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Developing global competitiveness by assessing organized retail productivity using data envelopment analysis

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Abstract

The purpose of this paper was to find out (using Regression, Data Envelopment Analysis and Sensitivity Analysis) how efficiently some of the top organized India retail companies have been performing relative to each other over the years and thereby to identify factors that help increase the efficiency of a retail company. The study was conducted based on the analysis of data downloaded from Prowess database for five Indian retail companies for the time period 2000-2007. The paper is deemed to be helpful to enable Indian retail companies gain a competitive advantage in the face of increased competition being faced in the emerging organized retail sector in India. The findings brought forth Advertising and Marketing expenses as the significant performance determining factors to be paid attention to.

Keywords: global competitive advantage, organized retail, data envelopment analysis (DEA), performance determinants, performance indicators

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1 INTRODUCTION

With opportunities come challenges. Retail and real estate are the two booming sectors of India in the present times. Retail, one of India's upcoming industries, has presently emerged as one of the most dynamic and fast paced industries of recent times with several players entering the market. Accounting for over 10% of the country's GDP and around 8% of employment (Indian Retail Sector – An Outlook 2005-2010), retailing in India is gradually inching its way towards becoming the next boom industry. But, with this growth comes a host of challenges which existing players have to face and overcome to remain successful in the coming onslaught of heightened competition.

1.1 The Indian retail sector

A shopping revolution is ushering in India where, a large population in the 20-34 age group in the urban regions is boosting demand. This has resulted in huge international retail investment and a more liberal FDI policy making India currently the most attractive destination for global retailers with a GRDI score of 92 and a growth rate of 25 to 30% in the year 2007 (Global Retail Development Index, 2007). Since the time the Narsimha Rao Government kicked off reforms in 1991 and interest rate deregulation became a reality, the retail sector has been like a toddler waiting to grow big. It has taken some time but finally it seems that the evolution of organized retailing in India is picking up momentum.

The world of retail merchandising has come a long way since the days when general stores, that stocked everything from groceries to stationery, and small shops that sold limited varieties of products, reigned supreme. There is a movement now from the unorganized to the organized sector. Several companies are setting up exclusive showrooms and large format stores such as Pantaloon, Shoppers' Stop, Westside and several others are expanding. The whole concept of shopping has altered in terms of format and consumer buying behavior, changing the face of shopping in India. These trends indicate that retailing, as an industry, has come into its own.

According to the Global Edge report on Market Potential for Emerging Markets (2008), India ranks eleventh in the list and has been able to maintain itself around this Figure for quite some years now. Infact, according to Global Retail Development Index (2007), India is positioned as the leading destination for retail investment topping the chart above Russia and China. Indian organized retail is growing at a faster pace than was expected and could constitute 25% of the overall retail sector by 2011. According to a study on retail sector prepared by Deloitte Haskins and Sells, organized retail in India had 8% share of overall retail market (total retail pie) in 2007 in comparison to 5% in the year 2006 and is expected to grow still further in the future.

1.2 Reasons for growth

Favorable demographic and psychographic changes relating to India's consumer class, international exposure, increasing availability of quality retail space, wider availability of products and brand communication are all bringing forth major opportunities in the organized retail sector in India, which is poised for an emphatic phase of growth. For a successful retail story what is required is the proper exploitation of these opportunities.

Over the last few years, many international retailers have entered the Indian market on the strength of rising affluence levels of the young Indian population along with the heightened awareness of global brands and international shopping experiences and the increased availability of retail real estate. Development of India as a sourcing hub shall further make India as an attractive retail opportunity for global retailers.

PricewaterhouseCoopers in its third edition of Retail & Consumer study, "From Beijing to Budapest: New Retail & Consumer Growth Patterns in Transitional Economies," assesses growth opportunities in fourteen countries in Asia, Central and Eastern Europe (CEE) and Russia; it has determined six countries with "GO" recommendations in terms of investment: China, India, Turkey, Thailand, Malaysia and Hungary. The study determines that the most immediate opportunities in the retail and consumer sector lie in China and that India offers more long-term potential for investment in the sector.

The biggest positive point as far as the sector is concerned is that Indian population is witnessing a significant demographic transition. A large young working population with median age of 24 years, nuclear families in urban areas, along with increasing working-women population and emerging opportunities in the services sector are the key growth drivers of organized retail sector in the country. The highly fragmented structure of the Indian retail sector is also helping the growth of the sector. There is a great potential for the organized retail industry to prosper in.

India, as a market for final consumption is very large. Many researches show that the total private consumption market in India is about Rs.15 trillion out of which about Rs 8.5 trillion is towards retail consumption. Though lucrative opportunities exist across product categories, food and grocery, never-the-less, presents the most significant potential in the Indian context as consumer spending is highest on food. While food and grocery represents about 6.5 trillion of retail consumption, clothing comes second with consumption of about Rs 600 billion (The Indian Retail Report 2005).

The next level of opportunities in terms of product retail expansion lies in categories such as apparel, jewellery and accessories, consumer durables, catering services and home improvement. These sectors have already witnessed the emergence of organized formats though more players are expected to join the bandwagon. Some of the niche categories like books, music and gifts also offer interesting opportunities for the retail players.

Wholesale trading is another area, which has potential for rapid growth. German giant Metro AG and South African Shoprite Holdings have already made headway in this segment by setting up stores selling merchandise on a wholesale basis in Bangalore and Mumbai respectively.

Manufacturers in industries such as FMCG, consumer durables, paints etc are waking up to the growing clout of retailers as a shift in bargaining power from the former to the latter becomes more discernible. Already, a number of manufacturers in India, in line with trends in developed markets, have set up dedicated units to service the retail channel. Also, instead of viewing retailers with suspicion, or as a 'necessary evil' as was the case earlier, manufacturers are beginning to acknowledge them as channel members to be partnered with for providing solutions to the end-consumer more effectively.

Rural Retailing has also being encased into by many companies. Of late, India's large rural population has caught the eye of retailers looking for new areas of growth. ITC launched the country's first rural mall 'Chaupal Saga", offering a diverse product range from FMCG to electronic appliances to automobiles, attempting to provide farmers a one-stop destination for all their needs. There has been yet another rural retail initiative by the DCM Sriram Group called the 'Hariyali Bazaar' that has initially started off by providing farm related inputs and services but plans to introduce the complete shopping basket in due course. Other corporate bodies include Escorts, and Tata Chemicals (with Tata Kisan Sansar) setting up agri-stores to provide products/services targeted at the farmer in order to tap the vast rural market.

With IT being the buzzword today how can Electronic Retailing be far behind. Videocon Group has entered the organized retail sector through an electronic retail chain, 'Next', under the venture Emart India. The two other electronic retail chains in the country have a regional or city presence: Viveks and Vijay Sales. Thus, with the growing popularity of Internet electronic retailing presents a golden opportunity to retailers.

1.3 Challenges faced by Indian retail

During the last 10 years, many retail start-ups promised a lot. A few folded up even before they really got started, a few others struggled and then burnt out before they could develop a sustainable business model and others are still evolving. Pantaloon, Shoppers' Stop, Lifestyle, Westside and Globus are few examples of an Indian success story in retail business.

Despite the bright picture and future prospects that Indian retail presents today, the segment is still at a nascent stage. It faces hurdles like government regulations, logistics, low margins, vendor's superior negotiating powers and fierce competition from Mom & Pop stores.

Competition from foreign players planning to enter into the country (Walmart for example has already gained an entry in association with Bharti) represents a major threat to the Indian organized retail sector. These foreign players have a great deal of experience in this field and their economic power is also much stronger than that of the Indian players.

In order to achieve success, the retailing industry will also have to counter competition from the unorganized sector. Traditional retailing is too well established in India to be wiped out. Besides, traditional retailers have negligible real estate and labor costs and little or no taxes to pay. In contrast, players in the organized sector have big expenses to meet, and still have to keep prices low to be able to compete with the traditional sector.

Given the size, and the geographical, cultural and socio-economic diversity of India, there is no role model for Indian suppliers and retailers to adapt or expand in the Indian context. Also, one must remember that there is no right retail model. The perfect model is a question of management. The large scale of consumer diversity, in terms of size, geography, culture and socio-economic background, would necessitate a varied type of successful models.

There are other issues that are needed to make the retailing industry a force to reckon with. For example, qualified manpower is required to look after day-to-day operations and cater to the wide spectrum of customer expectations.

What is required at this stage is for Indian retail companies to understand the factors that have an affect on the performance of organized retail in India so as to help them develop a strong competitive advantage which will help them in facing and overcoming the above mentioned challenges. Thus, the purpose of this paper was to find out the relative efficiency of some of the top retailers of India and thereby to identify and analyze the factors which have an affect on the performance of organized retail in India. Indian retail companies can develop global competitive advantage through a proper understanding of these performance determining factors.

2 LITERATURE REVIEW

Retail productivity is an important issue and vast literature was found on its definitions and measurements. A review of this literature showed that multiple methodologies have been applied to assess productivity of individual retail stores, groups of stores, and the retail industry as a whole, but surprisingly little attention has been given to comparing the efficiency of retail organizations in India.

Understanding and measuring the productivity and efficiency of retailers have been important issues in retailing research (e.g., Bucklin 1978; Ingene 1982, 1984; Ratchford and Brown 1985; Ratchford and Stoops 1988). Retail productivity has been considered important for society and for the individual retail firm (Bucklin, 1978; Ingene, 1984). But, despite a special issue of the Journal of Retailing in Fall, 1984 and subsequent researches, there is still no single widely accepted definition and measurement methodology for retail productivity.

Most of the international studies of retail productivity in the 1950s were based heavily on concepts developed in productivity assessments in the manufacturing sector. The European Productivity Agency and the National Institute of Economic and Social Research had provided foundation studies of various industrial sectors and economists drew on these sources (Rostas, 1948). These studies effectively set the parameters for studies, not only related to manufacturing but also to retailing, for the next 30 years (Deurinck, 1955). On these foundations, and comparable ones in USA, several studies of retail productivity were undertaken. While in essence the concepts remain relevant, much has changed over 50 years in respect of both the nature of retail productivity and the factors affecting this productivity thus requiring new and innovative methods for measuring retail productivity and efficiency.

Past researches have used and suggested the use of various measures and methods to assess retail efficiency and productivity. Retail productivity is usually measured as ratios of outputs to inputs (Bucklin, 1978; Ratchford and Brown, 1985; Ratchford and Stoops, 1988). Bloom (1972) defined productivity as a ratio of output measured in specific units and any input factor also measured in specific units. A higher ratio of measured output to measured input factors can be directly interpreted as higher productivity. It can also be seen that the most widely used conceptualization of productivity has been as the ratio of outputs to inputs; total input productivity is defined as the ratio of all outputs to all inputs, and partial or single input productivity is the ratio of all outputs to a single input (Ingene, 1982, Lusch and Moon, 1984). The majority of measures of organization efficiency are input-output ratios, such as sales per square foot or sales per employee (Kamakura, Lenartowiez, and Ratchford 1996). Good (1984) provides a list of possible measures of retail outputs and inputs. Outputs are usually measured as the number of transactions, physical units sold, value added, and sales. Inputs are measured as the hours of labor employed, number of employees, wages, salaries and benefits paid, area of selling place, inventory, and advertising. Thus it can be seen that for the most part measures of company efficiency have been developed as macro tools, such as those created by the Bureau of Labor Statistics, and play an important role in assessing how efficiently a particular industry, or economy, is developing, absorbing technology, or offsetting rising wages. For these purposes, the existing techniques may be more appropriate. Apart from the industry level studies, understanding is also required at the individual store level for which, the macro tools are not suitable. Thus, there is a need for micro tools for use at the individual store level.

Despite its popularity in literature, the output-to-input ratio approach to retail productivity has several problems. First, retail productivity has been used interchangeably with labor or salesperson productivity simply because retailing is often a labor-intensive activity (Bush, Bush, Ortinau, and Hair, 1990; Ingene, 1982, 1984; Stem and El-Ansary, 1992; Thurik and Wijst, 1984), even though there is a large non-sales portion of labor force in retail industries. As a result, retail productivity has sometimes been treated as an issue of sales management. Focusing on an individual salesperson does not directly meet the measurement criteria of retail productivity because labor is simply one of the input factors (Good, 1984).

Second, traditional retail productivity studies have often focused on too micro units of analysis (e.g., salesperson evaluation; Bush, Bush, Ortinau, and Hair, 1990) or too macro units of analysis (e.g., retail industries or aggregation of stores; Goldman, 1992; Pilling, Henson, and Yoo, 1995). Previous research has ignored retail productivity with respect to individual stores and has not applied macro techniques to any extent as a managerial tool. Measuring productivity of individual stores would make the evaluation and control of managerial activities more feasible and objective. Thus, retail managers need such store level productivity measurement tools.

Third, most previous measures have been absolute measures of productivity. These indexes are calculated by inserting numbers into the predetermined formulas or ratios. They do not take into account the performance of other retail organizations or other environmental circumstances. The productivity measurement of an individual retail organization should be "relative" and incorporate the performances of other similar organizations.

Thus, literature related to retail productivity clearly shows that though simple to define, assessments of retail productivity based on simple ratios of outputs to inputs have been criticized for the following reasons: improper measurement of output (Achabal et al., 1984; Parsons, 1994; Oi, 1992); failure to account for changes in the quality of inputs or outputs over time or across stores (Doutt, 1984; Good, 1984; Lusch and Moon, 1984; Nooteboom, 1985; Oi, 1992); failure to account for the consumer's input to the process (Ingene, 1984; Oi, 1992); improper weighting of multiple inputs and outputs (Parsons, 1990); inability to separate differences in productivity from scale effects (Ratchford and Brown, 1985). In addition to these limitations, the traditional "ratio" approach to retail productivity presents other problems when the focus is evaluation of different retailers. These retail companies are typically located in different markets and serve a diverse population of customers, leading to distinct operational characteristics at each organization. These differences are not taken into account by traditional productivity indices, leading to a biased assessment of the relative efficiency of different retail organizations.

Thus, what is required is a new approach to retail productivity measurement that focuses on one organization relative to the best performers rather than the average performers as done in the traditional absolute measures. There are two major advantages of relative-to-best measures. First, in contrast to relative-to-average measures, relative-to-best measures are consistent with quality control movements such as benchmarking. The best performing units need to be used as role models or the bases for evaluation (Farrell, 1957). Second, in contrast to absolute measures, relative-to-best measures show contingent productivity, which takes into account performances of other comparable units and environmental factors. The absolute measures tend to focus only on controllable input factors such as labor and capital (Banker and Morley, 1986).

Finally, previous techniques of retail productivity such as cost function and total factor productivity indexes have a few drawbacks. Regression in the form of a cost function imposes a particular functional form and total factor productivity refers to the measurement of efficiency of all employed inputs (Bucklin, 1978), and relates net output to the associated total factor input; that is, to the input of both labor and capital (Bloom, 1972). The weights employed in calculating indexes for total factor productivity (weighted sums of outputs divided by weighted sums of inputs) are often subjective.

Consequently, in order to assess the productivity of organizations of a retail firm there is a need to develop an output-to-input ratio system which can handle multiple inputs and outputs in order to go beyond basic labor or capital productivity measurement. Ideally such a system would measure relative-to-best productivity or efficiency, as opposed to absolute or relative- to-average values, and resolve problems in traditional measurement techniques (such as cost functions and total factor productivity discussed above).

In view of the changing scenario of the Indian Retail Industry, the scarcity of studies on the assessment of different retail organizations is not compatible with the importance of the topic. With so many opportunities as well as challenges facing the Indian organized retail sector, the organized retail companies of India need to develop global competitive advantage and become efficient in their operations. Thus, given the lack of studies undertaken in this area in the Indian scenario, this study was undertaken to gain an insight into the relative efficiency of different retail companies in India and to identify ways to increase the efficiency of inefficient companies. In order to overcome the shortcomings of the techniques previously used to asses productivity, Data Envelopment Analysis technique has been used to asses the relative efficiency and productivity of some of the top retailers of India. The study identifies and analyses the importance of performance determining factors in improving the efficiency of a retail company.

3 OBJECTIVES OF THE PRESENT STUDY

The present study was undertaken to understand the factors affecting the performance of organized retail in India so as to better understand ways to help companies develop global competitive advantage in the retail sector. In particular, the study focused on:

1. Identifying the factors that have an affect on the performance of organized retail in India.
2. Analysis of the affect of these performance determining factors on the performance indicating factors
3. Identifying the more significant performance determining factors
4. Analyzing the relative efficiency of some of the top organized retail companies of India.
5. Comparing the inefficient retail companies with the efficient ones in order to identify the areas where improvement is required to help companies increase their efficiency.

4 METHODOLOGY OF RESEARCH

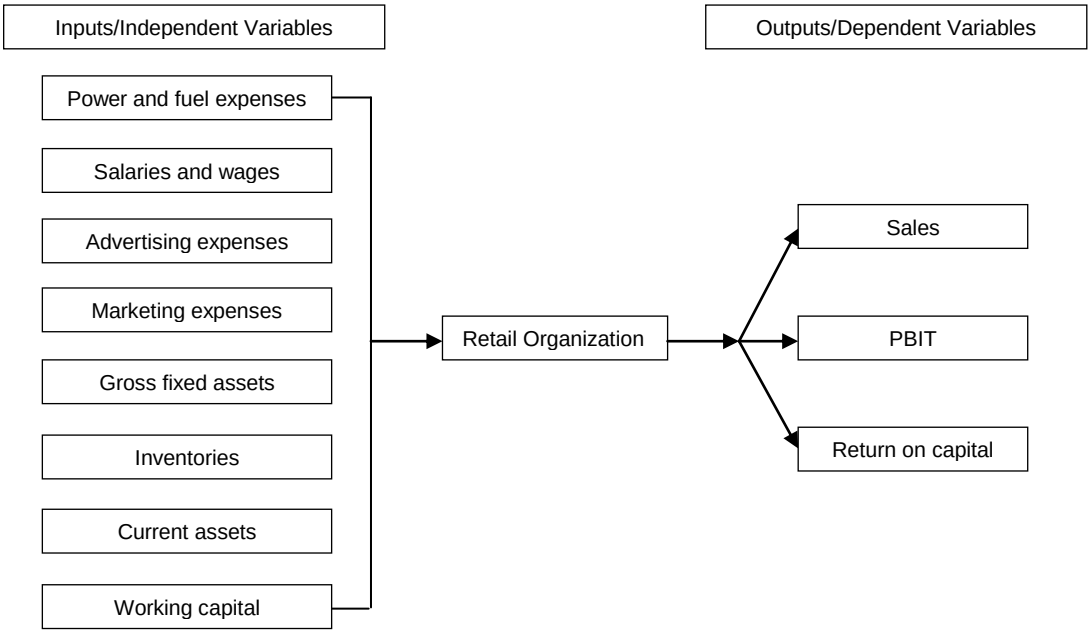
4.1 Data collection method & Justification of secondary source

The data used in this paper was collected from secondary sources. Data was obtained for 5 retail companies of India for the time period 2000 to 2007. The source of data was Prowess Database. Prowess is a database of large and medium Indian firms containing detailed information on over 20,000 firms. These comprise all companies traded on India's major stock exchanges and several others, including, the central public sector enterprises. The database covers most of the organized industrial activities such as banking, retailing, airlines and other service and manufacturing sectors of India. Prowess provides detailed information on each company including a normalized database of the financials covering 1,500 data items and ratios per company. Besides, it provides quantitative information on production, sales, consumption of raw material and energy etc. As Prowess database has found useful applications in places where trust and reliability matter the most, Prowess became the preferred source of data in respect of the variables identified for the present study.

4.2 Selection of Variables

On the basis of literature studied, data was gathered in respect of 12 variables out of which 9 were taken as performance determinants and 3 as performance indicators. The performance determinants included Advertising Expenses, Marketing Expenses, Capital employed, Current Assets, Gross Fixed Assets, Inventories, Power and Fuel Expenses, Salaries and Wages and Working Capital, while the performance indicators included Sales, PBIT and Return on Capital Employed. The different variables considered for the study have been tabled in Figure 1.

Figure 1: Conceptual Input Output framework



4.3 Method of analysis

Data was analyzed using two different techniques, Regression Analysis and DEA model. For Regression analysis, the nine performance determining factors were the independent variables while the three performance indicating factors were taken as the dependent variables. In the DEA Model, the performance determinants were used as the Input variables while the performance indicators were used as the Output variables.

4.4 Justification for using DEA method of analysis

Efficiency is usually measured as ratios of outputs to inputs. A higher ratio of measured output to measured input factors can be directly interpreted as higher efficiency. There are a number of methodologies which can be used for evaluation of efficiency of a unit such as, output-to-input ratio approach, regression, cost function, total factor productivity indexes and many others. DEA was chosen as the primary technique for efficiency evaluation since it was seen that though DEA works on the same concept as the traditional techniques of measurement, it covers lots of other aspects which the traditional techniques lack. DEA also has certain drawbacks but its advantages overshadow its disadvantages. The major advantages of DEA based method of efficiency evaluation includes utilization of both output and input observations, accommodation of multiple inputs and outputs, accommodation of both controllable and uncontrollable factors, computation of a single index of productivity, development of a relative measure of performance for each retail outlet using best performers as the bases, and non-imposition of any functional form on the data. Moreover, unlike total factor productivity indexes, DEA gives each of the observations its own set of weights which make the analysis more appropriate.

5 RESEARCH FINDINGS AND ANALYSIS

5.1 Affect of the performance determining factors of organized retail on performance indicators using Regression Analysis

5.1.1 Affect of performance determining factors on Sales

The value of Adjusted R^2 was found to be .991 which shows that the model is a good fit. The significance of the F-value came out to be .000 which indicates that the model is statistically significant at 5% level of significance. In order to adjudge whether there exists multi-collinearity between the independent variables, Durbin Watson test was administered along with regression. The value of the Durbin-Watson test came out to be 1.629 which indicated that auto correlation was not present in the data. Considering the correlation coefficients among predictors, it was deduced that they were not related so data was free from multi collinearity. The Beta values and the significance levels of t-tests for significance of individual independent variables are given in Table 1.

Table 1: Regression Analysis with Sales as dependent variable

Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**	**B**	**Std. Error**
1	(Constant)	23.481	20.021		1.173	.253
	Advertising Expenses	-7.243	2.844	-.203	-2.547	**.018**
	Capital employed	.018	.185	.007	.098	.923
	Current Assets	.224	.503	.090	.446	.660
	Gross fixed assets	-.569	.594	-.132	-.957	.349
	Inventories	1.110	.166	.337	6.697	**.000**
	Marketing expenses	2.572	1.730	.048	1.486	.151
	Power and fuel expenses	54.275	11.873	1.069	4.571	**.000**
	Salaries and wages	-1.170	3.493	-.065	-.335	.741
	Working capital	-.520	.436	-.088	-1.194	.245

Dependent Variable: Sales

As can be seen from Table 1, only 3 of the independent variables were found to be statistically significant in the model at 5% significance level. These include - Advertising Expenses, Inventories and Power & Fuel Expenses. Looking at the Beta values for all these variables, it could be seen that Advertising Expenses was negatively related to the dependent variable i.e. Sales while the other 2 variables i.e. Inventories and Power & Fuel Expenses were both positively related to the dependent variable. Looking at the Beta values, it can be said that in absolute terms Power & Fuel Expenses with a Beta value of 1.069 had the maximum effect on Sales while Advertising Expenses with a Beta value of -.203 had the least effect.

The estimated increase in sales for every unit increase or decrease in these variables is given by the standardized Beta values of these variables. Since the Advertising Expenses were negatively related to sales, it indicated that if advertising expenses are decreased by one unit, sales will increase by .203, if all the other variables remain unchanged. The positive effect of Inventories and Power & Fuel Expenses on Sales denotes that for every one unit increase in Inventories, Sales will increase by .337 other variables remaining constant and for every one unit increase in Power & Fuel Expenses, Sales will increase by 1.069, if all other variables are unchanged.

5.1.2 Affect of performance determining factors on PBIT

The value of Adjusted R^2 was found to be .934 which shows that the model is a good fit. The significance of the F-value came out to be .000 which indicates that the model is statistically significant at 5% level of significance. The value of the Durbin-Watson test came out to be 1.267 showing that auto correlation was not present in the data. Considering the correlation coefficients among predictors, it can be said that they were not related so data was free from multi collinearity. The Beta values and the significance levels of t-tests for significance of individual independent variables are given in Table 2.

Table 2: Regression Analysis with PBIT as dependent variable

Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**	**B**	**Std. Error**
1	(Constant)	-10.749	8.005		-1.343	.193
	Advertising Expenses	-5.500	1.137	-1.032	-4.837	**.000**
	Capital employed	.020	.074	.055	.273	.788
	Current Assets	.120	.201	.323	.598	.556
	Gross fixed assets	-.317	.238	-.491	-1.333	.196
	Inventories	.218	.066	.443	3.285	**.003**
	Marketing expenses	5.479	.692	.690	7.920	**.000**
	Power and fuel expenses	9.555	4.747	1.262	2.013	**.057**
	Salaries and wages	-.589	1.397	-.219	-.422	.677
	Working capital	.047	.174	.053	.267	.792

Dependent Variable: PBIT

As can be seen from Table 2, only 4 of the independent variables were found to be statistically significant in the model at 5% significance level. These include - Advertising Expenses, Inventories, Marketing Expenses and Power & Fuel Expenses. Looking at the Beta Values for all these variables, it could be seen that Advertising Expenses was negatively related to the dependent variable i.e. PBIT while the other 3 variables i.e. Inventories, Marketing Expenses and Power & Fuel Expenses were positively related to the dependent variable. Looking at the Beta values it could be said that in absolute terms Power & Fuel Expenses with a Beta value of 1.262 had the maximum effect on PBIT while Inventories with a Beta value of .443 had the least effect on PBIT.

The negative effect of Advertising Expenses on PBIT clearly shows that an increase in Advertising Expenses decreases PBIT and vice versa. Thus, every one unit decrease/increase in Advertising Expenses will lead to a 1.032 increase/decrease in PBIT, other variables remaining unchanged. The positive effect of Inventories, Marketing Expenses and Power & Fuel Expenses on PBIT indicates, that for every one unit increase in Inventories, Marketing Expenses and Power & Fuel Expenses, PBIT will increase by .443, .690 and 1.262 respectively, if the other variables remain constant.

5.1.3 Affect of performance determining factors on Return on Capital Employed

The value of Adjusted R^2 was found to be .748 which shows that the model is a good fit. The significance of the F-value came out to be .000 which indicates that the model is statistically significant at 5% level of significance. Existence of multi-collinearity between the independent variables was seen by administering Durbin Watson test along with regression. The value of the Durbin-Watson test came out to be 2.578 which showed that auto correlation was not present in the data. Considering the correlation coefficients among predictors, it was deduced that they were not related so data was free from multi collinearity. The Beta values and the significance levels of t-tests for significance of individual independent variables are given in Table 3.

Table 3: Regression Analysis with Return on Capital Employed as dependent variable

Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**	**B**	**Std. Error**
1	(Constant)	-22.488	11.973		-1.878	.074
	Advertising Expenses	-5.206	1.701	-1.273	-3.061	**.006**
	Capital employed	.021	.111	.074	.188	.853
	Current Assets	.280	.301	.977	.930	.362
	Gross fixed assets	.210	.355	.426	.592	.560
	Inventories	-.043	.099	-.115	-.436	.667
	Marketing expenses	5.816	1.035	.955	5.620	**.000**
	Power and fuel expenses	4.862	7.100	.837	.685	.501
	Salaries and wages	-1.733	2.089	-.839	-.829	.416
	Working capital	-.171	.261	-.254	-.655	.519

Dependent Variable: Return on Capital Employed

As can be seen from Table 3, only 2 of the independent variables were statistically significant in the model at 5% significance level. These include - Advertising Expenses and Marketing Expenses. Looking at the Beta Values for these 2 variables, it was seen that Advertising Expenses was negatively related to the dependent variable i.e. Return on Capital Employed while Marketing Expenses was positively related to the dependent variable. Looking at the Beta values it could be said that in absolute terms Advertising Expenses with a Beta Value of -1.273 had a more significant effect on the dependent variable than Marketing Expenses.

Looking at the standardized Beta values of the 2 significant variables, it becomes clear that an increase/decrease in Advertising Expenses leads to a decrease/increase in Return on Capital Employed, because of the negative relation of Advertising Expenses with Return on Capital Employed, while an increase/decrease in Marketing Expenses leads to an increase/decrease in Return on Capital Employed, because of the positive effect of the former on the latter. Thus, for every one unit decrease/increase in Advertising Expenses, the Return on Capital Employed will increase/decrease by 1.273 while for every one unit increase/decrease in Marketing Expenses, Return on Capital Employed will increase/decrease by .955.

5.2 Comparison of Retail Productivity using Data Envelopment Analysis (DEA)

In order to measure and evaluate the efficiency of some of the top retail organizations of India, data related to five retail organizations was obtained from a well known financial software – Prowess, for a period of eight years starting from year 2000 and ending at 2007. The five retail organizations were coded as 1, 2, 3, 4, and 5 respectively in the following analysis. Appropriateness of company and data to DEA has been examined in this study in terms of many assumptions which were cited by Dyson et al (2001). One of them was homogeneity assumptions relating to the homogeneity of units under assessment. In general the units were understood to be similar in a number of ways. Retail Organizations in this study offer similar product categories by driving similar inputs. The second assumption according to Dyson et al. (2001) was about the input/output set. The study satisfied the second assumption because all retail organizations were evaluated on the same input and output parameters. The sets of factors were common to all organizations. The last assumption named as factor measurement was on the measurement scales of inputs and outputs. According to it, they should conform to ratio scales. The present study also supported the last assumption.

Since the efficiencies of various organizations were measured by DEA model, it was necessary to solve the model three, four or five times depending on the data available for the five different organizations under study for different years. Productivity or efficiency in the context of DEA dealt with producing the maximum quantity of outputs for any given amount of inputs or the minimum use of inputs for any given amount of outputs. The first task of DEA was to find the most efficient retail organization, which produced a so-called efficient frontier, which is a series of points, a line, or a surface connecting the most efficient retail organizations, which were determined from a comparison of inputs and outputs of all retail organizations under consideration. Thus, DEA produced the relative efficiency boundaries, which are called envelopes.

Retail organizations lying on the efficient frontier were given the arbitrary efficiency score of one. In other words, any unit or organization whose efficiency score equaled one was defined as "efficient", otherwise "inefficient" (Bal and Örkcü, 2005). In other words, efficiency is the ratio of the weighted sum of outputs to the weighted sum of inputs. In the present study, the different retail organizations used 9 input variables as mentioned earlier and 3 output variables. Thus, for an organization to be efficient:

$$E_1 = \frac{A_1Y_1 + A_2Y_2 + A_3Y_3}{B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + B_7X_7 + B_8X_8 + B_9X_9} <= 1$$

Where,

If $E_i < 1$ ➔ organization is inefficient.
If $E_i = 1$ ➔ organization is efficient.

and

E = efficiency of a retail organization
Y = outputs used in the DEA model
X = inputs used in the DEA model
A = weights DEA estimates for the outputs
B = weights DEA estimates for the inputs

The model was run for each organization by utilizing Solver bundled with Microsoft Excel. The results of the analysis are discussed under headings of Efficient and Inefficient retail organizations while areas of improvement for inefficient retail organizations were identified using Sensitivity/Gap analysis.

5.2.1 Efficient and inefficient Retail Organizations

The results obtained from data entered in the DEA model are tabulated in Table 4. It can be seen from this table that companies 1, 2, 3, and 5 were found to be running efficiently with company 1 showing consistency in efficiency across all the years studied. Organization 4 secured efficiency score less than 1 in the years 2005 and 2006 showing that it was relatively inefficient in these years in comparison to the other companies.

Table 4: Efficiency scores for companies in different years

Companies	Year							
	2000	2001	2002	2003	2004	2005	2006	2007
1	1	1	1	1	1	1	1	1
2	1	1	1	1	1	1	1	1
3	NA	NA	1	1	1	1	1	NA
4	1	1	1	1	1	0.463	0.616	1
5	NA	NA	NA	NA	NA	NA	1	1

Figure 2: Snapshot of DEA model for an efficient retail organization

DEA Analysis													
Selected Company	5												
2006													
Inputs Used			Variables (Units Rs. Crore) --->										
Companies	Year		Power and fuel	Salaries and wa	Advertising	Marketing	Capital emp	Gross fixed	Inventories	Current ass	Working capital		
1	2006		21.95	50.75	32.57	10	458.28	266.89	275.93	409.34	218.36		
2	2006		14.64	40.29	11.91	7.29	272.94	159.32	65.84	251.83	111.98		
3	2006		5.11	20.93	4.16	0	60.38	70.1	36.5	74.31	2.31		
4	2006		9.69	20.61	29.85	19.07	335.32	97.24	55.36	188.3	82.28		
5	2006		3.12	13.04	3.39	0	129.18	101.01	42.43	107	49.34		
Unit costs of inputs			0.001	0.043	0.001	0.951	0.001	0.001	0.001	0.001	0.001		
Outputs Produced													
Companies	Year		Sales	PBIT	Return on capital employed								
1	2006		1085.6	82.21	22.22								
2	2006		678.36	97.14	53.47								
3	2006		290.63	-11.74	-27.88								
4	2006		948.23	38	12.74								
5	2006		104.86	-0.02	0								
Unit prices of outputs			0.010	0.000	0.058								
Constraints that input variables must cover output values													
Companies	Input Costs			Output Values									
1	13.386	>=		11.638									
2	9.562	>=		9.562									
3	1.159	>=		1.159									
4	19.815	>=		4.010									
5	1.000	>=		1.000									

Result Box			
Constraint that selected input variables must equal a nominal value of 1			
Selected Input Cost	1.000	=	1
Maximize selected Company's output value (if it is 1, efficient)			
Selected Output	1.000		

In using DEA, the weights were estimated separately for each retail organization such that its efficiency was the maximum attainable. As can be seen in Figure 2, DEA estimated the weights 0.001, 0.043, 0.001, 0.951, 0.001, 0.001, 0.001, 0.001 and 0.001 for the input variables and 0.010, 0.000, and 0.058 for the output variables for retail organization 5 for the year 2006. DEA estimated the weights such that the estimated efficiency of retail organization 5 (E_5) was the maximum possible. However, the weights estimated for retail organization 5 were such that when they were applied to the inputs (X_s) and outputs (Y_s) of all other units in the analysis their ratio of weighted outputs to weighted inputs was less than or equal to 1. Similarly, DEA estimated a separate set of weights for each retail organization such that the estimated weights led to a maximum attainable efficiency for that organization. As seen from Figure 2, DEA optimized on each individual retail organization's performance in relation to the performance of all other retail organizations. While using DEA, the estimated weights were constrained so that no one input or output variable dominated the efficiency estimation. Minimum limits were also set for the estimated weights so that all inputs and outputs were forced to play a role in efficiency computation. The efficiency computed by DEA assumed that 100% efficiency is attained for an organization only when (1) none of the outputs can be increased without either increasing one or more inputs or decreasing some of its other outputs and (2) none of the inputs can be decreased without decreasing some of its outputs or increasing some of its other inputs. Hence, 100% efficiency is defined to have been attained by a retail organization only when comparisons with other organizations do not provide evidence of inefficiency in the use of any inputs and in creation of any outputs.

5.2.2 Sensitivity/Gap analysis for inefficient Retail Organizations

At the individual retail organization level, DEA also provided rich diagnostic information through sensitivity analysis. For every retail organization not on the efficient frontier, DEA identified a set of efficient reference organizations in the corresponding envelope. These efficient reference organizations (whose efficiency is 100%) helped in identifying the inadequacies or slacks in the controllable inputs/outputs of the inefficient organization. By comparing the controllable inputs and outputs of the inefficient organization with the controllable inputs and outputs of a linear combination of the efficient reference organizations that comprised the frontier (a virtual organization), the amount of slack in each of the variables was computed. This can help the inefficient organization identify how to allocate resources more efficiently and improve its productivity.

An inefficient organization may become efficient by increasing all outputs by an amount equal to its corresponding slack (i.e., move towards the efficient frontier vertically in the case of a 2-dimensional plot) or by decreasing all controllable inputs by amounts equal to its corresponding slacks (i.e., move towards the efficient frontier horizontally in the case of a 2- dimensional plot).

Table 5: Sensitivity analysis for retail organization 4 for the year 2005

	(Units Rs. Crore)			
Inputs	**Estimated Weights**	**Value Measured**	**Value If Efficient**	**Improvement Scope/Slack**
Power and fuel expenses	0.001	6.8	4.489	-2.311
Salaries and wages	0.021	14.86	12.205	-2.655
Advertising expenses	0.001	21.17	4.032	-17.138
Marketing expenses	0.001	13.68	2.700	-10.980
Capital employed	0.001	216.97	56.832	-160.138
Gross fixed assets	0.001	80.96	65.724	-15.236
Inventories	0.001	37.63	34.199	-3.431
Current assets	0.001	183.15	62.786	-120.364
Working capital	0.001	123.62	-1.337	-124.957
Outputs				
Sales	0.002	231.49	231.490	0.000
PBIT	0.001	25.72	25.720	0.000
Return on capital employed	0.000	9.49	25.982	16.492

Table 6: Sensitivity analysis for retail organization 4 for the year 2006

	(Units Rs. Crore)			
Inputs	**Estimated Weights**	**Value Measured**	**Value If Efficient**	**Improvement Scope/Slack**
Power and fuel expenses	0.001	9.69	7.178	-2.512
Salaries and wages	0.009	20.61	18.993	-1.617
Advertising expenses	0.001	29.85	7.532	-22.318
Marketing expenses	0.001	19.07	3.337	-15.733
Capital employed	0.001	335.32	137.685	-197.635
Gross fixed assets	0.001	97.24	82.077	-15.163
Inventories	0.001	53.36	53.360	0.000
Current assets	0.001	188.3	126.433	-61.867
Working capital	0.001	82.28	58.833	-23.447
Outputs				
Sales	0.002	343.23	343.230	0.000
PBIT	0.002	38	38.000	0.000
Return on capital employed	0.000	12.74	17.174	4.434

Table 5 and 6 show the gap calculated for various inputs of the inefficient organization by comparing them with the combined weighted inputs of all the efficient organizations for year 2005 and year 2006 respectively. Table 5 shows the sensitivity analysis results for retail organization 4 for the year 2005 while Table 6 has the sensitivity analysis results for retail organization 4 for the year 2006. These tables show the amount of slack in each of the controllable input and output observations for this retail organization. This slack was computed by comparing the input and output of retail organization 4 with the inputs and outputs of its efficient reference organizations. These efficient reference organizations were organizations which operate under circumstances similar to that of organization 4, but have 100% efficiency. The results show that retail organization 4 could have become efficient (increased efficiency from 0.463 to 1.00 in year 2005 and from 0.616 to 1.00 in year 2006) by increasing all outputs by the corresponding slack amounts or decreasing all controllable inputs by corresponding slacks. Retail organization 4's estimated weights for the 12 variables are also shown in Table 5 and Table 6 for the year 2005 and 2006 respectively. DEA estimated these weights such that the estimated efficiency of 0.463 and 0.616 for retail organization 4 is the maximum attainable. No other combination of weights would have produced a higher efficiency estimate for retail organization 4 and yet satisfied all of the constraints in the optimization.

As can be seen from tables 5 and 6, the maximum contribution to total input savings was from marketing expenses (2005:17% & 2006:25%) and advertising expenses (2005:17% & 2006:23%). Though working capital was seen as a major improvement area in the year 2005, it got substantially covered in the year 2006 (from 21% to 9%). Thus, retail organization 4 in order to become efficient needed to pay more attention on the marketing and advertising expenses as the most potential improvements factors. From the perspective of improving outputs, the results suggested that a need existed to improve return on capital. Keeping these factors in mind, retail organization 4 became efficient in the year 2007 as can be seen from Figure 5.

Figure 5: Snapshot of DEA model for retail organization 4 for the year 2007

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	**DEA Analysis**													
2	Selected Company	4												
3	2007													
4		**Inputs Used**		**Variables (Units Rs. Crore) —>**										
5		Companies	Year	Power and fuel	Salaries and wa	Advertising	Marketing	Capital emp	Gross fixed	Inventories	Current ass	Working capital		
6		1	2007	37.41	112.72	50.96	7.03	794.26	452.07	507.02	829.76	250.29		
7		2	2007	18.34	58.5	17.64	9.92	295.18	211.83	115.24	334.44	86.06		
8		3	2007											
9		4	2007	0	12.83	1.79	38.06	4.32	46.18	453.16	72.53	9.99		
10		5	2007	6.8	21.64	9.04	0	118.91	90.11	54.46	127.18	44.86		
11		**Unit costs of inputs**		0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.001		
12														
13		**Outputs Produced**												
14		Companies	Year	Sales	PBIT	Return on capital employed								
15		1	2007	1962.06	127.58	19.84								
16		2	2007	899.91	122.01	43.15								
17		3	2007											
18		4	2007	563.01	284.86	179.94								
19		5	2007	160.98	-24.65	-18.28								
20		**Unit prices of outputs**		0.001	0.001	0.000								
21														
22		**Constraints that input variables must cover output values**						**Result Box**						
23		Companies	Input Costs		Output Values			**Constraint that selected input variables must equal a nominal value of 1**						
24		1	3.446	>=	2.552			Selected Input Cost	1.000	=	1			
25		2	1.239	>=	1.239									
26		3	0.000	>=	0.000			**Maximize selected Company's output value (if it is 1, efficient)**						
27		4	1.000	>=	1.000			Selected Output	1.000					
28		5	0.516	>=	0.172									

6 IMPLICATIONS OF THE STUDY

The present study aimed at identifying the performance determining factors that have a significant effect on the performance indicators of Indian organized retailers. The study also explored the efficiency levels of five of the top retail organizations of India so as to identify their efficiency/inefficiency levels across the years relative to each other. An understanding of this was necessary to have a clear idea of the factors/variables which make a retail organization efficient or inefficient and thereby gain cognizance of the way in which an inefficient retail organization can be made efficient.

The findings of regression analysis bring forth the performance determining factors which have a significant effect on the performance indicators. One variable which was commonly found to have a significant effect on each of the three performance indicators was Advertising Expenses. Advertising Expenses was found to have a negative effect on each of the three performance indicators i.e. Sales, PBIT and Return on Capital Employed. This clearly shows that the retail companies are spending more than the required amount on advertising. The amount of money being spent on advertising by companies should be used more judiciously by planning the investment depth in advertising arena incase the companies want to bring about an increase in their Sales, PBIT or Return on Capital Employed. This finding is also supported by the results of Sensitivity Analysis of the inefficient retail organization as shown by the DEA Model. Sensitivity/gap analysis of the inefficient retail organization clearly shows that one of the factors/inputs which needs to be reduced for the inefficient retail organization to become efficient is Advertising Expenses. The other significant performance determining factors as shown by regression analysis include Inventories, Power & Fuel Expenses and Marketing Expenses which were found to have a positive effect on either one or the other of the dependent variables - the performance indicators. Consequently, if retail organizations want to increase their performance, as denoted by either Sales, PBIT or Return on Capital Employed, they need to make an increase in their inventories, marketing expenses or power & fuel expenses. This can be justified by the reasoning that an increase in inventories can help the organization in providing more choice to the customers and can also reduce out of stock situations for the company. An increase in marketing expenses might include promotional schemes, events and loyalty programs the retail organization undertakes/organizes from time to time. This increase leads to an increase in performance, as expenses in these make the retail organization more attractive for customers by offering something new every few weeks in the way of schemes, festivals, discounts or visual merchandising. These expenses also

help in building the loyalty of a retail organization's regular customers by giving them rewards for being loyal to a particular retail organization. Similarly an increase in power and fuel expenses leading to an increase in performance can be justified as follows. Increase in such expenses means more lighting inside the retail store and use of entertainment and visual media to attract the customers. Use of technology in the form of computerized systems, theft tracking machines etc also leads to an increase in such expenses which is offset by an increase in the efficiency of operations.

The findings of the DEA Model help in determining the relative efficiency of some of the top retail organizations of India which helps in giving a benchmark of a relatively efficient retail organization against which other similar retail organizations can position themselves. The analysis helps in providing a suitable mix of inputs and outputs so as to make an inefficient organization efficient. For example the findings clearly indicate that retail organization 4 which came out to be relatively inefficient via the DEA Model should have focused on certain inputs specifically as for two consecutive years it failed to achieve efficiency and in both the years the slack had been in common input variables. Similarly, these efficiency improvement factors should be paid attention to by other retail organizations so as to improve their performance and become more efficient. Thus, beyond basic efficiency measurement, the findings of the present study can be used to improve individual store performance using the diagnostic information provided in sensitivity analysis. Similar analysis may also be used to compensate individual store operators which will motivate store operators to maximize operating efficiency as opposed to just increasing outputs. Efficiency based evaluation will motivate employees to not only work hard, but also work smart.

7 APPLICABILITY OF PRESENT STUDY TO OTHER ENVIRONMENTS

The present study is relevant to other developing countries particularly those with similar cultural values such as India. Countries in similar stages of development particularly the BRIC (Brazil, Russia, India and China) countries have been touted as being the power houses of the future in the BRIC Report prepared by Goldman Sachs in the year 2001, and defended in the paper Dreaming with BRICs: The Path to 2050 in the year 2003. All these countries are at similar stages of development and are thereby attracting a lot of attention and interest of foreign players. Retail is one of the highly attractive sectors in these economies attracting a great deal of interest of companies either domestic or foreign. Given the increased interest in the retail sector of these countries, the present study will be applicable for retail organizations in these countries irrespective of their size. The methodology used in the present study can be helpful to these organizations to increase their operational efficiency and gain a competitive edge and thereby be prepared for the competitive onslaught. Even for the retail organizations in developed countries, the present study is relevant since the input/performance determining and the output/performance indicating variables used in the present study are common for retail organizations across the spectrum irrespective of the level of development of the country.

8 LIMITATIONS OF THE STUDY

The present study though relevant in the highly volatile retail environment of today suffers from certain limitations. The study has been conducted only for 5 retail organizations of India, though there are many more in the market today. Also, the data for these companies has been taken only for 8 years and pertaining to only 12 variables. Though the variables which have been taken for the study are comprehensive enough in depicting the performance of retail organizations, a further study can be undertaken with more variables to make the analysis more thorough.

9 DIRECTIONS FOR FUTURE RESEARCH

A similar study can be conducted taking a larger number of retail organizations and variables into consideration to form a more comprehensive picture of the performance of retail organizations in India. The present study compares the performance efficiency of retail organizations having similar formats. The study can be extended to compare the efficiency of different formats of the same company to understand which format is performing more efficiently and hence is more suited for a developing country like India. For example, Spencer's (a retail store chain in India) has different retailing formats under the names of Spencer's Hyper, Spencer's Super, Spencer's Fresh, Spencer's Express, and Spencer's Daily which can be compared on the basis of efficiency/inefficiency in performance. Moreover, a comparative study can be undertaken to compare the performance efficiency of retail

organizations in different countries so as to make a cross cultural comparison of the effect of different input variables on the output variables. The present study could also be extended to make an intra-company comparison whereby the performance efficiency of a particular company could be seen across the years so as to find out which factors increase the efficiency of the company in certain year's vis-à-vis the other years.

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The effects of human resource practices on firm growth

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Abstract

Although the connection between firm growth and labour is well documented in economics literature, only recently the link between human resources (HR) and firm growth has attracted the interest of researchers. This study aims to assess the extent, if any, to which, specific HR practices may contribute to firm growth. We review a rich literature on the links between firm performance and the following HR practices: (1) job security (2) selective hiring, (3) self-managed teams (4) compensation policy, (5) extensive training, and (6) information sharing. We surveyed HR managers and recorded their perceptions about the links between HR practices and firm growth. Results demonstrated that compensation policy was the strongest predictor of sales growth. Results provide overall support for all HR practices except of job security. Eventually, selecting, training, and rewarding employees as well as giving them the power to decide for the benefit of their firm, contribute significantly to firm growth.

Keywords: human resource practices, firm growth, selective hiring, compensation policy

1 INTRODUCTION

The extent to which, if any, human resource management (HRM) impacts on organizational performance has emerged as the central research question in the personnel/HRM field (see Becker and Gerhart, 1996; Guest, 1997 for reviews). Although initial results indicate that some human resources practices may have a positive effect on organizational performance, most scholars suggest that more conceptual and empirical work is required (Brewster, 2004; Cardon and Stevens, 2004; Givord and Maurin, 2004; Zhu, 2004). For the moment, although Human resources (HR) are considered as the most valuable asset in an organization, they make a difference only for a few organisations (Pfeffer, 1998; Wimbush, 2005).

The link between human resources (HR) and firm growth is well documented in classic economic theory. Overwhelming evidence suggests growth is driven by specialization and division of labour in the processes of generation and attraction/development of technological opportunities. However, at the firm level of analysis, only recently the link between human capital and growth has attracted the interest of researchers.

Firm growth is often seen as an indication of market acceptance and firm success (Fesser and Willard, 1990). Growth is considered as a top strategic priority for most firms yet only few companies achieve growth and ever fewer in maintaining in (Baum and Wally, 2003; Zook and Allen, 2003). Assuming, that firm growth involves more purposeful work and strategic decision making than leaving it to random and chance events, the present study addresses a central research question: How do human resource management practices contribute to firm growth?

The next section reviews the relevant literature on HR practices and firm growth. A discussion of the methodology employed for data collection follows. The last two sections illustrate the data analysis, the discussion of the key results and the provision of possible avenues for future research.

2 LITERATURE REVIEW

A growing body of empirical research has examined the effect of certain HRM practices on firm performance. Although there is a long list of best HR practices that can affect either independently or collectively on the organizational performance, results are hard to interpret. In order to determine any effects of HR practices on firm growth, we choose to examine HR practices initially proposed by Pfeffer (1998) which according to the literature, can be expected to influence the firm performance. In his seminal work, Pfeffer (1998) proposed the following seven HRM practices: (1) employment security (2) selective hiring, (3) self-managed teams and decentralization of decision making (4) comparatively high compensation contingent on organizational performance, (5) extensive training, (6) reduced status distinctions and barriers, including dress, language, office arrangements, and wage differences across levels, and (7) extensive sharing of financial and performance information throughout the organization.

The following sections will develop hypotheses concerning the relationship between HRM practices and firm growth.

2.1 Compensation policy

Performance-based compensation is the dominant HR practice that firms use to evaluate and reward employees' efforts (Collins and Clark, 2003). Evidently, performance-based compensation has a positive effect upon employee and organizational performance (see for reviews: Brown et al. 2003; Cardon and Stevens, 2004). However, there is scarce evidence on the effects of compensation policy of firm growth. Empirical studies on the relationship between performance-related pay and company performance have generally found a positive relationship, but a growing body of empirical evidence suggests that it is not just pay level that matters, but pay structure as well (Wimbush, 2005; Singh 2005).

Barringer et al. (2005) conducted a quantitative content analysis of the narrative descriptions of 50 rapid-growth firms and a comparison group of 50 slow-growth companies. Results demonstrated that employee incentives differentiated the rapid-growth from the slow-growth firms. Firms that were eager to achieve rapid-growth provided their employees financial incentives and stock options as part of their compensation packages. In doing so, firms managed to elicit high levels of performance from employees, provide employees the feeling that they have an ownership interest in the firm, attract and retain high-quality employees, and shift a portion of a firm's business risk to the employees.

Delery and Doty (1996) identified performance-based compensation as the single strongest predictor of firm performance. Both performance-based compensation and merit-based promotion can

be viewed as ingredients in organizational incentive systems that encourage individual performance and retention (Uen and Chien, 2004). Collins and Clark (2003) studied 73 high-technology firms and showed that the relationships between the HR practices and firm performance (sales growth and stock growth) were mediated through their top managers' social networks.

Cho et al. (2005) suggested that incentive plans is effective in decreasing turnover rates. Banker et al. (2001) conducted a longitudinal study of the effectiveness of incentive plans in the hotel industry and found that incentive plans were related to higher revenues, increased profits, and decreased cost. Paul and Anantharaman (2003) found that compensation and incentives directly affect operational performance.

To be effective, compensation practices and policies must be aligned with organisational objectives. While performance-based compensation can motivate employees, sometimes employees perceive it as a management mechanism to control their behaviour (Lawler and Rhode, 1976). In such a case, employees are less loyal and committed, thus compensation plans have the opposite than desired outcome (Ahmad and Schroeder, 2003; Rodrıguez and Ventura, 2003).

Employee turnover can significantly slow revenue growth, particularly in knowledge-intensive industries (Baron and Hannan, 2002). Given that much of the tacit knowledge resides within employees, significant turnover poses a threat to firm performance and its future growth potential. With high turnover rates, firm growth flees away along with leaving managers who often become employers of rival firms or establish themselves rival firms.

Therefore, we propose this hypothesis:

Hypothesis 1: Compensation Policy is positively related to firm growth

2.2 Decentralization & Self-managed teams

More and more, employees are required to work in teams, make joint decisions, and undertake common initiatives in order to meet the objectives of their team and organization. Self-managed teams can affect firm growth in two ways: Firstly, a surplus of junior managers in a firm may create and support dynamics of firm growth. The growth stage is perhaps the most dynamic stage of a firm's life cycle. As the business expands, new levels of management are added. Decision-making becomes more decentralized, middle managers gain authority and self-managed teams proliferate as the firm adds more and more projects and customers (Flamholtz and Randle, 2000; Miller and Friesen, 1984). Secondly, teamwork and decentralization of decision making promotes employee commitment participation and create a sense of attachment, thus indirectly affecting firm performance (Tata and Prasad, 2004).

Several studies identified self-managed teams and decentralization as important high-performance HRM practices (Pfeffer, 1998; Wagner, 1994; Yeatts and Hyten, 1998; Singer and Duvall, 2000). Jayaram et al. (1999) found that decentralised teams have a positive effect on two dimensions of the performance, time and flexibility. Collins and Clark (2003) examined the role of human resource practices in creating organizational competitive advantage and found that top management team social networks (practices such as mentoring, incentives, etc.) mediated the relationship between HR practices and firm performance. Haleblian and Finkelstein (1993) examined the effects of top management team size and chief executive officer (CEO) dominance on firm performance in different environments. Results showed that firms with large teams performed better and firms with dominant CEOs performed worse in a turbulent environment than in a stable one.

Tata and Prasad (2004) found that a company with micro level of centralisation is a receptive environment for self-managed teams. In a study of differential outcomes of team structures for workers, supervisors, and middle managers in a large unionized telecommunications company, Batt (2004) found that participation in self-managed teams is associated with significantly higher levels of employment security, and satisfaction for workers and the opposite for supervisors. Black et al. (2004) examined the impact of organizational change on workers and found evidence that self-managed teams are associated with greater employment reductions.

Therefore, we propose this hypothesis:

Hypothesis 2: Decentralisation is positively related to firm growth.

2.3 Information Sharing

Sharing of information may have a dual effect: Firstly, it conveys employees the right meaning that the company trusts them. Secondly, in order to make informed decision, employees should have access to critical information. Communicating performance data on a routine basis throughout the year help employees to improve and develop. Employees presumably want to be good at their jobs, but if

they never receive any performance feedback, they may perceive to have a satisfactory performance when in fact they do not (Chow et al., 1999). Furthermore, information sharing fosters organizational transparency which reduces turnover (Ahmad and Schroeder, 2003) and forges synergistic working relationship among employees (Nonaka, 1994).

Information sharing is not a widespread HR practice as someone might have expected it to be. Many companies are vulnerable to share critical information with their employees because in this way employees become more powerful and companies may loose control of them (Pfeffer, 1998). Furthermore, information sharing always involves the danger of leaking important information to competitors (Ronde, 2001). In a study of Japanese consultation committees, Morishima (1991) found a positive association of information sharing with productivity and profitability, and a negative one with labour cost. Constant et al. (1994) pointed out that attitudes about information sharing depend on the form of the information. Burgess (2005) studied employee motivations for knowledge transfer outside their work unit and found that employees who perceived greater organizational rewards for sharing spent more hours sharing knowledge beyond their immediate work group. However, a significant percentage of employees perceived knowledge as a means of achieving upward organizational mobility. Therefore, employees sought information more often than shared it.

Roberts (1995) studied how HR strategy affects profits in 3,000 businesses throughout the world and found that sharing information was related with higher profitability. However, Ichniowski and Shaw (1999) compared US and Japanese steel-making plants and found that employee participation based solely on problem-solving teams or information sharing did not produce large improvements in productivity. In a study of Fortune 1,000 largest manufacturing and service companies on high-performance practices, Lawler et al. (1995) found information sharing to correlate to firm performance but results are inconclusive.

Therefore, we propose this hypothesis:

Hypothesis 3: Sharing of information is positively related to firm growth.

2.4 Selective Hiring

This practice can ensure that the right people, with the desirable characteristics and knowledge, are in the right place, so that they fit in the culture and the climate of the organization. Moreover, pinpointing the rights employees would decrease the cost of employees' education and development.

Schuster (1986) argued that selective hiring is a key practice that creates profits. Huselid (1995) examined HR practices of high performance companies and found that attracting and selecting the right employees increase the employee productivity, boost organizational performance, and contribute in reducing turnover.

Cohen and Pfeffer (1986) argued that hiring standards reflect not only organizations' skill requirements but also the preferences of various groups for such standards and their ability to enforce these preferences. Michie and Quinn (2001) proposed that a possible indirect link between selective hiring and organisational performance can be the forging of internal bonds between managers and employees that creates the write culture for productivity growth. Collins and Clark (2003) argued that the practice of selective hiring results at sales growth. Paul and Anantharaman (2003) pointed out that an effective hiring process ensures the presence of employees with the right qualifications, leading to production of quality products and consequently in increase of economic performance.

Cho et al. (2005) examined pre-employment tests as a key component of selective hiring and found that when employed, these tests can select employees that stay with a company longer. Passing pre-employment tests may give an applicant a stronger sense of belonging to the company, resulting in higher degrees of commitment if employed. Cardon and Stevens (2004) pointed out that for small companies recruiting is often problematic. This can be due to several reasons such as limited financial and material resources and jobs with unclear boundaries responsibilities, which decreases their potential to hire qualified candidates. Therefore, we propose this hypothesis:

Hypothesis 4: Selective hiring is positively related to firm growth.

2.5 Training and Development

Training and development may be related to firm performance in many ways. Firstly, training programmes increase the firm specificity of employee skills, which, it turn, increases employee productivity and reduces job dissatisfaction that results in employee turnover (Huselid, 1995). Secondly, training and developing internal personnel reduces the cost and risk of selecting, hiring, and internalising people from external labour markets, which again increases employee productivity and reduces turnover. Training and development like job security requires a certain degree of reciprocity: A

company that train and develop systematically its employees advocates them that their market value develops more favourably than in other firms. This increases employees' productivity, commitment, and lowers turnover. Companies may also assist their employees in career planning. In doing so, companies encourage employees to take more responsibility for their own development, including the development of skills viewed as significant in the company (Doyle, 1997).

Barringer et al. (2005) compared rapid-growth and slow-growth firms and found that rapid-growth firms depend heavily on the abilities and efforts of their employees to maintain their growth-oriented strategies. The fast-growth firms used training programs to achieve their objectives and emphasized employee development to a significantly greater extent than their slow-growth counterparts. Therefore, training and employee development practices are more common in rapid-growth firms than slow-growth ones.

Miller (2006) examined the growth strategies in the retail sector and suggested that modern retailers should place more emphasis on the policies and practices that could contribute to staff retention, rather than on the immediacy of recruitment and selection. Zhu (2004) reviewed the changes in the area of human resource development in Japan and observed that some companies and industries have shifted towards a more strategic approach that emphasizes the impact of effective learning at both individual and organizational levels on long-term organizational competitiveness. Husiled (1995) found that the education and development of employees have a significant effect both upon the personnel productivity and the sort-term and long-term indicators of organizational performance.

Ngo et al. (1998) investigated the effects of country origins on HR practices of firms from the United States, Great Britain, Japan and Hong Kong operating in Hong Kong. Study results showed that structural training and development and retention-oriented compensation were related to various measures of firm performance. Paul and Anantharaman (2003), in searching the links between human resource practices and organizational performance, proposed that career development programmes demonstrate a true interest of the organization for the growth of its personnel, which, in turn, stimulates commitment and devotion, which, subsequently, raises personnel productivity and consequently economical output.

Cerio (2003) examined the manufacturing industry in Spain and found that quality management practices related to product design and development, together with human resource practices, are the most significant predictors of operational performance. Michie and Quinn (2001) investigated the relationships between UK firms' use of flexible work practices and corporate performance and suggested that low levels of training are negatively correlated with corporate performance. Therefore, we propose this hypothesis:

Hypothesis 5: The extent of training and development will be positively related to firm growth.

2.6 Job Security

Job security creates a climate of confidence among employees which cultivates their commitment on the company's workforce. Job security requires a certain degree of reciprocity: firstly, a company must signal a clear message that jobs are secure; then, employees believing that this is true, feel confident and commit themselves to expend extra effort for the company's benefit; finally, a company that have learnt that job security contributes to its performance, invests again in job security (Pfeffer, 1998). Probst (2002) has developed a conceptual model of the antecedents and consequences of job security. Antecedents include worker characteristics, job characteristics, organizational change and job technology change. Consequences include psychological health, physical health, organizational withdrawal, unionisation activity, organizational commitment and job stress. Jon involvement, cultural values, and procedural justices moderate job security perceptions and attitudes.

Buitendach and Witte (2005) assessed the relationship between job insecurity, job satisfaction and affective organisational commitment of maintenance workers in a parastatal in Gauteng. Study results revealed small but significant relationships between job insecurity and extrinsic job satisfaction and job insecurity and affective organisational commitment. Job satisfaction was also found to mediate the relationship between job insecurity and affective organisational commitment.

However, today's business environments are far from providing job security to their employees. For example, in an analysis of involuntary job loss in France between 1982 and 2002, Givord and Maurin (2004) found evidence that technological changes contribute to keeping the employees for shorter periods of time, thus increasing job insecurity.

When companies do provide job security, then empirical evidence suggests that it has a positive effect on to firm performance. Following Pfeffer (1998), Ahmad and Schroeder (2003) found that among others, job security impacts operational performance indirectly through organizational commitment. Delery and Doty (1996) studied the US banking sector and found some support for a

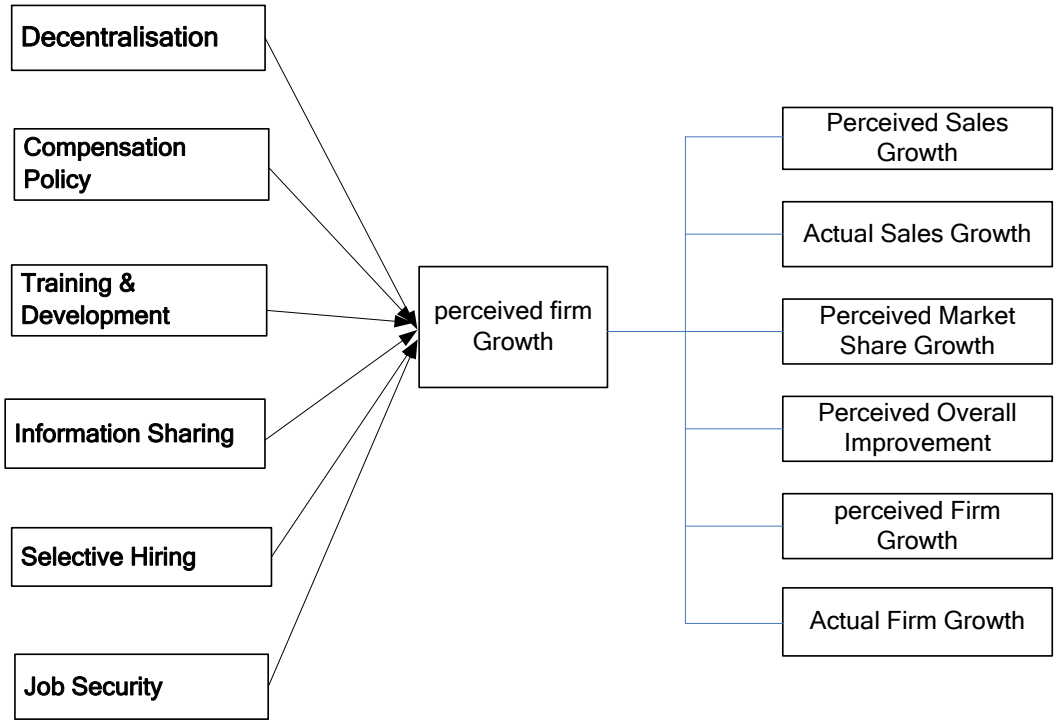
positive relationship between employment security and firm performance. In their study of 101 foreign firms operating in Russia, Fey et al. (2000) found evidence that human resource practices indirectly improve organisational performance. The results showed that not only, there was a direct positive relationship between job security and performance for non-managers, but job security was the most important predictor of HR outcomes for non-managerial employees. Results also suggested a direct positive relationship between managerial promotions based on merit and firm performance.

Michie and Quinn (2001) examined labour market flexibility in over 200 manufacturing UK firms and found that job security is negatively correlated with corporate performance. In contrast, results showed that 'high commitment' organizations are positively correlated with good corporate performance. Kraimera et al. (2005) used psychological contract and social cognition theories to explore the role of full-time employees' perceived job security in explaining their reactions to the use of temporary workers by using a sample of 149 full-time employees who worked with temporaries. Results demonstrated that employees' perceived job security negatively related to their perceptions that temporaries pose a threat to their jobs. On the one hand, for those with high job security, there was a positive relationship between benefit perceptions and performance. On the other hand, for those with low job security, there was a negative relationship between threat perceptions and performance. Therefore, we propose this hypothesis:

Hypothesis 6: The presence of job security is positively related to firm growth.

Figure 1 illustrates the associations between these hypotheses and relevant constructs.

Figure 1: The association between hypotheses and constructs



3 METHOD

3.1 The sampling procedure and sample

While Figure 1 is a model of the firm performance, we choose to examine it as understood by the individuals who take decisions about firm performance. In doing so, we operationalize and measure individuals' perceptions of the model's variables in their work situations.

In order to develop robust model linking HR practices and firm performance, we drew our sample from food companies operating in Greece for a minimum of five years. We included companies from the food processing and trading sub-sectors, excluding hospitality and retailing. In doing so, we aimed to increase the homogeneity of our population as we as decrease the necessary sample size to achieve robust validity of data analyses.

Testing the research hypotheses in a specific sector adds to the validity of the research design because managerial skills are to a large extent industry-specific. Furthermore, food industry is dealing with subsequent food crises and human resources are considered as a valuable asset to survive and maintain competitive advantage. In-depth interviews were conducted with key decision makers prior to designing a pre-test. The questionnaire was pre-tested with randomly selected firms. Based on the results of the pre-test instrument, the final questionnaire was refined. The respondents were mainly HR managers or, in same instances, the managing directors (MD) of the food firms.

In terms of the empirical research, we posted 372 questionnaires. We got 71 questionnaires, most of them answered by HR Managers (95%). We chose to include both HR and MD responses in the sample size although we recognize that there would be different perceptions about HR practices and organizational performance.

The total response rate was 19.1%. To ensure that the respondents were comparable to non-respondents, analyses of variances were conducted between these groups. We also found no significant differences between HR managers and managing directors. The non-response bias was assessed by comparing early respondents with late respondents (Armstrong and Overton, 1977).

3.2 Statistical Analysis

SPSS v.10 on Windows XP was utilized for all analyses. We first had to reduce a large number of variables to a smaller set of components. Principal component analysis is a preferred method for this kind of study. We, then, used hierarchical regression in order to assess the effect of relation, if any, between HR practices and firm growth measures.

Principal component analysis with varimax rotation was conducted to assess the underlying structure for the nineteen HR practices questionnaire. Principal component analysis (PCA) involves a mathematical procedure that transforms a number of (possibly) correlated variables into a (smaller) number of uncorrelated variables called *principal components*. The first principal component accounts for as much of the variability in the data as possible, and each succeeding component accounts for as much of the remaining variability as possible.

PCA helps with the latter. Having too many features often results in the problem having too many degrees of freedom leading to poor statistical coverage and thus poor generalization. The Varimax rotation is an orthogonal rotation applied to a truncated set of principal components (Harman 1970, Krzanowski 2000). Its application is an attempt to obtain modes that are simple to interpret.

Hierarchical regression models are well suited for this type of analysis. In hierarchical regression, the order of predictor entry, whether individual or in blocks, makes a difference in the results and conclusions. This allows examining the 'effects' of specific independent variables over and above one or more dependant variables.

Surveys using questionnaires often result in small sample size in Greece (Ketikidis et al. 2007; Pasiouras, 2008; Vlachos and Bourlakis, 2006). For example, Ketikidis et al. (2007) used a sample size of 79 observations in six South East European countries including Greece. Pasiouras (2008) used the total population of Greek banks to get 78 observations in order to estimate the technical and scale efficiency of Greek commercial banks.

Measures

Principal component analysis with varimax rotation was conducted to assess the underlying structure for the nineteen HR practices questionnaire. The scales were measured on a Likert format ranging from 1 (strongly disagree) to 5 (strongly agree). Six factors were requested, based on the fact that the items were designed to index the six HR practices. After rotation, decentralisation accounted for 17.53% of the variance, compensation policy for 12.67%, training & development for 12.24%, information sharing for 8.73%, selective hiring for 8.61%, and job security for 6.17%. We used the

Anderson-Rubin Method, which ensures orthogonality of the estimated factors, to produce factor scores.

Table 1 contains the items, the scale composite reliability (Cronbach α), and factor loadings for the rotated factors, with loading less than 0.40 omitted to improve clarity.

The first factor, which included items measuring the firm's decentralisation and decision making practices was labelled Decentralisation (seven items, α= 0.906). The second factor, labelled compensation policy, included items measuring the firm's compensation practices and items measuring the firm's policy and HR practices to reduce turnover of employees (four items, α= 0.757). The third factor, labelled training & development, included four items (α=0.647) measuring the firm's emphasis on train and develop its personnel. The fourth factor, labelled information sharing, included two items (α=0.713) measuring the firm's policy to share critical information and performance data with its personnel. The fifth factor, labelled selective hiring, included three items (α=0.556) measuring the firm's policy to recruit personnel that fits its culture and objectives.

The last factor had low internal validity to be included in further analysis. The six factor, labelled job security, included two items (α=0.383) measuring the ability of the firm to create a trustworthy business climate.

3.3 Firm Growth

Respondents were asked to indicate their firm's growth as compared to the industry's average in these areas: perceived sales growth, perceived market share growth, perceived overall improvement and perceived firm growth. For perceived items, a 5-point scale ranging from bad (1) to very good (5) was used. Furthermore, we calculated actual sales growth, and actual firm growth based on the last 3-year firm performance. We calculated firm growth using sales and employee figures.

Although we believe the perceived firm growth measures are appropriate, they have some limitations which should be discussed. The first is that they are self-reported responses from HR managers, who may have a stake in seeing positive relationships between their decisions about personnel recruitment, training, development and compensation with achievement of firm's objectives. However, the responses from the sample contain ample variance and means that do not reflect an extremely strong positive bias (see Table 2, variables 2 through 7). If the respondents had greatly inflated their responses, there may have been more consistently positive results than were seen. Secondly, as in all self-reported studies, the possibility of common method variance should be addressed. When both the outcome measure (i.e. firm growth) and the six predictor variables (i.e. compensation policy, decentralisation), are self-reported on the same survey instrument, both measures share common methods variance. There are several techniques that can be used to minimise common method variance (see Podsakoff et al. 2003 for a review of these methods).

We used the Harmon's factor test to examine whether or not common methods variance in the predictor and outcome variables inflates the empirical relationships among the variables. Harmon' test consists of a factor analysis of all relevant variables. If a large degree of common method variance is present, one factor will emerge. Such an analysis was conducted on the firm performance and HR practices variables of this sample. Seven factors emerged, with the first factor (which, in cases of common method variance, would account for most of the variance) only accounting for 18.472% of the variance. Thus, common method variance is unlikely to bias this sample.

Third, management perceptions about concepts like firm growth and organisational performance may actually be more valid indicators than objective data such as profitability, market share and sales, since actual figures are directly related to a vast number of variables, such as trends in the economy, industry factors, and other environmental factors. Therefore, self-reported measures may, in some cases, represent more accurate descriptions than more objective measures (Day, 2003; Podsakoff and Organ, 1986). In the present study, since we are interested in the direction of causation between HR practices and firm effectiveness, the only people with the breadth and depth of knowledge to report adequately about these concepts are the HR managers or managing directors.

Finally, since we were interested in assessing the separate factors of a successful collaboration, we were limited in the number of objective measures that were available within the scope of this study. Because of the previously stated arguments, we concluded that the expert opinions of HR managers or managing directors would be valid and appropriate for this study. The results of data analysis should be acceptable if adequate controls, such as Harmon's one factor test, are reported for the data. While we expect that further research into these firm performance constructs is essential, we believe that they are acceptable for this initial research study.

3.4 The Effect of HR Practices on Firm Growth

Table 2 presents the mean, standard deviation, and Pearson's correlation analysis of control variable (sales), firm growth (perceived sales growth, perceived market share growth, perceived overall improvement, perceived firm growth, actual sales growth, and actual firm growth), and HR practices (compensation policy, decentralisation, information sharing, selective hiring, training & development, and job security). The control variable showed low correlation with growth variables as well as each one HR practice.

Compensation Policy had significant association with perceived sales growth ($r=-.328$, $p<.01$) perceived market share growth ($r=.265$, $p<.05$), and perceived overall firm performance ($r=.323$, $p<.01$). Decentralisation had significant association with perceived sales growth ($r=-.284$, $p<.05$) perceived firm growth ($r=.422$, $p<.01$), and perceived overall firm performance ($r=-.271$, $p<.01$). Information sharing had significant association with perceived sales growth ($r=-.282$, $p<.05$), perceived firm growth ($r=.373$, $p<.01$) and perceived overall firm performance ($r=-.345$, $p<.01$). Selective hiring had significant association with perceived sales growth ($r=-.252$, $p<.05$) perceived market share growth ($r=-.510$, $p<.01$), perceived firm growth ($r=-.317$, $p<.05$). Training & Development had significant association with perceived market share ($r=-.274$, $p<.05$) perceived firm growth ($r=.311$, $p<.05$), and perceived overall improvement ($r=.346$, $p<.01$).

Job security, which had low internal validity, showed no significant correlations with any permanence measure. None HR practice showed any significant correlation with actual firm growth variables (sales growth, firm growth).

We then conducted hierarchical multiple regression to determine the best linear combination of HR practices for predicting firm growth. Initially, we entered the control variable (Firm size) in Step 1 of the regression equation. Based on the resource-based view, HR practices will be a competitive advantage if are difficult to emulate. Similarly, large firms may have a resource advantage over smaller firms. Therefore, we included firm size as a control variable, measured by the number of employees. In Step 2, we entered the five HR practices into the regression equations. Finally, in Step 3, we entered the ten interactions of the five factors into the regression equations. Tolerance tests showed no significant collinearity among variables.

We used six measures of firm growth: sales growth (actual, perceived), firm growth (actual perceived), perceived market share growth, and perceived improvement of overall firm performance.

The results are reported in detail in Table 3. Figure illustrates the results of the associations between the research hypotheses and the researched constructs. The combination of HR practices in Step 2 significantly predicted firm growth, in particular perceived firm growth (adjusted $R2=.483$; $F=11.9$, $p<.001$) with all five variables significantly contributing to the prediction. The beta weights, presented in Table 3, suggest that compensation policy (.2), decentralisation (.41), information sharing (.35), selective hiring (.3), and training & development (.29) were perceived to contribute to firm growth. The change in adjusted R square value was .49, $p<.001$. This indicates that 49% of the variance of firm growth was explained by the model. According to Cohen (1988), this is a large effect which makes us accept hypotheses 1 to 5.

For all perceived measures of firm growth, HR practices showed a significant effect. On the contrary, HR practices had no significant relation to actual firm growth.

In Step 3, the ten interactions of the five HR practices had a moderate effect only on the perceived firm growth ($F= 4.422$, $p<.001$) and the perceived overall firm performance ($F= 3.281$, $p<.001$) but with no significant changes in R2. This indicates that the five HR practices have unique impact on firm growth. Specifically, in Step 2, the changes in adjusted R square value were: perceived sales growth $R^2=.336$, $p<.001$; perceived market share growth $R^2= .342$, $p<.001$; perceived firm growth $R^2=.49$, $p<.001$; and perceived overall firm performance $R^2=.399$, $p<.001$.

Table 1: Rotated factor loadings for the six HR practices

	Factor loadings					
	Decentralisation	**Compensation Policy**	**Training & Development**	**Information Sharing**	**Selective Hiring**	**Job Security**
We encourage decentralized decision making	**.864**					
We use teams to decide about production problems	**.845**					
We regularly use teams to perform various task	**.725**					
All team members contribute to decision making	**.724**					
We encourage and reward personnel being team players	**.638**	.551				
We reward personnel to reduce turnover		**.784**				
We use incentives to boost individual performance		**.608**	.543			
We select and pay employees based on their contribution		**.583**				
Employees that care about firm's objectives are rewarded		**.539**	.458			
Training is a motive for employees to achieve more			**.700**			
We systematically train and develop our personnel			**.635**			
We provide training in one key skill	.410		**.436**			
We train personnel to gain many skills and abilities		.549	**.427**			
Our employees know well our objectives and strategy				**.729**		
We inform personnel about their performance				**.778**		
We use consultant when hiring personnel					**.747**	
We use pre-recruitment tests					**.655**	
We select personnel that fits our culture		.449			**.476**	
We focus on job security						**.814**
Employees that perform modestly do not get fired				.446		**.619**
Eigenvalue	8.220	2.279	1.610	1.394	1.279	1.043
Initial percent of variance explained	34.249	9.497	6.709	5.810	5.330	4.347
Rotation sum of squared loadings (total)	4.207	3.040	2.937	2.094	2.067	1.480
Percent of variance explained	17.531	12.667	12.238	8.726	8.612	6.167
Cronbach α (sample N)	0.906	0.757	0.647	0.713	0.556	0.383

Extraction Method: Principal Component analysis. Rotation method: Varimax with Kaiser Normalization.

Table 2: Means, Standard Deviations and Correlation Matrix

	Mean	SD	1	2	3	4	5	6	7
Control variables									
Sales	20,187	74,661	1	,151	,031	,165	,194	-,046	,183
Firm Growth									
Perceived Sales Growth	3.59	0.88		1	-.125	.515**	.585**	.104	.667**
Actual Sales Growth	0.06	0.37			1	-.181	.116	.522**	-.057
Perceived Market Share Growth	3.58	0.96				1	.514**	.016	.398**
Perceived Firm Growth	3.68	0.91					1	.145	.694**
Actual Firm Growth	0.20	0.37						1	.153
Perceived Overall Improvement	3.69	0.87							1
HR practices variables									
Compensation Policy	1	0	.089	.328**	-.061	.265*	.211	.057	.323**
Decentralisation	1	0	.059	.284*	.083	.105	.422**	.230	.271*
Information Sharing	1	0	.126	.282*	-.003	.063	.373**	.172	.345**
Selective Hiring	1	0	.070	.252*	-.178	.510**	.317*	-.007	.233
Training & Development	1	0	.218	.241	.148	.274*	.311*	-.092	.346**
Job Security	1	0	-.100	-.016	-.233	.106	-.103	.131	-.009

*** Correlation is significant at the 0.01 level (2-tailed).*

** Correlation is significant at the 0.05 level (2-tailed).*

Since the HR practices variables are factor scores, produced by the Anderson-Rubin Method, the scores produced have a mean of 0, a standard deviation of 1, are uncorrelated, the correlations with each other are .00, and thus are not included in this table. Sales: thousands of euros

Figure 2: Model results

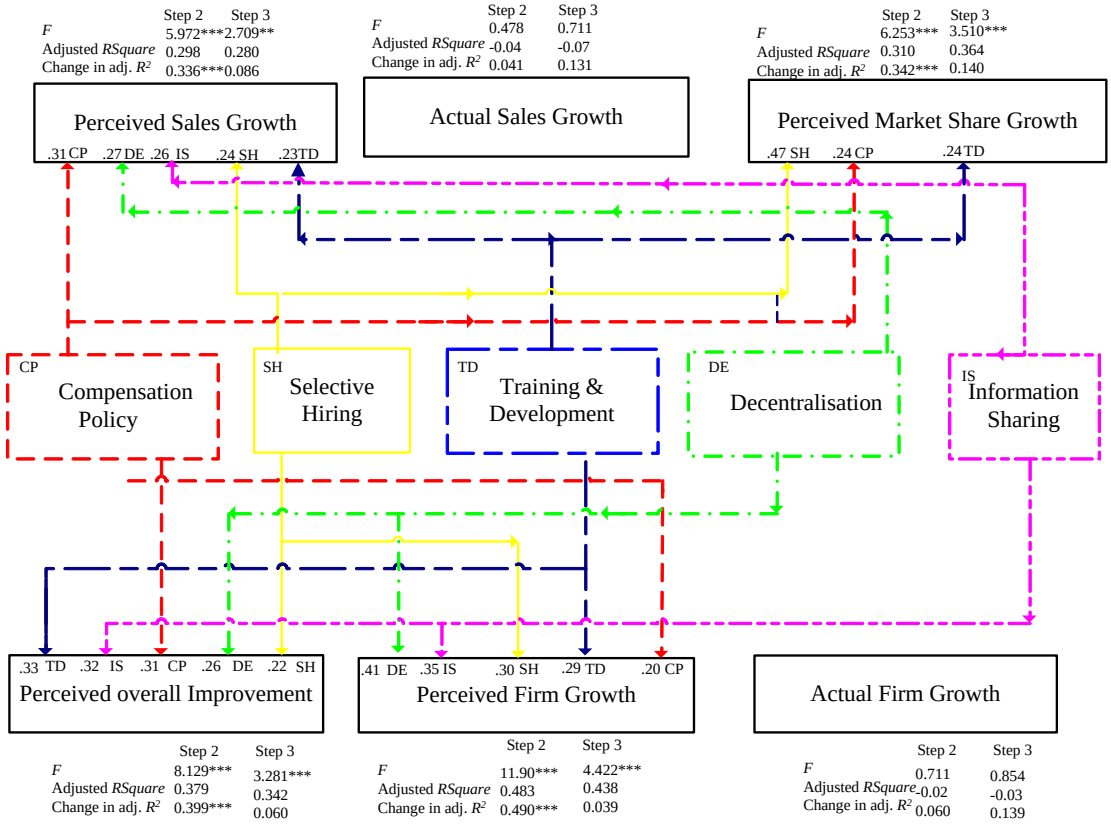


Table 3: Hierarchical regression results of HR practices on six growth measures

	Perceived Sales Growth			Actual Sales Growth			Perceived Market Share Growth		
Control variable	Step 1 (Control)	Step2 (HR practices)	Step3 (Interaction)	Step 1 (Control)	Step2 (HR practices)	Step3 (Interaction)	Step 1 (Control)	Step2 (HR practices)	Step3 (Interaction)
1. Firm Size	0.15 1.27	0.00 0.06	0.00 0.05	0.03 0.26	0.01 0.13	0.03 0.22	0.16 1.39	0.04 0.43	0.02 0.20
HR Practices									
1. Compensation Policy		0.31 3.14**	0.32 2.39*		-0.05 -0.45	-0.04 -0.28		0.24 2.44*	0.17 1.33
2. Decentralisation		0.27 2.72**	0.26 2.06*		0.06 0.52	0.00 0.05		0.09 0.95	0.18 1.50
3. Information Sharing		0.26 2.61*	0.18 1.49		-0.00 -0.01	0.04 0.30		0.05 0.50	0.10 0.93
4. Selective Hiring		0.24 2.42*	0.24 2.04*		-0.14 -1.18	-0.21 -1.45		0.47 4.76***	0.47 4.20***
5. Training & Development		0.23 2.25*	0.23 1.97*		0.11 0.93	0.08 0.55		0.24 2.41*	0.25 2.24*
Interactions									
1. Compensation Policy * Decentralisation			-0.12 -0.92			0.24 1.49			0.02 0.22
2. Compensation Policy * Information Sharing			-0.07 -0.46			-0.15 -0.82			0.09 0.66
3. Compensation Policy * Selective Hiring			0.16 1.21			0.02 0.14			-0.39 -2.98**
4. Compensation Policy * Training & Development			-0.03 -0.26			0.10 0.63			0.04 0.37
5. Decentralisation * Information Sharing			0.05 0.43			0.09 0.61			-0.08 -0.72
6. Decentralisation * Selective Hiring			0.08 0.58			0.06 0.35			-0.19 -1.46
7. Decentralisation * Training & Development			0.17 1.34			-0.17 -1.07			0.00 0.00
8. Information Sharing * Selective Hiring			0.10 0.67			0.05 0.28			-0.16 -1.16
9. Information Sharing *Training & Development			0.00 0.05			-0.14 -0.87			0.17 1.42
10. Selective Hiring * Training & Development			-0.18 -1.53			0.15 1.01			0.05 0.43
F	1.618	5.972***	2.709**	0.068	0.478	0.711	1.941	6.253***	3.510***
Adjusted *R*-square	0.008	0.298	0.280	-0.01	-0.04	-0.07	0.013	0.310	0.364
Change in adjusted *R*-square	0.022	0.336***	0.086	0.000	0.041	0.131	0.027	0.342***	0.140

*Standardized regression coefficients are reported. Within cells, first row figure is beta coefficients and second row the t-test values, significant at: *p <0 .10 **p <0.01 ***p <0.001*

Table 3: Continued

	Perceived Firm Growth			Actual Firm Growth			Perceived firm performance Improvement		
Control variable	Step 1 (Control)	Step2 (HR practices)	Step3 (Interaction)	Step 1 (Control)	Step2 (HR practices)	Step3 (Interaction)	Step 1 (Control)	Step2 (HR practices)	Step3 (Interaction)
. Firm Size	0.19 1.63	0.01 0.22	0.07 0.69	-0.04 -0.37	-0.06 -0.52	0.00 0.04	0.18 1.54	0.01 0.11	0.00 0.02
R Practices									
. Compensation Policy		0.20 2.37*	0.15 1.28		0.05 0.47	-0.10 -0.65		0.31 3.28**	0.37 2.91**
. Decentralisation		0.41 4.77***	0.40 3.47**		0.16 1.39	0.18 1.16		0.26 2.77**	0.13 1.06
. Information Sharing		0.35 4.07***	0.27 2.54*		0.15 1.28	0.27 1.85*		0.32 3.39**	0.30 2.60*
. Selective Hiring		0.30 3.58***	0.28 2.66*		0.00 0.00	-0.12 -0.84		0.22 2.38*	0.18 1.62
. Training & Development		0.29 3.38**	0.30 2.81**		-0.06 -0.51	-0.11 -0.78		0.33 3.41**	0.35 3.09**
nteractions									
. Compensation Policy* Decentralisation			-0.09 -0.84			0.19 1.24			-0.17 -1.40
. Compensation Policy* Information Sharing			-0.01 -0.09			-0.11 -0.63			0.06 0.42
. Compensation Policy* Selective Hiring			-0.10 -0.86			0.00 0.02			0.06 0.48
. Compensation Policy* Training & Development			-0.01 -0.14			-0.25 -1.58			-0.02 -0.15
. Decentralisation* Information Sharing			-0.12 -1.06			0.21 1.36			0.13 1.11
. Decentralisation* Selective Hiring			0.06 0.47			0.09 0.56			0.13 0.99
. Decentralisation* Training & Development			-0.05 -0.43			-0.09 -0.60			-0.10 -0.86
. Information Sharing* Selective Hiring			0.05 0.38			-0.07 -0.43			0.16 1.13
. Information Sharing* Training & Development			-0.05 -0.43			-0.14 -0.90			-0.02 -0.23
0. Selective Hiring* Training & Development			-0.06 -0.56			0.08 0.59			0.00 0.00
F	2.689	11.90***	4.422***	0.144	0.711	0.854	2.381	8.129***	3.281***
Adjusted *R*-square	0.023	0.483	0.438	-0.01	-0.02	-0.03	0.019	0.379	0.342
Change in adjusted *R*-square	0.037	0.490***	0.039	0.002	0.060	0.139	0.033	0.399***	0.060

*Standardized regression coefficients are reported. Within cells, first row figure is beta coefficients and second row the t-test values, significant at: * p <0 .10 **p <0.01 ***p <0.001*

4 DISCUSSION

The primary purpose of this study was to evaluate the impact of HR practices on firm growth. In summary, a review of existing literature finds that there are HR practices positively linked to organizational performance (Pfeffer, 1998; Becker and Gerhart, 1996; Guest, 1997; Cardon and Stevens, 2004; Givord and Maurin, 2004; Zhu, 2004). Based on a comprehensive literature review, we hypothesised that the following HR practices are related to firm growth: (1) Compensation policy, (2) Decentralization & self-managed teams, (3) Information Sharing (4) Selective Hiring, (5) Training and Development and (6) Job Security.

However, a review of literature pertaining to organizational performance shows that firm growth, an indication of market acceptance and firm success as well as a top priority of most companies (Baum and Wally, 2003; Zook and Allen, 2003; Fesser and Willard, 1990), has been studied mostly as a latent variable of organisational performance (Pfeffer, 1998; Cardon and Stevens, 2004; Givord and Maurin, 2004).

Consequently, this paper argues that the selection of specific HR practices becomes a strategic decision. Therefore, HR managers should be able to report on the concrete results of specific HR practices on specific firm growth measures. Briefly, a survey of HR managers demonstrated that HR practices are linked to firm growth. The findings of the study lead to a number of interesting implications for HRM theorists and practitioners. The first (and rather obvious) implication can be derived from the evidence found that all HR practices are related to firm growth, a finding consistent with a variety of extant theories and studies,. Hence, firm growth as a strategic priority depends on human capital: selecting, developing, and rewarding the best people as well as revealing to them critical company information in order to make informed decisions which they are authorised to take.

More profound implications can be derived from the findings regarding the links between specific HR practices and firm growth measures. All five HR practices contributed to perceived sales growth, overall firm performance improvement, and firm growth. Selective hiring, compensation policy, and training & development were the predictor of perceived market share growth. In particular, selective hiring was strongly correlated to perceived market share growth ($r2=.47$, $p<.01$). On the contrary, decentralisation and information sharing did not contributed significantly to market share growth.

Compensation policy was related to all perceived firm growth measures, being the strongest predictor of sales growth and the weakest of firm growth. Linking sales with compensation benefits can be an explanation of the high correlation between compensation policy and sales growth. Decentralisation and team working was significant factor of firm growth. This finding may provide some justification of the claim that as the business expands, decision-making becomes more decentralized and self-managed teams proliferate as the firm adds more and more projects and customers (Flamholtz and Randle, 2000; Miller and Friesen, 1984).

Training and development was related to all firm growth measures but it showed higher correlation to overall firm performance improvement. Beta weight was 0.33 (r2 3.41, $p<0.001$). This finding may have a profound implication: Given that firms were well established, they may have already run many in-company training programmes and noticed and reported concrete evidence of the benefits of training and development.

Information sharing comes with pros and cons. Information sharing has the inherent vulnerability that informed employees will become more powerful and companies may loose control of them (Pfeffer, 1998). Even worse, information sharing involves the danger of leaking important information to competitors (Ronde, 2001). On the other hand, information sharing tells employees that the company trusts them and thus gives them sensitive information to make informed decisions which will shape the future of the company. The findings demonstrate that information sharing does positively relate to firm growth. Information sharing was significantly correlated to sales growth, firm growth, and overall firm performance improvement. Respondents did not perceive that job security was an important HR practice. This finding can be attributed to the fact that most respondents were HR managers who might be reluctant to report an insecure job environment in their company's workplace.

The findings as a whole suggest that a positive relationship exists between the extent to which companies implement HR practices and firm growth achievements. This overall result corroborates previous empirical studies on the links between HRM and firm performance. These findings provide tentative support of the contention that HR practices can create a competitive advantage.

Future research could clarify the causal relationship between HR practices and firm performance. Another research stream is examining HR practices in sets in order to assess their collective effect. The conceptual basis of further research can be extended. An interesting avenue for future research is the market-based competitive advantage approach, which declares that the market determines who is competitive or not (Reed et al., 2000). The market-based approach can provide another theoretical basis

than resource-based view of competitive advantage, in order to examine the effect of HR practices on firm performance.

A series of limitations bounds the findings, conclusions, and implications of this study. The most obvious limitations of this study stem from the sample used and the measures employed. We examined a small set of HR practices that seem to have an effect on firm growth in Greek food industry. Given that managerial skills are to a large extent industry-specific, generalizability of research findings beyond the food industry remains an open question. Furthermore, given the dynamic nature of firm growth, this study measured one instance of this dynamic phenomenon. The effects of HR practices can take years to materialize into organizational performance. For example, selective hiring and training can produce results after years. Often, high performance work practices have better results in bundles than implemented in isolation. This study focused on established firms with more than 5 years of operation. However, the stage of a firm's lifecycle, either growth, mature, decline or revival stage (Ciavarella, 2003) can be an important factor in applying specific HR practices. Another limitation of the findings is the use of self-report questionnaires to collect data on all measures. This limits our ability to draw conclusions about the causal nature of the relationships between HR practices and firm growth. In a future study there would be of great value to see how different HR and MD responses are.

These limitations suggest that the interpretation of research findings need to be cautious they also indicate a number of potentially fruitfully avenues for future research. Except from testing the research hypotheses in other settings and environments, the combined effect of HR practices, and which practice works better with another one is yet another open question. A large quantitative survey could also control for mediating and/or moderating variables between human resource management and firm performance.

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Creativity in research and development environments: A practical review

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Abstract

Creativity is of paramount importance to the innovation process. Therefore the findings of creativity research should be thoroughly considered in organisations where innovation processes are required. This review summarises the literature in the field of work place creativity, with special attention given to R&D environments. Current theoretical models of creativity are discussed and a literature review of the influence of (i) motivation, (ii) interaction within work groups and between group leaders and members, and (iii) organisational culture and environment on creativity is undertaken. Practical advice is derived from literature findings wherever possible.

Keywords: creativity, innovation, research, development, motivation, organisational culture, brainstorming

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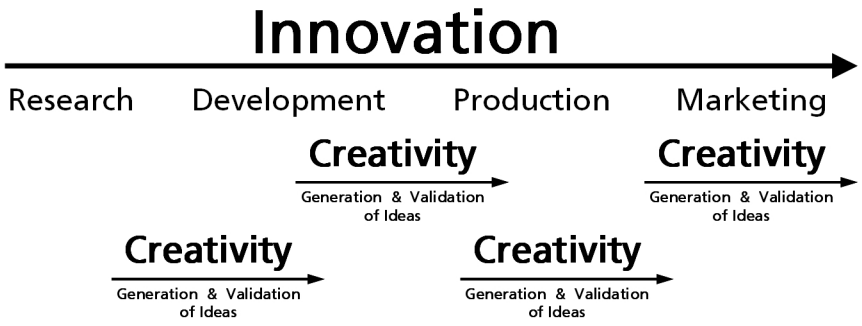
1 INTRODUCTION

There is general consensus that high profit companies of our times rely heavily on innovation to maintain their efficiency and survivability, with innovation being defined as the process from an idea to the introduction of a novelty into the market (Mumford 2000, Basadur 2004). *Novelty* and *usefulness* are in fact the two characteristic parameters to differentiate true innovations from me-too products and purely artistic achievements (Ford 1992, as cited in Scott 1995). Although an innovation is often a technologically different (and, in the best case, superior) product, it may also take the form of a new design, service or business process (Mumford 2000).

Creativity, which we define as the combination of *idea generation* and *idea validation* (see section 2.2), is essential to the innovation process. Again and again, novel ideas need to be incorporated into the innovation process (figure 1). Creativity is even necessary before the actual innovation process can begin, and can thus be considered as "pre-innovation": Although the first idea itself might be elusive, it is prerequisite for scientific, technological or procedural innovation.

Figure 1: The relationship of innovation and creativity



Shalley & Gilson (2004) state that "most managers would agree that there is room, in almost every job, for employees to be more creative." Although we generally agree with this view, creativity seems to be more important in some work domains than in others. While creativity is a *sine qua non* in advertising and marketing, it might be less desirable in accounting, although a novel accounting process can well be a valuable innovation. Most scientific and technological innovation is expected to originate from research and development (R&D) organisations or departments. As creativity is the source of innovation, it can well be claimed that creativity is essential for successful R&D and that creativity in R&D thus deserves special attention.

According to Heinze (2007) there are five types of scientific creativity:

1. Formulation of a new idea (or of a set of new ideas) that opens up a new cognitive frame or brings theoretical claims to a new level of sophistication (basic assumptions → theory, e.g. Einstein's theory of specific relativity)
2. Discovery of a new empirical phenomenon that stimulates new theorizing (observation → theory, e.g. Darwin's theory of evolution)
3. Development of a new methodology, by means of which theoretical problems can be empirically tested (theory → method, e.g. Spearman's development of factor analysis to test his theory on mental abilities)
4. Invention of a novel instrument that opens up new search perspectives and research domains (technique → new possibilities, e.g. scanning tunnelling microscopy which made nanotechnology possible)
5. New synthesis of formerly dispersed ideas into general theoretical laws enabling analyses of diverse phenomena within a common cognitive frame (single ideas → general theory, e.g. general systems theory)

All of these types of creative acts are achievements in their own right. Their diversity cautions against a definition of scientific creativity that is too narrow to reflect this range. Another danger in the study of creativity is to focus only on exceptional persons and events (like the examples in the above list). Although the study of exceptional persons or events might cast an interesting light on creativity in general (Holm-Hadulla 2007), it appears to be more useful to concentrate on average people. We propose that in normal circumstances the development of creativity in ordinary employees is a more

feasible way of inducing idea generation and validation than hiring or nurturing a genius, as by definition a genius is the great exception.

Moreover, there is another problem in the study of singular "geniuses", especially in the field of basic sciences. There is little doubt that chance has played a major role in many breakthrough discoveries. Historic examples are the discovery of the vulcanization of rubber by Charles Goodyear (which is reported to have happened the first time on a dirty lab floor in 1839), radioactive radiation by Henri Becquerel (while studying a faulty theory of phosphorescence in 1896), and Penicillin by Alexander Fleming (working with fungus-contaminated Petri dishes in 1928). The creative act of these researchers was to recognise the importance of unexpected findings, and what made them succeed was their determination to find the reason why something had gone wrong. On the other hand, if these "accidents" had happened in other laboratories, we would probably study other "scientific geniuses" nowadays (although Simonton (2004) remarks that some scientists "appear to be consistently more lucky than others", implying a special ability to exploit chance). The risk of studying champions that were "just lucky", and ignoring brilliant, but less fortunate scientists is reduced when looking at larger groups of more average people.

This paper summarises the literature in the field of work place creativity, with special attention given to the R&D environment. Though our aim was to focus on recent research, some older papers have been considered if they have proven to be the foundation of further fruitful work. As for structure, we will first outline some theoretical concepts of creativity, then analyse motivation - maybe the most important factor for individual creativity- , move on to creativity on team or work group level, and finally point out measures to be taken on institutional level to create an environment favourable to the generation and validation of new ideas.

2 MODELS OF CREATIVITY

The theoretical models of creativity currently discussed in literature can be divided into two groups: *componential theories* that examine which human characteristics and abilities are necessary to perform creative acts, and *sequential theories* that concentrate on the creative process. As both kinds of reasoning lead to interesting insights, examples of both are discussed below and referred to throughout this paper. Generally speaking, componential theories give advice on how to design long-term processes conducive to creativity, while sequential theories are more useful when considering short-term action or interaction.

2.1 The "Componential Theory of Individual Creativity"

According to the *Componential Theory of Individual Creativity* (Amabile 1997), the three essential components of individual creativity are expertise, creative-thinking skill and intrinsic task motivation.

Expertise comprises factual knowledge, technical proficiency and a special talent in the target work domain. While knowledge and proficiency can be improved over time, talent is more or less a given thing rooted in individual personality.

Creative-thinking skill is that "something extra" found in creative people. There is a consensus that creative thinking can be learned, at least to some degree. Basadur (2004) emphasises that idea generation should be separated from idea validation, and claims that this deferral of judgment can be trained. A "master-apprentice relationship" is generally considered to be most effective for the teaching of creative-thinking skills (e.g. Weilerstein 2003).

Motivation determines what a person actually will do. As motivation is the component that can be influenced most directly by environmental factors, it will receive special consideration in section 3.

2.2 Sequential models

There are several models that describe the creative process in a sequential way. According to Wallas (1926) the four stages in the development of an idea are: preparation, incubation, illumination, and verification. *Preparation* comprises both personal preparation (knowledge and proficiency) and the investigation of the problem in all directions. *Incubation* is a period in which the problem is banned from conscious thought, and dealt with in an unconscious way. *Illumination* is the appearance of the "happy idea". This can be either instantaneous or a slower process. These two, somewhat mystic, stages mentioned last can hardly be influenced from the outside. *Verification*, finally, is the testing of the validity (novelty and usefulness) of the idea, either by the creator or different persons (cited from Scott 1995 and Holm-Hadulla 2007).

In contrast to this rather abstract four-stage model, we describe the creative act as being composed of only two stages, both of which can be influenced on individual and institutional level. The two

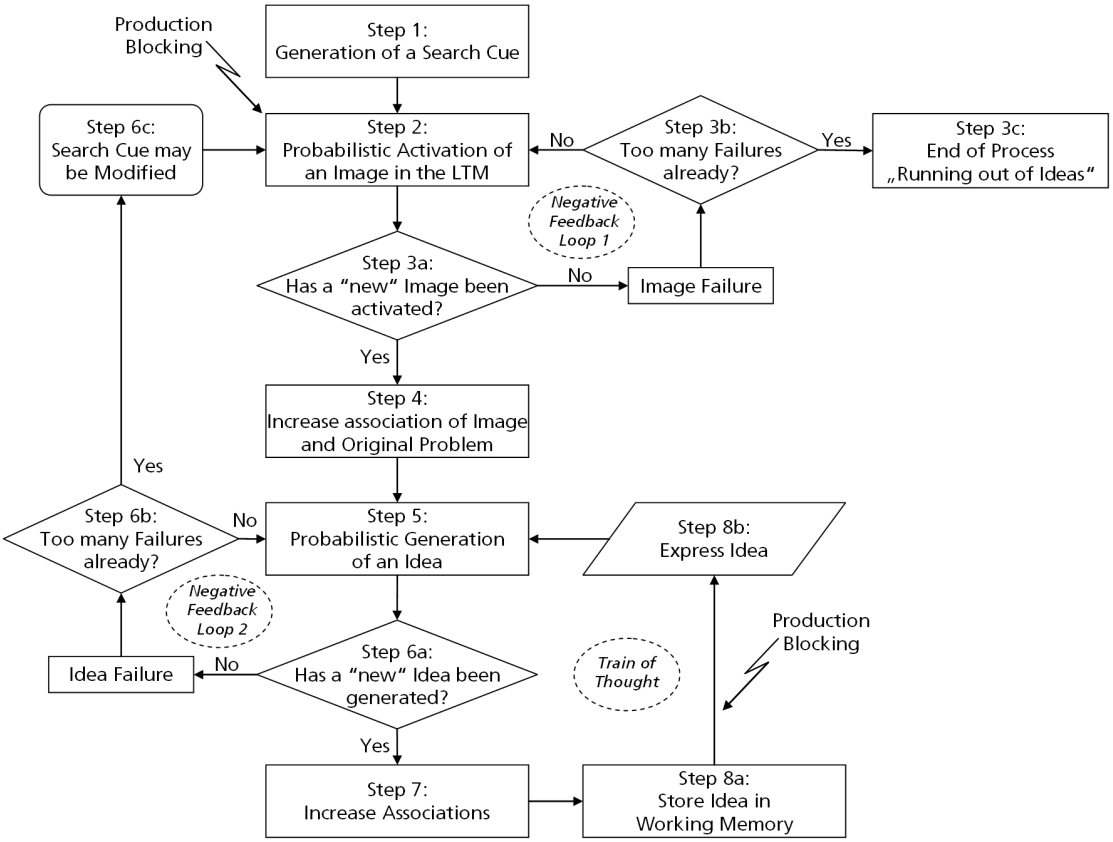
stages are *idea generation* and *idea validation*. While idea generation requires divergent thinking skills to produce as many and as diverse ideas as possible, in idea validation convergent thinking skills are necessary to decide which are the most promising ideas. A similar process, "ideation-evaluation", has been described to be essential to the three stages of the problem solving process (problem finding, problem solving, solution implementation) by Basadur, Graen & Green (1982). In artistic settings, the first step is a value in itself and validation is not that essential, as loose ends might even be desirable in a work of art. In commercial or scientific settings, validation is absolutely necessary as only very few ideas can be taken to realisation. Both stages can either be performed by one individual or as a group process.

2.3 The "Search for Ideas in Associative Memory" (SIAM) model

In the theoretical section of their paper, Nijstad & Stroebe (2006) describe a creativity model called *Search for Ideas in Associative Memory* (SIAM). They claim that two distinct types of memory are active in the creative process, i.e. a large, static network of associative images (Long-term Memory (LTM), Note: In this context, "images" are general intellectual objects with no necessity of visual or spatial components) and a small, dynamic Working Memory (WM) (closely associated with consciousness). Based on this assumption the generation of an idea is described as to proceed in several steps (figure 2):

1. Based on the given task, a search cue is generated in the WM. This takes some conscious effort.
2. The search cue activates an image in the LTM. The choice of which image is activated is not deterministic.
3. If no image can be activated or if the activated image has already been activated previously in the process, this is considered a "failure", and a new image has to be activated. If the number of failures exceeds a certain limit, the whole process is terminated. (negative feedback loop 1 → "running out of ideas")
4. If the image activated in step 2 is "new", the association between this image and the original problem is strengthened.
5. Next, an idea is created from the image, either by combination of different parts of the image, or the image and the cue, or the image and previously generated ideas. This is, again, a probabilistic process.
6. If no idea can be generated or if the generated idea has already been generated previously in the process, this is considered a "failure", and a new idea has to be generated. If the number of failures exceeds a certain limit, a new image has to be activated. (negative feedback loop 2 → "image depleted", search cue may be modified by considering new ideas)
7. If the idea generated in step 5 is "new", the associations between this idea and the image and between the idea and the original problem are strengthened.
8. Next, the idea is stored in the WM, and, if no disturbance arises, expressed.
9. A new idea is generated → step 5

Figure 2: The "Search for Ideas in Associative Memory" (SIAM) model (adapted from Nijstad & Stroebe (2006))



The *Search for Ideas in Associative Memory* (Nijstad 2006) matches well with the *Componential Theory of Individual Creativity* (Amabile 1997): *Expertise* can be considered a measure of how well developed (density and ontological interconnectedness) the LTM is, *creative-thinking skill* can be seen as proficiency in cue generation and activation of images, and *motivation* as tolerance to failures and thus a measure on how long the ideation process is kept active.

2.4 SIAM and production blocking

According to Nijstad & Stroebe (2006), production blocking, a concept important in the explanation of effects observed in brainstorming (see section 4.3), may occur at two stages of the process. In both cases it is caused by the limited resources of the WM. There is a high chance of a validated idea being simply forgotten if mental work has to be performed between storing the idea in the WM (step 8a) and expressing the idea (step 8b). In a group brainstorming setting, this mental work consists of monitoring the group proceedings for a possibility to express one's idea. The chance of forgetting an idea rises with waiting time, and thus with group size, making large brainstorming groups less effective. Apart from that, this mental work might also interfere with the demanding process of activating a new image in the LTM (step 2). The false impression that group brainstorming is more effective than individual brainstorming might be caused by these interruptions (at least in part, as other processes like social comparison play a part, too): In individual brainstorming, both more images are activated, and activated images are used more thoroughly, as fewer interruptions occur. That leads to a higher number of "failures", which again are experienced as negative, and lead to the (erroneous) feeling of low efficiency.

3 MOTIVATION

Although most of the relevant publications emphasise that innovation is a group process, Redmond (1993) underlines the fact that "it should, however, be recognised that the individual is the ultimate source of any idea or novel problem solution". Although this original idea will be modified, supplemented or excluded by a team, idea generation happens inside the individual. On the other hand, idea processing can only happen once the idea is expressed and communicated to the outside environment.

As pointed out above, the Componential Theory of Individual Creativity (Amabile 1997) insists on (intrinsic) motivation as a key component of individual creativity. The link between motivation and creativity is well established and generally accepted. Yet, there are two questions related to it that have not been answered exhaustively. The first one has received some attention, and results from research on it will be discussed further on: Does it make a difference if individuals are motivated by themselves (intrinsic motivation), in contrast to being motivated by prospects of receiving rewards for being creative from outside (extrinsic motivation)? The second question has not been raised in a scientific context, to the best of our knowledge: Does motivation really influence the production or just the expression of new ideas? In other words, do poorly motivated individuals have new ideas at the same rate as highly motivated ones, and do they just not tell anybody?

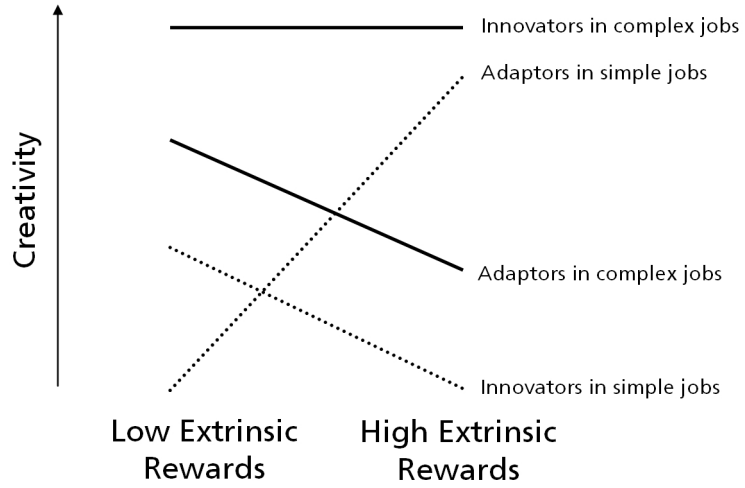
3.1 Intrinsic vs. extrinsic motivation

Arthur Schawlow, winner of the noble prize in physics 1981, was once asked what, in his opinion, made the difference between highly creative and less creative scientists. He replied: "The labor of love aspect is important. The most successful scientists often are not the most talented. But they are the ones who are impelled by curiosity. They've got to know what the answer is" (cited by Amabile 1997). This is a fair description of intrinsic motivation. Another example is given by Akio Morita (1986), the founder of Sony: "I believe people work for satisfaction. I believe it is a big mistake to think that money is the only way to compensate a person for his work. People need money, but they also want to be happy in their work and proud of it." This sense of pride (which seems to be closely associated with the sense of ownership mentioned in other studies) is another component of intrinsic motivation. It seems to reflect a genuine human longing to be creative and to be identified with the creative act or outcome.

While there is little doubt that intrinsic motivation is typical of highly creative individuals, the question if and why this type of motivation could be more conducive to creativity than motivation induced by the prospect of some kind of reward is still discussed vividly: Several authors claim that incentives and other measures that let employees participate in commercial success, will motivate creativity (e.g. Springer 1992), while others observe that creativity is dwarfed if rewards are promised (e.g. Amabile 1996). To make things even more complicated, a third kind of motivation, by feelings of obligation, has been proposed (Cooper 2006).

Baer et al. (2003) aimed at resolving the confusion caused by these inconsistent findings on the effects of rewards on creativity. They put forward the idea that the effect of rewards on creativity is influenced both by cognitive style and work complexity. Cognitive style is defined by the Adaption-Innovation Theory (Kirton 1994), in which "adaptors" tend to operate within given paradigms and procedures, while "innovators" tend to develop problem solutions that are qualitatively different from previous ones. After evaluating interviews with 117 employees of two manufacturing companies and correlating the results with creativity as perceived by immediate superiors, Baer et al. (2003) were able to show a complex pattern between cognitive style, job complexity, and the effect of rewards on creativity (figure 3). They found that employees with simple jobs showed a strong response to extrinsic rewards: While the creativity of innovators was lowered, adaptors showed a steep rise in creativity, reversing the original order of innovators being more creative than adaptors. Their main finding in respect to complex jobs, which are predominant in R&D environments, was that while innovators are hardly affected by the prospect of rewards, the creativity of adaptors is considerably lowered. This was explained by pointing out that adaptors in complex jobs have weaker intrinsic motivation, which is further shaken if extrinsic reward is offered, as this makes them feel even more instrumental for making profit and less valued as individuals. We are not totally convinced that this is the only possible explanation of these interesting findings.

Figure 3: The relationship between creativity and rewards (adapted from Baer *et al.* (2003))



According to Mumford (2000) a combination of extrinsic and intrinsic rewards might be the most effective way of boosting creativity: "Because creative work is linked to curiosity and independence, providing time to pursue topics of personal professional interest, or reducing administrative burdens, may prove useful reward strategies particularly when accompanied by pay incentives, bonuses, and patent rights." Rewards and incentives have an additional benefit: They indicate to employees what kind of performance is desired by the management and are thus valuable means of communicating corporate values and goals to individual employees (Wong 2003). As such, they support the immediate superior's function of conveying these values and goals (see section 4.2).

In contrast to this, Heinze (2007) observed that many research institutions run reward schemes that work in a detrimental way: "Institutional arrangements for rewarding outstanding scientists include increasing the size of their research group, putting them in charge of a research institute, or expecting them to act as a national expert on various committees. These rewards have the perverse effect of preventing these scientists from doing what they are best at: research and inspiring colleagues." These observations urgently call for a critical evaluation of incentive systems especially in highly innovative areas like R&D where the reward schemes described by Heinze are common and unquestioned practise.

3.2 Mission

A less individualistic approach towards improving motivation is the provision of a "mission". The perception of contributing a unique part to the achievement of a worthy goal (like "curing cancer" or "flying to the moon") has been identified as a major element in most of the creative events examined by Heinze (2007). According to Akio Morita (1986), it is one of the prime tasks of management to find and communicate these overall targets: "Management of an industrial company must be giving targets to the engineers constantly; that may be the most important job management has in dealing with its engineers." The same is surely true for scientists.

Some research has been conducted on how such overall goals or missions can be generated. In a model suggested by Strange & Mumford (2005), the analysis of idealized goals and their causes is prerequisite for the formation of a so-called prescriptive mental model (PMM), which is a set of ideas on how things should be. This PMM is then refined to a "vision" that can be communicated, and may thus inspire others to act in a way favourable to reaching the state imagined in the PMM. A vision in this sense can be distinguished from a plan, as it tells people where to go but does not necessarily tell them how to get there. Interestingly, Strange & Mumford (2005) have found that experience plays a major role in creating such mental models. They claim that having people with a wide range of experience and a "colourful" background in the team will benefit the creation of "vision" and thus contribute indirectly, but very effectively to enhancing creativity.

3.3 Contest

Several highly creative scientists interviewed by Heinze (2007) claimed that friendly competition between different groups of the same organisation had been important as a driving factor towards creative achievements. Priority races between groups of different organisations might also be strong motivators. These priority races can take the form of friendly competition with a high level of

communication or of fierce rivalry with no mutual communication at all, while anything in between is also possible.

Motivation can also be improved on inter-company or even international level: A study conducted under the auspices of the US National Academy of Engineering (1999) concluded that inducement prize contests have led to innovations in engineering (especially aeronautic engineering) in a highly effective way. This positive outcome is attributed to three effects: (i) the ability to attract a broad spectrum of ideas and participants, (ii) the potential to leverage financial resources from sponsors, and (iii) the capacity to educate, inspire and mobilise the public (as cited in Young 2007). Recent examples of this kind of contests are the Ansari X-Prize for the first non-government organisation to launch a reusable manned spacecraft into space twice within two weeks (won on October 4, 2004 by Scaled Composites and their "SpaceShipOne") and the DARPA Urban Challenge 2007 for an autonomous vehicle crossing an urban environment (won on November 3, 2007 by Tartan Racing's vehicle "Boss").

4 WORK GROUP CREATIVITY

In remarkable contrast to the rapid technological progress in the last decades, the process by which technological innovation is performed has remained fairly un-changed over the years: R&D is mainly carried out by project groups that generate or import scientific and technological information, transform it into novel ideas, products, or processes, and then export these innovations to other units of the organisation (Elkins & Keller 2003). So, while creativity is sometimes still associated with the "lone genius" working in a secluded laboratory, most creative work takes place in organisational settings and is usually conducted in teams nowadays (Redmond 1993). Going one step beyond, Fischer *et al.* (2005) claim that most intellectual processes, including creativity, are in fact social processes. According to them, "the power of the unaided individual mind is highly overrated" and "most scientific and artistic innovations emerge from joint thinking, passionate conversations and shared struggles among different people, emphasizing the importance of the social dimension of creativity."

This emphasis on group work is based on the assumption that idea generation is best performed in groups and that interaction with others fosters creativity (Vester 1978). Yet, some researchers challenge this view and assert that contrary to popular belief, group interaction inhibits the ideation process (e.g. Nijstad 2006). In the light of controversies like this, it seems to be prudent to examine group interaction processes, both inside the group (including interaction with group leaders), and between groups and their surroundings, in order to gain insight into creative processes in working environments.

We will examine processes of work group creativity under various aspects: (i) size and constitution of the group, (ii) impact of the group leader, and (iii) creativity techniques.

4.1 Size and constitution of the work group

While large groups offer the advantage of providing a large knowledge base, especially if group members come from different professions, there is a consensus among researchers that small groups are more apt to perform creative tasks. The mechanism behind the effects blocking creativity in large groups is quite complex. One aspect is losing track of "who is doing what", which in turn will lead to a reduced spread of novel ideas. Large groups are also less conducive to "master-apprentice relationships", which are considered exceptionally well suited for passing on creative abilities from senior to junior members of staff (Weilerstein, Ruiz, Gorman 2003). This kind of relationship is mutually beneficial, as senior staff is likely to get fresh ideas from newer members of the team: "The wellsprings of research creativity reside in junior scientists and are waiting to be unleashed" (Heinze 2007). Furthermore, collaborative peer review, most often by a more senior scientist, is considered the best method to direct creative work, when requisite expertise and motivation are present (Mumford 2000).

In larger groups, communication needs to be formalised and thus requires complex and time-consuming meeting procedures in contrast to low-level chats typical of smaller teams. In these less formal chats new ideas arise at a considerably higher rate. Regular, large meetings with a strict hierarchical order can even be considered as a means of suppressing creativity since they have the well-documented effect of weakening innovative ideas by voicing all kinds of concerns and limitations. They will thus level down novel ideas to a streamlined generally accepted consensus. Additional scarceness of administrative staff will add to the low effectiveness of these meetings, as preparation will be poor which makes the outcome even more erratic.

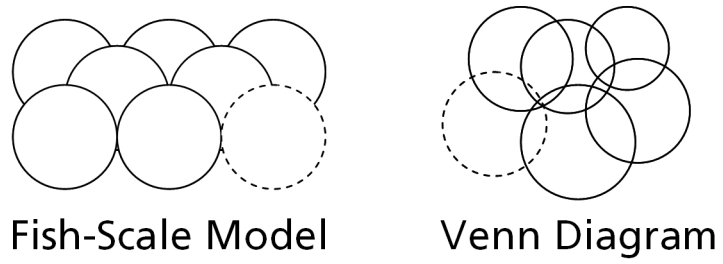
As a practical solution to the dilemma that small groups are more conducive to creativity, but lack the knowledge and ability base of larger groups, *Heinze* (2007) suggests to organize research in small teams, but to create an organisational environment that facilitates informal interaction of these small teams (see section 5.3). These interactions are considered to be especially fruitful if groups have highly

complementary knowledge and expertise, e.g. if theoretically focused groups interact with more experimentally oriented ones. In such a context, the small "core teams" can be considered as Communities of Practice (CoP), held together by a shared knowledge base and a homogeneous *modus operandi* (set of methods and techniques), while the whole organisation can be considered a Community of Interest (CoI), held together by a common goal. Smaller CoIs, made up of members of different CoPs, can be formed as the necessity arises. They are less stable than the core teams and might disband after a particular problem has been solved, be it after five minutes or several years.

The question whether constant or changing teams are more conducive to creativity has caused some debate among scientists. Nemeth & Ormiston (2007) claim that stable group membership might well increase morale, performance and felt creativity, while measurable creativity flourishes in a less comfortable environment with changing group members. People exposed to dissent, which stable groups appear to actively discourage, take account of more information on all sides of the issue, utilise multiple strategies, have improved performance and make better decisions (Gruenfeld, 1995; Van Dyne & Saavedra, 1996, both as cited in Nemeth 2007). As one conclusion Nemeth & Ormiston (2007) state that perceived creativity may have little to do with actual creativity. They suspect that people often confuse friendliness and comfort with creativity. The discrepancy between felt and measurable creativity shows parallels to the effects of group brainstorming (as described in section 4.3), and indicates that self-assessment of creativity is always precarious. This is supported by Scott (1995) who advises to set generous but strict deadlines to creative projects, as highly creative people are rarely satisfied with the outcome of their efforts. Nemeth & Ormiston (2007) conclude: "Managers should be cautioned against the 'paradox of success' wherein they place individuals in groups on a new task based on who previously worked well together. Rather, teaming individuals who have not previously worked together may better benefit the creative process."

There is considerable evidence that introducing new members with a background different from the one already existent in a team will lead to higher creativity. Leaders with the ability to select new group members with skills complementing the ones already present are considered to obtain the most creative groups in a scientific environment (Heinze 2007). These new members should share some domain knowledge with present members to make effective communication possible, but they should also bring new abilities to the group to broaden the team's domain coverage. These features can be depicted both as a fish-scale model (Fisher 2005) and as a Venn diagram (Simonton 2004) (figure 4). Both diagrams show that new members should broaden the horizon of the existing group, while still covering enough common ground to be able to communicate with other team members. Springer (1992) recommends considering individuals with a less-than-streamlined CV when hiring for creativity, as experience in diverse fields is a productive source of creative thought.

Figure 4: Different graphical representations of suitable knowledge within work groups (circles: knowledge domains of individuals; dashed circles: well suited domains of new group members)



4.2 Influence of leader behaviour

The influence of leader behaviour on creativity in subordinates is well documented in literature (e.g. Redmond 1993, Wong 2003, Amabile 2004).

A principal function of leaders is to set goals and assign tasks. In the case of highly skilled workers, like scientists or engineers, a special sensitivity is necessary, as both too much and too little guidance will impair creativity and productivity. Personal freedom, both in choosing which particular task to do next and how to tackle it, has been identified as a major source of creativity by various authors (e.g. Schepers & van den Berg 2007). Freedom of choice in how to conduct their research was one of the points stressed most when creative scientists were asked about the source of their creativity (Heinze 2007). This freedom also makes employees feel that they are indeed valued as persons, a factor that - according to Springer (1992) - leads to well-being and thus stimulates creativity. Goals and objectives should be defined in broad terms to guarantee the necessary procedural freedom. Goal

definition should focus on creativity rather than on production, as highly creative work is often less productive in terms of measurable output than more conventional one (Mumford 2000).

Shalley & Gilson (2004) underscore this view by stressing that time is a critical resource when managing for creativity. They point out that it is far easier and less time consuming for most employees to stick to routine methods that have proved to be efficient than to spend considerable time and energy on new, creative approaches whose final outcome is rather unpredictable. After studying the influence of leader behaviour on the quality of the solution of a marketing task, Redmond, Mumford & Teach (1993) suggest that although "the pressures of organisational life may cause leaders to seek and demand immediate problem solutions, […] leaders would be well-advised to give subordinates time to think about the problem." Leaders should "actively take steps to encourage subordinate problem construction", e.g. by having them list multiple issues or restate the problem. Basadur & Gelade (2006) give several examples where insufficient time spent on problem generation caused substantial delay in finding viable solutions.

Immediate superiors are thought to have the strongest impact on employee motivation. They have a central mediating role between the organisation and the individual employee. It is their task to communicate the values of the organisation and to serve as visible role models on how employees are supposed to act. In doing so, they reconcile the dichotomy between what employees would like to do and the actual work that the organisation expects them to do, without over-controlling highly skilled subordinates.

Another important function of group leaders is to connect the work group to the outside world. This means communicating the group's needs, aims, and results to higher-level management and, especially in the case of academic research, to a broader scientific community. On the other hand, it is the group leader's function to act as an information broker to connect the group to other interested parties that might provide physical or intellectual means not available to the group otherwise (Heinze 2007).

The perception of a leader that supports the team in these ways, combined with respect and (public) recognition for individual group members, have been shown to be among the strongest motivators for high ability subjects who found their task involving and meaningful (Amabile 2004). The inducement of self-efficacy (e.g. by appreciating individual potential or achievement) and the motivation of subordinates to apply time to problem identification and goal definition should also be mentioned. These factors have been identified as having positive effects both on the quality of work output and on the willingness to take creative risks (Redmond 1993).

Finally, examples of both positive and negative behaviour reveal that the positivity or negativity was often conveyed more by how something was done than by what was done. This means that leader actions that are conducive to creativity, like serving as a good work model, planning and setting goals appropriately, supporting the work group within the organisation, communicating and interacting well with the work group, valuing individual contributions, providing constructive feedback, showing confidence in the work group, and being open to new ideas, might not be enough if they are perceived as mere management tactics by employees. In the same way that interest in one's work is highly motivating (see section 3.1), the perception of genuine interest of the leader in the team and its individual members is a strong creativity enhancer that cannot be substituted by the mechanical application of simple motivation techniques. The study of this effect is complicated by the fact that leaders' behaviour patterns can lead to positive or negative spirals in team dynamics and performance, whereby the effects of leader behaviour become amplified over time. This suggests that the effects of leader behaviour on subordinate perception, emotion, and creativity are neither static nor unidirectional, but part of a dynamic relationship (Amabile 2004).

In the end, "what seems to be called for is an open, intellectually challenging environment where entrepreneurial behaviour on the part of collaborating teams is actively encouraged" (Mumford 2000).

4.3 Creativity techniques

Creativity techniques like *brainstorming* are generally considered useful tools for idea generation. Yet, Nijstad & Stroebe (2006) caution against their undiscriminating use in groups. They cite considerable evidence that while the general rules of brainstorming (emphasis on quantity, encouragement of unusual ideas, and discouragement of criticism) are well suited for producing high quality ideas, "the prediction that brainstorming is best performed in groups has not received support." While felt creativity is higher if brainstorming is performed in a group with *n* members, the measurable outcome is higher if creative tasks are performed by *n* individuals and ideas are then pooled ("nominal group"). By reviewing the literature (e.g. Mullen 1991), Nijstad & Stroebe (2006) were able to show that indeed "productivity loss in brainstorming groups is highly significant, and of strong magnitude." As a consequence, they recommend the use of this technique either for individual idea generation or in

two-person groups, as the loss of productivity increases rapidly with group size. *Production blocking*, that is stopping the transition from having an idea to expressing the idea, seems to be the main mechanism behind this negative effect. It correlates with group size, as the individuals have to wait for their turn to express an idea until other group members have expressed their thoughts (Nijstad 2006).

"Electronic brainstorming" (EBS) has been proposed as a creativity techniques that avoids this kind of forced break and can lead to improved idea output, especially in large groups. Although several different methods of EBS exist, most share a user interface consisting of two windows, one to type in ideas, and another to display all ideas generated in the particular session. DeRosa, Smith & Hantula (2007) have conducted a meta-analysis to evaluate the possible benefits of EBS. According to them, EBS could have several positive effects, as compared to traditional face-to-face (FTF) brainstorming: (i) *production blocking* should be less pronounced, as the individual group members can type in a new idea at any time, without having to wait for their turn, (ii) EBS has an *inherent memory advantage*, as ideas are conserved and remain visible on the computer screen, (iii) the *anonymity* possible in EBS might facilitate the expression of dissenting and minority opinions, which again stimulates thinking in divergent ways and finding creative solutions (Nemeth 2007). As to the quantity and quality of ideas, DeRosa, Smith & Hantula (2007) were able to place EBS between FTF brainstorming and nominal control groups: While outperforming traditional brainstorming groups by far, EBS groups were slightly less productive than the nominal controls, where the individual ideas were pooled without interaction. As to member satisfaction, EBS outperformed both other kinds of brainstorming, possibly because the results were so clearly visible on-screen. Taking the meta-analysis one step further, the influence of group size was analysed separately, with surprising results: While small nominal (non-interacting) groups outperformed EBS groups with eight members or less, larger EBS groups showed considerably better performance than their nominal controls. As for practical considerations, DeRosa, Smith & Hantula (2007) advise to use EBS instead of FTF if group brainstorming is desired. They believe that the size effect is only of practical importance if it is relatively easy and inexpensive to form large groups or teams. In any other setting, individual brainstorming and pooling of ideas might well be more efficient.

While brainstorming, as the classical creativity technique, still receives considerable research interest, other group techniques have evolved. Many of those applicable to small groups (in contrast to large group distributed design tools) deal with the *externalization of knowledge*. According to Fischer et al. (2005) externalization, that is the expression of otherwise tacit knowledge, supports group creativity in several ways: (i) to express a vague mental concept it has to be made more concrete, making thoughts and intentions more accessible for reflection, (ii) a physical record of mental efforts is produced, inhibiting the forgetting of ideas and conveying a higher feeling of productivity, (iii) it relieves from the difficult task of thinking about ones own thoughts, (iv) others can act on and react to externalized ideas, and (v) it contributes to a common language of understanding, a way to speak about things. The use of computers to support externalization of knowledge is becoming increasingly common. Interestingly, many of the supporting methods involve moving physical objects like Lego bricks. This seems to be a very "natural" way to discuss problems in groups that helps experts from different domains to interact in a meaningful way (Fischer 2005).

5 THE CREATIVE INSTITUTION

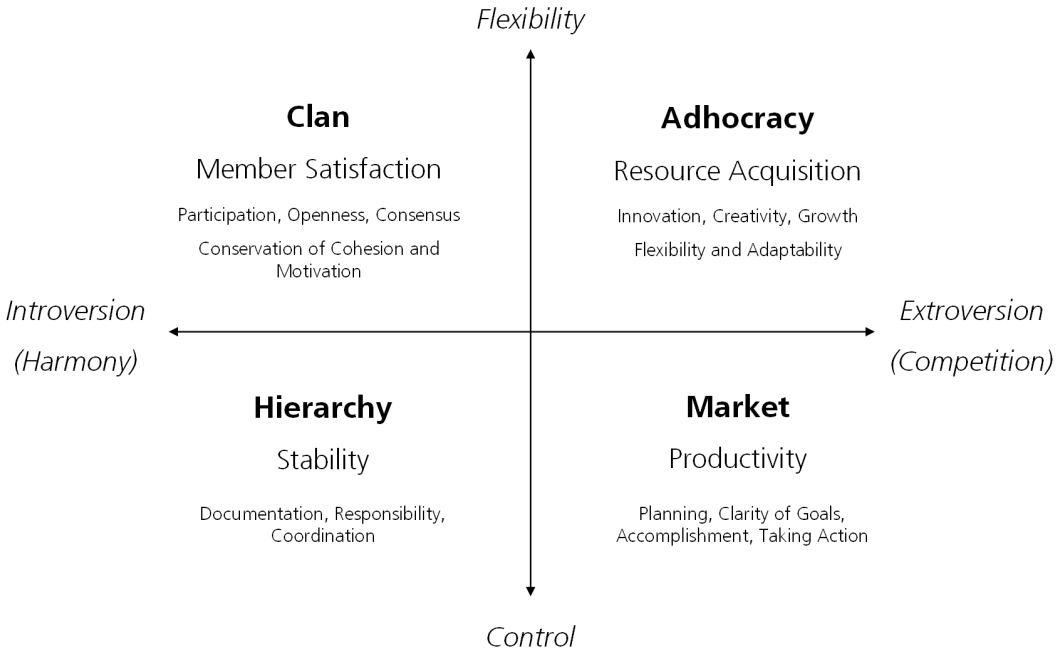
Most group creativity takes place in the context of larger organisations, be it pure research institutions or commercial enterprises with R&D as one department among others. While the size of an organisation might be less important for non-experimental work, a large, well-endowed working environment able to support an extensive array of instruments and workspaces is indispensable for experimentally oriented scientific or engineering work. As suggested above, the ideal organisational setting for creativity seems to be a large, highly diverse institution where small groups can easily interact and profit from each other's views, abilities and knowledge domains. In this section, some conditions that are conducive for creativity in such an organisation are examined.

5.1 Organisational culture

Organisational culture has been defined as "a guideline or pattern of regular and predictable activity, formed by a series of coordinated actions that are put into practice before a specific problem or stimulus" (Claver 1998). In other words, it describes the way that an organisation deals with problems, and indeed, what kind of problems it deems worthy dealing with. According to Cameron & Quinn (1999), the culture of organisations or their departments can be represented as the four quadrants of a system formed by the two axes "introversion – extroversion" and "flexibility – control" (figure 5). *Introversion* represents care for people and efficiency, while *extroversion* reflects awareness of the

organisational environment. *Flexibility* is linked to adaptation and change, whereas *control* reflects orientation towards top-down management and the application of formal rules and prescriptions. A striking feature of this system is that though the concepts at the extremes of the axes are incompatible, neither concept is *per se* superior to the other. The four organisational cultures represented as quadrants are coined *Clan* (flexibility & introversion, a culture that seeks to please its members), *Adhocracy* (flexibility & extroversion, a culture that seeks to broaden its horizon), *Market* (control & extroversion, a culture that seeks to get things done), and *Hierarchy* (control & introversion, a culture that seeks to ensure stability).

Figure 5: Organisational cultures (adapted from Cameron & Quinn (1999))

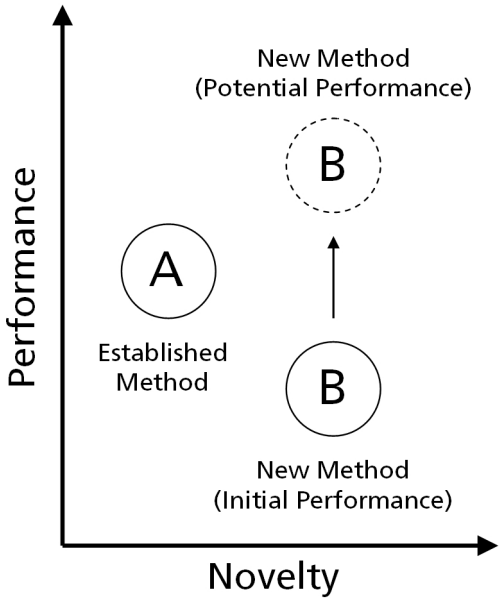


According to Claver *et al.* (1998), the ideal profile for creativity is *Adhocracy*: Openness for new technologies (and change in general) and the readiness to take risks, both factors these authors identify as creativity-promoting, are part of the ideals and values immanent to the *Adhocracy* culture. The flexibility to react rapidly to new developments, to incorporate new technology, and to address new problems and ideas as they arise, has also been found to be typical of highly creative research groups (Heinze 2007). It is therefore advisable to create an *Adhocracy* type environment if high creativity is desired, while alternative corporate cultures might be more valuable in other parts of a larger organisation.

Typical features of a *Hierarchy* are well-established procedures and adherence to strict rules. They are clearly detrimental to the establishment of an *Adhocracy* and should thus be avoided in an R&D setting.

A willingness to take risks has already been mentioned as conducive to creativity several times. It thus seems fitting to consider the risks posed by a creative approach to problem solving. The main risk in taking a new path lies in abandoning a well-trodden one. This has to be done at a point in time when it is not clear where the new path might lead to. The dilemma that novel, high potential methods perform worse than long established concepts and procedures has been addressed by Young (2007). It seems to be a general rule that in the beginning new methods have poorer performance than well-established procedures. On the other hand, they have the potential to result in higher performance, if enough effort and time are invested (figure 6). This is inherently associated with considerable risk, as it is not clear what the potential performance of the novel method is: The chances that it will never exceed the established, by-the-book procedure are considerable. In that case all the invested means and efforts were futile. Practically, this risk can lead to the effect that "negative stereotypes and immediate work demands can lead to a premature rejection of potentially valuable new ideas," if no sufficient emphasis is put on the introduction of novel ideas as a management principle (Mumford 2000). Again, it seems to be essential to define "success" in a way that allows creative failure to be considered a necessary step on the way to improved performance.

Figure 6: A risk associated with creativity lies in the unknown potential of method B (adapted from Young (2007))



Since R&D has a time-lagged, sporadic, and non-market nature in relation to its outputs its success is hard to evaluate by standard measures like turnover or revenue (Elkins & Keller 2003). This might be the reason why organisations with a strong financial focus (*Market* type culture) tend to be less innovative than strategically oriented enterprises. In *Market* type organisations, incremental innovation can be viable, while the introduction of more radical ideas might require the creation of new divisions, spinning off part of the company or licensing the technology to other enterprises (Mumford 2000). Apart from that, market-oriented cultures will prefer stable groups, as the efficiency of well-rehearsed teams is considerably higher than that of ad-hoc groups, which in turn exhibit a higher output of creativity (see section 4.1).

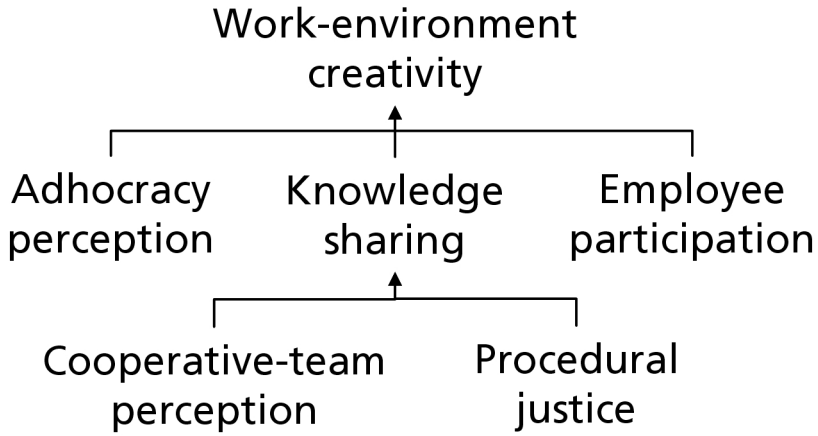
The introverted nature of the *Clan* makes it less apt for creative work, at least in a technological sense. Fisher *et al.* (2005) emphasise that integrating diversity, making all voices heard, and valuing openness and transparency, all features typical of a *Clan*, are highly beneficial for the development of social creativity. This creativity, however, is introverted, and might not be interested enough in what is happening in the outside world to actively develop solutions for real world problems. On the other hand, this tendency to ponder on its own issues makes the *Clan* very apt for the production of artistic outcomes, where usefulness is not of paramount importance.

Finally, it has to be noted that the individual perception of organisational culture has a higher influence on employees' creativity than the actual, objective work environment (Schepers 2007). Again, it is "in their heads" where creativity starts, and environmental factors will only influence their state of mind in an indirect way.

5.2 Employee perception of environmental conditions

To determine the social factors of work-environment creativity, Schepers & van den Berg (2007) evaluated 154 questionnaires completed by employees of the Civil Engineering Division of the Dutch Ministry of Transport. They sum up their results by stating that work-environment creativity is predominantly fostered by employee *Adhocracy* perception, the felt opportunity for employees to participate in the decision making process, and the willingness of employees to share their knowledge. Knowledge sharing, in turn, is encouraged if teams are perceived as cooperative (rather than competitive) and if employees expect to be treated in a fair way (figure 7). It is again of special interest that individual and group perceptions are of higher influence than measurable environmental facts. The combination of employee participation, freedom of expression and high performance standards seems to be most suitable for creativity and innovation in the eyes of these authors.

Figure 7: Factors conducive to work-environment creativity (adapted from Schepers & van den Berg (2007))



On the other hand, a feeling of personal insecurity is detrimental to the development of creativity. This feeling can be brought about by a seeming lack of support from the management (Wong 2003) and will be drastically intensified by precarious work contracts (Heinze 2007).

5.3 Resources

Heinze (2007) found that major creative events (in the sense of scientific breakthroughs) are more likely to occur in environments that provide some source of stable basic funding. He suggests that this reliability gives substantial freedom to think, especially about matters of no immediate utility. At the same time it reduces scientists' time spent on money-raising. The highly creative scientists he interviewed agreed that considerably more well-endowed multi-year awards should be granted to scientists, especially in the ascending stage of their career.

Although the availability of resources is prerequisite for the effective performance of creative work, there is some evidence that over-abundance may lead to a loss in efficiency, mainly due to a loss of focus (Mumford 2000). In a similar manner, the introduction of a novel technology in itself might decrease creativity. This happens if employees are confused by the introduction of a new process, method or machine (Claver 1998).

Knowledge is the main resource for producing knowledge. Access to relevant data-bases, literature and advanced computing facilities has been identified as a major requirement for creativity in the case of aeronautical engineering by Young (2007). But sophisticated computational tools can be double-edged swords: McMasters & Cummings (2002) caution against blind trust in simulation software as in many cases software engineers have included so many of their own biases and assumptions into the code that truly new ideas might well be determined as "beyond reality" if tested with software of this kind.

Adequate buildings and working schedules can also be conducive to creativity. Some examples are: (i) Leaving spaces for informal discussion (e.g. large staircases and coffee rooms), (ii) spatial closeness between departments to foster interdisciplinary contacts, (iii) avoiding large offices with many employees that might create an atmosphere where informal discussion is discouraged. Common lunch breaks provide good opportunities of communication between employees of different organisational areas. Schedules that allow and encourage this will also help to support creativity (Heinze 2007).

6. CONCLUSIONS

Creativity research has contributed many practical guidelines on how to manage R&D in a way that fosters creativity. Most suggestions do not require the raising of major funds, but it is often small things that make a difference. It would certainly be desirable to create an ideal environment for creativity by combining as many positive factors as possible, but even the well-considered adjustments of a few parameters might have a considerable bearing on creativity.

Most of the proposals compiled in this review will support each other in the actual process of enhancing creativity. Heinze (2007) has identified one particular set of contextual circumstances that, combined with the individual talents of scientists, is highly likely to lead to creative research: "Many of our highly creative researchers were recruited to these labs at an early stage in their careers, either as postdocs or junior staff researchers, and integrated into a mission oriented research program while giving them significant freedom to pursue the aspect of the overall program that they were most interested in or excited about. […] The context for this sort of work was characterized by organisations that provided significant job stability for its staff researchers, a base level of funding, […] and access to a large diversity of skills and interdisciplinary knowledge across the organisation. These research organisations were very well equipped with instruments and experimental capabilities that allowed the pursuit of empirical research in any direction the problem might suggest and the expert operators to yield reliable experimental results in a relatively short period of time. […] It was necessary to show a degree of research entrepreneurship within the larger directed context in order to focus on the problem of their interest and at the same time, the organisation provided the context and incentives for them to do so."

What could be hindrances to remodelling an R&D department or an academic unit in the ways suggested? A major obstacle might be the fear of losing control by granting considerable freedom to small research units. This is a dilemma indeed: Control seems to be detrimental to creativity, but at the same time, some control of what is done in R&D is highly desirable for senior management. Two suggestions to overcome this problem have been made: First, to make the overall goal of the organisation very clear to every employee and second, to evaluate R&D regularly, keeping in mind that highly innovative thinking is risky and thus a "failure" might be a sign that a creative approach has been tried. The fact that it is not possible to plan the outcome of creativity might also lead to reluctance in investing money in highly innovative R&D. There are examples of companies that have been ruined by lack of return from costly but fruitless research activities, especially in the pharmaceutical sector. It is thus generally suggested to hold both low-risk product enhancement projects and high-risk innovation approaches in the research portfolio, a managerial practice easier to accomplish in large companies than in small business units. Joint ventures and consortium building might be methods for smaller organisations to share the burden of possible failure in highly innovative research.

Finally it should be noted that to be efficient and effective, innovative action must be constant, as occasional or erratic efforts will probably not lead to any positive results (Claver 1998). It should have become clear in the course of this paper that creativity and innovation are not a matter of action plans and short-term campaigns, but have to be rooted in the very basic orientation of an organisation (Schepers 2007).

As to R&D environments, there is hardly any doubt that scientific research on creativity is of considerable value. Unfortunately, only few studies have specifically been conducted on R&D so far, most notably the one by Heinze (2007). One issue raised in that study is *reward*. As the mechanism behind popular reward systems for scientists and engineers has been found to be contra-productive (section 3.1), novel systems that overcome these problems need to be devised and evaluated. Perhaps the introduction of friendly contest could be a valuable means in this context (section 3.3). Another issue that certainly wants closer examination is interdependence of motivation, reward and creativity. Basic research in this field will certainly help to improve the effective managerial running of R&D departments. Furthermore, the results of Heinze (2007) indicate that adequate buildings are beneficial for creative work (section 5.3). It would be useful to determine what kind of R&D working environment is most conducive for creativity and how these theoretical findings can be translated into practical building guidelines.

The system that Cameron & Quinn (1999) have created to describe organisational culture appears to be a valuable theoretical foundation for further research on creativity in different industrial settings (section 5.1). It seems worthwhile to compare this theoretical framework with studies on corporate culture to fathom out correspondences and inconsistencies.

Concerning theoretical considerations, there is a need to reconcile componential and sequential theories that exist side by side without having many joints to connect them. Some ideas on how they could be brought together have been outlined in section 2.3.

This review shows that some valuable research on workplace creativity in R&D environments has already been conducted in recent years, but it also points out that a number of issues remain still unresolved. As effective R&D is considered a main driving force in modern economies, further studies should be carried out in this rewarding field of creativity research.

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Book Review: Understanding Strategic Management

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BOOK REVIEW

In Strategic Management theory and application go well together. However, as an academic teacher I note, that there is often a need for attention to applied Case Studies in order to improve students' understanding of the business world. Teaching theory alone is not always so fruitful, and the understanding of Strategic Management should include a balanced mix of synergies between theory and practice. The book *Understanding Strategic Management* by Claire Capon therefore provides sound support in that direction.

Altogether there are 12 chapters that cover the main areas of strategic management, followed by a glossary and a subject index at the end of the book. All chapters introduce the reader to the topic to be covered with a graphical illustration of the essential strategy model to be discussed, an exposition of chapter's objectives, and more importantly an "Entry Case Study" that facilitates enormously students to "break in" the topic that follows. "Margin Definitions" and "Important Key Terms" are also included and highlighted throughout the entire text. At the end of every chapter the authoress includes five successive sections on "Check your Understanding", on "Review Questions", on "Conclusion", on "Learning Outcomes and Summary" and on one "Exit Case Study" that round up students' learning objectives for the topics presented. This is followed with a "Discussion Topic" and a "Widen your Horizons" themes that enhance further students' critical thinking and understanding, and the educational task in every chapter reaches a climax with the incorporation of a "Weblinks" section that cites accessible to the topics covered web links, and also by two reference sections, one for "Further Reading" and one with topic specific "References".

Chapter 1 introduces the reader to the question of "What is Strategy?" and how it matters to business firms, by giving a thorough emphasis on the definition and the understanding of the essential concepts and approaches of the three strategic Cs, the EVR model, the various levels of strategy, the 7-S framework, the prescriptive and the emergent strategies, and Mintzberg's 5Ps of strategy approach. In Chapter 2 a well organised and presented environmental analysis is included, that contains the standard tools of PEST analysis and Porter's five forces of competition model. PEST analysis incorporates an informed presentation of the UK "political and economic environments", and, a very useful to the student of strategic management, presentation of the regulation of competition in the United Kingdom. The authoress could add, in a future edition of the present text, the inclusion of strategic groups analysis next to Porter's five forces of competition model, something that will enable students to have a better grasp of both the competitive environment and the competitive rivalry principles that promote market segmentation. Chapter 3 switches the focus on strategic management from the firm's external environment to "a within the company" perspective, via the discussion of the issue of "Managing Resources Competitively". Thompson's and Richardson's generic competence categories and Prahalad's and Hamel's criteria for identifying the "resource based" core competencies of the corporation are exposed well, followed by a technically competent value chain analysis and its associated value system and value chain linkages. Moving on to Chapter 4, there exists a thorough analysis of company's financial resources that every strategic management team must know to handle. A strong asset of the chapter in question is the "Evaluating Financial Performance" part, where a number of accounting performance ratios are juxtaposed effectively within short space. Chapter 5, that follows, is concerned with the power and the interest of the stakeholders of the firm, the organizational culture of the company, and the driving and restraining forces for organisational change processes that take place within companies. The next chapter, Chapter 6, tackles the issues of human resource management and the role and the kind of leadership in organisations. The chapter discusses effectively the different ways to manage staff and resources in companies, and additionally the various approaches to managerial leadership under different circumstances. In Chapter 7 the task in hand is to analyse and to develop competitive and marketing strategies in company's favour. The discussion and the examples on Porter's three generic strategies on United Kingdom supermarkets, as well as the inclusion of the "Strategy Clock" and the "Product Life Cycle" techniques, clearly assist the understanding of the concepts of the cost and differentiation competitive advantages on the company's pursued broad and narrow market targets and competitive position. The theme that follows in Chapter 8 relates the reader to strategic options open to firms for successful expansion. Growth for success may take place in the form of acquisition, organic growth, exporting, licensing or franchising and the company's competitive stature can also be strengthened via strategic alliances. A missing link in Chapter 8 is that Williamson's transaction cost economics approach on the firm's motives to expand in local and in international markets is not properly addressed. Chapter 9 on developing international strategy is a smooth and well-placed continuation of Chapter 8, as the firm now is engaged in an effort to develop an international strategy or to place its superior products in foreign markets via the form of foreign direct investment. Chapter 10, on structure, culture and groups in organisations, consists one of the best chapters of the

book as it includes a detailed analysis of competitive organisational structures in local and in international markets. In Chapter 11 the issue of strategic control of the value chain and of the value system are presented. In the relevant chapter the authoress develops effectively the issues of diversification and vertical integration under the umbrella of the strategic control of the value system. Finally, Chapter 12 on managing company failure and turnaround offers a standard package of causes of failure and recommended remedies for company recovery and retrenchment.

The text is full of case studies that link in an effective manner the understanding of the theory and the practice of Strategic Management. In addition, the text is linked to supporting resources in the form of a Companion Website for both Students and Instructors. The book is primarily addressed to the audience of BA Business Studies and HND Business Studies students, but it may also be used selectively to specific postgraduate courses. In conclusion the text by Claire Capon provides a very useful tool to the increasingly important subject of Strategic Management.