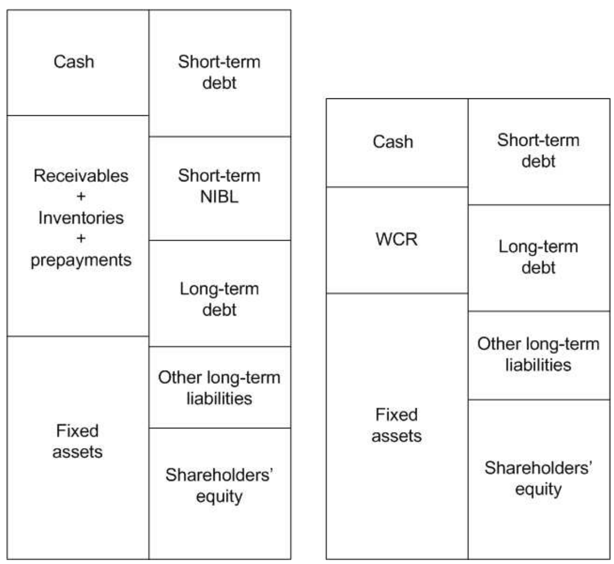


Figure 3.6: Regular and EVA Balance Sheets

When calculating EVA, invested capital does not take under account short-term, non-interest bearing liabilities such as accrued wages, accrued taxes, accounts payable. They are excluded from the calculations since their sources claim no interest.

$$\begin{aligned}\text{Invested capital} &= \text{excess cash} + \text{WCR} + \text{fixed assets}\\ &= \text{total assets} - \text{short-term non-interest-bearing liabilities}\\ &= \text{short-term debt} + \text{long-term debt}\\ &+ \text{other long-term liabilities} + \text{shareholders' equity}\end{aligned}$$

The formula is consistent with EVA balance sheet, which is depicted on right side of figure 3.6.

3.5.4 Weighted-Average Cost of Capital

Weighted-Average Cost of Capital represents the capital cost, which the company is charged with for its financing. The number is an average of costs of different sorts of capital committed. It therefore represents the cost of lost opportunities, or the economic opportunity cost, that investors incur, when they commit their capital to the firm. Weighted-Average Cost of Capital is calculated according to formula 3.10

$$\text{WACC} = w_d C_d + w_e C_e \tag{3.10}$$

w_d - debt weight
w_e - equity weight
C_d - cost of debt
C_e - cost of equity

WACC is therefore the sum of cost of each component of company's capital (short and long term debt and/or equity), weighted by its proportion in the capital structure of the enterprise. Debt and equity weights (w_d) are respectively debt and equity's shares in company's total financing, where total financing is the sum of debt and equity committed. The cost of debt C_d accounts firm's tax benefits, i.e.

$$C_d = i_d(1 - T)$$

where i_d represents debt's interest rate and T is the rate of Corporate Income Tax. Firm's cost of equity (C_e) is the return rate that is expected by firm's shareholders. The cost of firm's equity can be calculated using the *Capital Assets Pricing Model.*

3.5.5 Capital Asset Pricing Model

The Capital Asset Pricing Model (CAPM) was independently developed by Professors William Sharpe of Stanford University and John Lintner of Harvard University, relying on previous contributions to finance theory by Harry Markovitz. The model relates the required rate of return for a security to its risk as measured by beta.[10]

$$E(r) = r_f + \beta[r_m - r_f] \tag{3.11}$$

$E(r)$ - expected return on asset in question

r_f - return on risk-free asset

β - asset's risk factor

r_m - market return rate

The equation states, that the return on asset is equal to the risk-free return rate, augmented by a premium due to the risk of investing in stock of the particular firm, as depicted in figure 3.7.

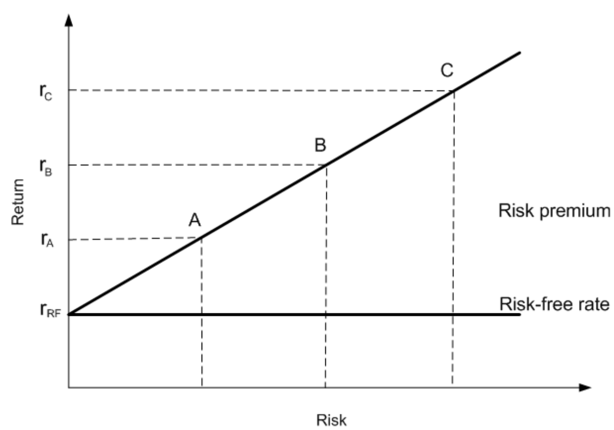


Figure 3.7: Risk - return relation [15]

The return (r_f) on risk-free asset is usually considered to be equal to the rate of return of short-term Treasury bonds, assuming that the default risk of the issuer and the risk of interest rate change are close to zero. These rates of return are quoted by national banks as their interest rates.

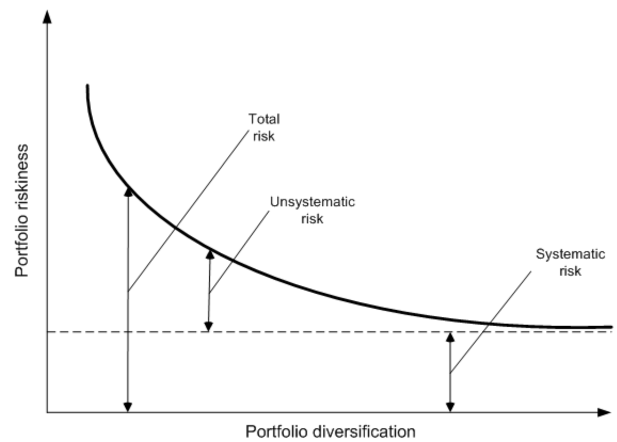


Figure 3.8: Unsystematic and systematic risks with respect to portfolio diversification[15]

The market return rate (m_f)is an expected return rate of a portfolio consisting of all stocks of the particular market. In other words, it is the return rate of the entire market, in which the firm operates. The calculation of market return rate is based on the analysis of price changes of stocks quoted on the market. It is known as the stock exchange index. The most famous indexes are:

- U.S. Dow Jones Industrial Average (DJIA),
- U.S. Standard & Poor's 500 (S&P 500),
- U.S. NASDAQ,
- U.K. Financial Times Stock Exchange (FTSE),
- German Deutsche Aktienindex (DAX).

The difference between market return rate and risk-free rate constitutes market's risk premium. The market risk premium depends on industrial and political stability in the country in question, as well as the number and strength of public companies quoted on the market. Risk premiums for different markets are presented in table 3.6.

Asset's risk premium (β), also known as stock's volatility factor, is a function of stock's unsystematic risks. It describes stock's volatility with respect to the market it is quoted on. Consequently, it is estimated as a regression function parameter of relation between asset's return rate and return rate of corresponding stock market according to formula 3.12.

Characteristic of capital market	Market risk premium
Emerging markets *Asia, Central and Eastern Europe, South America*	7,5% - 8,5%
Developed markets with large number of joint-stock companies *USA, Japan, UK*	5,5% - 6,5%
Developed markets with small number of joint-stock companies *Germany, Switzerland*	3,5% - 4%

Table 3.6: Average market risk premiums determined on the basis of many-year observation[15]

$$\beta_c = \frac{Cov(r_c, r_m)}{Var(r_m)} \quad (3.12)$$

$$\alpha_c = Avg(r_c) - \beta_c \times Avg(r_m) \quad (3.13)$$

Beta is therefore the gradient of linear regression of stock vs. market returns, as depicted in figure 3.9.

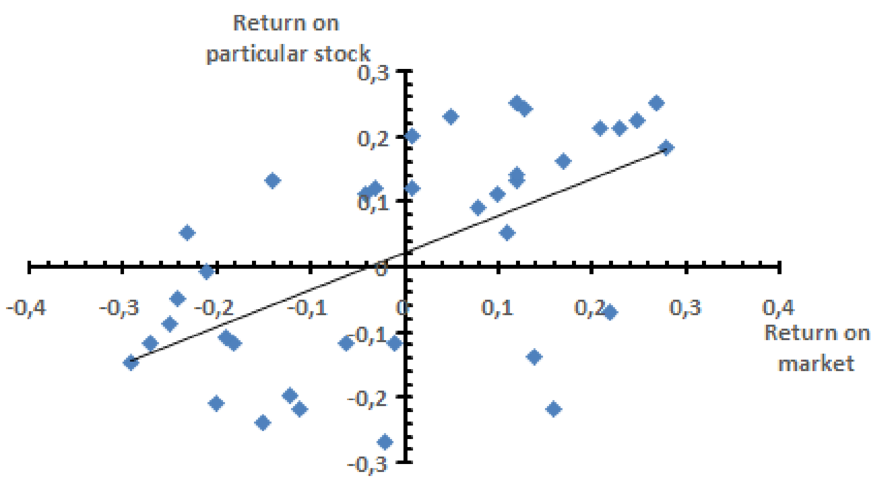


Figure 3.9: Linear regression, β estimation

3.6 EVA Conclusions

Economic Value Added, as a measure of performance in creating shareholders' value constitutes management's evaluation framework, consistent with the way in which capital markets assess joint-stock companies. In order to maximize investors assessment, management should undertake initiatives that maximize economic value added. Management compensation system based on EVA results should provide relevant incentives.

By charging for the use of capital, Economic Value Added focuses managements attention on proper utilization of firm's assets. Resources that are not transformed into finished goods, are kept in reserves, freezing capital invested and generating no returns. From economics perspective, the capital could be utilized in other way, in which it could earn return, therefore it accounts for a waste. By punishing this behavior, management receives an inventive to pay attention to proper forecasting of resource requirements, which leads to better utilization of assets.
Arithmetics of Economic Value Added suggests that management can strive to generate EVA in four ways.

3.6.1 Operational effectiveness

Operational effectiveness reveals management's efficiency in using company's assets. Having certain amount of capital available, management can allocate it in different ways, which can generate significantly different returns. The management can therefore seek for optimal capital allocation, which by increasing its operational effectiveness, results in higher returns on capital invested simultaneously generating higher Economic Value Added.

Management can seek for improvement product (or service), or process-wise. Product-wise improvement means changing firm's product line in a way that generates higher return. It may be achieved by reducing direct product production costs, simultaneously increasing its profit margin etc. Process-wise improvement deals with production process. Through process re-engineering and optimization, management can reduce resource consumption therefore augmenting its production capacity. Within the same capital committed, firm can produce more, generating more revenues thus increasing return rate on its capital

3.6.2 New investments

Expansion can increase firm's revenues. A company can expand its operations by entering new markets or industries. Before the activities start generating revenues they usually require new capital to be committed. For the investments to be successful, firm's Net Operating Profit After Tax improvement due to the initiative must be higher than the increase of capital cost due to increase of company's financing.

The management can analyze in advance investment's profitability by careful inspection of its cash flows. Setting the return requirement to firm's WACC, the management should invest in NPV-positive projects that is in projects whose Internal Rate of Return exceeds firm's Weighted-Average Cost of Capital.

3.6.3 Restructuring

Changing business environment, due to competitive market rivalry may cause initially EVA positive activities loose its profitability. Management should therefore monitor its profit margins and business opportunities that arise. Firms whose operations generate no, or negative EVA should be restructured.

Management should perform economic analysis of its restructuring targets. Withdrawing capital from unprofitable activities, should generate savings from the reduction of capital costs that are higher than the drop of NOPAT due to the abandonment. In other words, the company should eliminate activities and liquidate assets that do not generate earnings that exceed their cost of capital.

3.6.4 Optimal capital structure

Firm's financing strategy has great impact on its cost of capital and consequently on Economic Value Added generated from its operations. According to Modigliani and Miller, the existence of profit before tax, makes debt the cheapest way of financing, due to interest rate payments that reduce taxation basis. However, the optimal capital structure, which balances tax shield benefits with the risk of bankruptcy, depends on business nature of the firm. Company operating in well established market with stable and certain cash flows, may increase its financial leverage ratio (increase debt participation in capital structure) taking full advantage of the tax shield. In contrast, high-risk companies, not being certain about its future cash flows may not afford the risk of bankruptcy due to default of debt maintenance.

The management should therefore design firm's capital structure in a manner that suits business characteristic and market environment, simultaneously minimizing its Weighted-Average Cost of Capital.

Chapter 4

Optimization models

While some decisions are of strategic nature and so they cannot be simply the result of optimization, others in particular related to production and distribution can be easily modeled with mathematics and solved for optimality. Application of Operations Research enables maximization of operational effectiveness, which is one of the four leverages of EVA and consequently of firm's market value.

4.1 Decision environment

Global Management Challenge is a simulation, in which participating teams compete against one another through managing virtual production firms, which sell their products globally. Teams' strategies and tactics have to be expressed within a consistent format, that the simulator understands. Consequently, at every stage of the simulation participants have to make a defined set of decisions that describes their plan of action.

Decisions concern firm's overall operations, as a whole providing firm's holistic move. The decisions are taken in four functional areas, which are:

- Marketing,
- Production and Distribution,
- Human resources,
- Finance.

Figure 4.1 is a section of a report sheet, that is provided to participants as a summary of their decisions.

PLEASE CHECK THE DECISIONS GIVEN BELOW

Quantities of Product to			Product 1	Product 2	Product 3
make and ship to:	EU Agents		545 *	410 *	241 *
(Not delivered in	Nafta Distrbutors		413 *	315 *	179 *
full if starred)	Internet Distributor		1114 *	634 *	459 *
Prices (€):	EU		325	490	715
	Nafta		320	485	710
	Internet		310	480	695
Advertising (€ '000)		Corporate Image	Direct Product Advertising		
EU		10	7	6	7
Nafta		10	7	6	7
Internet		22	7	7	9
Assembly Times (minutes)			120	170	325
Take up Product Improvements			0	0	0
R & D Expenditure (€ '000)			30	30	35
Purchasing			Next Quarter	3-months hence	6-months hence
Raw Materials Ordered ('000)			6	0	0
Agents and Distributors			Total Number Wanted for Next Quarter	Support Payments (€ '000)	% Commission
	EU Agents		1	5	10,0
	Nafta Distributors		1	5	10,0
	Internet Distributor		xxxxx	12	9,0
Production	Machines to Buy	0	Number of Ports Operated		5
	Machines to Sell	0	Web-site Development (€ '000)		20
Maintenance Hours per Machine		25			
Assembly Hourly Wage Rate (€.c)		10,00	Shift Level		3
Assembly Workers Hired (+) / Fired (-)		0	Assembly Workers Trained		0
Investments (+/- € '000)		0	Term Loans (€ '000)		0
Management Budget (€ '000)		115 *	% Dividend Paid		0
Information on Corporate Activity		0	Information on Market Shares		0
Insurance Plan Number		1			

Figure 4.1: Quarterly management decisions

4.1.1 Marketing

The primary functional area is marketing. It is the fundamental decision area because firstly it is the ground for firm's corporate strategy, understood as a unique market position that provides the firm with competitive advantage over its rivals.[17] Secondly, marketing decisions impact all other functional areas, meaning that in order for the company to be successful, all departments have to cooperate in order to realize the strategy.

Strategy

The ultimate decision that the marketing has to take is establishing its strategy. It can adopt one of Generic Strategies[18], described by Michael Porter, namely

- cost leadership,
- differentiation,
- focus.

It can also define its own strategy, as "the essence of strategy is choosing to perform activities differently than rivals do".[17] In either case, "A company can outperform rivals only if it can establish a difference that it can preserve. It must deliver greater value to customers, or create comparable value at a lower cost, or do both. The arithmetic of superior profitability then follows: delivering greater value allows a company to charge higher average unit prices; greater efficiency results in lower average unit costs."[17]

Team's strategy is expressed with its quality, pricing and advertising policy. The three aspects have to be consistent: quality of product should be manifested by its price and supported by relevant advertising. The three dimensions define firm's position in the market.

Pricing

Firm's pricing strategy has to consider its impact on demand. One of the fundamental laws in microeconomics, the law of demand, states that the higher the price, the smaller the quantity demanded, ceteris paribus[1].[20]

[1] Latin expression for *everything else being equal*

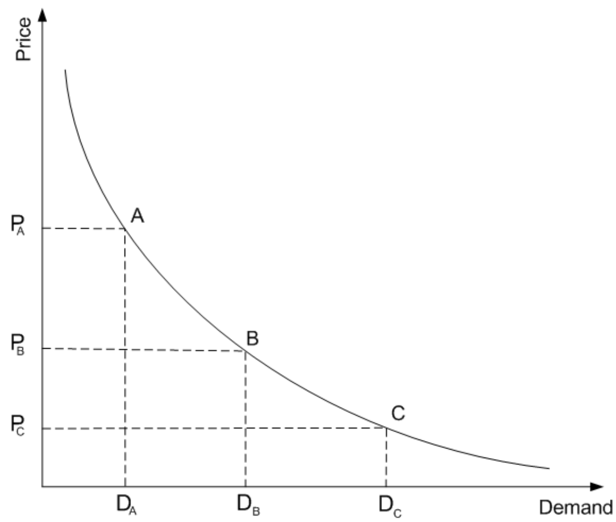


Figure 4.2: Demand curve

The price-demand relation is depicted in figure 4.2. One can draw the demand curve by careful inspecting how changes in price affect corresponding demand. Points A, B and C represent price and quantity demanded. By connecting the points, one can draw the demand curve. Shape of a demand curve is specific to every case. It depends on type of goods in question, the curve would look differently for everyday and premium or luxury products. It also depends on the market, e.g. region, or wealth of its target group. Furthermore, the price-demand relation is not constant over time. It might change due to product life cycle, competition activity or current macroeconomic outlook. When deciding on its pricing strategy, marketing should first gain deep insight into its market and then, after establishing its prices, constantly monitor the demand.

According to the law of demand, ceteris paribus, by decreasing price, the firm can increase the quantity of its products demanded. If the company is able to satisfy increased demand, it can in this way broaden its market share. However, theretofore it should make sure that the increase of company's revenues due to greater sales exceeds the drop of revenues due to decreased unit price. This concept, as a measure of responsiveness is known in microeconomics as the price elasticity of demand.[19]

$$E_d = \frac{\Delta Q}{\Delta P} \tag{4.1}$$

ΔQ - percentage change in quantity demanded

ΔP - percentage change in price

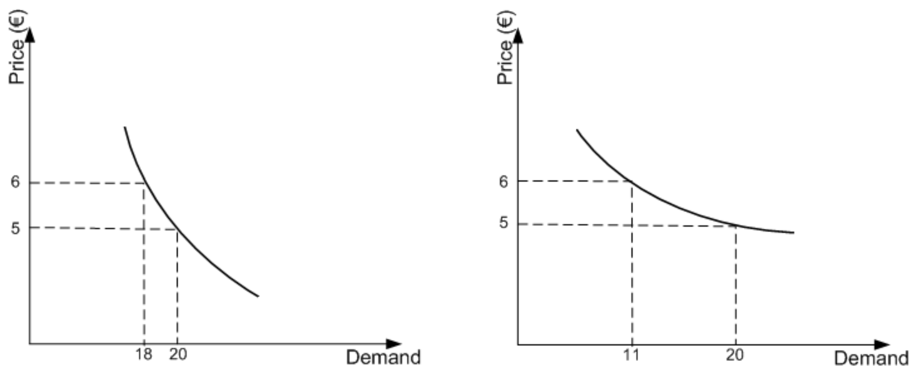


Figure 4.3: Price Elasticity of Demand

Figure 4.3 depicts two elasticity scenarios. In the example on the left, 20% change in price (5-6) causes demand to change by 10% (20-18). Using formula 4.1 $E_d = \frac{10\%}{20\%} = 0,5$. In that case, demand is considered inelastic. The calculations repeated for the example on the right yields $E_d = \frac{45\%}{20\%} = 2,25$, which means the demand is elastic.

The price elasticity of demand has tremendous effect on firm's total revenues with respect to price changes. In case of an inelastic demand there is a positive relation between price and total revenues: an increase of price increases total revenue and decrease of price decreases total revenue. On the contrary, in case of elastic demand price has negative relation with total revenue, meaning that an increase of price decreases total revenue and a decrease of price increases total revenue. This relationship is summarized in table 4.1.

Demand	**Value of $\mathbf{E_d}$**	**Price** $\nearrow$	**Price** $\searrow$
Inelastic	$E_d < 1$	TR $\nearrow$	TR $\searrow$
Unitary elastic	$E_d = 1$	*const*	*const*
Elastic	$E_d > 1$	TR $\searrow$	TR $\nearrow$

Table 4.1: Effects of price elasticity of demand on total revenues (TR)

Quality

Another aspect of the firm's corporate strategy is quality of company's products. In the Global Management Challenge, quality is regulated through assembly time skilled workers are supposed to spend assembling a single unit. Since the company produces three kinds of products, it needs to decide on the quality of each kind.

Marketing's product quality requirements are constrained by company's assembly workshop capacity which is the function of assembly workers employed. Since employment of skilled workers requires a quarter notice (with a probability of success), decisions about quality standards should consider number of skilled workers available, that has been reported in the management report. Consequently, increasing product quality, lengthens unit assembly time simultaneously decreasing number of products assembly workshop can produce within resources available. Furthermore increasing product quality increases unit production cost, which provided price remains unchanged, shrinks unit profit margin.

Product quality however has great effect on customer satisfaction. Good quality builds trust and loyalty toward corporate brand, on the contrary to poor quality, which in extrema cases makes customers feel cheated and eventually destroys it. Moreover quality is one of the main differentiating factors, which build firm's unique market position.

Research & Development

Together with quality innovation is the most differentiating factor of company's products. Innovative products, by definition, have no competition in the market, which when preserve, enables the firm to outperform its rivals.

Innovation is build through Research & Development activity, which should be a part of marketing strategy. Aligned with its strategy, marketing should decide on the level of support it is willing to spend on R&D activity of its product line.

Successful activities of R&D department result in improvement to company's products. In case of a major improvement, the decision to implement it needs to be made by the marketing. In that case, stock of old products are sold out for much lower price.

Advertising

One of the main ways of creating demand for firm's products is advertising. Advertising provides the company with means of communication with the market. It enables the company to announce to the market the existence of its products or any improvement. The scale and reach of its efforts depend on the level of financial support marketing is willing to spend on advertising. Apart from direct advertising of its products, the firm should advertise its corporate image, which builds power of the brand.

Marketing has to decide on the level of support of direct advertising activities of an individual product in particular market. Furthermore, it needs to decide on its corporate image advertising spending for particular market.

Apart from creating demand, advertising supports product differentiation. It should be therefore an integral part of marketing strategy.

Agency

Besides advertising the agency system plays a vital role in creating demand for company's products. Right number of agents and distributors can provide appropriate coverage of the market which can significantly increase company sales.

Marketing has to decide on the number of agents in EU and distributors in NAFTA that it is willing to maintain in those markets.

Market awareness

An essential element of building a winning strategy and maintaining competitive advantage is information. Apart from constant analysis of business environment, marketing can order market research, that it has to pay for. There are two researches that marketing can order:

- Corporate activity report,
- Market share report.

The reports enable the firm to identify market opportunities and find its unique market position. They also serve as a benchmark for firm's operations.

4.1.2 Production

Production of goods is firm's primary operational area. It is firm's fundamental activity, which enables other activities to happen. It is the process of transforming raw material into finished products through a series of activities. Production planning and scheduling is essential for efficient utilization of firm's resources. In case of scarce resources such as constrained workshop capacity or raw material limit, production plan needs to be restricted. Optimal allocation of scarce resources is a vital activity for maintaining operational effectiveness, which according to Michael Porter is an important part of firm's competitive advantage.

Short-term demand forecasts, prepared by marketing, are delivered to production department. The forecasts should be thoroughly analyzed and confronted with production capacity of production plant. As a result of the analysis, the department should decide about the level of shifts machinists are expected to work. However the planning should take under account the fact that introducing every consecutive shift increases average machinist wage by 33%.

It might be the case that demand forecast exceeds production capacity by a quantity, which does not generate enough revenue to cover the increase of production cost due to the introduction of the consecutive shift. In that case, production management has two options. It can limit the production to so that demand is satisfied within production capacity available with current level of shifts. In that case, one of the decision criterion used for prioritize production is products unit profit margin.

	Product A	**Product B**
Unit price	€ 200	€ 400
Unit production cost	€ 120	€ 280
Unit profit margin	**€ 80**	**€ 120**

Table 4.2: Profitability analysis example

Figure 4.2 depicts an example of two products comparison. The company sells product A for € 200 and product B for € 400. Their respective unit production costs are € 120 and € 280. Consequently, the products yield € 80 and € 120 of unit profit. According to the analysis, product B is more profitable.

The above analysis neglects resource consumption of production processes of the two above products. More precisely, let us assume that the products have common production process, which differ with time that is spend on assembling an individual product. Product A requires 50 minutes while product B requires 150 minutes. Let us further assume that the production line has the capacity of 100 000 minutes. In that case, the factory is capable of producing 2 000 units of product A and 666 units of product B. Applying unit profit margins from table 4.2 we conclude that monotonous production of product A yields € 160 000 of profit, while monotonous production of product B generates only € 80 000 profit. In that case, product A is more attractive.

	Product A	**Product B**
Resource requirement	50 units	150 units
Productivity *within 100 000 units available*	2 000 products	666 products
Total profit *using unit profit margins from table 4.2*	**€ 160 000**	**€ 80 000**

Table 4.3: Profitability analysis under production constraints

Compiling the two tables into one, we obtain:

	Product A	**Product B**
Unit profit margin	€ 80	€ 120
Resource requirement	50 units	150 units
Return on resource unit	**€ 1,6**	**€ 0,8**

Table 4.4: Return on resource unit

In other words, for every resource unit invested, product A generates € 1,6 whereas, product B only € 0,8.

In the above example, in order to maximize firm's profit, the firm should satisfy demand for product A entirely, and use any resources left for production of product B. Obviously, the example is of the simplest form. In case of GMC, the management deals with three different products, being sold in three different markets, which due to different transportation and agency costs cause the products to have different profit margins. Consequently, from the profitability perspective the management deals with nine different products. Moreover, the production process is multi-stage, which makes the analysis even more complicated.

An alternative would be to adopt forward-looking production planning. The approach requires additionally one quarter ahead demand forecast, to be delivered by the marketing. In that case, provided that the demand exceeds current shift level capacity, the factory can switch on higher gear to satisfy the current demand and partially cover next quarter's demand, so that next quarter both the demand is fully satisfied and the production goes on lower pace. In other words, current production schedule would include the quarter after next demand by working in higher gear. This situation is depicted in figure 4.4
In the example presented in figure 4.4, the demand in quarter IV exceeds two shift production ca-

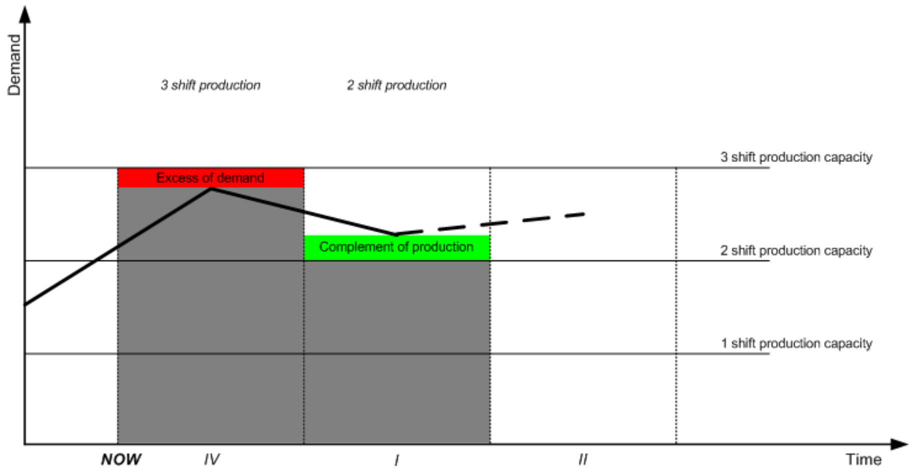


Figure 4.4: Optimal utilization of excess of demand

pacity. Three shift production however provides production capacity that is higher than the demand. Furthermore the increase of machinist wage rate due to introduction of additional shift applies to all machine operators, so any production capacity that is not utilized might be considered a waste. Addressing that, the three shift production capacity can be utilized fully, so that any stock of unsold products (i.e. excess of demand as depicted with red color) are used as a complement of two shift production in the quarter after next (i.e. complement of production as depicted with green color). Alternatively the excess of demand in quarter after next with respect to two shift production capacity can be incorporated into demand forecast, expected for the next quarter. In either case, the unsold products that are warehoused for the quarter after next are charged warehousing fee, which shrinks their profit margins.

In its search for optimal production, management can additionally manipulate its production capacity, which due to its nature, is a long-term action. Machine purchasing requires considerable financial outlays and takes two quarter to introduce changes, it provides however means to expand sales volume and/or decrease production costs. Production schedule engaging three-shift machining can be accomplished at two-shift pace with correctly increased number of machines. The decision about purchasing additional machines requires careful investigation. Purchasing of too many machines leads to resources not being utilized i.e. earning no interest and in fact loosing money due to opportunity cost. On the other hand purchasing of too few machines limits production capacity, causing the company not being able to satisfy demand for its products and moreover increases production costs.

In the above discussion there were examples of dilemma that management faces, while preparing production schedules. The variety of production options, which impact products' profit margins and consequently firm's operating profit calls for application of optimization techniques.

Michael Porter defines operational effectiveness as performing activities better than rivals do.[17] Application of operations research for production planning and scheduling maximizes firm's profit. Measuring operational effectiveness with rate of return on firm's operations, optimization makes firm's operations most possibly effective.

Besides the schedule, production department needs to decide on the assembly time that is devoted on assembling an individual product. The decision relies on quality requirements set by marketing, as a consequence of its strategy. It might be the case that quality requirements make satisfying demand unattainable, since assembly time available is one of production constraint. In that case, production department should communicate the shortage to human resources department, which would take appropriate measures to provide necessary workforce.

Production department is also responsible for managing raw material supply. Future market transactions offer significant saving, they require however long-term demand forecasts, to relay on.

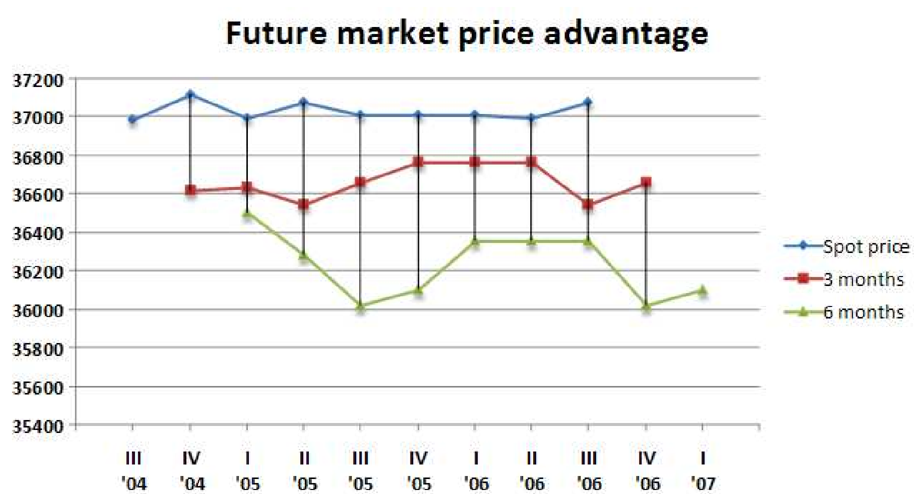


Figure 4.5: Price difference between spot, 3- and 6-month delivery

Figure 4.5 depicts advantage of future- over spot-market purchasing. The blue line represents raw material prices available in the spot market. The red and green lines recall future market prices available three and six months earlier respectively for three and six month future delivery. In this way, considering third quarter of 2005, the spot price is $ 37 008 (for 1000 units), as opposed to $ 36 660 if it had been ordered in the second quarter of 2005 (one quarter earlier) and $ 36 018 if it had been ordered in the first quarter of 2005 (two quarters earlier). In this way purchasing raw material in the future market with six months delivery generates saving of nearly $ 1 000 per 1000 units, which accounts for lower directs production costs, increasing product profitability.

4.1.3 Human Resources

Human Resources department is responsible for providing adequate workforce to achieve production goals. While unskilled machine operators are employed implicitly according to the number of machines and level of shifts; hiring of skilled assembly workers requires explicit decision, takes one quarter (if successful worker is available in quarter after next) and its success depends on the labor market, e.e. unemployment rate, and conditions offered. It requires therefore sound familiarity of the market and appropriate planning.

Instead of hiring within the assembly workers' market, which carries the risk of failure, the firm can educate its own assembly workers from the pool of unskilled workers available in the labor market. Although it is a costly process, its provides certainty that the assembly worker will be available in the quarter after next. Shortage of assembly workers can limit firm's production capacity, simultaneously thwarding marketing's plans.

Work conditions offered by the company have strong influence on company's image as an employer in the labor market. Positive image eases hiring process, while negative hinders it. Through work conditions labor market understands:

- Wage rate,
- Workload.

Average wage rate in the company bases on assembly worker wage, that HR management sets quarterly. It should be high enough to keep employees satisfied and/or attract new hires, on the other hand, low enough to maintain products profitability at a reasonable level. The basic wage rate of machine operators equals 65% of assembly worker's, but increases by 33% with every consecutive shift level introduced.

Assembly employees work single shift only. In case of excessive demand, they may work on Saturdays and Sundays, being compensated with 50% and 100% extra of their basic rate. Continuing working on weekends negatively impacts firm's image and may be the reason for leaves.

Furthermore, human resources department should monitor long-term assembly workers demand, through long-term production goals. Since every dismissal and new hire incur costs and carry the risk of failure; in case of temporary drop in production it might be more cost efficient to keep them work at lower pace, than dismissing them at one point and then hiring them back again in another.

4.1.4 Finance

Another firm's functional area, finance, strives to maintain firm's financial prosperity.

One of the issue finance department is responsible for is providing firm's financing. A properly functioning business should be able to finance its day-to-day operations with revenue that they generate. The revenue should not only cover direct costs of producing goods, it should be high enough to cover company's fixed costs e.g. lease installment, management budget, R&D expenditures. That is why finance department should play an important role in deciding on product prices and profit margins.

As part of their strategy management may decide to expand its operations through entering new market, or significantly increasing its market share. Such activities usually require former expenditure, before they start generating revenue. The expenditure is considered an investment. When deciding on investment financing sources, the management can either:

- Use equity capital i.e. reserves or retained earnings,
- Use debt i.e. long- or short-term bank loans.

Firm's fundamental capital is shareholders' equity, that has been initially invested or raised by issuing stock at further stage of corporate development. Throughout the simulation, shareholders' equity remains unchanged, the management cannot either issue additional, or repurchase of existing stock. Consequently, management can control its capital structure and indirectly Weighted-Average Cost of Capital by incorporating debt to its financing sources.

When managing debt, management can decide between three alternatives, as summarized in table 4.5.

	Term loans	Flexible loans	Unsecured loans
Control	Direct	Indirect	Indirect
Type	Fixed	Variable	Variable
Interest	12%	$\approx 7\%$[1]	$\approx 13\%$[2]

Table 4.5: Debt financing options summary in Global Management Challenge

In Global Management Challenge, management has direct control only on a single debt source - term loans. Flexible and unsecured loans are taken automatically, according to firm's current financial conditions and capital requirements. In that sense, management has an indirect control of this kind of debt. A flexible loan is a bank account overdraft. Every quarter based on firm's financial condition the bank grants the firm an overdraft limit. The limit for the next quarter is quoted in last management report. In case firm cash requirement exceeds the limit, unsecured loans are taken automatically. In case management decides to use debt to finance its investment, it can decide to take a term-loan. The amount of capital that financial institutions are willing to commit is quoted every quarter in the management report. Generally, term loan is a long term investment, therefore it is not repaid throughout the simulation.

Petty cash i.e. cash that is accounted in firm's Balance Sheet, when not invested not only does not earn any interest, due to inflation it actually looses value over time. In case firm possesses much cash, management can decide to it invest it in liquid financial instruments that generate interest. If the firm needs cash, the instruments can be easily converted to cash.

Every quarter finance department needs to decide on management budget. Management compensation is an essential element of any value-based system. It serves as an incentive for managers to achieve certain managerial goals. The compensation system should therefore be bound to management performance, measured with clearly defined metrics, that are aligned with shareholder's goals. According to EVA practitioners, employees should be compensated according to wealth created from their activities. The simplicity of Economic Value Added enables and provides means to measure value created at any level of a business. Furthermore, EVA practitioners suggests that managers should participate in wealth created, in order to achieve the highest level of their commitment. Based on the above premises, the level of management budget, that needs to be decided every quarter, can serve as a compensation system. The level of support should then depend on value that has been created in former quarter.

[1] EU Central Bank's base rate + 4%, assuming base rate of 3%
[2] EU Central Bank's base rate + 10%, assuming base rate of 3%

Risk attitude determines firm's willingness to take risk. According to this attitude, every quarter the management needs to make the decision about its insurance policy. It can either choose between four insurance plans, which vary in insurance excess and consequently insurance premium, or to take the highest risk of not taking any insurance and covering any losses by itself.

Profit generating joint-stock firm can decide to distribute part of its profits to its shareholders. Twice a year, the finance department needs to decide on the amount that is going to be given away as dividend. Earnings that are not distributed are retained and can be used for investments.

4.2 Modeling

Beneath, a number of optimization models are presented, serving for decision support in Global Management Challenge.

4.3 Single period profit maximization model

The purpose of this model is finding profit maximization configuration of products. The model is expected to control the level of shifts at which production is carried. The model should be fed with demand forecasts and product prices, as well as number of machines possessed by the firm and number of assembly workers employed.

4.3.1 Verbal model description

The model introduces a number of indexes: i - products, j - markets, l - level of shifts, h - week-wise work load. Then the model introduces a number of decision variables: x_{ij} defines number of units of products i, that is going to be produced and shipped to market j.

Demand

Production schedules must rely on demand forecasts delivered by marketing. The forecasts should contain precise estimates of demand for product i in market j. Having demand estimates, number of products produced and shipped to market must not exceed the forecasts. In other words, the following equation must hold:

$$x_{ij} \leq D_{ij} \qquad \forall i, j$$

Machining

Production throughput of machine shop is restricted by two limitations. Firstly, machines have their production capacity for every shift: quarterly 588 hours for one and additional 504, and 546 for second and third shift, respectively. Secondly, labor union agreement allows certain quarterly workload limits for every shift. These are quarterly 588 hours for one shift, additional 546 hours for each of second and third shifts. These figures, introduced in tables 2.16 and 2.3, have been aggregated into table 4.6.

Shift	Machine production capacity	Machinist workload limit
1^{st} shift	588	588
2^{nd} shift	504	546
3^{rd} shift	546	546

Table 4.6: Machine capacity and machinist workload limit, according to shift level

Joining the two constraints with week-wise workload limits of machine operators due to labor union agreements introduced in table 2.16, one obtains machining time limit (ψ_{lh}) along l and h dimensions, defined by table 4.7.

$l \setminus h$	Weekdays	Saturday base $\times$ 1,5	Sunday base $\times$ 2
I	420	84	84
II	420	42	42
III	420	42	84

Table 4.7: Machining time limits, ψ_{lh}

Let variable m_{lh} represent machining hours that are used to realize production plan, expressed in terms of week-wise and shift-wise workload reflecting the structure presented in table 4.7. The machining hours constituting machining plan must not exceed corresponding maximum machining capacity available for the number of machines that the firm possesses. In other words, the following equation must hold:

$$m_{lh} \leq \psi_{lh} M \qquad \forall l, h$$

Furthermore, the plan must reflect shift policy captured by binary variable w_l in the way that when it is set to 0, the plan has to be set to zero for the corresponding shift as well. In other words, the following equation must hold:

$$\sum_{h} m_{lh} \leq \text{BigM} w_l \qquad \forall l$$

Moreover, production plan (x_{ij}) when translated into machining hours (Ξ_i) and updated with machine efficiency (e), must not exceed machine-shop plan (m_{lh}). The relation therefore serves as a binding between production plan x_{ij} and machining plan m_{lh} In other words, the following equation must hold:

$$\sum_{i}\sum_{j} x_{ij}\frac{\Xi_i}{e} \leq \sum_{l}\sum_{h} m_{lh}$$

Shift introduced	Premium L_l
I	1
II	0,33
III	0,33

Table 4.8: Premium by which base wage rate is increased when introducing consecutive shifts

An essential aspect of firm's total machining cost is the hour rate machinists are paid. Initially (working single shift) it equals to 65% of assembly workers hour rate. When second shift is introduced, the hour rate increases by 33% and applies equally to all hours, no matter if used in first, or second shift. Similarly, when the third shift is introduced, the hour rate increases by extra 33% and applies to all subsequent shifts. Assuming w_l is a binary variable being set to 1 if corresponding shift is introduced and 0 if it is not and L_l defines rate premium for subsequent shifts as introduced in table 4.8, the machinist hour rate can be calculated according to the formula:

$$\text{Hour rate} = 65\% \sum_{l} w_l L_l \Omega$$

Within machine-shop work plan m_{hl}, hours worked on Saturdays and Sundays are compensated by additional week-wise workload bonuses (H_h), as shown in table 4.7. Every hour worked on Saturday and Sunday is compensated by additional 50% and 100% rate. They however do not affect the base rate. Since every machine is operated by four machinists, machining time required to realize scheduled production plan translates to machinists time, that the company pays for. The direct machining cost can be calculated according to the formula:

$$\text{Direct machining cost} = \sum_l \sum_h m_{lh} H_h 65\% \sum_l w_l L_l \Omega$$

The above equation introduces nonlinearity to the formulation. Possible linearization solutions are discussed later in this chapter.
Additionally every shift requires proper supervision which imposes a cost (S) of € 12 500 per shift. The supervision cost can therefore be calculated by formula:

$$\text{Cost of supervision} = \sum_l w_l S$$

Bringing it all together, the constraints represented by equations 4.41 to 4.43 are incorporated to the model.

Assembling

Assembly workers are skilled workforce, who only work single shift. Apart from the regular 5-day work week, they can be told to work at Saturdays and Sundays. Working at weekends augments workshop capacity but requires additional compensation according to table 4.9.

h	Weekdays	Saturday	Sunday
Quarterly time available $\psi_{l=\mathrm{I},h}$	420	84	84
Week-wise workload bonuses H_h	base $\times$ 1	base $\times$ 1,5	base $\times$ 2

Table 4.9: Assembly workers parameters

Analogically to machining, firm's assembly-shop also requires planning. The production plan x_{ij} expressed in terms of finished products must be translated into assembling hours and confronted with shop's capacity.

Let a_h denote assembly shop work plan, expressed in terms of assembling hours that are utilized along the h dimensions, that is let a_{Weekdays} represent quarterly hours of all assembly workers, planned to be utilized within weekdays, whereas a_{Saturday} and a_{Sunday} represent analogical hours on weekends. Then the plan must not exceed the maximum capacity ($\psi_{l=\mathrm{I},h}$) available for all assembly workers (A) employed by the firm. In other words the following equation must hold:

$$a_h \leq \psi_{lh} A \qquad \forall h, l = \mathrm{I}$$

Furthermore, production plan x_{ij} when translated into assembly hours (λ_i), must be feasible with respect to assembly-shop work plan a_h. In other words, the following equation must hold:

$$\sum_i \sum_j x_{ij}\lambda_i \leq \sum_h a_h \tag{4.2}$$

Assembly workers are paid per hour at fixed hourly rate Ω. Hours worked on Weekends are compensated by extra 50% and 100% premiums for Saturdays and Sundays respectively. Firm's assembly cost is therefore calculated accordint to the formula:

$$\sum_h a_h H_h \Omega \tag{4.3}$$

Bringing it all together the above equations are incorporated to the model.

Raw material

All three products are made of the same raw material, though they vary in its content. Raw material content per product is presented in table 4.10.

	Product 1	Product 2	Product 3
Raw material content	1	2	4

Table 4.10: Raw material content per product R_i

Raw material is ordered and delivered in parcels of 1 000 units. Excessive unused raw material imposes additional storage costs, secondly it stalls cash flows. Addressing the decision problem an integer variable r is introduced, which represents number of parcels that are needed. Then production plan x_{ij} translated into raw material units (R_i), must not exceed raw material that is available from ordering r number of raw material parcels. In other words, the following equation must hold:

$$\sum_i \sum_j x_{ij} R_i \leq r\theta$$

Raw material cost is the consequence of parcels ordered that is, the number of parcels (r) charged with current raw material price χ. It is therefore calculated with the following formula:

$$\text{Raw material cost} = r\chi$$

The above equations are incorporated to the model.

Transportation

Finished products are shipped to their destination markets in transportation containers of fixed size of 500 units. The products differ in sizes, according to table 4.11.

	Product 1	Product 2	Product 3
Standardized product size in units V_i	1	2	4

Table 4.11: Product sizes

Let integer variable c_j represent a number of containers that are to be shipped to market j. Then for every market the sum of products that are to be shipped to that market, multiplied by their volume, must not exceed total container capacity available for the market (c_jU).

$$\sum_i x_{ij}V_i \leq c_jU \qquad \forall j$$

The transportation costs differ between markets, however total transportation cost is the sum of transportation costs of every market. Assuming C_j defines transportation cost to market j, total transportation cost can be calculated with the following equation:

$$\text{Transportation cost} = \sum_j c_jC_j$$

Objective function

Most generally, firm's operating profit is the difference between firm's revenue generated by its operations and the cost of those operations.

The firm generates revenue by selling its products in markets where it operates. The revenue can therefore be calculated with the following formula:

$$\text{Revenue} = \sum_i \sum_j P_{ij}x_{ij}$$

In order to arrive at firm's operating profit, one needs to diminish its revenue by costs incurred by its operations. Besides machining, assembly and raw material and transportation costs, which have been described in preceding sections, there are additional variable costs that are directly proportional to the magnitude of production having impact on the profitability of production.

One of such costs are agents' provisions. Agents and distributors are paid for selling company's products. As a motivating aid, they are given certain part of revenue they generate. The firm's quarterly sets the level of provision F_j that is paid to representatives in a given market. The provisions are therefore calculated using the following formula:

$$\text{Provisions} = \sum_i \sum_j x_{ij} P_{ij} F_j$$

Another variable cost, proportional to the magnitude of production is the planning cost O, which is charged for every product produced. It is calculated using the following formula:

$$\text{Planning cost} = \sum_i \sum_j x_{ij} O$$

4.3.2 Mathematical formulation

The data is:

- Sets (indexes)

  i - Products $\in$ {Product 1, Product 2, Product 3}

  j - Markets $\in$ {EU, NAFTA, Internet}

  l - Shift $\in$ {I, II, III}

  h - Week pace $\in$ {Weekday, Saturday, Sunday}

- Variables :

  x_{ij} - Amount of product i scheduled for production and shipment to market j

  m_{lh} - Quarterly machine-shop working plan

  a_h - Quarterly assembly-shop working plan

  r - Integer variable representing number of raw material parcels needed

  c_j - Integer variable representing number of containers shipped to market j

  w_l - Binary variable being set to 1 if corresponding shift level is introduced

- Data:

  D_{ij} - Demand for product i in market j

P_{ij} - Price of product i in market j

τ - Assembly worker wage rate

Ξ_i - Machining time of product i in hours assuming 100% machine efficiency

e - Machine efficiency

M - Number of machines possessed by the company

ψ_{lh} - Maximum production capacity of a single machine per week and shift, according to table 4.7

λ_i - Assembly time of product i

A - Number of assembly workers employed by the company

R_i - Raw material content in product i

θ - Raw material units in a parcel = 1000

V_i - Volume of product i [1,2,4]

U - Container capacity = 500

L_l - Hourly rate increase per shift [1; 0,33; 0,33]

H_h - Hourly rate bonus for working on Weekends [1; 1,5; 2]

Ω - Assembly worker hour rate

χ - Raw material cost per 1000 unit parcel

F_j - Agents and distributor provisions [10%; 10%; 5%]

O - Planning cost

C_j - Container shipping cost

S - Cost of shift supervision of € 12 500

The model is:

maximize:

$$
\begin{aligned}
& \sum_i \sum_j P_{ij} x_{ij} && (4.4)\\
& \quad - \quad 4 \sum_h \sum_l m_{lh} H_h \sum_l w_l L_l 65\% \Omega - \sum_l w_l S && (4.5)\\
& \quad - \quad \sum_h a_h H_h \Omega && (4.6)\\
& \quad - \quad r\chi && (4.7)\\
& \quad - \quad \sum_i \sum_j x_{ij} P_{ij} F_j && (4.8)\\
& \quad - \quad \sum_i \sum_j x_{ij} O && (4.9)\\
& \quad - \quad \sum_j c_j C_j && (4.10)
\end{aligned}
$$

subject to:

$$
\begin{aligned}
x_{ij} &\le D_{ij} && \forall i, j && (4.11)\\
\sum_i \sum_j x_{ij} \frac{\Xi_i}{e} &\le \sum_l \sum_h m_{lh} && && (4.12)\\
m_{lh} &\le \psi_{lh} M && \forall l, h && (4.13)\\
\sum_h m_{lh} &\le \text{Big-M} w_l && \forall l && (4.14)\\
\sum_i \sum_j x_{ij} \lambda_i &\le \sum_h a_h && && (4.15)\\
a_h &\le \psi_{lh} A && \forall h, l = \mathrm{I} && (4.16)\\
\sum_i \sum_j x_{ij} R_i &\le r\theta && && (4.17)\\
\sum_i x_{ij} V_i &\le c_j U && \forall j && (4.18)\\
x_{ij} &\ge 0 && \forall i, j\\
m_{lh} &\ge 0 && \forall l, h\\
a_h &\ge 0 && \forall h\\
& && && (4.19)
\end{aligned}
$$

4.3.3 Model findings

The model determines optimal production configuration that maximizes profit. The model suggest satisfying demand for product 3 in the first place, then the second and finally the first. A number of runs of the model with different input parameters showed, that within the simulation environment introducing third shift if unprofitable. In most cases it is more profitable not to satisfy demand for low-margin products (product 1) while keeping the shift level at the level of 2, than to introduce the third shift to satisfy that demand. That also refers to working at weekend. The model rarely utilized weekend capacity, rather leaving the demand unsatisfied.

Running the model with artificial cases, has shown that in case of large demand for high-margin products the third shift might actually be worthwhile. In that case profits from sales due to capacity increase must exceed losses due to the raise of machinist hour rate.

4.4 Two-period profit maximization model

The model addresses the decision problem of excessive production. Namely, it might be worth to produce more in one period for the sake of producing less in the following, preserving the excess of products in external storage.

The model relies on the single-period formulation, extending it to span over two decision periods. Relevant adjustments are incorporated to the model.

4.4.1 Verbal model description

Model assumptions and definitions

Figure 4.6 depicts tournament time-line. Decisions are always made in between quarters. The model runs in time D_1, looking two quarters ahead. The goal is to maximize two-quarter profit.

With respect to the single-period, the two period model introduces a new index - q representing quarters Q_1 and Q_2. Furthermore, the model introduces new variables: s_{ijq} representing sale of product i in market j in quarter q, and variable t_{ijq}, representing stock of product i in market j in quarter q. Variable x_{ijq} in the model represents production only i.e. these are products produced and shipped to its destination, but not necessarily sold in the quarter. Other variables from preceding model are adjusted to span over the quarters.

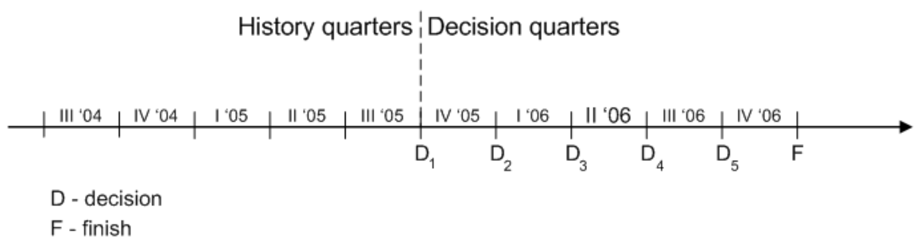


Figure 4.6: GMC competition time line

Balance equation

The inflows and outflows of particular products in given market for certain quarter are depicted in figure 5.9.

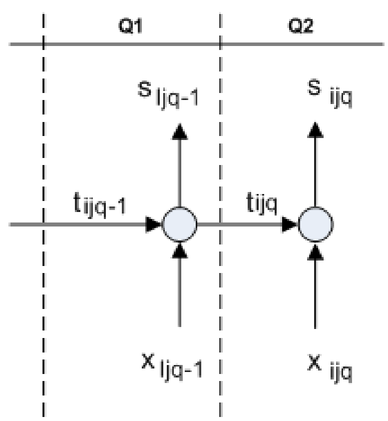


Figure 4.7: Balance relation

Products sold in quarter Q_2 must not exceed the number produced in that quarter augmented by any unsold products from quarter Q_1. In other words, the following equation must hold:

$$t_{ijq-1} + x_{ijq-q} = s_{ijq-1} + t_{ijq} \qquad \forall i, j, q$$

The model can be fed with any stock of unsold products from previous quarter, so that they can be sold in quarter Q_1. Since the model is two-period, the stocks at period Q_2 must be empty.
The firm is charged for any unsold products a storage fee, according to table 2.8.

4.4.2 Mathematical formulation

The data is:

- Sets (indexes)

  i - Products $\in$ {Product 1, Product 2, Product 3}

  j - Markets $\in$ {EU, NAFTA, Internet}

  l - Shift $\in$ {I, II, III}

  h - Week-wise work $\in$ {Weekday, Saturday, Sunday}

  q - Quarters $\in \{Q_1, Q2\}$

- Variables :

  s_{ijq} - Number of product i sold in market j in quarter q

  t_{ijq} - Number of product i unsold in market j in quarter q

  x_{ijq} - Amount of product i scheduled for production and shipment to market j in quarter q

  m_{lhq} - Quarterly machine-shop working plan in quarter q

  a_{hq} - Quarterly assembly-shop working plan in quarter q

  r_q - Integer variable representing number of raw material parcels needed in quarter q

  c_{jq} - Integer variable representing number of containers shipped to market j in quarter q

  w_{lq} - Binary variable being set to 1 if corresponding shift level is introduced in quarter q

- Data:

  D_{ijq} - Demand for product i in market j in quarter q

  P_{ijq} - Price of product i in market j in quarter q

  T_j - Unit storage cost in market j

  τ - Assembly worker wage rate

  Ξ_i - Machining time of product i in hours assuming 100% machine efficiency

  e - Machine efficiency

  M_q - Number of machines possessed by the company in quarter q

  ψ_{lh} - Maximum production capacity of a single machine per week and shift, according to table 4.7

  λ_i - Assembly time of product i

A_q - Number of assembly workers employed by the company in quarter q

R_i - Raw material content in product i

θ - Raw material units in a parcel = 1000

V_i - Volume of product i [1,2,4]

U - Container capacity = 500

L_l - Hourly rate increase per shift [1; 0,33; 0,33]

H_h - Hourly rate bonus for working on Weekends [1; 1,5; 2]

Ω - Assembly worker hour rate

χ - Raw material cost per 1000 unit parcel

F_j - Agents and distributor provisions [10%; 10%; 5%]

O - Planning cost

C_j - Container shipping cost

S - Cost of shift supervision of € 12 500

The model is:

maximize:

$$\begin{aligned}\sum_q(\sum_i \sum_j P_{ijq}s_{ijq} \\ &- \sum_i \sum_j t_{ijq}T_j \\ &- 4\sum_h \sum_l \sum m_{lhq}H_h \sum_l w_{lq}L_l 65\%\Omega - \sum_l w_{lq}S \\ &- \sum_h a_{hq}H_h\Omega \\ &- r_q\chi \\ &- \sum_i \sum_j x_{ijq}P_{ijq}F_j \\ &- \sum_i \sum_j x_{ijq}O \\ &- \sum_j c_{jq}C_j)\end{aligned} \tag{4.20}$$

subject to:

$$s_{ijq} \leq D_{ijq} \qquad \forall i,j,q \qquad (4.21)$$

$$t_{ijq-1} + x_{ijq-q} = s_{ijq-1} + t_{ijq} \qquad \forall i,j,q \qquad (4.22)$$

$$\sum_i \sum_j x_{ijq} \frac{\Xi_i}{e} \leq \sum_l \sum_h m_{lhq} \qquad \forall q \qquad (4.23)$$

$$m_{lhq} \leq \psi_{lh} M_q \qquad \forall l,h,q \qquad (4.24)$$

$$\sum_h m_{lhq} \leq \text{Big-M} w_{lq} \qquad \forall l,q \qquad (4.25)$$

$$\sum_i \sum_j x_{ijq} \lambda_i \leq \sum_h a_{hq} \qquad \forall q \qquad (4.26)$$

$$a_{hq} \leq \psi_{lh} A_q \qquad \forall h,q,l = \mathrm{I} \qquad (4.27)$$

$$\sum_i \sum_j x_{ijq} R_i \leq r_q \theta \qquad \forall q \qquad (4.28)$$

$$\sum_i x_{ijq} V_i \leq c_{jq} U \qquad \forall j,q \qquad (4.29)$$

$$x_{ijq} \geq 0 \qquad \forall i,j,q$$

$$s_{ijq} \geq 0 \qquad \forall i,j,q$$

$$t_{ijq} \geq 0 \qquad \forall i,j,q$$

$$m_{lhq} \geq 0 \qquad \forall l,h,q$$

$$a_{hq} \geq 0 \qquad \forall h,q$$

4.4.3 Model findings

The model purpose was profit maximization over two period horizon. It introduced the possibility to preserve unsold products in external storage in order to sell them in the following quarter. Storage however imposed additional costs.

The model suggests that it might be worth to produce more in the first quarter for the sake of producing less in the following. An optimal solution was found, which utilized full two-shift capacity of the first quarter in order to work single-shift in the second, preserving a supply of high-margin products (product 3) in external storage. The supply of high-margin product for the account of next quarter demand has been made at the expense of the demand for low-margin products not being satisfied. In a sense, high-margin products of the second quarter additionally charged with the storage fees successfully competed against low-margin products of the first quarter.

4.5 Relaxed Linear Programming model

In section 4.3 a single-period nonlinear mixed integer model has been introduced. Although for a simple problems a nonlinear formulation might find global optimal solution, it still lacks the important sensitivity analysis, that a linear program provides.

4.5.1 Bypassing nonlinearity

The model is nonlinear since calculation of total machining cost requires a product of two variables: machining work-load and machinist hour rate. Namely:

$$\text{Direct machining cost} = \sum_l \sum_h m_{lh} H_h 65\% \sum_l w_l L_l \Omega$$

The hourly machinist rate is a function of number of shifts introduced. Simultaneously, increasing shift level augments machine-shop capacity. The level of shifts is controlled by three binary variables l_1, l_2, l_3 being set to 1 if introduced and 0 if not. Since the machining-shop requires at least single shift to operate the decision reduces to two variables, namely, whether or not to introduce the second and third shift. In either case, since there are only three modes in which machine-shop can operate, one can bypass nonlinearity by changing the binary variable w_l into a parameter and performing simple scenario/ what-if analysis. Since in every scenario, the number of shifts is predetermined, then so is the machinist hour rate. The nonlinearity is therefore bypassed.

4.5.2 LP relaxation

Even though the model is linear, it still has integer variables which requires a heuristic solver, preventing sensitivity analysis. The integer variables are: r representing number of raw material parcels of 1000 units to order and c_j, which represents number of containers shipped to market j. Redefining the variables to be real numbers, relaxes the model making it linear. Simultaneously, the model preserves transportation and raw material costs, which have influence on products' margins.

An LP model enables sensitivity analysis, which reveals important information about product profitability. Shadow prices of demand constraints, reveal marginal profitability of firm's products. Furthermore dual value of a variable with an optimal value of zero carry number by which the cost of producing a corresponding product would have to decrease for it to be relatively profitable. It is referred as a reduced cost and can serve as an indicator of a product being underpriced.

4.5.3 Mathematical formulation

The data is:

- Sets (indexes)

  i - Products $\in$ {Product 1, Product 2, Product 3}

  j - Markets $\in$ {EU, NAFTA, Internet}

  l - Shift $\in$ {I, II, III}

  h - Week work load $\in$ {Weekday, Saturday, Sunday}

- Variables :

  x_{ij} - Amount of product i scheduled for production and shipment to market j

  m_{lh} - Quarterly machine-shop working plan

  a_h - Quarterly assembly-shop working plan

  r - number of raw material parcels needed

  c_j - number of containers shipped to market j

- Data:

  w_l - Shift level, 1 if introduced, 0 if not

  D_{ij} - Demand for product i in market j

  P_{ij} - Price of product i in market j

  τ - Assembly worker wage rate

  Ξ_i - Machining time of product i in hours assuming 100% machine efficiency

  e - Machine efficiency

  M - Number of machines possessed by the company

  ψ_{lh} - Maximum production capacity of a single machine per week and shift, according to table 4.7

  λ_i - Assembly time of product i

  A - Number of assembly workers employed by the company

  R_i - Raw material content in product i

  θ - Raw material units in a parcel = 1000

  V_i - Volume of product i [1,2,4]

U - Container capacity = 500

L_l - Hourly rate increase per shift [1; 0,33; 0,33]

H_h - Hourly rate bonus for working on Weekends [1; 1,5; 2]

Ω - Assembly worker hour rate

χ - Raw material cost per 1000 unit parcel

F_j - Agents and distributor provisions [10%; 10%; 5%]

O - Planning cost

C_j - Container shipping cost

S - Cost of shift supervision of € 12 500

The model is:

maximize:

$$
\begin{aligned}
\sum_i \sum_j P_{ij} x_{ij} \quad & \\
& - \quad 4 \sum_h \sum_l m_{lh} H_h \sum_l w_l L_l 65\% \Omega - \sum_l w_l S \\
& - \quad \sum_h a_h H_h \Omega \\
& - \quad r\chi \\
& - \quad \sum_i \sum_j x_{ij} P_{ij} F_j \\
& - \quad \sum_i \sum_j x_{ij} O \\
& - \quad \sum_j c_j C_j
\end{aligned} \tag{4.30}
$$

subject to:

$$x_{ij} \leq D_{ij} \qquad \forall i, j \tag{4.31}$$

$$\sum_i \sum_j x_{ij} \frac{\Xi_i}{e} \leq \sum_l \sum_h m_{lh} \tag{4.32}$$

$$m_{lh} \leq \psi_{lh} M \qquad \forall l, h \tag{4.33}$$

$$\sum_h m_{lh} \leq \text{Big-M} w_l \qquad \forall l \tag{4.34}$$

$$\sum_i \sum_j x_{ij} \lambda_i \leq \sum_h a_h \tag{4.35}$$

$$a_h \leq \psi_{lh} A \qquad \forall h, l = \mathrm{I} \tag{4.36}$$

$$\sum_i \sum_j x_{ij} R_i \leq r\theta \tag{4.37}$$

$$\sum_i x_{ij} V_i \leq c_j U \qquad \forall j \tag{4.38}$$

$$x_{ij} \geq 0 \qquad \forall i, j$$

$$m_{lh} \geq 0 \qquad \forall l, h$$

$$a_h \geq 0 \qquad \forall h$$

4.5.4 Model findings

Unlike the previous models, the linear programming model enables sensitivity analysis of the solution. Analyzing shadow prices of the demand constraints reveals marginal product profits. Furthermore in case of variables that have been set to zero in optimal solution, reduced costs analysis suggests how their prices should be updated in order to become relatively profitable.

4.6 EVA maximization model

So far, the models did not interfere capital structure. Their purpose was pure profits maximization within fixed capital. The concept of economic value added introduces capital charge, which, besides profit influences EVA.

In chapter 3 the concept of Economic Value Added was introduced. A firm generates economic value added if its operating income exceeds its capital charge, according to the following formula:

$$\text{EVA} = \text{Net Operating Profit After Tax} - \text{Invested capital} \times \text{WACC}$$

While net operating profit after tax measures firm's profit, firm's capital charge is the value that firm's capital provides expect to receive for committing their capital. It is calculated as the product of firm's invested capital and its weighted average cost of capital, according to the above formula.

4.6.1 Modeling firm's capital charge

The firm can influence its capital charge by controlling the amount of capital expecting certain return (invested capital) and changing the cost of its capital by restructuring its financing. Since change of the amount invested usually induces changes to the structure of the capital and vice versa, the decision problem is of nonlinear nature.

In Global Management Challenge the control over firm's capital structure is somewhat limited. The firm cannot issue or repurchase stock, or return long-term debt. It can on the other hand manage its reserves and take a long-term loan.

Let Γ represent firm's equity capital, whereas Δ represent firm's debt. Moreover let μ and ν represent equity and debt financing respectively. Let ρ denote invested capital. Firm's invested capital ρ is therefore the sum of it's equity capital Γ, its current debt Δ and its new debt ν, according to the formula:

$$\rho = \Gamma + \Delta + \nu$$

Let y be an integer variable representing number of new machines that the company should purchase. Let ι denote price of a new machine and let ϵ denote firm's borrowing power. Let η represent firm's reserves. Since the firm can finance new machines either with its reserves or with new debt, the cost of new investment must be covered with either of the two, according to the formula.

$$y\iota = \mu + \nu$$

Financing by equity μ cannot exceed firm's current reserves η whereas financing with debt ν cannot exceed firm's borrowing power ϵ. In other words the following equations must hold:

$$\mu \leq \eta$$
$$\nu \leq \epsilon$$

Let γ represent interest rate on firm's equity, calculated with Capital Asset Pricing Model and δ represent interest rate on long term debt. Let ω represent firm's weighted average cost of capital and let κ represent corporate income tax. Since reserves constitute firm's equity capital their utilization does not change firm's WACC, as opposed to new long-term debt. Firm's weighted average cost of capital can be calculated with the following formula:

$$\omega = \frac{\Gamma}{\rho}\gamma + \frac{\Delta + \nu}{\rho}\delta(1 - \kappa)$$

The capital charge can therefore be calculated with the following formula

$$\text{capital charge} = \omega\rho$$

Incorporating the cost of financing to the objective function, one obtains a model maximizing economic value added.

4.6.2 Mathematical formulation

The data is:

- Sets (indexes)

  i - Products $\in$ {Product 1, Product 2, Product 3}

  j - Markets $\in$ {EU, NAFTA, Internet}

  l - Shift $\in$ {I, II, III}

  h - Week pace $\in$ {Weekday, Saturday, Sunday}

- Variables :

  x_{ij} - Amount of product i scheduled for production and shipment to market j

  m_{lh} - Quarterly machine-shop working plan

  a_h - Quarterly assembly-shop working plan

  r - Integer variable representing number of raw material parcels needed

  c_j - Integer variable representing number of containers shipped to market j

  w_l - Binary variable being set to 1 if corresponding shift level is introduced

  y - Integer variable representing number of machines that should be bought

  μ - Equity capital financing

  ν - Debt financing

  ω - Weighted average cost of capital

  ρ - Invested capital

- Data:

D_{ij} - Demand for product i in market j

P_{ij} - Price of product i in market j

τ - Assembly worker wage rate

Ξ_i - Machining time of product i in hours assuming 100% machine efficiency

e - Machine efficiency

M - Number of machines possessed by the company

ψ_{lh} - Maximum production capacity of a single machine per week and shift, according to table 4.7

λ_i - Assembly time of product i

A - Number of assembly workers employed by the company

R_i - Raw material content in product i

θ - Raw material units in a parcel = 1000

V_i - Volume of product i [1,2,4]

U - Container capacity = 500

L_l - Hourly rate increase per shift [1; 0,33; 0,33]

H_h - Hourly rate bonus for working on Weekends [1; 1,5; 2]

Ω - Assembly worker hour rate

χ - Raw material cost per 1000 unit parcel

F_j - Agents and distributor provisions [10%; 10%; 5%]

O - Planning cost

C_j - Container shipping cost

S - Cost of shift supervision of € 12 500

Γ - Firm's equity capital

Δ - Firm's debt capital

γ - Interest rate on firm's equity

δ - Interest rate on firm's long-term debt

ι - Price of new machine

η - Firm's reserves

ϵ - Firm's borrowing power

The model is:

maximize:

$$
\begin{aligned}
(\sum_i \sum_j P_{ij} x_{ij} \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad (4.39)\\
&- \quad 4\sum_h \sum_l m_{lh} H_h \sum_l w_l L_l 65\%\Omega - \sum_l w_l S \\
&- \quad \sum_h a_h H_h \Omega \\
&- \quad r\chi \\
&- \quad \sum_i \sum_j x_{ij} P_{ij} F_j \\
&- \quad \sum_i \sum_j x_{ij} O \\
&- \quad \sum_j c_j C_j)(1-\kappa) \\
&- \quad \omega\rho
\end{aligned}
$$

subject to:

$$x_{ij} \leq D_{ij} \qquad \forall i, j \tag{4.40}$$

$$\sum_i \sum_j x_{ij} \frac{\Xi_i}{e} \leq \sum_l \sum_h m_{lh} \tag{4.41}$$

$$m_{lh} \leq \psi_{lh}(M + y) \qquad \forall l, h \tag{4.42}$$

$$\sum_h m_{lh} \leq \text{Big-M} w_l \qquad \forall l \tag{4.43}$$

$$\sum_i \sum_j x_{ij} \lambda_i \leq \sum_h a_h \tag{4.44}$$

$$a_h \leq \psi_{lh} A \qquad \forall h, l = \mathrm{I} \tag{4.45}$$

$$\sum_i \sum_j x_{ij} R_i \leq r\theta \tag{4.46}$$

$$\sum_i x_{ij} V_i \leq c_j U \qquad \forall j \tag{4.47}$$

$$\rho = \Gamma + \Delta + \nu \tag{4.48}$$

$$y\iota = \mu + \nu \tag{4.49}$$

$$\mu \leq \eta \tag{4.50}$$

$$\nu \leq \epsilon \tag{4.51}$$

$$\omega = \frac{\Gamma}{\rho}\gamma + \frac{\Delta + \nu}{\rho}\delta(1 - \kappa) \tag{4.52}$$

$$x_{ij} \geq 0 \qquad \forall i, j$$

$$m_{lh} \geq 0 \qquad \forall l, h$$

$$a_h \geq 0 \qquad \forall h$$

4.6.3 Model findings

Apart from optimal production configuration, the model determines optimal number of machines, that should be purchased with respect to firm's current reserves and borrowing power. The model accounts implication of incorporating additional debt into firm's financing on firm's capital structure and finds optimal solution that maximizes the excess of firm's operating profit over firm's capital charge.

The model suggests increasing the number of machines consequently, first utilizing its reserves, then using its entire borrowing power. By increasing the share of debt in its capital structure, the model decreases firm's weighted average cost of capital. The model suggests to purchase new machines, as the savings due to enlarged capacity exceed the increase of capital charge. In case of unbounded borrowing power, the model suggests increasing the number of machines to the level which enables single shift production.

4.7 Chapter conclusions

The models presented in the chapter help finding optimal production configuration for the expected demand and pricing.

The NLP models showed, that three shift working is unprofitable for most cases. They also suggested that excessive utilization of weekend capacity destroys value. They also solved the dilemma of satisfying demand with higher shift. Furthermore, linear programming models helped improve product pricing and overall profitability. They also suggested that enlarging the market for high-margin products should be firm's strategic priority. Finally, EVA maximization model suggested increasing the number of machines possessed by the company in order to lower machining costs.

Chapter 5

The game

The report covers the first round of the 2006 edition of Global Management Challenge taking place between May 23. and July 14. The author leads firm 2, of group 23.

5.1 Competition timeline

On the 24th of May all teams received 5 historical management reports, that documented firms' activity over the preceding five quarters (W011043 - W011053). The reports were identical between firms, so that the teams started from exactly the same business condition. After the teams took over the charge of the virtual companies, their decisions brought diversity to the game.

	Decision Sheets to be delivered to the Organizer	**Management Reports to be delivered to the Teams**
1 decision cycle (23.05 - 05.06)	05.06 till 4 p.m.	07.06 till noon
2 decision cycle (07.06 - 14.06)	14.06 till 4 p.m.	16.06 till noon
3 decision cycle (16.06 - 23.06)	23.06 till 4 p.m.	26.06 till noon
4 decision cycle (26.06 - 03.07)	03.07 till 4 p.m.	05.07 till noon
5 decision cycle (05.07 - 12.07)	12.07 till 4 p.m.	14.07 till noon

Table 5.1: Schedule of the 1st round of the 2006 edition of Global Management Challenge

After receiving historical reports, the teams were supposed to get familiar with their entities and as a result of their analysis create strategies for upcoming quarters. They were also supposed to prepare the first set of decisions, that were expected to be submitted until the June 5th. The decisions were then simulated against decisions of their rival teams. As a result of the simulation two days later a new management report (W232054) has been generated and delivered to the participants. The processes were reproduced four times throughout the following five weeks. The schedule is presented in table 5.1.

5.2 Historical data

Figure 5.1 quotes product prices set throughout the historical quarters. The prices remain unchanged throughout the period, which might suggest no pricing strategy available.

			W011043	W011044	W011051	W011052	W011053
Product prices	p1	EU	275	275	275	275	275
		NAFTA	275	270	270	270	270
		Internet	270	270	270	270	270
	p2	EU	440	440	440	440	440
		NAFTA	440	435	435	435	435
		Internet	435	435	435	435	435
	p3	EU	665	665	665	665	665
		NAFTA	665	660	660	660	660
		Internet	660	660	660	660	660

Figure 5.1: Product prices throughout the historical timespan

The demand for company's products is subject to strong annual seasonality, as depicted in figure 5.3. It is the lowest in the first quarter and the highest in the fourth, quarters second and third being somewhere in the middle. Comparing third quarter of '04 with a corresponding quarter of '05 reveals that the demand is rather constant on European market and on the Internet. The demand has a strong upward trend in NAFTA, as the demand in third quarter exceeds peak fourth quarter of the previous year.

When analyzing the increase of demand for company's products in NAFTA, one needs to be aware of the fact that its price, while set in Euros, is charged in US Dollars according to the exchange rate quoted in the last management report. The exchange rate is the price in Euros paid for one US Dollar. The exchange rates throughout 5 historical quarters are depicted in figure 5.4.

Figure 5.4 shows an increasing Euro-Dollar exchange rate, which indicates that the dollar has been

Product orders			W011043	W011044	W011051	W011052	W011053
	p1	EU	776	860	727	773	777
		NAFTA	627	718	648	710	756
		Internet	1 380	1 477	1 311	1 390	1 374
	p2	EU	432	468	397	417	400
		NAFTA	337	379	338	371	390
		Internet	773	808	706	740	712
	p3	EU	236	262	219	231	221
		NAFTA	182	204	183	199	206
		Internet	397	428	368	392	377

Figure 5.2: Table of product orders throughout the historical timespan

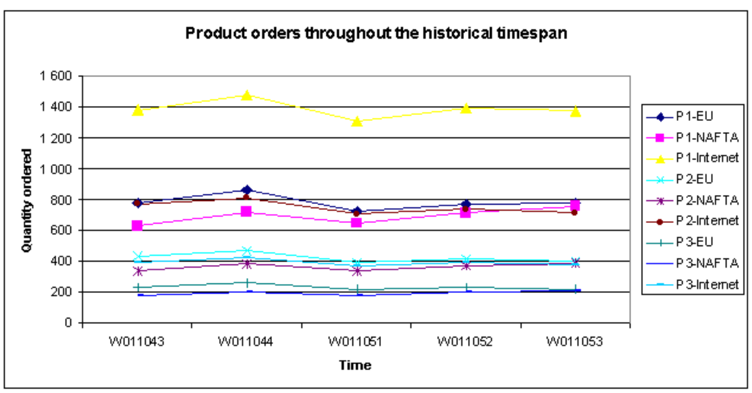


Figure 5.3: Graph of product orders throughout the historical timespan

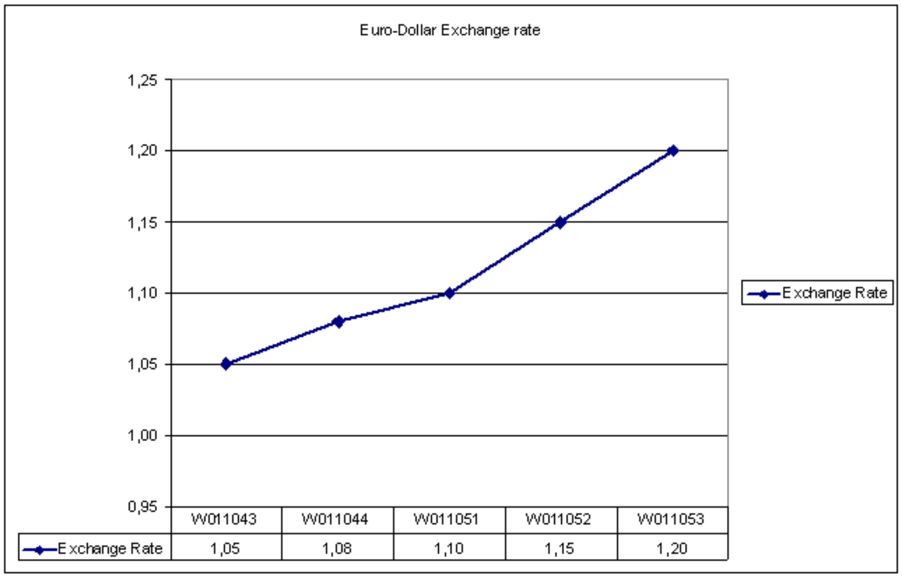


Figure 5.4: Exchange rate throughout the historical quarters

restrengthening. In case the Euro price is unchanged, increasing Euro-Dollar exchange rate decreases product's Dollar price.

The Euro-Dollar exchange rate has also a strong impact on the price of raw material. Since the price is quoted in Dollars, the money the firm needs to pay has to be updated with the exchange rate. Strengthening Dollar makes US goods more expensive. Within the 5 historical quarters, due to the exchange rate increase, the price of raw material has risen by nearly 20%.

Within the historical quarters, the company has not purchased any raw material at the future market. Assuming the increasing exchange rate trend remains constant, purchasing raw material for future delivery takes advantage both of lower price of future contracts as well as lower price due to expected exchange rate increase. The advantage is depicted on figure 5.5. If in quarter W011051 the company purchased 10 parcels of raw material at the future market for six months delivery, it would get the advantage of nearly € 50 000 over a company purchasing raw material for the same quarter at the spot market.

Since purchasing raw material on the future market requires immediate payment, it therefore freezes cash for six months. For this reason valuation technique should be applied to evaluate profitability of the cash commitment. One can use the Net Present Value introduced in chapter 3 according to

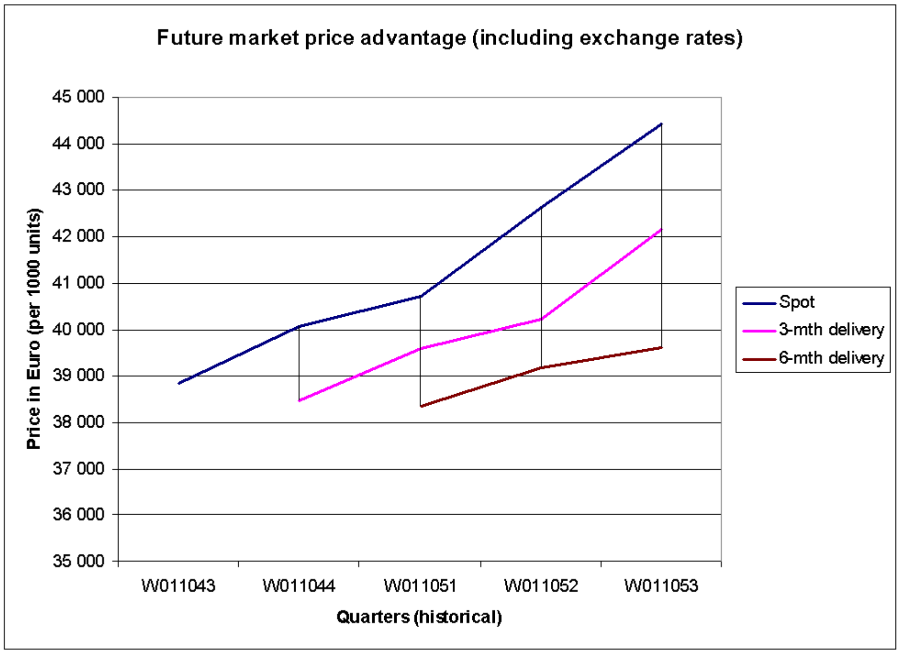


Figure 5.5: Future market and exchange rate price advantage

formula 3.4. We would analyze the Net Present Value of purchasing 10 parcels of raw material in quarter I of 2005 (report W011051) for six-month delivery with respect to its market value at spot market six months later. The initial investment would be the cost of purchasing 10 parcels of raw material for 6-month delivery for € 39 620, each. We would assume that the experiment would take one period of 6 months. The final payment would be the market value the 10 parcels according to current raw material price at the spot market equal 44 410 per parcel. Furthermore, assuming that the expected annual rate of return of an investment would be firm's weighted average cost of capital equal to 12%, 6-month investment would have expected rate of return equal to 6%. Feeding formula 3.4 one obtains

$$\frac{10 \times 44410}{(1 + 0,06)} - 10 \times 39620 = 22760$$

In other words, the Net Present Value of purchasing 10 parcels of raw material at in quarter I of 2005 for delivery in six months with respect to corresponding market value 6 month later, discounted at the rate of firm's cost of capital is equal to € 22 760! If the firm had purchased 10 parcels in the first quarter of 2005, it would achieve the advantage of € 22 760 over a company purchasing the same amount at the spot market six months later.

Another issue is product advertising. The advertising should communicate improvements introduced to firm's products and drive demand. Improvements should also be reflected by proper updates to product prices. Figure 5.6 presents advertising expenditures throughout historical period. The color indicates that in the given quarter there was no improvement to the product (color red), that there was a minor improvement (color yellow), or that there was a major improvement (color green). As one can observe, there was a major product 1 improvement in quarter 2 of 2005, it however was not communicated to customers by increased advertising spending. A implemented major improvement should also be reflected by an increased product price. Figure 5.1 reveals, there was no appropriate reaction.

Advertising		W011043	W011044	W011051	W011052	W011053
p1	EU	6	6	6	6	6
	NAFTA	6	6	6	6	6
	Internet	6	6	6	6	6
p2	EU	6	6	6	6	6
	NAFTA	6	6	6	6	6
	Internet	6	6	6	6	6
p3	EU	6	6	6	6	6
	NAFTA	6	6	6	6	6
	Internet	6	6	6	6	6

NONE
MINOR
MAJOR

Figure 5.6: Advertising expenditures and product improvement throughout historical period

As part of the analysis, one should also analyze how did the company manage to satisfy demand for its products. Figure 5.7 depicts demand satisfaction throughout the historical period. The color indicates that the demand has been partially satisfied: color red - less than 80%, color yellow - between 80% and 90%, and color green - above 90%. As the figure reveals, the demand has been usually satisfied at the level lower than 90%, in 40% being lower than 80% reaching the level of 53% in the third quarter of 2005! These are extraordinary opportunity losses, that the company experienced.

Demand satisfaction		W011043	W011044	W011051	W011052	W011053
p1	EU	81%	78%	92%	83%	82%
	NAFTA	80%	77%	85%	73%	69%
	Internet	80%	81%	92%	84%	84%
p2	EU	81%	78%	93%	89%	91%
	NAFTA	82%	73%	81%	74%	69%
	Internet	78%	80%	92%	88%	91%
p3	EU	74%	76%	91%	87%	59%
	NAFTA	82%	86%	96%	88%	55%
	Internet	69%	76%	88%	83%	53%

< 80%
< 90%
> 90%

Figure 5.7: Demand satisfaction throughout historical period

Simultaneously one should consider production capacity that the firm has had. Figure 5.8 shows capacity utilization throughout the historical period. Concluding from the labor union agreements time available for two shift working is distributed in the following way: 74% for weekdays, 11% for Saturday and 15% for Sunday. Utilization of these respective times is indicated with proper color. Throughout the whole historical period, the machinists were scheduled for working from Monday to Sunday, utilization reaching 95% of their time. Throughout the historical period the management decided not to introduce the third shift, which would signifficantly harm firm's profitability. Analogical analysis performed form the assembly shop indicates that it has been also over exploited with utilization reaching 96%.

	W011043	W011044	W011051	W011052	W011053
Machine utilization	86%	94%	95%	94%	90%
Assembly shop utilization	86%	95%	96%	94%	85%

Sunday
Saturday
Weekday

Figure 5.8: Machine and assembly shop utilization throughout the historical period

Even though the company was not able to satisfy the demand for its products, while over exploiting its production capacity, throughout the historical period the management did not decide to purchase any new machines or hire new assembly workers. It can be considered an opportunity loss.

A fundamental aspect of Value-Based Management is the rate of return expected on firm's capital. Due to the different cost of debt and equity financing and their different share in firm's invested capital, the cost of capital is calculated as a weighted-average, according to formula 3.10 introduced in chapter 3.

To calculate the cost, one needs to determine the expected rate of return on firm's equity. The concept of Capital Asset Pricing Model has been introduced in chapter 3. Although the methodology of calculating the riskiness factor (β) has been introduced in chapter 3, due to fact that throughout historical period all companies have identical backgrounds, one is unable to perform a regression on the correlation of firm's stock with its market environment. This opportunity occurs after subsequent decisions. For the sake of simplicity let β be equal to 1 meaning that it faithfully follows market trends. Furthermore, the management reports carry no information about market risk. However due to the the fact that the company is quoted in European stock exchange and has its operations in NAFTA and on the Internet, its market risk premium can be assumed to oscillate in the upper level of the Developed Markets risk premiums, according to table 3.6 at the level of 6,5%. Taking the average risk-free rate of European market, quoted in management reports of 3,3%, one obtains:

$$E(r_E) = 3.3\% + 1 \times 6.5\% = 9.8\%$$

Balance Sheet	W011043	W011044	W011051	W011052	W011053
Assets					
Value of Property	250000	250000	250000	250000	250000
Value of Machines	1777822	1733376	1690044	1647792	1606596
Total Fixed Assets	2027822	1983376	1940044	1897792	1856596
Value of Product Stock	0	0	0	0	0
Value of Raw Material Stock	59819	83947	107546	139169	200275
Debtors	716580	756984	762371	750754	675588
Cash	355225	474325	572821	635509	691734
Investments	0	0	0	0	0
Total Assets	3159446	3298632	3382782	3423224	3424193
0	0	0	0	0	0
Liabilities	0	0	0	0	0
Tax Assessed & Due	0	109302	109302	0	0
Creditors	344612	346931	354476	361440	366558
Bank Overdraft	0	0	0	0	0
Unsecured Loans	0	0	0	0	0
Total Current Liabilities	344612	456233	463778	361440	366558
Net Assets	2814834	2842399	2919004	3061784	3057635
Term Loans	601772	601772	601772	601772	601772
Net Worth	2213062	2240627	2317232	2460012	2455863
Share Capital	2000000	2000000	2000000	2000000	2000000
Reserves	213062	240627	317232	460012	455863
Shareholders Funds	2213062	2240627	2317232	2460012	2455863

Figure 5.9: Balance sheet throughout historical period

Using the information published quarterly in firm's balance sheet (figure 5.9), one can calculate firm's invested capital. Firm's equity capital can be arrived at, by summing firm's share capital, reserves, debtors, cash and investments, since it is the cash that firm's shareholders commit by not retrieving it through dividends. As an example, in the fourth quarter of 2004, firm's equity capital was:

$$\Gamma = 2000000 + 240627 + 756984 + 474325 + 0 = 2714952$$

In the same quarter, firm's debt financing consisted of long-term debt only, therefore:

$$\Delta = 601772$$

Adopting return on firm's equity equal to 9,8% and long-term debt interest rate equal to 12%, one can calculate the weighted average cost of capital in the following way:

$$\text{WACC} = \frac{2714952}{3316724} \times 9,8\% + \frac{601772}{3316724} \times 12\% \times (1 - 30\%) = 9,4\%$$

In the journey toward Economic Value Added, one needs to establish the Net Operating Profit After Tax. Using the Profit & Loss statement, depicted in figure 5.10 and the Accounts statement, depicted in figure 5.11, one can arrive at NOPAT through the series of calculation steps.

Profit & Loss	W011043	W011044	W011051	W011052	W011053
Sales Revenue	1 549 280	1 692 885	1 695 085	1 671 390	1 489 895
Opening Stock Value	16 973	59 819	83 947	107 546	139 169
Materials Purchased	307 305	310 699	320 682	325 591	341 117
Assembly Wages	117 645	138 860	139 140	136 480	114 675
Machinists Wages	214 878	251 626	254 063	256 290	230 276
Machine Running Costs	95 234	99 898	100 239	99 825	97 140
Quality Control	8 000	8 000	8 000	8 000	8 000
Minus Closing Stock Value	59 819	83 947	107 546	139 169	200 275
Cost of Sales	700 216	784 955	798 525	794 563	730 102
Gross Profit/Loss	849 064	907 930	896 560	876 827	759 793
Insurance Receipts	0	0	0	31 294	39 189
Interest Received	0	0	0	0	0
Interest Paid	18 053	18 053	18 053	18 053	18 053
Overheads	686 959	708 564	698 570	705 036	683 882
Depreciation	45 586	44 446	43 332	42 252	41 196
Tax Assessed	0	109 302	0	0	0
Net Profit/Loss	98 466	27 565	136 605	142 780	55 851
Dividends Paid	60 000	0	60 000	0	60 000
Transferred to Reserves	38 466	27 565	76 605	142 780	-4 149

Figure 5.10: Profit&Loss statements throughout historical period

$$\begin{aligned} \text{Tax} = 30\% \times (&\text{Sales Revenue} \\ &- \text{Cost of Sales} \\ &- \text{Amortization} \\ &- \text{Interest} \\ &+ \text{Insurance} \\ &- \text{Total Overheads}) \end{aligned}$$

Accounts (Euros)	W011043	W011044	W011051	W011052	W011053
Overheads					
Advertising	72 000	72 000	72 000	72 000	72 000
Internet Distrbution Agent	93 345	102 337	102 337	101 356	91 631
Internet Service Provider	28 185	29 637	29 637	29 369	26 717
Selling Agents & Distributors	111 867	120 027	110 385	112 545	106 972
Sales Office	19 730	21 427	18 669	19 900	19 758
Guarantee Servicing	19 410	19 240	20 190	23 020	21 020
Shipping & Hired Transport	54 750	55 400	55 400	55 400	52 150
Product Research	55 000	55 000	55 000	55 000	55 000
Web-Site Development	22 000	22 000	22 000	22 000	22 000
Personnel Department	7 000	7 000	7 000	7 000	7 000
Machine Maintenance	15 300	15 300	15 300	15 300	15 300
Warehousing & Purchasing	12 500	12 642	14 245	15 925	18 530
Business Intelligence	7 500	7 500	7 500	7 500	7 500
Credit Control	4 050	4 410	4 415	4 328	4 038
Insurance	12 268	12 525	12 403	12 285	12 221
Management Budget	120 000	120 000	120 000	120 000	120 000
Other Miscellaneous Costs	32 054	32 119	32 089	32 108	32 045
Total Overheads	686 959	708 564	698 570	705 036	683 882
Taxable Profit/Loss Accumulate	227 476	364 343	136 605	279 385	335 236
Insurance Claimed	1 694	0	840	33 341	41 225
Insurance Excess	2 044	2 087	2 067	2 047	2 036

Figure 5.11: Overheads statement throughout historical period

$$\begin{aligned} \text{NOPAT} = {} & \text{Gross Profit} \\ & - \text{Total Overheads} \\ & - \text{Tax} \\ & + \text{Amortization} \\ & + \text{Interest} \\ & + \text{Insurance} \end{aligned} \tag{5.1}$$

Applying the above formulas, one can arrive at firm's Economic Value Added. The calculation is presented in figure 5.12

Economic Value Added is then confronted with firm's stock price throughout the historical period. Plots of the data are depicted in figures 5.13 and 5.14.

As one can observe from the graphs, the firm is EVA positive, meaning that its profits exceed its capital charge. However in the light of falling demand satisfaction and over exploitation of its production capacity, switching to value destroying company seems just a matter of time. The stock market seems to share the same opinion since firm's stock price is falling. To address that Value-Based Management approach should be adopted.

Gross profit	**849 064**	**907 930**	**896 560**	**876 827**	**759 793**
Total Overheads	*686 959*	*708 564*	*698 570*	*705 036*	*683 882*
Operating Income	**162 105**	**199 366**	**197 990**	**171 791**	**75 911**
Tax	*29 540*	*41 060*	*40 982*	*42 834*	*16 755*
Amortization	*45 586*	*44 446*	*43 332*	*42 252*	*41 196*
Depreciation	*0*	*0*	*0*	*0*	*0*
Interest	*-18 053*	*-18 053*	*-18 053*	*-18 053*	*-18 053*
Insurance	*0*	*0*	*0*	*31 294*	*39 189*
NOPAT	**160 098**	**184 699**	**182 288**	**184 450**	**121 488**
Share capital	2 568 287	2 714 952	2 890 053	3 095 521	3 147 597
Interest on share capital	2%	2%	2%	2%	2%
Long-term debt	601 772	601 772	601 772	601 772	601 772
Interest on long-term debt	3%	3%	3%	3%	3%
Tax shield	30%	30%	30%	30%	30%
Overdraft	**0**	**0**	**0**	**0**	**0**
Interest rate	2%	2%	2%	2%	2%
Unsecured loans	**0**	**0**	**0**	**0**	**0**
Interest rate	3%	3%	3%	3%	3%
Invested capital	**3 170 059**	**3 316 724**	**3 491 825**	**3 697 293**	**3 749 369**
WACC	2%	2%	2%	2%	2%
Capital charge	**74 918**	**78 475**	**82 721**	**87 704**	**88 966**
EVA	**85 180**	**106 224**	**99 567**	**96 746**	**32 521**

Figure 5.12: Quarterly Economic Value Added Calculation

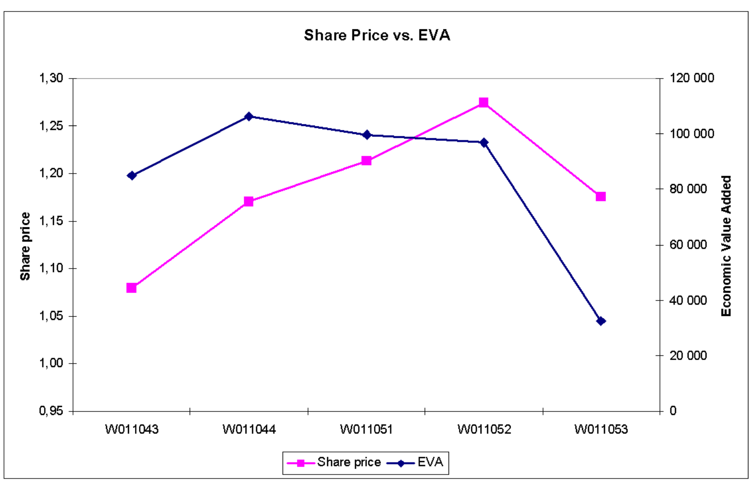


Figure 5.13: Share Price vs. Economic Value Added

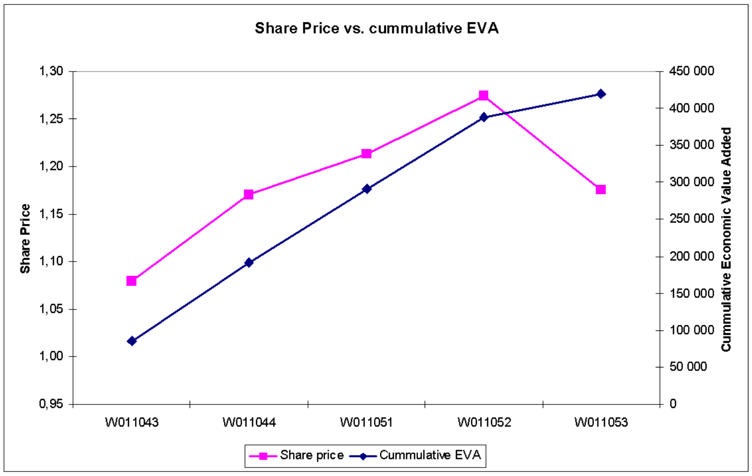


Figure 5.14: Share Price vs. Cumulative Economic Value Added

5.3 The winning decisions

To address shrinking Economic Value Added, models described in chapter 4 were applied. The initial tactics, were the consequences of the analysis described in preceding section.

The short-term strategy was to utilize quick-wins, as described in preceding section. Raw material was purchased at the spot market for upcoming quarter, but also at the future market both for three-month and six-month deliveries. In the future quarters, the company would only purchase raw material at the future-market with six-month delivery, with possible three months and spot market purchases in case of increased raw material demand.

Secondly, the shortage of production capacity was addressed with fundamental economical principle of price and demand. The demand for most profitable products was to be fully satisfied, sacrificing the demand for least profitable products. The remaining capacity was to be equally distributed among the least profitable products. Since the supply of company's least profitable products was expected to be seriously limited, the prices were decided to be radically increased in order to limit the demand.

The demand forecast for upcoming quarter, was the demand of a corresponding quarter last a year ago updated with the rate of change of the preceding quarter with respect to its seasonal equivalent, a year earlier. It was calculated with the following formula:

$$D_n = \frac{D_{n-1}}{D_{n-5}} D_{n-4}$$

Figure 5.15 depicts calculated demand forecasts updated with orders backlog from preceding quarter.

			W011043	W011044	W011051	W011052	W011053	Forecast	Backlog	Plan
Demand	p1	EU	776	860	727	773	777	861	127	**988**
		NAFTA	627	718	648	710	756	866	193	**1 059**
		Internet	1 380	1 477	1 311	1 390	1 374	1 471		**1 471**
	p2	EU	432	468	397	417	400	433	43	**476**
		NAFTA	337	379	338	371	390	439	101	**540**
		Internet	773	808	706	740	712	744		**744**
	p3	EU	236	262	219	231	221	245	61	**306**
		NAFTA	182	204	183	199	206	231	55	**286**
		Internet	397	428	368	392	377	406		**406**

Figure 5.15: Demand forecast for fourth quarter of 2005 and orders backlog

Production plan accompanied by products' prices from preceding quarter were then fed to the Linear Programming model, described in section 4.5 of chapter 4. The model was set to faithfully reflect firm's production plant. Solving the model for optimality finds optimal solution that is depicted in figure 5.16.

	P1	P2	P3
Prices			
EU	275	440	665
NAFTA	270	435	660
Internet	270	435	660
Demand			
EU	988	476	306
NAFTA	1059	540	286
Internet	1471	744	406
Solution			
EU	*988*	*476*	*306*
NAFTA	*0*	*540*	*0*
Internet	*1 086*	*744*	*406*

Figure 5.16: LP solution

The solution translates to demand satisfaction and production pace depicted in figure **??**.

In optimal solution products 1 and 3 intended for NAFTA market are set to zero, which indicates the products are least profitable. Sensitivity analysis presented in figure **??** confirms this finding.

The model was then adjusted so that the demand for company products in European Union and on the Internet would be fully satisfied. The production plan for NAFTA was reduced by 75%, while the

Demand satisfaction	P1	P2	P3
EU	100%	100%	100%
NAFTA	0%	100%	0%
Internet	74%	100%	100%

Machining	Week	Sat	Sun
I	100,0%	100,0%	100,0%
II	100,0%	100,0%	100,0%
III	0,0%	0,0%	0,0%

Assembling	Week	Sat	Sun
	100%	100%	18%

Figure 5.17: Demand satisfaction and production pace

Reduced costs	P1	P2	P3
EU	0	0	0
NAFTA	13	0	29
Internet	0	0	0

Shadow prices	P1	P2	P3
EU	7	53	39
NAFTA	0	16	0
Internet	0	44	28

Figure 5.18: Sensitivity analysis of the LP solution

price has been increased by 30%. Solving the model for optimality improves the previous solution by € 10 000!

Analogical analysis using NLP models was performed before all consecutive quarters, which streamlined firm's operational efficiency.

Shrinking Economic Value Added was also tackled with the EVA model described in section 4.6 of chapter 4. The model was designed to find optimal machine portfolio, through managing new machine investments taking under consideration its impact on firm's capital structure and EVA.

Again, the model was fed with current conditions including its borrowing power, WACC, interest rate on debt financing etc. Model findings are compiled in figure 5.19.

The model suggested purchasing 2 new machines, which although increased capital charge by € 15 000, still improved EVA by € 100 000! The finding was immediately implemented, although due to diminished borrowing power by cash necessary for covering future contracts on raw material, the purchased was spanned over two consecutive quarters.

Machines	6	6
New machine investment	-	2
Total machines	6	8
Revenue	**1 832 694**	**2 070 198**
Total Machining Cost	304 071	325 363
Total Assembly Cost	141 192	164 934
Raw Material Cost	370 780	417 128
Provisions	190 879	216 038
Planning cost	4 317	5 720
NAFTA Transportation cos	34 600	34 600
Profit	**786 854**	**906 416**
Equity capital	2 703 421	2 703 421
% in capital structure	*82%*	*67%*
Debt	601 772	1 301 772
% in capital structure	*18%*	*33%*
Invested capital	3 305 193	4 005 193
WACC	*3,7%*	*3,4%*
Capital Charge	**120 774**	**135 474**
EVA*	**666 080**	**770 942**

**neglecting operational costs*

Figure 5.19: Comparison of initial and EVA maximization solution

After the machines were installed in the second quarter of 2006, additional agent in European Union and distributor in NAFTA were hired. The decision, although not modeled with optimization, had great impact on total sales.

5.4 Results

The firm (firm 2) managed by the author has won the round with significant advantage over its rivals. Figure 5.20 depicts stock quotes throughout the entire simulation.

Furthermore, firm's stock performance was confronted with Economic Value Added, generated throughout the simulation period. The comparisons are depicted in figures 5.21, 5.22 and 5.23.

Management reports for the entire simulation can be found in Appendix A.

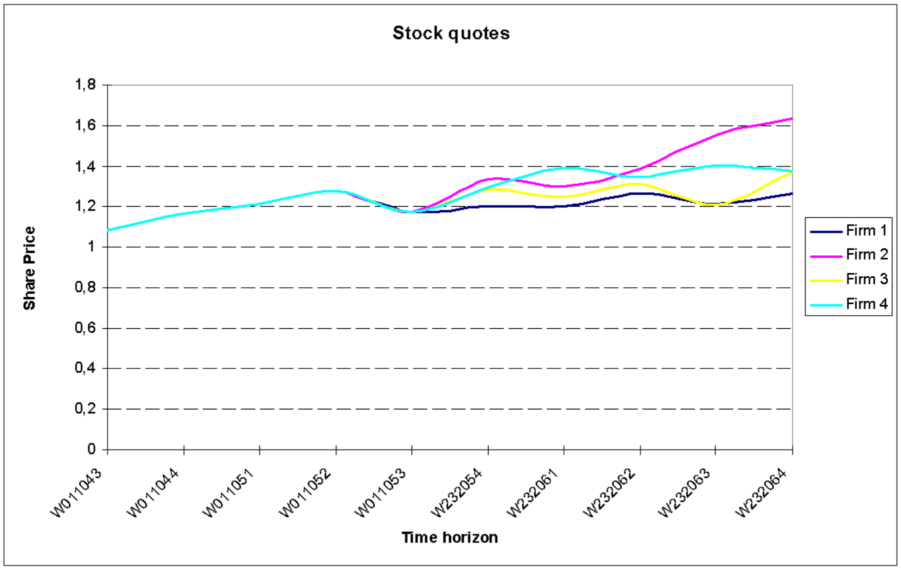


Figure 5.20: Stock Quotes in Global Management Challenge

	W011043	W011044	W011051	W011052	W011053	W232054	W232061	W232062	W232063	W232064
Gross profit	**849 064**	**907 930**	**896 560**	**876 827**	**759 793**	783 819	787 372	940 115	1 063 885	1 274 274
Total Overheads	*686 959*	*708 564*	*698 570*	*705 036*	*683 882*	710 649	711 729	735 315	770 678	838 715
Operating Income	**162 105**	**199 366**	**197 990**	**171 791**	**75 911**	73 170	75 643	204 800	293 207	435 559
Tax	*29 540*	*41 060*	*40 982*	*42 834*	*16 755*	16 705	35 421	40 834	74 548	109 038
Amortization	*45 586*	*44 446*	*43 332*	*42 252*	*41 196*	40 164	47 912	55 463	54 073	52 726
Depreciation	*0*	*0*	*0*	*0*	*0*	0	0	0	0	0
Interest	*-18 053*	*-18 053*	*-18 053*	*-18 053*	*-18 053*	-18 053	-22 658	-27 117	-25 711	-20 211
Insurance	*0*	*0*	*0*	*31 294*	*39 189*	40 731	112 997	13 892	35 070	838
NOPAT	**160 098**	**184 699**	**182 288**	**184 450**	**121 488**	**119 307**	**178 473**	**206 204**	**282 091**	**359 874**
Share capital	2 568 287	2 714 952	2 890 053	3 095 521	3 147 597	2 703 421	2 452 341	2 588 453	2 796 946	3 197 236
Share price	1,08	1,17	1,21	1,28	1,18	1,34	1,30	1,39	1,55	1,63
Interest on share capital	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Long-term debt	601 772	601 772	601 772	601 772	601 772	601 772	601 772	601 772	601 772	601 772
Interest on long-term debt	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Tax shield	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%
Overdraft	**0**	**0**	**0**	**0**	**0**	**0**	**302 662**	**607 139**	**239 778**	**0**
Interest rate	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Unsecured loans	**0**	**0**	**0**	**0**	**0**	**0**	**120 630**	**0**	**0**	**0**
Interest rate	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Invested capital	**3 170 059**	**3 316 724**	**3 491 825**	**3 697 293**	**3 749 369**	**3 305 193**	**3 477 405**	**3 797 364**	**3 638 496**	**3 799 008**
WACC	2%	2%	2%	2%	2%	**2%**	**2%**	**2%**	**2%**	**2%**
Capital charge	**74 918**	**78 475**	**82 721**	**87 704**	**88 966**					
						78 195	78 781	83 163	83 526	90 170
EVA	**85 180**	**106 224**	**99 567**	**96 746**	**32 521**	**41 112**	**99 692**	**123 041**	**198 565**	**269 704**

Figure 5.21: Complete EVA calculations throughout the entire simulation

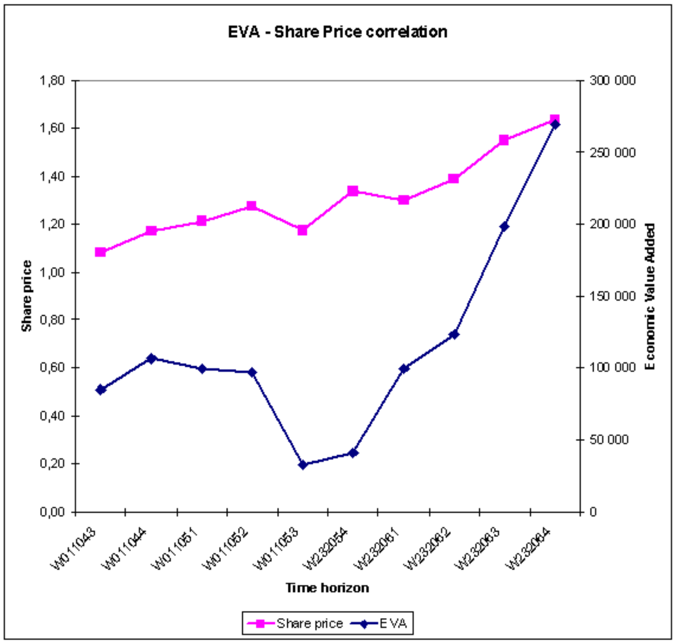


Figure 5.22: Share Price vs. Economic Value Added

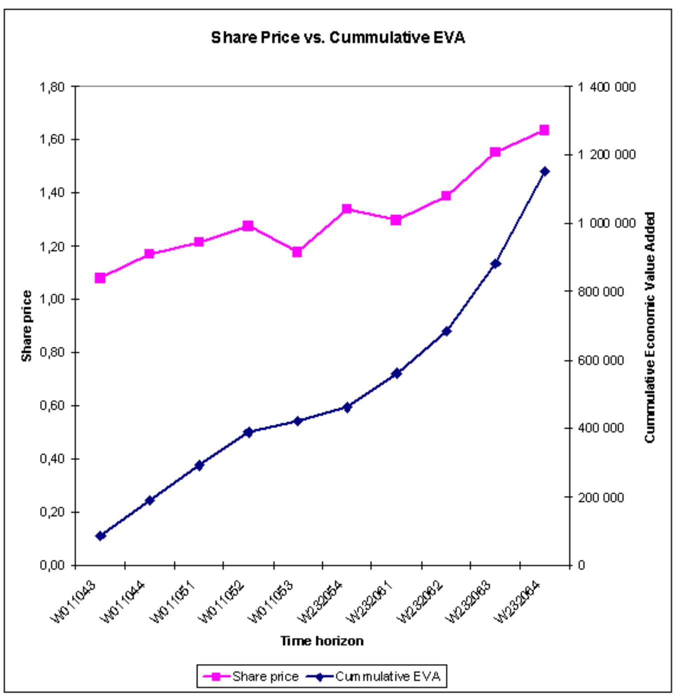


Figure 5.23: Share Price vs. Cumulative Economic Value Added

5.5 Continuation

By winning the first round, the team qualified for the second round of the tournament. It took place from September 1. until the 20. of October 2006. Similarly, all teams were provided with 5 historical management reports, after analysis of which they had to construct the strategy and come up with the first decision set to be submitted.

Historical reports covered the very initial period after the company had been launched. It showed the very first decisions made by the management including purchase of new machines, hiring employees, entering new market etc. The company was selling its products on the Internet market solely.

Apart from streamlining operational effectiveness, the team had to decide whether to expand its operations on new markets. Business intelligence suggested that the Internet market was rather small, initial rapid growth curbing at a constant level. The team's strategy was to enter EU and NAFTA markets immediately. Firm's production capacity was hardly sufficient to satisfy demand on the Internet market with two-shift working, so the capacity was decided to be initially doubled and intended to be tippled throughout the simulation. Since in case of the Internet entering the market took 3 quarters to establish a reasonable demand, the team decided to shift its production capacity from producing for the Internet to producing for EU and NAFTA in order to gain a demand advantage over its rivals. Furthermore, since sacrificing the Internet demand was considered a radical move, the team expected initially little competition and supply of products in the new markets and consequently decided to significantly increase products prices in those markets.

Firm was financed entirely by equity capital. The company still owned much assets in the form of cash brought initially as seed capital by firm's owners. There has not been enough cash, however, to finance the purchase of new machines, so debt had to be incorporated into firm's capital structure. Furthermore incorporating debt decreased firm's weighted average cost of capital.

Even though rival companies were careful about entering new markets and therefore there was little competition and low supply of products, initially the demand in those market was far lower than the team had expected. Consequently, after first decision there was a substantial amount of unsold products stored in commercial storage in EU and NAFTA. Simultaneously, the firm lost market share on the Internet, which all led to radical drop of revenue and threatened firm's financial liquidity.

The team decided to abandon further machine purchases focusing on maintaining financial stability while streamlining operating effectiveness. Ironically, within the next quarters the demand for company's products in EU and NAFTA markets started to grow rapidly, it was, however, already to late to make new machine investments. The company was unable to satisfy the demand for its products and eventually lost the second round.

The round therefore proves, that operating effectiveness solely is not enough, that to win the company needs thorough knowledge of the market, to build a strategy, that gives an advantage over its rivals and furthermore enough courage to comply to it despite initial adversities. A research conducted by Michael E. Raynor of Deloitte Consulting shows that strategies of successful firms have most in common with strategies of companies that suffers a defeat.[22] Radical strategy, he writes, is about guessing what the market will be like in the future.

Chapter 6

Conclusions

The goal of the thesis was to show how optimization could be used with Value-Based Management aiming at share price maximization. Using the Global Management Challenge tournament as a stock-market environment, the thesis modeled decision problems faced in the game and solved for optimality under VBM paradigms.

The report documents the research flow, that went from thorough understanding of rules of the simulation, through the theory behind Value-Based Management to finish up with optimization models, that embraced the theory to make value-based driven decisions.

Chapter 2 described the managerial environment. The chapter covered all aspects of the simulation: firstly it provided an overall introduction to the game, followed by detailed rules governing production and distribution, marketing, human resources and finance departments of the virtual firm.

Chapter 3 introduced the concept of Value-Based Management. It covered the necessary theory and provided detailed and technical description of Economic Value Added - one of the most renowned value-based performance metrics. The chapter guided through the technicalities of EVA describing necessary adjustments that needed to be incorporated to Net Operating Profit After Tax to arrive from accounting to firm's true economic profit. It also introduced relevant corporate finance concepts, necessary for understanding firm's capital structure and its impact on EVA.

Chapter 4 illustrated how optimization could be used to solve decision problems with value-based management paradigms in mind. The chapter introduced decision environment, describing problems that needed to be tackled with optimization. It then provided optimization models, which served shareholders' wealth creation.

Chapter 5 showed models described in chapter 4 in action. Firstly, the chapter described firm's business context, based on 5 historical management report that the teams were supplied with. Secondly, the chapter guided through the findings of the models.

6.1 Research contribution

Global Management Challenge provided competing teams with the opportunity to manage virtual companies in a simulated, competitive market environment. The firm was a joint-stock company, whose performance was evaluated on share price quoted at the stock exchange. The teams could therefore experience complex decision problems faced at different levels of organization, from low-level operational tactics such as how much of a certain product to produce, to high-level strategic ones, such as what unique position to take in the market, to achieve competitive advantage over its rivals.

Although as a simulation GMC was driven by a deterministic stock valuation model, its complexity and competition-wise relative dependence provided the teams with high degree of nondeterminism. Consequently the market resembled a black-box, whose post-facto result analysis always found rational, though distinct explanation of stock price behavior.

Addressing this *"stochastivity"* instead of regressing the valuation model, a proved management approach has been adopted to provide decision-making framework, leading to stock-market value maximization.

VBM promotes operational effectiveness as one of the main drivers of Economic Value Added. The thesis showed the impact of optimization driven operations on Economic Value Added. The models have confirmed VBM premises that effective resource allocation and utilization translates to the increase of price of share.

The thesis has also shown how optimization can be used to restructure firm's financing, arriving at optimal capital structure, that minimizes capital cost. A model has been proposed which maximized Economic Value Added through lowering of production costs by increasing production capacity. The capacity has been augmented by purchasing of new machines, whose financing influenced firm's cost of capital.

Value-based management supported by optimization has proved to be a good driver of firm's stock price. The simulated stock-exchange environment of Global Management Challenge has shown strong correlation between shareholders' value measured by EVA and firm's stock performance. The quantitative nature of VBM, made it easy to model and solve decision problems for optimality.

The second round of GMC showed that for a firm to succeed it needs its operational effectiveness to be reinforced with strategy clearly defining firm's unique position in the market, simultaneously providing it with competitive advantage. Such unique position could be specialization, or focusing on particular market. Finding this unique position requires however sound knowledge of current market, but also certain ability or simply luck to foresee what the market will be like in the future. A research conducted by Deloitte indicates that the strategies of successful firms have had most in common with strategies of firms that have failed. [22] The fact is referred by Michael E. Raynor, as peculiar strategic paradox. The strategic radicalism that has driven Wall-Mart or Apple to success, has proved to fail in case of K-mart or Sony. Radical strategy is about guessing which scenario of market development would come true. Analogically, firm's success in Global Management Challenge depends on the compliance of radical actions being the consequence of initial market expectation, with market conditions that materialize.

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Appendix A

Management reports

A.1 Historical management reports

A.1.1 Quarter III '04 Report (W011043)

THE GLOBAL MANAGEMENT CHALLENGE REPORT (06G0)

GMC HISTORY
GMC HISTORY — Group — Company — Identity — Year 2004 — Quarter 3 — FIRST HISTORY QUARTER
GMC HISTORY
GMC HISTORY
GMC HISTORY

PLEASE CHECK THE DECISIONS GIVEN BELOW

			Product 1	Product 2	Product 3
Quantities of Product to					
make and ship to:	EU Agents		625	350	175
(Not delivered in	Nafta Distrbutors		500	275	150
full if starred)	Internet Distributor		1100	600	275
Prices (€):	EU		275	440	665
	Nafta		275	440	665
	Internet		270	435	660
Advertising (€ '000)		Corporate Image	Direct Product Advertising		
EU		6	6	6	6
Nafta		6	6	6	6
Internet		6	6	6	6
Assembly Times (minutes)			110	160	320
Take up Product Improvements			0	0	0
R & D Expenditure (€ '000)			20	15	20
Purchasing			Next Quarter	3-months hence	6-months hence
Raw Materials Ordered ('000)			8	0	0
			Total Number Wanted for Next Quarter	Support Payments (€ '000)	% Commission
Agents and Distributors	EU Agents		1	10	10
	Nafta Distributors		1	10	10
	Internet Distributor		xxxxx	12	11

Production Machines to Buy	0	Number of Ports Operated	5
Machines to Sell	0	Web-site Development (€ '000)	22
Maintenance Hours per Machine	30		
Assembly Hourly Wage Rate (€ c)	10,0	Shift Level	2
Assembly Workers Hired (+) / Fired (-)	0	Assembly Workers Trained	0
Investments (+/- € '000)	0	Term Loans (€ '000)	0
Management Budget (€ '000)	120	% Dividend Paid	3
Information on Corporate Activity	1	Information on Market Shares	0
Insurance Plan Number	1		

Information Technology Report for Last Quarter	
Number of Internet Communications Ports Operated	5
Number of Internet Visits carried through successfully	27 975
% of Potential Internet Visits that failed to connect	5,5

AVAILABILITY & USE OF RESOURCES

Machines Available Last Quarter		6
Machines Available for Next Quarter		6
Assembly Workers Hours		
Total Hours Available Last Quarter		12 936
Hours Absenteeism/Sickness		263
Total Hours Worked Last Quarter		10 923
Notice of Strike Weeks Next Quarter		0
Machine Hours		
Total Hours Available Last Quarter		6 552
Hours Breakdown		97
Hours Planned Maintenance		83
Total Hours Worked Last Quarter		5 648
Average Machine Efficiency %		91
Raw Material Units Used & Available		
Opening Stock Available		492
Bought Spot Last Quarter		8 000
Bought Default Last Quarter		0
Lost/Destroyed		51 !
Used Last Quarter		6 707
Closing Stock Last Quarter		1 734
For Delivery Next Quarter		
Bought Last Quarter		0
Bought Quarter before Last		0
For Delivery Quarter after Next		
Bought Last Quarter		0

Human Resource Management	Assembly	Machinists
Personnel at Start of Last Quarter	22	41
Recruited during Last Quarter	0	7
Trained from Unemployed	0	0
Dismissed	0	0
Quit at end of Last Quarter	0	7
Available for Next Quarter	22	41

Agents & Distributors	EU	Nafta	Internet
Available Last Quarter	1	1	1
Quit Last Quarter	0	0	0
Dismissed Last Qtr.	0	0	0
Recruited for Next Qtr.	0	0	0
Available for Next Qtr.	1	1	1

PRODUCT MOVEMENTS & AVAILABILITY

	Product 1	Product 2	Product 3
Quantities:			
Scheduled	2 225	1 225	600
Produced	2 303	1 269	622
Rejected	78	44	22
Lost/Destroyed	0	0	0
Shipped to:			
EU Agents	625	350	175
Nafta Distributors	500	275	150
Internet Distributor	1 100	600	275
Orders from:			
EU	776	432	236
Nafta	627	337	182
Internet	1 380	773	397
Sold to:			
EU	625	350	175
Nafta	500	275	150
Internet	1 100	600	275
Order Backlog			
EU	122	68	42
Nafta	85	49	17
Warehouse Stocks			
EU	0	0	0
Nafta	0	0	0
Internet	0	0	0
Product			
Improvements	MINOR	NONE	MINOR
Serviced under			
Guarantee	86	50	27
Internet Service			
Complaints	160	74	35

Transport	EU	Nafta	Internet
Average Journey(km)	1 594	500	300
No. of Loads	5	4	7

The Global Management Challenge is an interactive Business Simulation developed by Edit Systems Ltd., Edinburgh, Scotland, © 2004; and organised by SDG Lda, Lisbon, Portugal

Figure A.1: Historical Management Report W011043 a

THE GLOBAL MANAGEMENT CHALLENGE REPORT - PART 2

Group	Company	Year	2004	Quarter	3

Accounts (Euros)

Overheads	
Advertising	72 000
Internet Distrbution Agent	93 345
Internet Service Provider	28 185
Selling Agents & Distributors	111 867
Sales Office	19 730
Guarantee Servicing	19 410
Shipping & Hired Transport	54 750
Product Research	55 000
Web-Site Development	22 000
Personnel Department	7 000
Machine Maintenance	15 300
Warehousing & Purchasing	12 500
Business Intelligence	7 500
Credit Control	4 050
Insurance	12 268
Management Budget	120 000
Other Miscellaneous Costs	32 054
Total Overheads	686 959
Taxable Profit/Loss Accumulated	227 476
Insurance Claimed	1 694
Insurance Excess	2 044

Profit & Loss	
Sales Revenue	1 549 280
Opening Stock Value	16 973
Materials Purchased	307 305
Assembly Wages	117 645
Machinists Wages	214 878
Machine Running Costs	95 234
Quality Control	8 000
Minus Closing Stock Value	59 819
Cost of Sales	700 216
Gross Profit/Loss	849 064
Insurance Receipts	0
Interest Received	0
Interest Paid	18 053
Overheads	686 959
Depreciation	45 586
Tax Assessed	0
Net Profit/Loss	98 466
Dividends Paid	60 000
Transferred to Reserves	38 466

Balance Sheet	Group	Company
Assets		
Value of Property	250 000	
Value of Machines	1 777 822	
Total Fixed Assets		2 027 822
Value of Product Stock		0
Value of Raw Material Stock		59 819
Debtors		716 580
Cash		355 225
Investments		0
Total Assets		3 159 446
Liabilities		
Tax Assessed & Due		0
Creditors		344 612
Bank Overdraft		0
Unsecured Loans		0
Total Current Liabilities		344 612
Net Assets		2 814 834
Term Loans		601 772
Net Worth		2 213 062
Share Capital		2 000 000
Reserves		213 062
Shareholders Funds		2 213 062

Cash Flow Statement	
Trading Receipts	1 627 324
Capital Receipts	0
Interest Received	0
Investments Sold	0
Insurance Receipts	0
Additional Loans	0
Trading Payments	1 444 481
Capital Payments	0
Interest Paid	18 053
Investments Bought	0
Tax Paid	0
Dividends Paid	60 000
Loans Repaid	0
Net Cash Flow	104 790
Overdraft Limit Next Quarter (€)	455 000
Borrowing Power Next Quarter (€)	23 000

Raw Material Prices (US$ per '000 units)		
Spot Price	3-Month	6-Month
36 988	36 617	36 505

ALL-COMPANY SHARE PRICES & DIVIDENDS					
Company Number	1	2	3	4	5
Share Price (€.c)	1,080	1,080	1,080	1,080	1,080
% Dividend Paid	3	3	3	3	3

BUSINESS INTELLIGENCE

Free Information on Companies' Activity

		1	2	3	4	5
Company Number		1	2	3	4	5
Product 1:	EU Price (€)	275	275	275	275	275
	Nafta Price (€)	275	275	275	275	275
	Internet Price (€)	270	270	270	270	270
Product 2:	EU Price (€)	440	440	440	440	440
	Nafta Price (€)	440	440	440	440	440
	Internet Price (€)	435	435	435	435	435
Product 3:	EU Price (€)	665	665	665	665	665
	Nafta Price (€)	665	665	665	665	665
	Internet Price (€)	660	660	660	660	660
Total Number Employed		63	63	63	63	63
Assembly Wage Rate (€.c)		10,00	10,00	10,00	10,00	10,00
Number of Agents/Distributors		2	2	2	2	2

Business Activity - Paid for Information					
Company	1	2	3	4	5
Total Advertising Spend (€)	72 000	72 000	72 000	72 000	72 000
Total Research Spend (€)	55 000	55 000	55 000	55 000	55 000
Consumer Star Ratings					
Product 1	**	**	**	**	**
Product 2	**	**	**	**	**
Product 3	***	***	***	***	***
Web-site Star Rating	****	****	****	****	****

ECONOMIC INTELLIGENCE	EU	NAFTA	Rest of Developed World
Gross Domestic Product Last Quarter (deseasonalised)	4 764	4 347	27 334
% Unemployment Rate Last Quarter (deseasonalised)	2,80	4,30	
Balance of External Trade Last Quarter	2 747	-2 840	
% Annual Central Bank Base Rate for Next Quarter	3,40	3,20	
Exchange Rate of 1 USD quoted in Euros, Next Quarter	1,05		
% Access of Population to PCs	49,00	59,00	28,00

% of Market Share by Products Sold - Paid for Information		NOT REQUESTED
Company		
Product 1:	EU	
	Nafta	
	Internet	
Product 2:	EU	
	Nafta	
	Internet	
Product 3:	EU	
	Nafta	
	Internet	

ALL COMPANY BALANCE SHEETS	
Company Number	
Assets	NOT AVAILABLE THIS QUARTER
Value of Property	
Value of Machines	
Value of Product Stock	
Value of Raw Material Stock	
Debtors	
Cash	
Investments	
Liabilities	
Tax Assessed & Due	
Creditors	
Bank Overdraft	
Unsecured Loans	
Net Assets	
Term Loans	
Net Worth	
Share Capital	
Reserves	
Shareholders Funds	

BUSINESS REPORT

The European economy is failing to increase its growth rate.
Interest rates may have to be cut to encourage growth.
Small companies are demanding action to boost sales.

Figure A.2: Historical Management Report W011043 b

A.1.2 Quarter IV '04 Report (W011044)

THE GLOBAL MANAGEMENT CHALLENGE REPORT (06G0)

GMC HISTORY						FIRST HISTORY QUARTER
GMC HISTORY	Group	Company	Identity	Year 2004	Quarter 4	
GMC HISTORY						
GMC HISTORY						
GMC HISTORY						

PLEASE CHECK THE DECISIONS GIVEN BELOW

Quantities of Product to			Product 1	Product 2	Product 3
make and ship to:	EU Agents		670	365	200
(Not delivered in	Nafta Distrbutors		550	275	175
full if starred)	Internet Distributor		1200	650	325
Prices (€):	EU		275	440	665
	Nafta		270	435	660
	Internet		270	435	660
Advertising (€ '000)		Corporate Image	Direct Product Advertising		
EU		6	6	6	6
Nafta		6	6	6	6
Internet		6	6	6	6
Assembly Times (minutes)			110	160	320
Take up Product Improvements			0	0	0
R & D Expenditure (€ '000)			20	15	20
Purchasing			Next Quarter	3-months hence	6-months hence
Raw Materials Ordered ('000)			8	0	0
			Total Number Wanted for Next Quarter	Support Payments (€ '000)	% Commission
Agents and Distributors	EU Agents		1	10	10
	Nafta Distributors		1	10	10
	Internet Distributor		xxxxx	12	11

Production Machines to Buy	0	Number of Ports Operated	5
Machines to Sell	0	Web-site Development (€ '000)	22
Maintenance Hours per Machine	30		
Assembly Hourly Wage Rate (€.c)	10,0	Shift Level	2
Assembly Workers Hired (+) / Fired (-)	0	Assembly Workers Trained	0
Investments (+/- € '000)	0	Term Loans (€ '000)	0
Management Budget (€ '000)	120	% Dividend Paid	0
Information on Corporate Activity	1	Information on Market Shares	0
Insurance Plan Number	1		

Information Technology Report for Last Quarter	
Number of Internet Communications Ports Operated	5
Number of Internet Visits carried through successfully	25 451
% of Potential Internet Visits that failed to connect	4,1

AVAILABILITY & USE OF RESOURCES

Machines Available Last Quarter	6
Machines Available for Next Quarter	6
Assembly Workers Hours	
Total Hours Available Last Quarter	12 936
Hours Absenteeism/Sickness	275
Total Hours Worked Last Quarter	12 025
Notice of Strike Weeks Next Quarter	0
Machine Hours	
Total Hours Available Last Quarter	6 552
Hours Breakdown	89
Hours Planned Maintenance	91
Total Hours Worked Last Quarter	6 186
Average Machine Efficiency %	91
Raw Material Units Used & Available	
Opening Stock Available	1 734
Bought Spot Last Quarter	8 000
Bought Default Last Quarter	0
Lost/Destroyed	0
Used Last Quarter	7 354
Closing Stock Last Quarter	2 380
For Delivery Next Quarter	
Bought Last Quarter	0
Bought Quarter before Last	0
For Delivery Quarter after Next	
Bought Last Quarter	0

Human Resource Management	Assembly	Machinists
Personnel at Start of Last Quarter	22	41
Recruited during Last Quarter	0	7
Trained from Unemployed	0	0
Dismissed	0	0
Quit at end of Last Quarter	0	7
Available for Next Quarter	22	41

Agents & Distributors	**EU**	**Nafta**	**Internet**
Available Last Quarter	1	1	1
Quit Last Quarter	0	0	0
Dismissed Last Qtr.	0	0	0
Recruited for Next Qtr.	0	0	0
Available for Next Qtr.	1	1	1

PRODUCT MOVEMENTS & AVAILABILITY

	Product 1	Product 2	Product 3
Quantities:			
Scheduled	2 420	1 290	700
Produced	2 505	1 337	725
Rejected	85	47	25
Lost/Destroyed	0	0	0
Shipped to:			
EU Agents	670	365	200
Nafta Distributors	550	275	175
Internet Distributor	1 200	650	325
Orders from:			
EU	860	468	262
Nafta	718	379	204
Internet	1 477	808	428
Sold to:			
EU	670	365	200
Nafta	550	275	175
Internet	1 200	650	325
Order Backlog			
EU	156	85	52
Nafta	126	76	23
Warehouse Stocks			
EU	0	0	0
Nafta	0	0	0
Internet	0	0	0
Product Improvements	MINOR	NONE	MINOR
Serviced under Guarantee	89	51	25
Internet Service Complaints	168	77	37
Transport	**EU**	**Nafta**	**Internet**
Average Journey(km)	1 594	500	300
No. of Loads	5	4	8

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Figure A.3: Historical Management Report W011044 a

THE GLOBAL MANAGEMENT CHALLENGE REPORT - PART 2

Group	Company	Year	2004	Quarter	4

Accounts (Euros)

Overheads	
Advertising	72 000
Internet Distrbution Agent	102 337
Internet Service Provider	29 637
Selling Agents & Distributors	120 027
Sales Office	21 427
Guarantee Servicing	19 240
Shipping & Hired Transport	55 400
Product Research	55 000
Web-Site Development	22 000
Personnel Department	7 000
Machine Maintenance	15 300
Warehousing & Purchasing	12 642
Business Intelligence	7 500
Credit Control	4 410
Insurance	12 525
Management Budget	120 000
Other Miscellaneous Costs	32 119
Total Overheads	708 564
Taxable Profit/Loss Accumulated	364 343
Insurance Claimed	0
Insurance Excess	2 087

Profit & Loss	
Sales Revenue	1 692 885
Opening Stock Value	59 819
Materials Purchased	310 699
Assembly Wages	138 860
Machinists Wages	251 626
Machine Running Costs	99 898
Quality Control	8 000
Minus Closing Stock Value	83 947
Cost of Sales	784 955
Gross Profit/Loss	907 930
Insurance Receipts	0
Interest Received	0
Interest Paid	18 053
Overheads	708 564
Depreciation	44 446
Tax Assessed	109 302
Net Profit/Loss	27 565
Dividends Paid	0
Transferred to Reserves	27 565

Balance Sheet		
Assets		
Value of Property	250 000	
Value of Machines	1 733 376	
Total Fixed Assets		1 983 376
Value of Product Stock		0
Value of Raw Material Stock		83 947
Debtors		756 984
Cash		474 325
Investments		0
Total Assets		3 298 632
Liabilities		
Tax Assessed & Due		109 302
Creditors		346 931
Bank Overdraft		0
Unsecured Loans		0
Total Current Liabilities		456 233
Net Assets		2 842 399
Term Loans		601 772
Net Worth		2 240 627
Share Capital		2 000 000
Reserves		240 627
Shareholders Funds		2 240 627

Cash Flow Statement			
Trading Receipts			1 652 481
Capital Receipts			0
Interest Received			0
Investments Sold			0
Insurance Receipts			0
Additional Loans			0
Trading Payments			1 515 328
Capital Payments			0
Interest Paid			18 053
Investments Bought			0
Tax Paid			0
Dividends Paid			0
Loans Repaid			0
Net Cash Flow			119 100
Overdraft Limit Next Quarter (€)			392 000
Borrowing Power Next Quarter (€)			177 000
Raw Material Prices (US$ per '000 units)			
	Spot Price	3-Month	6-Month
	37 116	36 638	36 287

ALL-COMPANY SHARE PRICES & DIVIDENDS					
Company Number	1	2	3	4	5
Share Price (€.c)	1,170	1,170	1,170	1,170	1,170
% Dividend Paid	0	0	0	0	0

BUSINESS INTELLIGENCE					
Free Information on Companies' Activity					
Company Number	1	2	3	4	5
Product 1: EU Price (€)	275	275	275	275	275
Nafta Price (€)	270	270	270	270	270
Internet Price (€)	270	270	270	270	270
Product 2: EU Price (€)	440	440	440	440	440
Nafta Price (€)	435	435	435	435	435
Internet Price (€)	435	435	435	435	435
Product 3: EU Price (€)	665	665	665	665	665
Nafta Price (€)	660	660	660	660	660
Internet Price (€)	660	660	660	660	660
Total Number Employed	63	63	63	63	63
Assembly Wage Rate (€.c)	10,00	10,00	10,00	10,00	10,00
Number of Agents/Distributors	2	2	2	2	2

Business Activity - Paid for Information					
Company	1	2	3	4	5
Total Advertising Spend (€)	72 000	72 000	72 000	72 000	72 000
Total Research Spend (€)	55 000	55 000	55 000	55 000	55 000
Consumer Star Ratings					
Product 1	**	**	**	**	**
Product 2	*	*	*	*	*
Product 3	***	***	***	***	***
Web-site Star Rating	****	****	****	****	****

ECONOMIC INTELLIGENCE	EU	NAFTA	Rest of Developed World
Gross Domestic Product Last Quarter (deseasonalised)	4 757	4 457	27 334
% Unemployment Rate Last Quarter (deseasonalised)	2,70	4,10	
Balance of External Trade Last Quarter	2 633	-3 115	
% Annual Central Bank Base Rate for Next Quarter	3,40	3,00	
Exchange Rate of 1 USD quoted in Euros, Next Quarter	1,08		
% Access of Population to PCs	49,00	60,00	28,00

% of Market Share by Products Sold - Paid for Information		NOT REQUESTED
Company		
Product 1:	EU	
	Nafta	
	Internet	
Product 2:	EU	
	Nafta	
	Internet	
Product 3:	EU	
	Nafta	
	Internet	

ALL COMPANY BALANCE SHEETS	
Company Number	
Assets	NOT AVAILABLE THIS QUARTER
Value of Property	
Value of Machines	
Value of Product Stock	
Value of Raw Material Stock	
Debtors	
Cash	
Investments	
Liabilities	
Tax Assessed & Due	
Creditors	
Bank Overdraft	
Unsecured Loans	
Net Assets	
Term Loans	
Net Worth	
Share Capital	
Reserves	
Shareholders Funds	

BUSINESS REPORT

Europe is expecting to perform well over the next year or two. Germany in particular is expected to shrug off the effects of economic downturn with consumer and corporate confidence increasing.

Figure A.4: Historical Management Report W011044 b

A.1.3 Quarter I '05 Report (W011051)

THE GLOBAL MANAGEMENT CHALLENGE REPORT (06G0)

GMC HISTORY					THIRD HISTORY QUARTER
GMC HISTORY	Group	Company	Identity	Year 2005	Quarter 1
GMC HISTORY					
GMC HISTORY					
GMC HISTORY					

PLEASE CHECK THE DECISIONS GIVEN BELOW

Quantities of Product to		Product 1	Product 2	Product 3
make and ship to:	EU Agents	670	370	200
(Not delivered in	Nafta Distrbutors	550	275	175
full if starred)	Internet Distributor	1200	650	325
Prices (€):	EU	275	440	665
	Nafta	270	435	660
	Internet	270	435	660

Advertising (€ '000)	Corporate Image	Direct Product Advertising		
EU	6	6	6	6
Nafta	6	6	6	6
Internet	6	6	6	6

Assembly Times (minutes)	110	160	320
Take up Product Improvements	0	0	0
R & D Expenditure (€ '000)	20	15	20

Purchasinc	Next Quarter	3-months hence	6-months hence
Raw Materials Ordered ('000)	8	0	0

Agents and Distributors	Total Number Wanted for Next Quarter	Support Payments (€ '000)	% Commission
EU Agents	1	10	10
Nafta Distributors	1	10	10
Internet Distributor	xxxxx	12	11

Production Machines to Buy	0	Number of Ports Operated	5
Machines to Sell	0	Web-site Development (€ '000)	22
Maintenance Hours per Machine	30		
Assembly Hourly Wage Rate (€.c)	10,0	Shift Level	2
Assembly Workers Hired (+) / Fired (-)	0	Assembly Workers Trained	0
Investments (+/- € '000)	0	Term Loans (€ '000)	0
Management Budget (€ '000)	120	% Dividend Paid	3
Information on Corporate Activity	1	Information on Market Shares	0
Insurance Plan Number	1		

Information Technology Report for Last Quarter	
Number of Internet Communications Ports Operated	5
Number of Internet Visits carried through successfully	23 808
% of Potential Internet Visits that failed to connect	3,3

AVAILABILITY & USE OF RESOURCES

Machines Available Last Quarter		6
Machines Available for Next Quarter		6
Assembly Workers Hours		
Total Hours Available Last Quarter		12 936
Hours Absenteeism/Sickness		319 !
Total Hours Worked Last Quarter		12 039
Notice of Strike Weeks Next Quarter		0
Machine Hours		
Total Hours Available Last Quarter		6 552
Hours Breakdown		82
Hours Planned Maintenance		98
Total Hours Worked Last Quarter		6 228
Average Machine Efficiency %		90
Raw Material Units Used & Available		
Opening Stock Available		2 380
Bought Spot Last Quarter		8 000
Bought Default Last Quarter		0
Lost/Destroyed		0
Used Last Quarter		7 364
Closing Stock Last Quarter		3 016
For Delivery Next Quarter		
Bought Last Quarter		0
Bought Quarter before Last		0
For Delivery Quarter after Next		
Bought Last Quarter		0

Human Resource Management	Assembly	Machinists
Personnel at Start of Last Quarter	22	41
Recruited during Last Quarter	0	7
Trained from Unemployed	0	0
Dismissed	0	0
Quit at end of Last Quarter	0	7
Available for Next Quarter	22	41

Agents & Distributors	EU	Nafta	Internet
Available Last Quarter	1	1	1
Quit Last Quarter	0	0	0
Dismissed Last Qtr.	0	0	0
Recruited for Next Qtr.	0	0	0
Available for Next Qtr.	1	1	1

PRODUCT MOVEMENTS & AVAILABILITY

	Product 1	Product 2	Product 3
Quantities:			
Scheduled	2 420	1 295	700
Produced	2 505	1 342	725
Rejected	85	47	25
Lost/Destroyed	0	0	0
Shipped to:			
EU Agents	670	370	200
Nafta Distributors	550	275	175
Internet Distributor	1 200	650	325
Orders from:			
EU	727	397	219
Nafta	648	338	183
Internet	1 311	706	368
Sold to:			
EU	670	370	200
Nafta	550	275	175
Internet	1 200	650	325
Order Backlog			
EU	106	56	35
Nafta	112	69	15
Warehouse Stocks			
EU	0	0	0
Nafta	0	0	0
Internet	0	0	0
Product			
Improvements	MINOR	MINOR	MINOR
Serviced under			
Guarantee	94	52	27
Internet Service			
Complaints	168	76	38
Transport	**EU**	**Nafta**	**Internet**
Average Journey(km)	1 594	500	300
No. of Loads	5	4	8

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Figure A.5: Historical Management Report W011051 a

THE GLOBAL MANAGEMENT CHALLENGE REPORT - PART 2

Group | Company | Year 2005 | Quarter 1

Accounts (Euros)

Overheads	
Advertising	72 000
Internet Distrbution Agent	102 337
Internet Service Provider	29 637
Selling Agents & Distributors	110 385
Sales Office	18 669
Guarantee Servicing	20 190
Shipping & Hired Transport	55 400
Product Research	55 000
Web-Site Development	22 000
Personnel Department	7 000
Machine Maintenance	15 300
Warehousing & Purchasing	14 245
Business Intelligence	7 500
Credit Control	4 415
Insurance	12 403
Management Budget	120 000
Other Miscellaneous Costs	32 089
Total Overheads	698 570
Taxable Profit/Loss Accumulated	136 605
Insurance Claimed	840
Insurance Excess	2 067

Profit & Loss	
Sales Revenue	1 695 085
Opening Stock Value	83 947
Materials Purchased	320 682
Assembly Wages	139 140
Machinists Wages	254 063
Machine Running Costs	100 239
Quality Control	8 000
Minus Closing Stock Value	107 546
Cost of Sales	798 525
Gross Profit/Loss	896 560
Insurance Receipts	0
Interest Received	0
Interest Paid	18 053
Overheads	698 570
Depreciation	43 332
Tax Assessed	0
Net Profit/Loss	136 605
Dividends Paid	60 000
Transferred to Reserves	76 605

Balance Sheet		
Assets		
Value of Property	250 000	
Value of Machines	1 690 044	
Total Fixed Assets		1 940 044
Value of Product Stock		0
Value of Raw Material Stock		107 546
Debtors		762 371
Cash		572 821
Investments		0
Total Assets		3 382 782
Liabilities		
Tax Assessed & Due		109 302
Creditors		354 476
Bank Overdraft		0
Unsecured Loans		0
Total Current Liabilities		463 778
Net Assets		2 919 004
Term Loans		601 772
Net Worth		2 317 232
Share Capital		2 000 000
Reserves		317 232
Shareholders Funds		2 317 232

Cash Flow Statement			
Trading Receipts			1 689 698
Capital Receipts			0
Interest Received			0
Investments Sold			0
Insurance Receipts			0
Additional Loans			0
Trading Payments			1 513 149
Capital Payments			0
Interest Paid			18 053
Investments Bought			0
Tax Paid			0
Dividends Paid			60 000
Loans Repaid			0
Net Cash Flow			98 496
Overdraft Limit Next Quarter (€)			401 000
Borrowing Power Next Quarter (€)			211 000
Raw Material Prices (US$ per '000 units)			
	Spot Price	3-Month	6-Month
	36 999	36 548	36 018

ALL-COMPANY SHARE PRICES & DIVIDENDS					
Company Number	1	2	3	4	5
Share Price (€.c)	1,213	1,213	1,213	1,213	1,213
% Dividend Paid	3	3	3	3	3

BUSINESS INTELLIGENCE					
Free Information on Companies' Activity					
Company Number	1	2	3	4	5
Product 1: EU Price (€)	275	275	275	275	275
Nafta Price (€)	270	270	270	270	270
Internet Price (€)	270	270	270	270	270
Product 2: EU Price (€)	440	440	440	440	440
Nafta Price (€)	435	435	435	435	435
Internet Price (€)	435	435	435	435	435
Product 3: EU Price (€)	665	665	665	665	665
Nafta Price (€)	660	660	660	660	660
Internet Price (€)	660	660	660	660	660
Total Number Employed	63	63	63	63	63
Assembly Wage Rate (€.c)	10,00	10,00	10,00	10,00	10,00
Number of Agents/Distributors	2	2	2	2	2

Business Activity - Paid for Information					
Company	1	2	3	4	5
Total Advertising Spend (€)	72 000	72 000	72 000	72 000	72 000
Total Research Spend (€)	55 000	55 000	55 000	55 000	55 000
Consumer Star Ratings					
Product 1	**	**	**	**	**
Product 2	*	*	*	*	*
Product 3	**	**	**	**	**
Web-site Star Rating	****	****	****	****	****

ECONOMIC INTELLIGENCE	EU	NAFTA	Rest of Developed World
Gross Domestic Product Last Quarter (deseasonalised)	4 744	4 536	27 334
% Unemployment Rate Last Quarter (deseasonalised)	2,50	3,80	
Balance of External Trade Last Quarter	2 831	-2 995	
% Annual Central Bank Base Rate for Next Quarter	3,30	3,20	
Exchange Rate of 1 USD quoted in Euros, Next Quarter	1,10		
% Access of Population to PCs	50,00	60,00	28,00

% of Market Share by Products Sold - Paid for Information		NOT REQUESTED
Company		
Product 1:	EU	
	Nafta	
	Internet	
Product 2:	EU	
	Nafta	
	Internet	
Product 3:	EU	
	Nafta	
	Internet	

ALL COMPANY BALANCE SHEETS	
Company Number	
Assets	NOT AVAILABLE THIS QUARTER
Value of Property	
Value of Machines	
Value of Product Stock	
Value of Raw Material Stock	
Debtors	
Cash	
Investments	
Liabilities	
Tax Assessed & Due	
Creditors	
Bank Overdraft	
Unsecured Loans	
Net Assets	
Term Loans	
Net Worth	
Share Capital	
Reserves	
Shareholders Funds	

BUSINESS REPORT

Investors are looking at European companies for high returns. Mid size organisations in France are favoured because of production efficiencies obtained by restructuring and new management.

Figure A.6: Historical Management Report W011051 b

A.1.4 Quarter II '05 Report (W011052)

THE GLOBAL MANAGEMENT CHALLENGE REPORT (06G0)

GMC HISTORY							FOURTH HISTORY QUARTER
GMC HISTORY	Group	Company	Identity	Year	2005	Quarter	2
GMC HISTORY							
GMC HISTORY							
GMC HISTORY							

PLEASE CHECK THE DECISIONS GIVEN BELOW

			Product 1	Product 2	Product 3
Quantities of Product to					
make and ship to:	EU Agents		650 *	370	200
(Not delivered in	Nafta Distrbutors		525 *	275	175
full if starred)	Internet Distributor		1175 *	650	325
Prices (€):	EU		275	440	665
	Nafta		270	435	660
	Internet		270	435	660
Advertising (€ '000)		Corporate Image	Direct Product Advertising		
	EU	6	6	6	6
	Nafta	6	6	6	6
	Internet	6	6	6	6
Assembly Times (minutes)			110	160	320
Take up Product Improvements			0	0	0
R & D Expenditure (€ '000)			20	15	20
Purchasing			Next Quarter	3-months hence	6-months hence
Raw Materials Ordered ('000)			8	0	0
			Total Number Wanted for Next Quarter	Support Payments (€ '000)	% Commission
Agents and Distributors	EU Agents		1	10	10
	Nafta Distributors		1	10	10
	Internet Distributor		xxxxx	12	11
Production	Machines to Buy	0	Number of Ports Operated		5
	Machines to Sell	0	Web-site Development (€ '000)		22
Maintenance Hours per Machine		30			
Assembly Hourly Wage Rate (€ c)		10,0	Shift Level		2
Assembly Workers Hired (+) / Fired (-)		0	Assembly Workers Trained		0
Investments (+/- € '000)		0	Term Loans (€ '000)		0
Management Budget (€ '000)		120	% Dividend Paid		0
Information on Corporate Activity		1	Information on Market Shares		0
Insurance Plan Number		1			
Information Technology Report for Last Quarter					
Number of Internet Communications Ports Operated				5	
Number of Internet Visits carried through successfully				22 782	
% of Potential Internet Visits that failed to connect				2,9	

AVAILABILITY & USE OF RESOURCES

Machines Available Last Quarter		6
Machines Available for Next Quarter		6
Assembly Workers Hours		
Total Hours Available Last Quarter		12 936
Hours Absenteeism/Sickness		278
Total Hours Worked Last Quarter		11 906
Notice of Strike Weeks Next Quarter		0
Machine Hours		
Total Hours Available Last Quarter		6 552
Hours Breakdown		157
Hours Planned Maintenance		23
Total Hours Worked Last Quarter		6 185
Average Machine Efficiency %		90
Raw Material Units Used & Available		
Opening Stock Available		3 016
Bought Spot Last Quarter		8 000
Bought Default Last Quarter		0
Lost/Destroyed		0
Used Last Quarter		7 292
Closing Stock Last Quarter		3 724
For Delivery Next Quarter		
Bought Last Quarter		0
Bought Quarter before Last		0
For Delivery Quarter after Next		
Bought Last Quarter		0
Human Resource Management	Assembly	Machinists
Personnel at Start of Last Quarter	22	41
Recruited during Last Quarter	0	7
Trained from Unemployed	0	0
Dismissed	0	0
Quit at end of Last Quarter	0	7
Available for Next Quarter	22	41

Agents & Distributors	**EU**	**Nafta**	**Internet**
Available Last Quarter	1	1	1
Quit Last Quarter	0	0	0
Dismissed Last Qtr.	0	0	0
Recruited for Next Qtr.	0	0	0
Available for Next Qtr.	1	1	1

PRODUCT MOVEMENTS & AVAILABILITY

	Product 1	Product 2	Product 3
Quantities:			
Scheduled	2 350	1 295	700
Produced	2 433	1 342	725
Rejected	83	47	25
Lost/Destroyed	17	0	0
Shipped to:			
EU Agents	645	370	200
Nafta Distributors	521	275	175
Internet Distributor	1 167	650	325
Orders from:			
EU	773	417	231
Nafta	710	371	199
Internet	1 390	740	392
Sold to:			
EU	645	370	200
Nafta	521	275	175
Internet	1 167	650	325
Order Backlog			
EU	117	51	33
Nafta	150	82	19
Warehouse Stocks			
EU	0	0	0
Nafta	0	0	0
Internet	0	0	0
Product			
Improvements	NONE	MINOR	MINOR
Serviced under			
Guarantee	97	53	40
Internet Service			
Complaints	166	76	42
Transport	**EU**	**Nafta**	**Internet**
Average Journey(km)	1 594	500	300
No. of Loads	5	4	8

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Figure A.7: Historical Management Report W011052 a

THE GLOBAL MANAGEMENT CHALLENGE REPORT - PART 2

Group | Company | Year 2005 | Quarter 2

Accounts (Euros)

Overheads	
Advertising	72 000
Internet Distrbution Agent	101 356
Internet Service Provider	29 369
Selling Agents & Distributors	112 545
Sales Office	19 900
Guarantee Servicing	23 020
Shipping & Hired Transport	55 400
Product Research	55 000
Web-Site Development	22 000
Personnel Department	7 000
Machine Maintenance	15 300
Warehousing & Purchasing	15 925
Business Intelligence	7 500
Credit Control	4 328
Insurance	12 285
Management Budget	120 000
Other Miscellaneous Costs	32 108
Total Overheads	705 036
Taxable Profit/Loss Accumulated	279 385
Insurance Claimed	33 341
Insurance Excess	2 047

Profit & Loss	
Sales Revenue	1 671 390
Opening Stock Value	107 546
Materials Purchased	325 591
Assembly Wages	136 480
Machinists Wages	256 290
Machine Running Costs	99 825
Quality Control	8 000
Minus Closing Stock Value	139 169
Cost of Sales	794 563
Gross Profit/Loss	876 827
Insurance Receipts	31 294
Interest Received	0
Interest Paid	18 053
Overheads	705 036
Depreciation	42 252
Tax Assessed	0
Net Profit/Loss	142 780
Dividends Paid	0
Transferred to Reserves	142 780

Balance Sheet		
Assets		
Value of Property	250 000	
Value of Machines	1 647 792	
Total Fixed Assets		1 897 792
Value of Product Stock		0
Value of Raw Material Stock		139 169
Debtors		750 754
Cash		635 509
Investments		0
Total Assets		3 423 224
Liabilities		
Tax Assessed & Due		0
Creditors		361 440
Bank Overdraft		0
Unsecured Loans		0
Total Current Liabilities		361 440
Net Assets		3 061 784
Term Loans		601 772
Net Worth		2 460 012
Share Capital		2 000 000
Reserves		460 012
Shareholders Funds		2 460 012

Cash Flow Statement			
Trading Receipts			1 683 007
Capital Receipts			0
Interest Received			0
Investments Sold			0
Insurance Receipts			31 294
Additional Loans			0
Trading Payments			1 524 258
Capital Payments			0
Interest Paid			18 053
Investments Bought			0
Tax Paid			109 302
Dividends Paid			0
Loans Repaid			0
Net Cash Flow			62 688
Overdraft Limit Next Quarter (€)			509 000
Borrowing Power Next Quarter (€)			165 000
Raw Material Prices (US$ per '000 units)			
	Spot Price	3-Month	6-Month
	37 078	36 660	36 107

ALL-COMPANY SHARE PRICES & DIVIDENDS					
Company Number	1	2	3	4	5
Share Price (€.c)	1,275	1,275	1,275	1,275	1,275
% Dividend Paid	0	0	0	0	0

BUSINESS INTELLIGENCE					
Free Information on Companies' Activity					
Company Number	1	2	3	4	5
Product 1: EU Price (€)	275	275	275	275	275
Nafta Price (€)	270	270	270	270	270
Internet Price (€)	270	270	270	270	270
Product 2: EU Price (€)	440	440	440	440	440
Nafta Price (€)	435	435	435	435	435
Internet Price (€)	435	435	435	435	435
Product 3: EU Price (€)	665	665	665	665	665
Nafta Price (€)	660	660	660	660	660
Internet Price (€)	660	660	660	660	660
Total Number Employed	63	63	63	63	63
Assembly Wage Rate (€.c)	10,00	10,00	10,00	10,00	10,00
Number of Agents/Distributors	2	2	2	2	2

Business Activity - Paid for Information					
Company	1	2	3	4	5
Total Advertising Spend (€)	72 000	72 000	72 000	72 000	72 000
Total Research Spend (€)	55 000	55 000	55 000	55 000	55 000
Consumer Star Ratings					
Product 1	**	**	**	**	**
Product 2	*	*	*	*	*
Product 3	**	**	**	**	**
Web-site Star Rating	****	****	****	****	****

ECONOMIC INTELLIGENCE	EU	NAFTA	Rest of Developed World
Gross Domestic Product Last Quarter (deseasonalised)	4 738	4 576	27 334
% Unemployment Rate Last Quarter (deseasonalised)	2,20	3,60	
Balance of External Trade Last Quarter	2 885	-2 976	
% Annual Central Bank Base Rate for Next Quarter	3,20	3,20	
Exchange Rate of 1 USD quoted in Euros, Next Quarter	1,15		
% Access of Population to PCs	50,00	61,00	28,00

% of Market Share by Products Sold - Paid for Information		NOT REQUESTED
Company		
Product 1:	EU	
	Nafta	
	Internet	
Product 2:	EU	
	Nafta	
	Internet	
Product 3:	EU	
	Nafta	
	Internet	

ALL COMPANY BALANCE SHEETS	
Company Number	
Assets	NOT AVAILABLE THIS QUARTER
Value of Property	
Value of Machines	
Value of Product Stock	
Value of Raw Material Stock	
Debtors	
Cash	
Investments	
Liabilities	
Tax Assessed & Due	
Creditors	
Bank Overdraft	
Unsecured Loans	
Net Assets	
Term Loans	
Net Worth	
Share Capital	
Reserves	
Shareholders Funds	

BUSINESS REPORT

Some European countries are showing signs of overheating economies. Membership of the Euro and its one-size fits all interest rates mean that countries such as Spain are undergoing an unsustainable consumer boom. Spain has been one of the few success stories of western Europe in

Figure A.8: Historical Management Report W011052 b

A.1.5 Quarter III '05 Report (W011053)

THE GLOBAL MANAGEMENT CHALLENGE REPORT (06G0)

GMC HISTORY
GMC HISTORY — Group — Company — Identity — Year 2005 — Quarter 3 — FIFTH HISTORY QUARTER
GMC HISTORY
GMC HISTORY
GMC HISTORY

PLEASE CHECK THE DECISIONS GIVEN BELOW

			Product 1	Product 2	Product 3
Quantities of Product to					
make and ship to:	EU Agents		640	365	150 *
(Not delivered in	Nafta Distrbutors		520	270	130 *
full if starred)	Internet Distributor		1150	650	225 *
Prices (€):	EU		275	440	665
	Nafta		270	435	660
	Internet		270	435	660
Advertising (€ '000)		Corporate Image	Direct Product Advertising		
	EU	6	6	6	6
	Nafta	6	6	6	6
	Internet	6	6	6	6
Assembly Times (minutes)			110	160	320
Take up Product Improvements			1	0	0
R & D Expenditure (€ '000)			20	15	20
Purchasinc			Next Quarter	3-months hence	6-months hence
Raw Materials Ordered ('000)			8	0	0
			Total Number Wanted for Next Quarter	Support Payments (€ '000)	% Commission
Agents and Distributors					
	EU Agents		1	10	10
	Nafta Distributors		1	10	10
	Internet Distributor		xxxxx	12	11
Production Machines to Buy		0	Number of Ports Operated		5
Machines to Sell		0	Web-site Development (€ '000)		22
Maintenance Hours per Machine		30			
Assembly Hourly Wage Rate (€ c)		10,0	Shift Level		2
Assembly Workers Hired (+) / Fired (-)		0	Assembly Workers Trained		0
Investments (+/- € '000)		0	Term Loans (€ '000)		0
Management Budget (€ '000)		120	% Dividend Paid		3
Information on Corporate Activity		1	Information on Market Shares		0
Insurance Plan Number		1			
Information Technology Report for Last Quarter					
Number of Internet Communications Ports Operated				5	
Number of Internet Visits carried through successfully				22 100	
% of Potential Internet Visits that failed to connect				2,6	

AVAILABILITY & USE OF RESOURCES

Machines Available Last Quarter			6
Machines Available for Next Quarter			6
Assembly Workers Hours			
Total Hours Available Last Quarter			12 936
Hours Absenteeism/Sickness			259
Total Hours Worked Last Quarter			10 725
Notice of Strike Weeks Next Quarter			0
Machine Hours			
Total Hours Available Last Quarter			6 552
Hours Breakdown			87
Hours Planned Maintenance			93
Total Hours Worked Last Quarter			5 880
Average Machine Efficiency %			87
Raw Material Units Used & Available			
Opening Stock Available			3 724
Bought Spot Last Quarter			8 000
Bought Default Last Quarter			0
Lost/Destroyed			0
Used Last Quarter			6 624
Closing Stock Last Quarter			5 100
For Delivery Next Quarter			
Bought Last Quarter			0
Bought Quarter before Last			0
For Delivery Quarter after Next			
Bought Last Quarter			0
Human Resource Management		Assembly	Machinists
Personnel at Start of Last Quarter		22	41
Recruited during Last Quarter		0	7
Trained from Unemployed		0	0
Dismissed		0	0
Quit at end of Last Quarter		0	7
Available for Next Quarter		22	41
Agents & Distributors	**EU**	**Nafta**	**Internet**
Available Last Quarter	1	1	1
Quit Last Quarter	0	0	0
Dismissed Last Qtr.	0	0	0
Recruited for Next Qtr.	0	0	0
Available for Next Qtr.	1	1	1

PRODUCT MOVEMENTS & AVAILABILITY

	Product 1	Product 2	Product 3
Quantities:			
Scheduled	2 310	1 285	505
Produced	2 391	1 332	523
Rejected	81	47	18
Lost/Destroyed	0	0	62
Shipped to:			
EU Agents	640	365	131
Nafta Distributors	520	270	114
Internet Distributor	1 150	650	198
Orders from:			
EU	777	400	221
Nafta	756	390	206
Internet	1 374	712	377
Sold to:			
EU	640	365	131
Nafta	520	270	114
Internet	1 150	650	198
Order Backlog			
EU	127	43	61
Nafta	193	101	55
Warehouse Stocks			
EU	0	0	0
Nafta	0	0	0
Internet	0	0	0
Product			
Improvements	NONE	MINOR	MINOR
Serviced under			
Guarantee	97	53	29
Internet Service			
Complaints	164	76	31
Transport	**EU**	**Nafta**	**Internet**
Average Journey(km)	1 594	500	300
No. of Loads	4	4	7

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Figure A.9: Historical Management Report W011053 a

THE GLOBAL MANAGEMENT CHALLENGE REPORT - PART 2

Group		Company	Year	2005	Quarter	3

Accounts (Euros)

Overheads	
Advertising	72 000
Internet Distrbution Agent	91 631
Internet Service Provider	26 717
Selling Agents & Distributors	106 972
Sales Office	19 758
Guarantee Servicing	21 020
Shipping & Hired Transport	52 150
Product Research	55 000
Web-Site Development	22 000
Personnel Department	7 000
Machine Maintenance	15 300
Warehousing & Purchasing	18 530
Business Intelligence	7 500
Credit Control	4 038
Insurance	12 221
Management Budget	120 000
Other Miscellaneous Costs	32 045
Total Overheads	683 882
Taxable Profit/Loss Accumulated	335 236
Insurance Claimed	41 225
Insurance Excess	2 036

Profit & Loss	
Sales Revenue	1 489 895
Opening Stock Value	139 169
Materials Purchased	341 117
Assembly Wages	114 675
Machinists Wages	230 276
Machine Running Costs	97 140
Quality Control	8 000
Minus Closing Stock Value	200 275
Cost of Sales	730 102
Gross Profit/Loss	759 793
Insurance Receipts	39 189
Interest Received	0
Interest Paid	18 053
Overheads	683 882
Depreciation	41 196
Tax Assessed	0
Net Profit/Loss	55 851
Dividends Paid	60 000
Transferred to Reserves	-4 149

Balance Sheet		
Assets		
Value of Property	250 000	
Value of Machines	1 606 596	
Total Fixed Assets		1 856 596
Value of Product Stock		0
Value of Raw Material Stock		200 275
Debtors		675 588
Cash		691 734
Investments		0
Total Assets		3 424 193
Liabilities		
Tax Assessed & Due		0
Creditors		366 558
Bank Overdraft		0
Unsecured Loans		0
Total Current Liabilities		366 558
Net Assets		3 057 635
Term Loans		601 772
Net Worth		2 455 863
Share Capital		2 000 000
Reserves		455 863
Shareholders Funds		2 455 863

Cash Flow Statement	
Trading Receipts	1 565 061
Capital Receipts	0
Interest Received	0
Investments Sold	0
Insurance Receipts	39 189
Additional Loans	0
Trading Payments	1 469 972
Capital Payments	0
Interest Paid	18 053
Investments Bought	0
Tax Paid	0
Dividends Paid	60 000
Loans Repaid	0
Net Cash Flow	56 225
Overdraft Limit Next Quarter (€)	467 000
Borrowing Power Next Quarter (€)	107 000

Raw Material Prices (US$ per '000 units)		
Spot Price	3-Month	6-Month
37 008	36 769	36 360

ALL-COMPANY SHARE PRICES & DIVIDENDS					
Company Number	1	2	3	4	5
Share Price (€.c)	1,175	1,175	1,175	1,175	1,175
% Dividend Paid	3	3	3	3	3

BUSINESS INTELLIGENCE					
Free Information on Companies' Activity					
Company Number	1	2	3	4	5
Product 1: EU Price (€)	275	275	275	275	275
Nafta Price (€)	270	270	270	270	270
Internet Price (€)	270	270	270	270	270
Product 2: EU Price (€)	440	440	440	440	440
Nafta Price (€)	435	435	435	435	435
Internet Price (€)	435	435	435	435	435
Product 3: EU Price (€)	665	665	665	665	665
Nafta Price (€)	660	660	660	660	660
Internet Price (€)	660	660	660	660	660
Total Number Employed	63	63	63	63	63
Assembly Wage Rate (€.c)	10,00	10,00	10,00	10,00	10,00
Number of Agents/Distributors	2	2	2	2	2

Business Activity - Paid for Information					
Company	1	2	3	4	5
Total Advertising Spend (€)	72 000	72 000	72 000	72 000	72 000
Total Research Spend (€)	55 000	55 000	55 000	55 000	55 000
Consumer Star Ratings					
Product 1	***	***	***	***	***
Product 2	*	*	*	*	*
Product 3	**	**	**	**	**
Web-site Star Rating	****	****	****	****	****

ECONOMIC INTELLIGENCE	EU	NAFTA	Rest of Developed World
Gross Domestic Product Last Quarter (deseasonalised)	4 801	4 611	27 334
% Unemployment Rate Last Quarter (deseasonalised)	2,20	3,40	
Balance of External Trade Last Quarter	2 918	-2 948	
% Annual Central Bank Base Rate for Next Quarter	3,10	3,20	
Exchange Rate of 1 USD quoted in Euros, Next Quarter	1,20		
% Access of Population to PCs	50,00	61,00	28,00

% of Market Share by Products Sold - Paid for Information		NOT REQUESTED
Company		
Product 1:	EU	
	Nafta	
	Internet	
Product 2:	EU	
	Nafta	
	Internet	
Product 3:	EU	
	Nafta	
	Internet	

ALL COMPANY BALANCE SHEETS	
Company Number	
Assets	NOT AVAILABLE THIS QUARTER
Value of Property	
Value of Machines	
Value of Product Stock	
Value of Raw Material Stock	
Debtors	
Cash	
Investments	
Liabilities	
Tax Assessed & Due	
Creditors	
Bank Overdraft	
Unsecured Loans	
Net Assets	
Term Loans	
Net Worth	
Share Capital	
Reserves	
Shareholders Funds	

BUSINESS REPORT

Wall street is expecting further increases in the value of the dollar. Traders continue to believe that the dollar will strengthen further against European countries.

Figure A.10: Historical Management Report W011053 b

A.2 Management reports

A.2.1 Quarter IV '05 Report (W232054)

THE GLOBAL MANAGEMENT CHALLENGE REPORT (06PS)

Łukasz Kalinowski | GMC Poland 2006
kontrolerzy | Group 23 | Company 2 | Identity 0 | Year 2005 | Quarter 4 | ROUND I

REPORT AFTER FIRST DECISION

PLEASE CHECK THE DECISIONS GIVEN BELOW

Quantities of Product to			Product 1	Product 2	Product 3
make and ship to:	EU Agents		988 *	476 *	306 *
(Not delivered in	Nafta Distrbutors		270 *	135 *	45 *
full if starred)	Internet Distributor		1471 *	744 *	406 *
Prices (€):	EU		275	440	665
	Nafta		358	572	865
	Internet		270	435	660
Advertising (€ '000)		Corporate Image	Direct Product Advertising		
	EU	6	6	6	6
	Nafta	6	4	3	2
	Internet	6	6	6	6
Assembly Times (minutes)			110	160	320
Take up Product Improvements			0	0	0
R & D Expenditure (€ '000)			15	15	15
Purchasing			Next Quarter	3-months hence	6-months hence
Raw Materials Ordered ('000)			8	8	9
Agents and Distributors			Total Number Wanted for Next Quarter	Support Payments (€ '000)	% Commission
	EU Agents		1	12	10
	Nafta Distributors		1	10	10
	Internet Distributor		xxxxx	12	11
Production	Machines to Buy	1	Number of Ports Operated		6
	Machines to Sell	0	Web-site Development (€ '000)		25
Maintenance Hours per Machine		32			
Assembly Hourly Wage Rate (€.c)		10,5	Shift Level		2
Assembly Workers Hired (+) / Fired (-)		5	Assembly Workers Trained		0
Investments (+/- € '000)		0	Term Loans (€ '000)		0
Management Budget (€ '000)		120	% Dividend Paid		0
Information on Corporate Activity		1	Information on Market Shares		1
Insurance Plan Number		1			
Information Technology Report for Last Quarter					
Number of Internet Communications Ports Operated			6		
Number of Internet Visits carried through successfully			21 956		
% of Potential Internet Visits that failed to connect			0,9		

AVAILABILITY & USE OF RESOURCES

Machines Available Last Quarter			6
Machines Available for Next Quarter			6
Assembly Workers Hours			
Total Hours Available Last Quarter			12 936
Hours Absenteeism/Sickness			139 !
Total Hours Worked Last Quarter			12 003
Notice of Strike Weeks Next Quarter			0
Machine Hours			
Total Hours Available Last Quarter			6 552
Hours Breakdown			84
Hours Planned Maintenance			108
Total Hours Worked Last Quarter			6 465
Average Machine Efficiency %			87
Raw Material Units Used & Available			
Opening Stock Available			5 100
Bought Spot Last Quarter			8 000
Bought Default Last Quarter			0
Lost/Destroyed			0
Used Last Quarter			7 311
Closing Stock Last Quarter			5 789
For Delivery Next Quarter			
Bought Last Quarter			8 000
Bought Quarter before Last			0
For Delivery Quarter after Next			
Bought Last Quarter			9 000
Human Resource Management		Assembly	Machinists
Personnel at Start of Last Quarter		22	41
Recruited during Last Quarter		5	7
Trained from Unemployed		0	0
Dismissed		0	0
Quit at end of Last Quarter		0	2
Available for Next Quarter		27	46
Agents & Distributors	**EU**	**Nafta**	**Internet**
Available Last Quarter	1	1	1
Quit Last Quarter	0	0	0
Dismissed Last Qtr.	0	0	0
Recruited for Next Qtr.	0	0	0
Available for Next Qtr.	1	1	1

PRODUCT MOVEMENTS & AVAILABILITY

	Product 1	Product 2	Product 3
Quantities:			
Scheduled	2 729	1 355	757
Produced	2 587	1 285	718
Rejected	89	45	25
Lost/Destroyed	0	47	0
Shipped to:			
EU Agents	904	419	280
Nafta Distributors	247	118	41
Internet Distributor	1 347	656	372
Orders from:			
EU	842	452	238
Nafta	423	224	124
Internet	1 570	821	413
Sold to:			
EU	904	419	280
Nafta	247	118	41
Internet	1 347	656	372
Order Backlog			
EU	32	38	9
Nafta	119	69	50
Warehouse Stocks			
EU	0	0	0
Nafta	0	0	0
Internet	0	0	0
Product			
Improvements	NONE	MINOR	MINOR
Serviced under			
Guarantee	96	207	36
Internet Service			
Complaints	172	102	33
Transport	**EU**	**Nafta**	**Internet**
Average Journey(km)	1 594	500	300
No. of Loads	6	2	9

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Figure A.11: Historical Management Report W232054 a

THE GLOBAL MANAGEMENT CHALLENGE REPORT - PART 2

Group	23	Company	2	Year	2005	Quarter	4

Accounts (Euros)

Overheads	
Advertising	63 000
Internet Distrbution Agent	110 401
Internet Service Provider	31 835
Selling Agents & Distributors	100 007
Sales Office	20 291
Guarantee Servicing	39 285
Shipping & Hired Transport	40 050
Product Research	45 000
Web-Site Development	25 000
Personnel Department	17 000
Machine Maintenance	16 320
Warehousing & Purchasing	21 110
Business Intelligence	12 500
Credit Control	4 384
Insurance	12 341
Management Budget	120 000
Other Miscellaneous Costs	32 125
Total Overheads	710 649
Taxable Profit/Loss Accumulated	390 920
Insurance Claimed	42 787
Insurance Excess	2 056

Profit & Loss	
Sales Revenue	1 715 277
Opening Stock Value	200 275
Materials Purchased	1 100 947
Assembly Wages	145 341
Machinists Wages	284 168
Machine Running Costs	102 561
Quality Control	8 000
Minus Closing Stock Value	909 834
Cost of Sales	931 458
Gross Profit/Loss	783 819
Insurance Receipts	40 731
Interest Received	0
Interest Paid	18 053
Overheads	710 649
Depreciation	40 164
Tax Assessed	117 276
Net Profit/Loss	-61 592
Dividends Paid	0
Transferred to Reserves	-61 592

Balance Sheet		
Assets		
Value of Property	250 000	
Value of Machines	1 741 432	
Total Fixed Assets		1 991 432
Value of Product Stock		0
Value of Raw Material Stock		909 834
Debtors		658 141
Cash		309 150
Investments		0
Total Assets		3 868 557
Liabilities		
Tax Assessed & Due		117 276
Creditors		755 238
Bank Overdraft		0
Unsecured Loans		0
Total Current Liabilities		872 514
Net Assets		2 996 043
Term Loans		601 772
Net Worth		2 394 271
Share Capital		2 000 000
Reserves		394 271
Shareholders Funds		2 394 271

Cash Flow Statement			
Trading Receipts			1 732 724
Capital Receipts			0
Interest Received			0
Investments Sold			0
Insurance Receipts			40 731
Additional Loans			0
Trading Payments			1 962 986
Capital Payments			175 000
Interest Paid			18 053
Investments Bought			0
Tax Paid			0
Dividends Paid			0
Loans Repaid			0
Net Cash Flow			-382 584
Overdraft Limit Next Quarter (€)			300 000
Borrowing Power Next Quarter (€)			436 000
Raw Material Prices (US$ per '000 units)			
	Spot Price	3-Month	6-Month
	37 008	36 769	36 360

ALL-COMPANY SHARE PRICES & DIVIDENDS

Company Number	1	2	3	4
Share Price (€.c)	1,203	1,337	1,280	1,294
% Dividend Paid	0	0	0	0

BUSINESS INTELLIGENCE

Free Information on Companies' Activity

Company Number		1	2	3	4
Product 1:	EU Price (€)	275	275	277	280
	Nafta Price (€)	277	358	275	275
	Internet Price (€)	271	270	273	275
Product 2:	EU Price (€)	440	440	442	445
	Nafta Price (€)	433	572	440	440
	Internet Price (€)	437	435	437	435
Product 3:	EU Price (€)	665	665	667	670
	Nafta Price (€)	666	865	665	665
	Internet Price (€)	666	660	663	665
Total Number Employed		59	73	78	74
Assembly Wage Rate (€.c)		10,00	10,50	10,50	10,50
Number of Agents/Distributors		2	2	2	2

Business Activity - Paid for Information

Company	1	2	3	4	0
Total Advertising Spend (€)	73 000	63 000	72 000	75 000	0
Total Research Spend (€)	39 000	45 000	55 000	60 000	0
Consumer Star Ratings					
Product 1	**	**	**	**	0
Product 2	*	*	*	*	0
Product 3	**	**	**	**	0
Web-site Star Rating	****	****	****	****	0

ECONOMIC INTELLIGENCE	EU	NAFTA	Rest of Developed World
Gross Domestic Product Last Quarter (deseasonalised)	4 804	4 682	27 334
% Unemployment Rate Last Quarter (deseasonalised)	2,20	3,20	
Balance of External Trade Last Quarter	2 918	-2 948	
% Annual Central Bank Base Rate for Next Quarter	3,10	3,20	
Exchange Rate of 1 USD quoted in Euros, Next Quarter	1,22		
% Access of Population to PCs	50,00	61,00	28,00

% of Market Share by Products Sold - Paid for Information

Company		1	2	3	4
Product 1:	EU	3,9	5,0	3,6	3,9
	Nafta	4,4	2,0	6,8	4,4
	Internet	13,2	13,2	9,8	12,2
Product 2:	EU	3,8	4,6	3,6	3,9
	Nafta	4,0	1,9	3,9	4,8
	Internet	10,9	12,5	12,6	12,1
Product 3:	EU	3,7	8,0	5,1	4,3
	Nafta	4,5	1,8	8,4	5,6
	Internet	10,0	17,9	13,5	10,8

ALL COMPANY BALANCE SHEETS

Company Number	1	2	3	4
Assets				
Value of Property	250 000	250 000	250 000	250 000
Value of Machines	1 566 432	1 741 432	1 916 432	1 566 432
Value of Product Stock				
Value of Raw Material Stock	422 119	909 834	351 133	128 436
Debtors	667 556	658 141	813 647	721 385
Cash	650 236	309 150	166 892	769 138
Investments	1 000			
Liabilities				
Tax Assessed & Due	115 077	117 276	99 786	114 903
Creditors	451 353	755 238	443 082	329 979
Bank Overdraft				
Unsecured Loans				
Net Assets	2 990 913	2 996 043	2 955 236	2 990 509
Term Loans	601 772	601 772	601 772	601 772
Net Worth	2 389 141	2 394 271	2 353 464	2 388 737
Share Capital	2 000 000	2 000 000	2 000 000	2 000 000
Reserves	389 141	394 271	353 464	388 737
Shareholders Funds	2 389 141	2 394 271	2 353 464	2 388 737

BUSINESS REPORT

Governments around the world are still poorly prepared to prevent a bird flu pandemic from causing severe. economic disruption. The International Monetary Fund claims that an outbreak could wipe as much as eight percent off Gross Domestic Product.

Figure A.12: Historical Management Report W232054 b

A.2.2 Quarter I '06 Report (W232061)

THE GLOBAL MANAGEMENT CHALLENGE REPORT (06PS)

Łukasz Kalinowski													GMC Poland 2006
kontrolerzy	Group	23	Company	2	Identity	0	Year	2006	Quarter	1			ROUND I
													REPORT AFTER SECOND DECISION

PLEASE CHECK THE DECISIONS GIVEN BELOW

Quantities of Product to		Product 1		Product 2		Product 3	
make and ship to:	EU Agents	744	*	421	*	208	*
(Not delivered in	Nafta Distrbutors	500	*	269	*	161	*
full if starred)	Internet Distributor	866	*	717	*	355	*
Prices (€):	EU	289		459		699	
	Nafta	319		509		769	
	Internet	309		459		699	

Advertising (€ '000)	Corporate Image	Direct Product Advertising		
EU	6	8	8	5
Nafta	4	5	4	3
Internet	6	8	8	5

Assembly Times (minutes)	150	225	400
Take up Product Improvements	0	0	0
R & D Expenditure (€ '000)	13	13	10

Purchasing	Next Quarter	3-months hence	6-months hence
Raw Materials Ordered ('000)	0	0	7

Agents and Distributors	Total Number Wanted for Next Quarter	Support Payments (€ '000)	% Commission
EU Agents	1	12	10
Nafta Distributors	1	10	10
Internet Distributor	xxxxx	12	11

Production Machines to Buy	1	Number of Ports Operated	6
Machines to Sell	0	Web-site Development (€ '000)	25
Maintenance Hours per Machine	32		
Assembly Hourly Wage Rate (€.c)	10,5	Shift Level	2
Assembly Workers Hired (+) / Fired (-)	3	Assembly Workers Trained	0
Investments (+/- € '000)	0	Term Loans (€ '000)	0
Management Budget (€ '000)	120	% Dividend Paid	3
Information on Corporate Activity	0	Information on Market Shares	0
Insurance Plan Number	1		

Information Technology Report for Last Quarter	
Number of Internet Communications Ports Operated	6
Number of Internet Visits carried through successfully	21 995
% of Potential Internet Visits that failed to connect	0,9

AVAILABILITY & USE OF RESOURCES

Machines Available Last Quarter		6	
Machines Available for Next Quarter		7	
Assembly Workers Hours			
Total Hours Available Last Quarter		15 876	
Hours Absenteeism/Sickness		354	
Total Hours Worked Last Quarter		15 522	
Notice of Strike Weeks Next Quarter		0	
Machine Hours			
Total Hours Available Last Quarter		6 552	
Hours Breakdown		117	!
Hours Planned Maintenance		75	
Total Hours Worked Last Quarter		6 185	
Average Machine Efficiency %		87	
Raw Material Units Used & Available			
Opening Stock Available		13 789	
Bought Spot Last Quarter		0	
Bought Default Last Quarter		0	
Lost/Destroyed		0	
Used Last Quarter		7 159	
Closing Stock Last Quarter		6 630	
For Delivery Next Quarter			
Bought Last Quarter		0	
Bought Quarter before Last		9 000	
For Delivery Quarter after Next			
Bought Last Quarter		7 000	
Human Resource Management	Assembly	Machinists	
Personnel at Start of Last Quarter	27	46	
Recruited during Last Quarter	3	2	
Trained from Unemployed	0	0	
Dismissed	0	0	
Quit at end of Last Quarter	0	7	
Available for Next Quarter	30	41	

Agents & Distributors	**EU**	**Nafta**	**Internet**
Available Last Quarter	1	1	1
Quit Last Quarter	0	0	0
Dismissed Last Qtr.	0	0	0
Recruited for Next Qtr.	0	0	0
Available for Next Qtr.	1	1	1

PRODUCT MOVEMENTS & AVAILABILITY

	Product 1	Product 2	Product 3
Quantities:			
Scheduled	2 110	1 407	724
Produced	2 127	1 418	732
Rejected	55	37	21
Lost/Destroyed	0	95	90
Shipped to:			
EU Agents	730	384	178
Nafta Distributors	491	246	138
Internet Distributor	851	656	305
Orders from:			
EU	659	355	187
Nafta	535	280	143
Internet	1 018	642	329
Sold to:			
EU	685	384	178
Nafta	491	246	138
Internet	851	642	305
Order Backlog			
EU	0	1	8
Nafta	81	51	27
Warehouse Stocks			
EU	45	0	0
Nafta	0	0	0
Internet	0	14	0
Product Improvements	NONE	MINOR	MINOR
Serviced under Guarantee	100	244	82
Internet Service Complaints	138	96	37
Transport	**EU**	**Nafta**	**Internet**
Average Journey(km)	1 594	500	300
No. of Loads	5	4	7

Figure A.13: Historical Management Report W232061 a

THE GLOBAL MANAGEMENT CHALLENGE REPORT - PART 2

Group	23	Company	2	Year	2006	Quarter	1

Accounts (Euros)

Overheads		Profit & Loss	
Advertising	70 000	Sales Revenue	1 665 120
Internet Distrbution Agent	96 790		
Internet Service Provider	29 123	Opening Stock Value	909 834
Selling Agents & Distributors	109 205	Materials Purchased	310 514
Sales Office	17 464	Assembly Wages	194 984
Guarantee Servicing	52 499	Machinists Wages	266 165
Shipping & Hired Transport	54 750	Machine Running Costs	99 721
Product Research	36 000	Quality Control	8 000
Web-Site Development	25 000	Minus Closing Stock Value	911 470
Personnel Department	8 000	Cost of Sales	877 748
Machine Maintenance	16 320		
Warehousing & Purchasing	23 123	Gross Profit/Loss	787 372
Business Intelligence	0		
Credit Control	3 920	Insurance Receipts	112 997
Insurance	17 407	Interest Received	0
Management Budget	120 000	Interest Paid	22 658
Other Miscellaneous Costs	32 128	Overheads	711 729
Total Overheads	711 729	Depreciation	47 912
		Tax Assessed	0
Taxable Profit/Loss Accumulated	118 070		
		Net Profit/Loss	118 070
Insurance Claimed	115 898	Dividends Paid	60 000
Insurance Excess	2 901	Transferred to Reserves	58 070

Balance Sheet			Cash Flow Statement	
Assets			Trading Receipts	1 549 121
Value of Property	250 000		Capital Receipts	0
Value of Machines	2 043 520		Interest Received	0
Total Fixed Assets		2 293 520	Investments Sold	0
Value of Product Stock		7 984	Insurance Receipts	112 997
Value of Raw Material Stock		903 486	Additional Loans	423 292
Debtors		774 140		
Cash		0	Trading Payments	1 961 902
Investments		0	Capital Payments	350 000
Total Assets		3 979 130	Interest Paid	22 658
			Investments Bought	0
Liabilities			Tax Paid	0
Tax Assessed & Due		117 276	Dividends Paid	60 000
Creditors		384 449	Loans Repaid	0
Bank Overdraft		302 662		
Unsecured Loans		120 630	Net Cash Flow	-309 150
Total Current Liabilities		925 017		
Net Assets		3 054 113	Overdraft Limit Next Quarter (€)	776 000
Term Loans		601 772	Borrowing Power Next Quarter (€)	0
Net Worth		2 452 341		
Share Capital		2 000 000	Raw Material Prices (US$ per '000 units)	
Reserves		452 341		
Shareholders Funds		2 452 341		

Raw Material Prices	Spot Price	3-Month	6-Month
	37 008	36 769	36 360

ALL-COMPANY SHARE PRICES & DIVIDENDS

Company Number	1	2	3	4
Share Price (€.c)	1,204	1,297	1,250	1,389
% Dividend Paid	0	3	3	3

BUSINESS INTELLIGENCE

Free Information on Companies' Activity

Company Number		1	2	3	4
Product 1:	EU Price (€)	275	289	280	280
	Nafta Price (€)	277	319	280	300
	Internet Price (€)	271	309	278	275
Product 2:	EU Price (€)	440	459	444	445
	Nafta Price (€)	433	509	444	500
	Internet Price (€)	437	459	440	435
Product 3:	EU Price (€)	665	699	670	670
	Nafta Price (€)	666	769	670	725
	Internet Price (€)	666	699	666	665
Total Number Employed		55	71	73	68
Assembly Wage Rate (€.c)		10,00	10,50	10,50	10,50
Number of Agents/Distributors		2	2	2	2

Business Activity - Paid for Information

Company	
Total Advertising Spend (€)	
Total Research Spend (€)	
Consumer Star Ratings	
Product 1	
Product 2	
Product 3	
Web-site Star Rating	

ECONOMIC INTELLIGENCE	EU	NAFTA	Rest of Developed World
Gross Domestic Product Last Quarter (deseasonalised)	4 914	4 755	27 334
% Unemployment Rate Last Quarter (deseasonalised)	2,20	3,00	
Balance of External Trade Last Quarter	2 918	-2 948	
% Annual Central Bank Base Rate for Next Quarter	3,10	3,20	
Exchange Rate of 1 USD quoted in Euros, Next Quarter	1,22		
% Access of Population to PCs	50,00	61,00	28,00

% of Market Share by Products Sold - Paid for Information

Company		
Product 1:	EU	
	Nafta	
	Internet	
Product 2:	EU	
	Nafta	
	Internet	
Product 3:	EU	
	Nafta	
	Internet	

ALL COMPANY BALANCE SHEETS

Company Number	
Assets	
Value of Property	
Value of Machines	
Value of Product Stock	
Value of Raw Material Stock	
Debtors	
Cash	
Investments	
Liabilities	
Tax Assessed & Due	
Creditors	
Bank Overdraft	
Unsecured Loans	
Net Assets	
Term Loans	
Net Worth	
Share Capital	
Reserves	
Shareholders Funds	

BUSINESS REPORT

Performances of leading economies around the world are expected to increase. After a weak financial quarter last year the United States remains the main engine for global growth. Oil prices are the main problem.

Figure A.14: Historical Management Report W232061 b

A.2.3 Quarter II '06 Report (W232062)

THE GLOBAL MANAGEMENT CHALLENGE REPORT (06PS)

Łukasz Kalinowski												GMC Poland 2006
kontrolerzy	Group	23	Company	2	Identity	0	Year	2006	Quarter	2		ROUND I
												REPORT AFTER THIRD DECISION

PLEASE CHECK THE DECISIONS GIVEN BELOW

		Product 1	Product 2	Product 3
Quantities of Product to				
make and ship to:	EU Agents	656	374 *	205
(Not delivered in	Nafta Distrbutors	667	358 *	183
full if starred)	Internet Distributor	1079	659 *	350
Prices (€):	EU	280	445	670
	Nafta	358	572	865
	Internet	275	435	665

Advertising (€ '000)	Corporate Image	Direct Product Advertising		
EU	6	6	6	6
Nafta	6	4	3	2
Internet	6	6	6	6

Assembly Times (minutes)	110	160	320
Take up Product Improvements	1	0	0
R & D Expenditure (€ '000)	13	13	10

Purchasing	Next Quarter	3-months hence	6-months hence
Raw Materials Ordered ('000)	0	0	7

Agents and Distributors	Total Number Wanted for Next Quarter	Support Payments (€ '000)	% Commission
EU Agents	1	12	10
Nafta Distributors	1	10	10
Internet Distributor	xxxxx	12	11

Production Machines to Buy	0	Number of Ports Operated	6
Machines to Sell	0	Web-site Development (€ '000)	25
Maintenance Hours per Machine	32		
Assembly Hourly Wage Rate (€ c)	10,5	Shift Level	2
Assembly Workers Hired (+) / Fired (-)	0	Assembly Workers Trained	0
Investments (+/- € '000)	0	Term Loans (€ '000)	0
Management Budget (€ '000)	120	% Dividend Paid	0
Information on Corporate Activity	1	Information on Market Shares	1
Insurance Plan Number	1		

Information Technology Report for Last Quarter	
Number of Internet Communications Ports Operated	6
Number of Internet Visits carried through successfully	22 138
% of Potential Internet Visits that failed to connect	1

AVAILABILITY & USE OF RESOURCES

Machines Available Last Quarter	7
Machines Available for Next Quarter	8
Assembly Workers Hours	
Total Hours Available Last Quarter	17 640
Hours Absenteeism/Sickness	366
Total Hours Worked Last Quarter	12 499
Notice of Strike Weeks Next Quarter	0
Machine Hours	
Total Hours Available Last Quarter	7 644
Hours Breakdown	85
Hours Planned Maintenance	139
Total Hours Worked Last Quarter	6 687
Average Machine Efficiency %	87
Raw Material Units Used & Available	
Opening Stock Available	15 630
Bought Spot Last Quarter	0
Bought Default Last Quarter	0
Lost/Destroyed	0
Used Last Quarter	7 676
Closing Stock Last Quarter	7 954
For Delivery Next Quarter	
Bought Last Quarter	0
Bought Quarter before Last	7 000
For Delivery Quarter after Next	
Bought Last Quarter	7 000

Human Resource Management	Assembly	Machinists
Personnel at Start of Last Quarter	30	41
Recruited during Last Quarter	0	15
Trained from Unemployed	0	0
Dismissed	0	0
Quit at end of Last Quarter	0	8
Available for Next Quarter	30	48

Agents & Distributors	EU	Nafta	Internet
Available Last Quarter	1	1	1
Quit Last Quarter	0	0	0
Dismissed Last Qtr.	0	0	0
Recruited for Next Qtr.	0	0	0
Available for Next Qtr.	1	1	1

PRODUCT MOVEMENTS & AVAILABILITY

	Product 1	Product 2	Product 3
Quantities:			
Scheduled	2 402	1 391	738
Produced	2 490	1 444	766
Rejected	88	53	28
Lost/Destroyed	0	30	0
Shipped to:			
EU Agents	656	365	205
Nafta Distributors	667	350	183
Internet Distributor	1 079	646	350
Orders from:			
EU	777	398	221
Nafta	457	233	127
Internet	1 415	776	392
Sold to:			
EU	656	365	205
Nafta	493	254	139
Internet	1 079	660	350
Order Backlog			
EU	60	16	10
Nafta	0	0	0
Warehouse Stocks			
EU	0	0	0
Nafta	174	96	44
Internet	0	0	0
Product			
Improvements	NONE	MINOR	NONE
Serviced under			
Guarantee	248	47	25
Internet Service			
Complaints	171	66	34

Transport	EU	Nafta	Internet
Average Journey(km)	1 594	500	300
No. of Loads	5	5	8

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Figure A.15: Historical Management Report W232062 a

THE GLOBAL MANAGEMENT CHALLENGE REPORT - PART 2

Group	23	Company	2	Year	2006	Quarter	2

Accounts (Euros)

Overheads	
Advertising	63 000
Internet Distrbution Agent	101 822
Internet Service Provider	30 496
Selling Agents & Distributors	120 474
Sales Office	19 368
Guarantee Servicing	25 690
Shipping & Hired Transport	64 700
Product Research	36 000
Web-Site Development	25 000
Personnel Department	15 000
Machine Maintenance	19 040
Warehousing & Purchasing	26 596
Business Intelligence	12 500
Credit Control	4 201
Insurance	19 229
Management Budget	120 000
Other Miscellaneous Costs	32 199
Total Overheads	735 315
Taxable Profit/Loss Accumulated	254 182
Insurance Claimed	17 096
Insurance Excess	3 204

Profit & Loss	
Sales Revenue	1 758 117
Opening Stock Value	911 470
Materials Purchased	310 514
Assembly Wages	143 727
Machinists Wages	268 290
Machine Running Costs	107 527
Quality Control	8 000
Minus Closing Stock Value	931 526
Cost of Sales	818 002
Gross Profit/Loss	940 115
Insurance Receipts	13 892
Interest Received	0
Interest Paid	27 117
Overheads	735 315
Depreciation	55 463
Tax Assessed	0
Net Profit/Loss	136 112
Dividends Paid	0
Transferred to Reserves	136 112

Balance Sheet		
Assets		
Value of Property	250 000	
Value of Machines	2 163 057	
Total Fixed Assets		2 413 057
Value of Product Stock		49 040
Value of Raw Material Stock		882 486
Debtors		832 064
Cash		0
Investments		0
Total Assets		4 176 647
Liabilities		
Tax Assessed & Due		0
Creditors		379 283
Bank Overdraft		607 139
Unsecured Loans		0
Total Current Liabilities		986 422
Net Assets		3 190 225
Term Loans		601 772
Net Worth		2 588 453
Share Capital		2 000 000
Reserves		588 453
Shareholders Funds		2 588 453

Cash Flow Statement	
Trading Receipts	1 700 193
Capital Receipts	0
Interest Received	0
Investments Sold	0
Insurance Receipts	13 892
Additional Loans	183 847
Trading Payments	1 578 539
Capital Payments	175 000
Interest Paid	27 117
Investments Bought	0
Tax Paid	117 276
Dividends Paid	0
Loans Repaid	0
Net Cash Flow	0
Overdraft Limit Next Quarter (€)	960 000
Borrowing Power Next Quarter (€)	0

Raw Material Prices (US$ per '000 units)		
Spot Price	3-Month	6-Month
36 999	36 548	36 018

ALL-COMPANY SHARE PRICES & DIVIDENDS				
Company Number	1	2	3	4
Share Price (€.c)	1,264	1,386	1,313	1,343
% Dividend Paid	0	0	0	0

BUSINESS INTELLIGENCE					
Free Information on Companies' Activity					
Company Number		1	2	3	4
Product 1:	EU Price (€)	275	280	282	285
	Nafta Price (€)	277	358	300	305
	Internet Price (€)	271	275	278	280
Product 2:	EU Price (€)	440	445	447	445
	Nafta Price (€)	433	572	500	500
	Internet Price (€)	437	435	440	445
Product 3:	EU Price (€)	665	670	673	670
	Nafta Price (€)	666	865	700	725
	Internet Price (€)	666	665	666	675
Total Number Employed		55	78	91	90
Assembly Wage Rate (€.c)		10,00	10,50	10,80	11,00
Number of Agents/Distributors		2	2	2	2

Business Activity - Paid for Information				
Company	1	2	3	4
Total Advertising Spend (€)	73000	63000	78000	78000
Total Research Spend (€)	39000	36000	21000	65000
Consumer Star Ratings				
Product 1	**	***	**	***
Product 2	*	*	*	*
Product 3	**	**	**	**
Web-site Star Rating	****	****	****	****

ECONOMIC INTELLIGENCE	EU	NAFTA	Rest of Developed World
Gross Domestic Product Last Quarter (deseasonalised)	4 944	4 732	27 334
% Unemployment Rate Last Quarter (deseasonalised)	2,50	3,00	
Balance of External Trade Last Quarter	2 831	-2 995	
% Annual Central Bank Base Rate for Next Quarter	3,30	3,20	
Exchange Rate of 1 USD quoted in Euros, Next Quarter	1,24		
% Access of Population to PCs	50,00	60,00	28,00

% of Market Share by Products Sold - Paid for Information					
Company		1	2	3	4
Product 1:	EU	4,4	4,1	4,3	3,7
	Nafta	4,5	4,1	6,0	6,0
	Internet	14,4	11,5	11,2	12,1
Product 2:	EU	4,3	4,3	4,2	4,4
	Nafta	3,9	4,0	6,5	6,0
	Internet	11,7	13,2	11,9	13,2
Product 3:	EU	4,1	6,5	6,9	4,2
	Nafta	4,3	5,8	9,0	8,3
	Internet	9,8	16,6	17,6	13,5

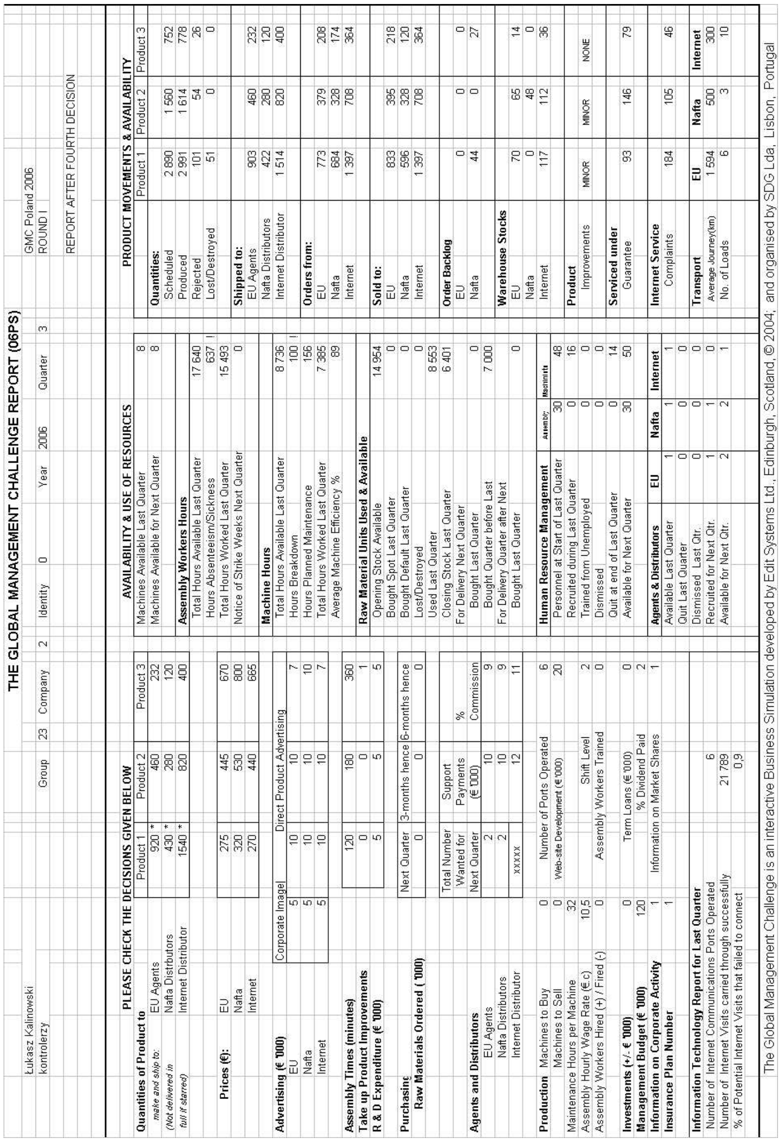
ALL COMPANY BALANCE SHEETS				
Company Number	1	2	3	4
Assets				
Value of Property	250000	250000	250000	250000
Value of Machines	1489088	2163057	2154526	1830338
Value of Product Stock		49040	226276	
Value of Raw Material Stock		882486	444097	567623
Debtors	666149	832064	982066	906514
Cash	1044641			70326
Investments	1000		200000	
Liabilities				
Tax Assessed & Due				
Creditors	249507	379283	440953	571093
Bank Overdraft		607139	658953	
Unsecured Loans			140075	
Net Assets	3201371	3190225	3016984	3053708
Term Loans	601772	601772	601772	601772
Net Worth	2599599	2588453	2415212	2451936
Share Capital	2000000	2000000	2000000	2000000
Reserves	599599	588453	415212	451936
Shareholders Funds	2599599	2588453	2415212	2451936

BUSINESS REPORT

In the United States commodity prices are rising.
Profits and share prices are providing surprises.
The American economy is moving ahead with consumer
spending increasing.

Figure A.16: Historical Management Report W232062 b

A.2.4 Quarter III '06 Report (W232063)



THE GLOBAL MANAGEMENT CHALLENGE REPORT (06PS)

Łukasz Kalinowski
kontrolerzy

Group 23 Company 2 Identity 0 Year 2006 Quarter 3

GMC Poland 2006
ROUND I

REPORT AFTER FOURTH DECISION

PLEASE CHECK THE DECISIONS GIVEN BELOW

		Product 1	Product 2	Product 3
Quantities of Product to				
make and ship to:	EU Agents	920 *	460	232
(Not delivered in	Nafta Distrbutors	430 *	280	120
full if starred)	Internet Distributor	1540 *	820	400
Prices (€):	EU	275	445	670
	Nafta	320	530	800
	Internet	270	440	665

Advertising (€ '000)	Corporate Image	Direct Product Advertising		
EU	5	10	10	7
Nafta	5	10	10	10
Internet	5	10	10	7

	Product 1	Product 2	Product 3
Assembly Times (minutes)	120	180	360
Take up Product Improvements	0	0	1
R & D Expenditure (€ '000)	5	5	5

Purchasing	Next Quarter	3-months hence	6-months hence
Raw Materials Ordered ('000)	0	0	0

Agents and Distributors	Total Number Wanted for Next Quarter	Support Payments (€ '000)	% Commission
EU Agents	2	10	9
Nafta Distributors	2	10	9
Internet Distributor	xxxxx	12	11

Production Machines to Buy	0	Number of Ports Operated	6
Machines to Sell	0	Web-site Development (€ '000)	20
Maintenance Hours per Machine	32		
Assembly Hourly Wage Rate (€ c)	10,5	Shift Level	2
Assembly Workers Hired (+) / Fired (-)	0	Assembly Workers Trained	0
Investments (+/- € '000)	0	Term Loans (€ '000)	0
Management Budget (€ '000)	120	% Dividend Paid	2
Information on Corporate Activity	1	Information on Market Shares	1
Insurance Plan Number	1		

Information Technology Report for Last Quarter	
Number of Internet Communications Ports Operated	6
Number of Internet Visits carried through successfully	21 789
% of Potential Internet Visits that failed to connect	0,9

AVAILABILITY & USE OF RESOURCES

Machines Available Last Quarter	8
Machines Available for Next Quarter	8
Assembly Workers Hours	
Total Hours Available Last Quarter	17 640
Hours Absenteeism/Sickness	637 !
Total Hours Worked Last Quarter	15 493
Notice of Strike Weeks Next Quarter	0
Machine Hours	
Total Hours Available Last Quarter	8 736
Hours Breakdown	100 !
Hours Planned Maintenance	156
Total Hours Worked Last Quarter	7 385
Average Machine Efficiency %	89
Raw Material Units Used & Available	
Opening Stock Available	14 954
Bought Spot Last Quarter	0
Bought Default Last Quarter	0
Lost/Destroyed	0
Used Last Quarter	8 553
Closing Stock Last Quarter	6 401
For Delivery Next Quarter	
Bought Last Quarter	0
Bought Quarter before Last	7 000
For Delivery Quarter after Next	
Bought Last Quarter	0

Human Resource Management	Assembly	Machinists
Personnel at Start of Last Quarter	30	48
Recruited during Last Quarter	0	16
Trained from Unemployed	0	0
Dismissed	0	0
Quit at end of Last Quarter	0	14
Available for Next Quarter	30	50

Agents & Distributors	EU	Nafta	Internet
Available Last Quarter	1	1	1
Quit Last Quarter	0	0	0
Dismissed Last Qtr.	0	0	0
Recruited for Next Qtr.	1	1	0
Available for Next Qtr.	2	2	1

PRODUCT MOVEMENTS & AVAILABILITY

	Product 1	Product 2	Product 3
Quantities:			
Scheduled	2 890	1 560	752
Produced	2 991	1 614	778
Rejected	101	54	26
Lost/Destroyed	51	0	0
Shipped to:			
EU Agents	903	460	232
Nafta Distributors	422	280	120
Internet Distributor	1 514	820	400
Orders from:			
EU	773	379	208
Nafta	684	328	174
Internet	1 397	708	364
Sold to:			
EU	833	395	218
Nafta	596	328	120
Internet	1 397	708	364
Order Backlog			
EU	0	0	0
Nafta	44	0	27
Warehouse Stocks			
EU	70	65	14
Nafta	0	48	0
Internet	117	112	36
Product			
Improvements	MINOR	MINOR	NONE
Serviced under			
Guarantee	93	146	79
Internet Service			
Complaints	184	105	46

Transport	EU	Nafta	Internet
Average Journey(km)	1 594	500	300
No. of Loads	6	3	10

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Figure A.17: Historical Management Report W232063 a

THE GLOBAL MANAGEMENT CHALLENGE REPORT - PART 2

Group	23	Company	2	Year	2006	Quarter	3

Accounts (Euros)

Overheads	
Advertising	99 000
Internet Distrbution Agent	114 383
Internet Service Provider	33 921
Selling Agents & Distributors	123 300
Sales Office	19 832
Guarantee Servicing	40 592
Shipping & Hired Transport	50 000
Product Research	15 000
Web-Site Development	20 000
Personnel Department	16 000
Machine Maintenance	21 760
Warehousing & Purchasing	27 059
Business Intelligence	12 500
Credit Control	4 959
Insurance	20 067
Management Budget	120 000
Other Miscellaneous Costs	32 305
Total Overheads	770 678
Taxable Profit/Loss Accumulated	502 675
Insurance Claimed	38 414
Insurance Excess	3 344

Profit & Loss	
Sales Revenue	1 966 832
Opening Stock Value	931 526
Materials Purchased	0
Assembly Wages	179 822
Machinists Wages	288 103
Machine Running Costs	117 282
Quality Control	8 000
Minus Closing Stock Value	621 786
Cost of Sales	902 947
Gross Profit/Loss	1 063 885
Insurance Receipts	35 070
Interest Received	0
Interest Paid	25 711
Overheads	770 678
Depreciation	54 073
Tax Assessed	0
Net Profit/Loss	248 493
Dividends Paid	40 000
Transferred to Reserves	208 493

Balance Sheet		
Assets		
Value of Property	250 000	
Value of Machines	2 108 984	
Total Fixed Assets		2 358 984
Value of Product Stock		77 431
Value of Raw Material Stock		544 355
Debtors		916 137
Cash		0
Investments		0
Total Assets		3 896 907
Liabilities		
Tax Assessed & Due		0
Creditors		258 411
Bank Overdraft		239 778
Unsecured Loans		0
Total Current Liabilities		498 189
Net Assets		3 398 718
Term Loans		601 772
Net Worth		2 796 946
Share Capital		2 000 000
Reserves		796 946
Shareholders Funds		2 796 946

Cash Flow Statement			
Trading Receipts			1 882 759
Capital Receipts			0
Interest Received			0
Investments Sold			0
Insurance Receipts			35 070
Additional Loans			0
Trading Payments			1 484 757
Capital Payments			0
Interest Paid			25 711
Investments Bought			0
Tax Paid			0
Dividends Paid			40 000
Loans Repaid			367 361
Net Cash Flow			0
Overdraft Limit Next Quarter (€)			1 002 000
Borrowing Power Next Quarter (€)			0
Raw Material Prices (US$ per '000 units)			
	Spot Price	3-Month	6-Month
	37 078	36 660	36 107

ALL-COMPANY SHARE PRICES & DIVIDENDS

Company Number	1	2	3	4
Share Price (€.c)	1,215	1,551	1,210	1,401
% Dividend Paid	0	2	0	3

% of Market Share by Products Sold - Paid for Information

Company		1	2	3	4
Product 1:	EU	4,6	5,4	4,0	4,9
	Nafta	4,6	5,1	4,1	5,7
	Internet	14,0	14,6	11,3	13,6
Product 2:	EU	4,6	5,0	4,1	5,1
	Nafta	4,1	5,5	4,4	4,8
	Internet	12,0	14,5	12,4	13,9
Product 3:	EU	4,4	7,4	6,4	5,9
	Nafta	4,7	5,4	8,3	7,6
	Internet	10,2	18,0	16,3	15,2

BUSINESS INTELLIGENCE

Free Information on Companies' Activity

Company Number		1	2	3	4
Product 1:	EU Price (€)	275	275	282	285
	Nafta Price (€)	277	320	340	330
	Internet Price (€)	271	270	280	280
Product 2:	EU Price (€)	440	445	450	445
	Nafta Price (€)	433	530	540	550
	Internet Price (€)	437	440	442	445
Product 3:	EU Price (€)	665	670	680	680
	Nafta Price (€)	666	800	780	800
	Internet Price (€)	666	665	680	675
Total Number Employed		51	80	90	92
Assembly Wage Rate (€.c)		10,00	10,50	10,90	11,00
Number of Agents/Distributors		2	2	2	2

ALL COMPANY BALANCE SHEETS

Company Number
Assets
Value of Property
Value of Machines
Value of Product Stock
Value of Raw Material Stock
Debtors
Cash
Investments
Liabilities
Tax Assessed & Due
Creditors
Bank Overdraft
Unsecured Loans
Net Assets
Term Loans
Net Worth
Share Capital
Reserves
Shareholders Funds

Business Activity - Paid for Information

Company	1	2	3	4
Total Advertising Spend (€)	73000	99000	68000	78000
Total Research Spend (€)	39000	15000	9000	60000
Consumer Star Ratings				
Product 1	**	***	**	***
Product 2	*	*	*	*
Product 3	**	***	***	***
Web-site Star Rating	****	****	****	****

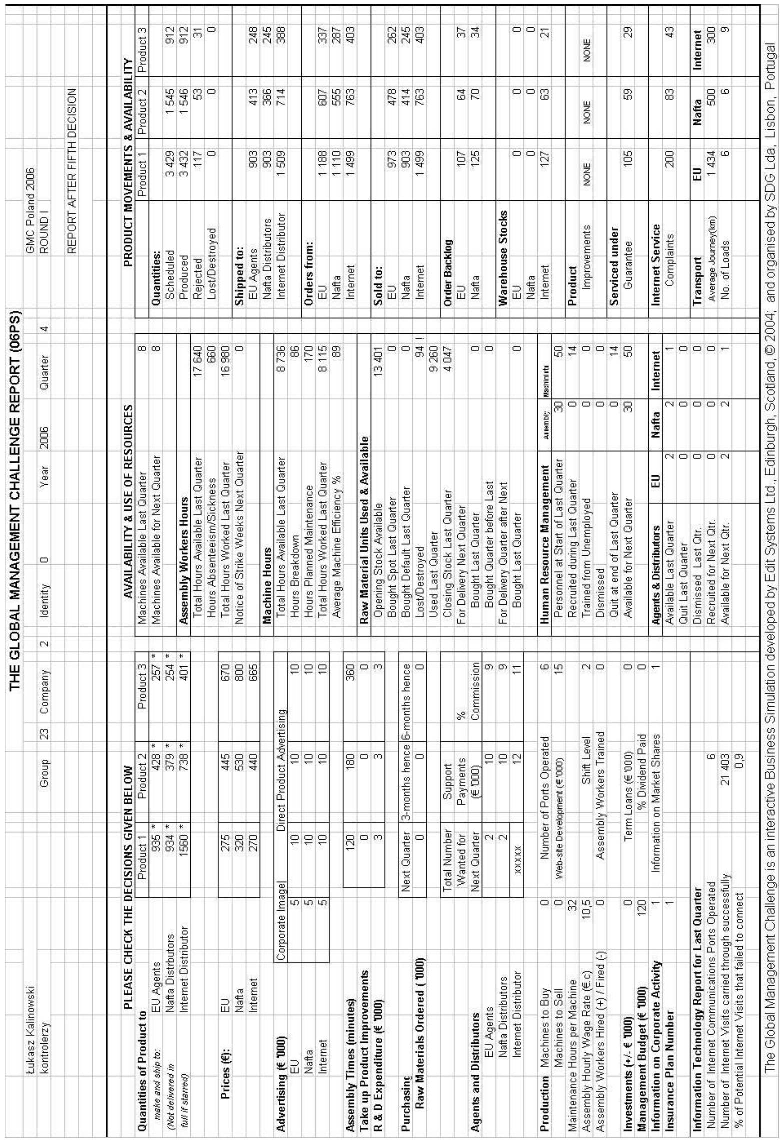
ECONOMIC INTELLIGENCE	EU	NAFTA	Rest of Developed World
Gross Domestic Product Last Quarter (deseasonalised)	4 938	4 793	27 334
% Unemployment Rate Last Quarter (deseasonalised)	2,20	3,00	
Balance of External Trade Last Quarter	2 885	-2 976	
% Annual Central Bank Base Rate for Next Quarter	3,20	3,20	
Exchange Rate of 1 USD quoted in Euros, Next Quarter	1,25		
% Access of Population to PCs	50,00	61,00	28,00

BUSINESS REPORT

A strong dollar will make foreign goods more expensive
in America. This may improve the pressure on inflation
High oil prices may have the opposite effect.

Figure A.18: Historical Management Report W232063 b

A.2.5 Quarter IV '06 Report (W232064)



THE GLOBAL MANAGEMENT CHALLENGE REPORT (06PS)

Łukasz Kalinowski
kontrolerzy

Group 23 Company 2 Identity 0 Year 2006 Quarter 4

GMC Poland 2006
ROUND I
REPORT AFTER FIFTH DECISION

PLEASE CHECK THE DECISIONS GIVEN BELOW

Quantities of Product to		Product 1	Product 2	Product 3
make and ship to:	EU Agents	935 *	428 *	257 *
(Not delivered in	Nafta Distrbutors	934 *	379 *	254 *
full if starred)	Internet Distributor	1560 *	738 *	401 *
Prices (€):	EU	275	445	670
	Nafta	320	530	800
	Internet	270	440	665

Advertising (€ '000)	Corporate Image	Direct Product Advertising		
EU	5	10	10	10
Nafta	5	10	10	10
Internet	5	10	10	10

	Product 1	Product 2	Product 3
Assembly Times (minutes)	120	180	360
Take up Product Improvements	0	0	0
R & D Expenditure (€ '000)	3	3	3

Purchasing	Next Quarter	3-months hence	6-months hence
Raw Materials Ordered ('000)	0	0	0

Agents and Distributors	Total Number Wanted for Next Quarter	Support Payments (€ '000)	% Commission
EU Agents	2	10	9
Nafta Distributors	2	10	9
Internet Distributor	xxxxx	12	11

Production Machines to Buy	0	Number of Ports Operated	6
Machines to Sell	0	Web-site Development (€'000)	15
Maintenance Hours per Machine	32		
Assembly Hourly Wage Rate (€ c)	10,5	Shift Level	2
Assembly Workers Hired (+) / Fired (-)	0	Assembly Workers Trained	0
Investments (+/- € '000)	0	Term Loans (€ '000)	0
Management Budget (€ '000)	120	% Dividend Paid	0
Information on Corporate Activity	1	Information on Market Shares	1
Insurance Plan Number	1		

Information Technology Report for Last Quarter	
Number of Internet Communications Ports Operated	6
Number of Internet Visits carried through successfully	21 403
% of Potential Internet Visits that failed to connect	0,9

AVAILABILITY & USE OF RESOURCES

Machines Available Last Quarter	8
Machines Available for Next Quarter	8
Assembly Workers Hours	
Total Hours Available Last Quarter	17 640
Hours Absenteeism/Sickness	660
Total Hours Worked Last Quarter	16 980
Notice of Strike Weeks Next Quarter	0
Machine Hours	
Total Hours Available Last Quarter	8 736
Hours Breakdown	86
Hours Planned Maintenance	170
Total Hours Worked Last Quarter	8 115
Average Machine Efficiency %	89
Raw Material Units Used & Available	
Opening Stock Available	13 401
Bought Spot Last Quarter	0
Bought Default Last Quarter	0
Lost/Destroyed	94
Used Last Quarter	9 260
Closing Stock Last Quarter	4 047
For Delivery Next Quarter	
Bought Last Quarter	0
Bought Quarter before Last	0
For Delivery Quarter after Next	
Bought Last Quarter	0

Human Resource Management	Assembly	Machinists
Personnel at Start of Last Quarter	30	50
Recruited during Last Quarter	0	14
Trained from Unemployed	0	0
Dismissed	0	0
Quit at end of Last Quarter	0	14
Available for Next Quarter	30	50

Agents & Distributors	EU	Nafta	Internet
Available Last Quarter	2	2	1
Quit Last Quarter	0	0	0
Dismissed Last Qtr.	0	0	0
Recruited for Next Qtr.	0	0	0
Available for Next Qtr.	2	2	1

PRODUCT MOVEMENTS & AVAILABILITY

	Product 1	Product 2	Product 3
Quantities:			
Scheduled	3 429	1 545	912
Produced	3 432	1 546	912
Rejected	117	53	31
Lost/Destroyed	0	0	0
Shipped to:			
EU Agents	903	413	248
Nafta Distributors	903	366	245
Internet Distributor	1 509	714	388
Orders from:			
EU	1 188	607	337
Nafta	1 110	555	287
Internet	1 499	763	403
Sold to:			
EU	973	478	262
Nafta	903	414	245
Internet	1 499	763	403
Order Backlog			
EU	107	64	37
Nafta	125	70	34
Warehouse Stocks			
EU	0	0	0
Nafta	0	0	0
Internet	127	63	21
Product			
Improvements	NONE	NONE	NONE
Serviced under			
Guarantee	105	59	29
Internet Service			
Complaints	200	83	43

Transport	EU	Nafta	Internet
Average Journey(km)	1 434	500	300
No. of Loads	6	6	9

The Global Management Challenge is an interactive Business Simulation developed by Edit Systems Ltd., Edinburgh, Scotland, © 2004; and organised by SDG Lda, Lisbon, Portugal

Figure A.19: Historical Management Report W232064 a

THE GLOBAL MANAGEMENT CHALLENGE REPORT - PART 2

Group	23	Company	2	Year	2006	Quarter	4

Accounts (Euros)

Overheads	
Advertising	105 000
Internet Distrbution Agent	122 928
Internet Service Provider	36 251
Selling Agents & Distributors	177 427
Sales Office	27 100
Guarantee Servicing	22 400
Shipping & Hired Transport	77 250
Product Research	9 000
Web-Site Development	15 000
Personnel Department	14 000
Machine Maintenance	21 760
Warehousing & Purchasing	21 767
Business Intelligence	12 500
Credit Control	5 940
Insurance	17 884
Management Budget	120 000
Other Miscellaneous Costs	32 508
Total Overheads	838 715
Taxable Profit/Loss Accumulated	866 135
Insurance Claimed	3 818
Insurance Excess	2 980

Profit & Loss	
Sales Revenue	2 381 290
Opening Stock Value	621 786
Materials Purchased	0
Assembly Wages	211 050
Machinists Wages	340 205
Machine Running Costs	123 806
Quality Control	8 000
Minus Closing Stock Value	197 831
Cost of Sales	1 107 016
Gross Profit/Loss	1 274 274
Insurance Receipts	838
Interest Received	0
Interest Paid	20 211
Overheads	838 715
Depreciation	52 726
Tax Assessed	259 840
Net Profit/Loss	103 620
Dividends Paid	0
Transferred to Reserves	103 620

Balance Sheet		
Assets		
Value of Property	250 000	
Value of Machines	2 056 258	
Total Fixed Assets		2 306 258
Value of Product Stock		32 285
Value of Raw Material Stock		165 546
Debtors		1 224 596
Cash		296 670
Investments		0
Total Assets		4 025 355
Liabilities		
Tax Assessed & Due		259 840
Creditors		263 177
Bank Overdraft		0
Unsecured Loans		0
Total Current Liabilities		523 017
Net Assets		3 502 338
Term Loans		601 772
Net Worth		2 900 566
Share Capital		2 000 000
Reserves		900 566
Shareholders Funds		2 900 566

Cash Flow Statement	
Trading Receipts	2 072 831
Capital Receipts	0
Interest Received	0
Investments Sold	0
Insurance Receipts	838
Additional Loans	0
Trading Payments	1 517 010
Capital Payments	0
Interest Paid	20 211
Investments Bought	0
Tax Paid	0
Dividends Paid	0
Loans Repaid	239 778
Net Cash Flow	296 670
Overdraft Limit Next Quarter (€)	803 000
Borrowing Power Next Quarter (€)	229 000

Raw Material Prices (US$ per '000 units)

Spot Price	3-Month	6-Month
37 008	36 769	36 360

ALL-COMPANY SHARE PRICES & DIVIDENDS

Company Number	1	2	3	4	0
Share Price (€.c)	1,267	1,633	1,366	1,375	0,000
% Dividend Paid	0	0	0	0	0

BUSINESS INTELLIGENCE

Free Information on Companies' Activity

Company Number		1	2	3	4
Product 1:	EU Price (€)	275	275	282	280
	Nafta Price (€)	277	320	340	325
	Internet Price (€)	271	270	280	275
Product 2:	EU Price (€)	440	445	450	445
	Nafta Price (€)	433	530	540	540
	Internet Price (€)	437	440	442	440
Product 3:	EU Price (€)	665	670	680	675
	Nafta Price (€)	666	800	800	790
	Internet Price (€)	666	665	679	670
Total Number Employed		51	80	72	89
Assembly Wage Rate (€.c)		10,00	10,50	10,90	11,00
Number of Agents/Distributors		2	4	2	2

Business Activity - Paid for Information

Company	1	2	3	4
Total Advertising Spend (€)	73000	105000	72000	93000
Total Research Spend (€)	39000	9000	12000	45000
Consumer Star Ratings				
Product 1	**	**	*	***
Product 2	*	*	*	*
Product 3	**	***	***	***
Web-site Star Rating	****	****	****	****

ECONOMIC INTELLIGENCE	EU	NAFTA	Rest of Developed World
Gross Domestic Product Last Quarter (deseasonalised)	4 913	4 712	27 334
% Unemployment Rate Last Quarter (deseasonalised)	2,20	2,80	
Balance of External Trade Last Quarter	2 918	-2 948	
% Annual Central Bank Base Rate for Next Quarter	3,10	3,20	
Exchange Rate of 1 USD quoted in Euros, Next Quarter	1,25		
% Access of Population to PCs	50,00	61,00	28,00

% of Market Share by Products Sold - Paid for Information

Company		1	2	3	4
Product 1:	EU	4,5	6,2	3,9	5,1
	Nafta	4,4	7,3	4,3	6,0
	Internet	13,7	15,0	11,5	13,5
Product 2:	EU	4,4	5,9	3,8	4,6
	Nafta	3,9	6,6	4,6	4,9
	Internet	11,3	14,8	12,1	14,5
Product 3:	EU	4,1	8,6	6,6	5,6
	Nafta	4,1	9,9	7,2	7,3
	Internet	9,4	18,8	16,7	14,3

ALL COMPANY BALANCE SHEETS

Company Number	1	2	3	4
Assets				
Value of Property	250000	250000	250000	250000
Value of Machines	1415566	2056258	1604354	1739967
Value of Product Stock		32285	273323	98304
Value of Raw Material Stock		165546	158960	274724
Debtors	661208	1224596	860276	990324
Cash	1328119	296670	207022	169218
Investments	1000			60000
Liabilities				
Tax Assessed & Due	91058	259840	71267	77469
Creditors	361452	263177	221140	453797
Bank Overdraft				
Unsecured Loans				
Net Assets	3203383	3502338	3061528	3051271
Term Loans	601772	601772	601772	601772
Net Worth	2601611	2900566	2459756	2449499
Share Capital	2000000	2000000	2000000	2000000
Reserves	601611	900566	459756	449499
Shareholders Funds	2601611	2900566	2459756	2449499

BUSINESS REPORT

A lack of oil refining capacity in America and elsewhere is helping to drive oil prices higher. If prices become too high the current boom in the world economy will fade leading to a fall in global oil demand. This will in turn lead to a reduction in oil prices at a later date.

Figure A.20: Historical Management Report W232064 b