Identification of key factors for enhancing competitiveness: an exploratory study of the selected agri-biotech firms of Punjab in India

Sandeep SINGH[1], Ravi KIRAN[2], Dinesh GOYAL[3]

[1]*School of Management Studies, Thapar University, Patiala, India*
[2]*School of Behavioral Sciences and Business Studies, Thapar University,, Patiala, India*
[3]*Department of Biotechnology & Environmental Sciences Thapar University, Patiala, India*

Abstract: The present study covers empirical research on the selected Agri-Biotech firms of Punjab. The sample has been chosen from the state of Punjab covering the sectors Food Processing Industry, Fertilizer and Pesticides Industry. On the basis of factor analysis, the study has also identified key factors influencing competitiveness. These are Threat of new competition; Threat of substitute products or services; Bargaining power of suppliers; Intensity of competitive rivalry; Bargaining power of customers; Rivalry among existing firms. The study also tries to evaluate the findings on the basis of the author-factor matrix. The aim is to identify the key factors influencing competiveness. It analyses the difference in competitive factors on the basis of the nature of the industry and on the basis of scale of the firms. Then finally it tries to determine the key competitive factors influencing the market share. The results indicate that the Threat of new competition and Threat of substitutes/services emerge as the important predictors. Intensity of competitive rivalry; Preparedness for Competition; and Bargaining power of suppliers also emerge as significant predictors. These variables explain 79.6% of variation in the model.

Key words: bargaining power, suppliers, competitive rivalry

Bio-technology has become one of the emerging spheres and technologies in India as well on a global level. Indian economy is going through a transition phase where the restructuring of industries and firms are taking place in the form of privatization, globalization, and liberalization. Along with the global economic integration, there has been a marked acceleration in the pace of the technological and scientific progress. Advances in technology have created new opportunities for businesses. Technology plays a vital role in the development of any economy. The modern industry is driven by technology, and the lack of access to technology can stunt the economic growth. Technology played an important role in the rapid economic growth observed in the late twentieth century in Korea, Taiwan, and Singapore. The world is changing fast and the world of business is changing still faster. In the new millennium, business corporations will have to deal with entirely new challenges to meet the customer demands, to move from competition to collaborative reconfiguration, to dovetail the supplier and subcontractor processes to the corporate goals and empower employees to be able to meet and surpass customer expectations. Due to the global competitiveness, now the companies are taking more effective steps to improve the overall productivity and efficiency.

To attain a place in the competitive market, companies have to reduce the cost price of their product. It can only be possible if the production of goods is increased by applying the same input or by reducing the time wastage. The past experience shows that Indian firms took decades to be able to catch up with the global productivity levels. There is a strong need to evaluate the available technological options to overcome new challenges and to become top performers. At the strategic level, the main challenge is to become globally competitive by adopting collaborative manufacturing strategies. The process of acquiring a production capability is initiated by importing a plant from another country or having a new plant built with the help of a technology provider.

REVIEW OF LITERATURE

Many explanatory and interesting studies have been undertaken in the world to analyse the competitive-

ness in different sectors. The present research tries to identify the key factors for enhancing competitiveness in the selected Agri-biotech firms of Punjab in India through a survey of the large and medium scale industries operating in Punjab.

It is essential to understand the concept of competitiveness. In the works of (Lall 2001), competitiveness in industrial activities could be achieved by developing the relative efficiency along with the sustainable growth. Researchers associate competitiveness with improved quality, cost and production efficiency. According to Beck (1990), competitiveness is the ability of firms to manage the structural change. Accordingly, Buckley et al. (1988) relate the firm's competitiveness with the superior quality products and services at lower costs.

There is rich literature associating competitiveness with the financial performance, basically the return on shares, and the return on investment. Bobillo et al. (2006) considered sales and the net profit margin as the measures of financial performance. Bains (1986) attributed profitability the main role for enhancing competitiveness. Focus also has been put on the non-financial indicators, viz. market share, customer satisfaction. Fischer and Schornberg (2007) consider the market share as a useful indicator for judging competitiveness. Beck (1990), states that competitiveness can be interpreted as the ability of firms to cope with the structural change. Porter's contribution to competiveness cannot be overlooked. It in fact has heightened the debate about competitiveness and provided an extensive depth, vigour and intensity to the topic. Porter (2008) defined competitiveness at the organisational level as the productivity growth reflected in lower costs or differentiated products for commanding the premium prices. Porter's competitive strategies include: three forces from the 'horizontal' competition. These are: the threat of substitute products or services, the threat of established rivals, and the threat of new entrants. It also includes two forces from the 'vertical' competition, viz. the bargaining power of suppliers and the bargaining power of buyers (customers).

Infrastructure plays a predominant role, as Sheel (2002) opines that for technological advances new infrastructures, mainly telecommunication, information technology, new strategic thinking practices are needed for the hyper-competitive environment. However, the investment in infrastructure has to be supplemented by a strong investment into the human capital development as well. Khamba and Singh (2001)

considered the technology adoption and adaptation as the most critical for the firms. Dealing with the issue of technology transfers, Forero-Pineda (2006) concluded that the developed and developing countries should take a different stance concerning the protection of the intellectual property. The issues need a separate focus and analysis as the monopoly and oligopoly in the world technology markets prevented developing countries from having a fair access to technology. So the issue here is the access to the latest technology, only then the issue of adaptation will arise.

The satisfaction of the customers can be measured by the quality of products provided by the firms. Different companies have used various factors for judging the quality factor. Hassan et al. (2006) opine that the successful organizations in the today's business environment are those who manage along with their technological resources equally focus on their human resources as well. Similar feelings have been highlighted by Hollbeche (1998), focusing on the fact that the organizations perform better when they invest in training their employees to broaden their skills. These ideas are further reverberated by Koning (1998) expressing that the employee's creativity and innovation skills can increase only by giving them an appropriate recognition and reward for their creative work.

There are some studies which focus on the enhancing productivity through the investment into human capital. However, the partial productivity indices fail to measure the technical progress. This leads to the emergence of the index of the Total Factor Productivity by Goldar (1985), Ahluwalia (1991), Srivastava (1996). The extensive study by Ahluwalia (1991) for the period 1959 to 1985 reports that the total factor productivity during the two decades of the sixties and seventies of the manufacturing sector declined, but in the first half of eighties productivity growth showed a turn around. The acceleration in the total factor productivity has been due to the growth of the value added in most of the manufacturing industries. According to Goldar (1986), the growth in the total factor productivity is sluggish, but the technological progress has contributed marginally to the output growth. The average annual rate of growth during 1951–1979 was 1.27% per annum. In the study by Srivastava (1996), the TFPG for the period 1985–1986 to 1988–1989 ranges between 0.10% to 2.00%, and for the earlier period (1980–1981 to 1984–1985), it is negative. The study suggests that a significant increase in the TFPG rates occurred in 1987. Different studies report mixed results Goldar (1986, 2000), Rao (1996), Gangopadhyaya and Wadhwa

(1998) and Trivedi et al. (2000) report an acceleration in the TFP in Indian manufacturing during the decade of 80s. Das (2003) suggests a deceleration in the TFP in the post-1991 reform period to be negative. Similar findings are reported by Kiran and Kaur (2007), where TFP is 1.24% per annum for the period, 1980–1981 to 2002–2003. Further, the analysis for pre-liberalisation periods indicates a deceleration from 1.53 in the pre-liberalisation phase to 0.44% in the post-liberalisation phase. Thus, the 92–93 onwards era has a lower TFP growth. The capital productivity for this period is low.

A comparative analysis of India and China by Lee (2007) since 1980 highlights that the real value added and the labour productivity growth for Chinese manufacturing has been well above the Indian levels. The results from the Tobit regression conducted by Chen et al. (2005) further indicate that the food-related firms have higher scale efficiencies than others. Zeng et al. (2008) found that the "technology level", "cost control", and "brand consciousness" are the top three most important factors affecting the competitiveness of internationalization of manufacturing in China. Damiyano et al. (2012) analysed the manufacturing competitiveness of Zimbabwe and stresses the reduction in transaction costs, the concentration on improving exports and the proportion of electricity per output and FDI. Hitchens et al. (1998) and Hoste and Backus (2003) use production costs as measures for the agribusiness sector competitiveness.

Competitiveness is such a topic which has attracted researchers from all over the world to empirically examine the factors influencing competitiveness. The present study tries to identify the key factors for enhancing competitiveness in the selected agri-biotech firms of Punjab in India.

Objectives of the study

The present study has been taken to:
O1: Identify the key factors influencing competiveness.
O2: Analyse the difference in competitive factors on the basis of the nature of the Industry.
O3: Analyse the difference in competitive factors on the basis of the scale of the firms.
O4: Determine the key competitive factors influencing sales.

Hypotheses of the study

H_1: There is a significant difference regarding competitive factors on the basis of the nature of the industry.

H_2: There is a significant difference regarding competitive factors on the basis of the scale of the firm.
H_3: Sales of the firms are influenced more by Buyers' Competitive factors than by Sellers' Competitive factors.
H_4: Sales of the firms are influenced more by the Threat of new entrants than by the Threat of substitute products or services and the Intensity of the competitive rivalry.

DESIGN AND METHODOLOGY

The present study will use the descriptive research design. Primary data has been collected from the selected Agri-Biotech Firms of Punjab by using a self-structured questionnaire. The sample size consists of sixty nine firms. The questionnaire has been divided into three major parts. The first part is the organization profile, the second part covers research questions on competitiveness and the third section pertains to productivity. An effort has been made to cover all three regions, viz, the Malwa, Majha and Doaba, and all firms registered with the pollution control board. The reliability of the questionnaire expressed as the Cronbach Alpha is 0.745. The present study endeavours to identify the factors for enhancing competitiveness in Agri-Biotech sector. The present study has used factor analysis for identifying key factors for improving competeness. The sectors included are: Food Processing, Dairy products, Alcohol processing, Distilleries and Pesticides. The analysis has been done on the basis of the size and nature of the industry. The statistical tools used to analyse the data are the Factor Analysis, the Analysis of Variance (ANOVA) and the Regression Analysis.

RESULTS AND DISCUSSION

Profile of respondents

Data has been collected from 69 firms (Figure 1) from the state Punjab in India. Punjab is a progressive state of India. The break-up of these firms has been depicted through Figure I. The sample is dominated by dairy products, followed by the food processing units.

The size-wise analysis depicts that the sample is dominated by large sized firms as reflected through Figure 2. The profile of survey firms depicts that there are large-sized firms and medium-sized firms from
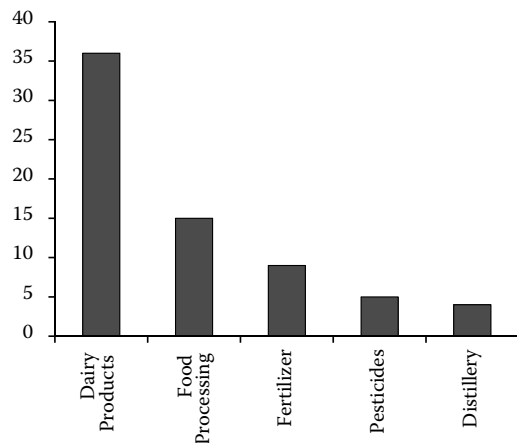
Figure 1. Nature of industry

Figure 2. Size of the firms

the total sample of 69 firms. For the small scale, the investment in plant & m/c is from 2.5 lakh up to 50 million, for the medium scale it is from 50 million to 100 million and for the large scale it is above 100 million.

Key factors for competitiveness

The initial step was to identify the factors of competitiveness. This was done through the factor analysis
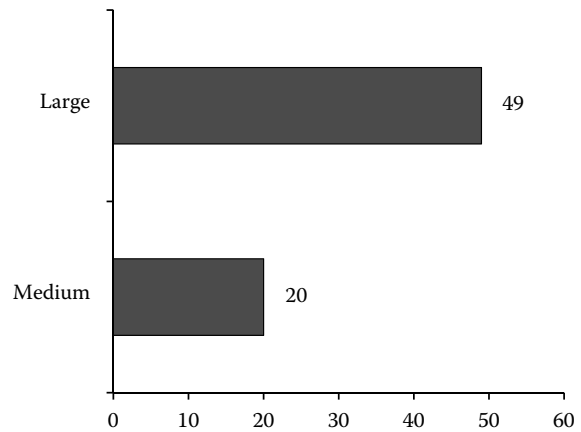
of twenty four questions pertaining to competition in the survey. On the basis of the factor analysis, these were reduced to six factors, viz. (i) Threat of new competition, (ii) Threat of substitute products or services; (iii) Bargaining power of suppliers; (iv) Intensity of competitive rivalry; (v) Bargaining power of customers (buyers); and (vi) Rivalry among existing firms (Table 1).

These six factors account for 96.208% of the total variation. The Threat of new competition emerged

Table 1. Key Competitive factors

Factor name	Items	Factor loading	Eigen value	% of variance	Cumulative
F1: Threat of new entrants	Economies of scale	0.891	5.113	20.452	20.452
	Barriers to entry	0.821			
	Importance of brand loyalties in purchase decision	0.663			
F2: Threat of substitutes/ services	Buyers' switching costs	0.930	4.989	19.958	40.410
	Quality of substitutes	0.922			
	Perceived level of product differentiation	0.787			
	Number of substitutes available in the market	0.738			
	Buyers' propensity to substitute	0.660			
F3: Bargaining power of suppliers	Supplier switching costs	0.863	4.286	17.144	57.553
	Supplier concentration	0.764			
	Ability for forward vertical integration	0.591			
F4: Intensity of competitive rivalry	Online competition	0.951	4.227	16.906	74.459
	Customization	0.938			
	Competitive advantage through innovation	0.778			
	Level of advertising expense	0.760			
	Strong competitive strategy	0.631			
F5: Bargaining power of customers (buyers)	Availability of Buyer information	0.886	2.808	11.231	85.690
	Products uniqueness	0.813			
	Bargaining power of Buyers	0.769			
	Buyer concentration	0.678			
	Buyer price sensitivity	0.575			
F6: Preparedness for change	Rapid adjustment to stocks	0.933	2.630	10.518	96.208
	Sensitivity to market changes	0.636			
	Workplace flexibility	0.625			

as an important factor explaining 20.452% of the total variation. All the variables in this factor account for loadings in the range of 0.821 to 0. 891. The Economies of scale and Barriers to entry load heavily on this factor.

The second factor viz. the Threat of substitutes/services had variables accounting for 19.958% of the variation. Here the item Buyer switching costs and Quality of substitutes have higher loadings. The Buyers' propensity to substitute has a lower loading compared with the Buyers switching costs. The perceived level of product differentiation has a slightly higher loading than the number of substitutes available in the market.

The next perceived factor is the Bargaining power of suppliers which accounts for 17.144% of the vari-

ation. The items Supplier switching costs and the Supplier concentration had the item loading of 0.863, 0.764 whereas the item Ability to forward vertically integrate had the item loading of 0.591.

The fourth factor is the intensity of competitive rivalry which explains 16.906% of the total variation. The Online completion and customization load heavily on this factor. The Competitive advantage through innovation and the Level of advertising expense score slightly lower loadings than the Online competition and customization. This depicts that the today's customers aspire more for convenience. Equally important is the Online competition and it cannot be ignored. The Competitive strategy had a lower score of 0.631.

The fifth factor Bargaining power of customers explains 11.231% of the variation, the Buyer in-

Table 2. Supportive literature – Competitive Factor matrix

Key factors for competitiveness/ supportive literature	F1: Threat of new entrants	F2: Threat of substitutes/ services	F3: Bargaining power of suppliers	F4: Intensity of competitive rivalry	F5: Bargaining power of customers (buyers)	F6: Preparedness for change
Bhardwaj (1990)	+			+	+	
Ahluwalia (1991)	+			+		
Khamba and Singh (2007)		+	+			+
Cornish (2003)			+		+	
Dutfield (2000)		+	+		+	
Sethi et al. (2007)		+				+
Lee (2007)	+		+	+		
Mascus (2000)	+		+	+		
Forero-Pineda (2006)	+		+	+		
Mehta (1990)	+			+		
Hassan et al. (2006)	+				+	
Griliches (1990)		+	+			
Biber (2000)		+	+		+	
Porter (2008)	+	+	+	+	+	
Kaur and Kiran (2008)	+	+				+
Lalitha (2004)	+		+	+		
Kavida and Sivakoumar (2007)		+				
Adler and Shenher (1990)	+					+
Hollbeche (1998)				+	+	+
Mei-Fang et al. (2007)				+	+	
Koning (1998)	+					+
Goldar (1986	+			+		
Buckley et al. (1988)	+		+	+		
Hoste and Backus (2003)	+		+	+		
Hitchens et al. (1998)	+		+	+		

formation availability having the item loading of 0.886, and the Products uniqueness having the item loading of 0.813, suggesting once again the role of the information sharing in the knowledge era we are living in today. The Bargaining power is having the item loading of 0.769 and the Buyer concentration having the item loading of 0.678. The Buyer's price sensitivity had the lowest loading. Thus, the firms also recognize that price may not be the only factor to be considered for the bargaining power of the buyers.

The last factor Preparedness for change accounts for 10.518% of the variation. The Rapid adjustment to stocks loads heavily. The Workplace flexibility has a lower loading than the Sensitivity to market changes. Thus in the competitive factors, the Preparedness for change still has a lower Eigen value and explains less variation. This calls for the enhanced impetus to be given to the Preparedness for change.

After the exploratory study for identifying the factors influencing competitiveness, it was imperative to find out the factors extracted by other researchers who had worked in the similar area. This was done to establish the link with the earlier literature and it also helped in providing a further direction to research. Table 2 represents the Supportive Literature-Competitive Factor Matrix. The matrix indicated that the Threat of new competitor, Intensity of competitive rivalry and the Bargaining power of customers (buyers) are important factors and are highly supported by the earlier literature. The Preparedness for change is a recent factor having less supportive evidence through the empirical studies.

For a deeper analysis, it was essential to conduct the ANOVA on the basis of the Nature of industry and the Scale of the firms, to find out whether there is a significant difference on the basis of these regarding the six competitive factors. Table 3 presents the ANOVA results for the Nature of Firms and the Competitive factors.

The results indicate that except for one factor, viz. F5: the Bargaining power of customers (buyers), the ANOVA results were significant for all other factors. Thus this highlights that there is a significant difference among firms regarding the competitive factors on the basis of the Nature of the industry.

Table 3. ANOVA Results for the Nature of industry and Competitive factors

		Sum of squares	df	Mean square	*F*	Sig.
F1: Threat of new entrants	between groups	6.616	4	1.654	19.602	0.000***
	within groups	5.400	64	0.084		
	total	12.015	68			
F2: Threat of substitutes/services	between groups	6.808	4	1.702	20.877	0.000***
	within groups	5.218	64	0.082		
	total	12.026	68			
F3: Bargaining power of suppliers	between groups	11.345	4	2.836	68.793	0.000***
	within groups	2.639	64	0.041		
	total	13.984	68			
F4: Intensity of competitive rivalry	between groups	14.573	4	3.643	454.479	0.000***
	within groups	.513	64	0.008		
	total	15.086	68			
F5: Bargaining power of customers (buyers)	between groups	2.652	4	0.663	1.912	0.119
	within groups	22.198	64	0.347		
	total	24.850	68			
F6: Preparedness for change	between groups	4.985	4	1.246	12.864	0.000***
	within groups	6.200	64	0.097		
	total	11.185	68			

***$p < 0.001$

Thus the hypothesis H_1 that there is a significant difference regarding the Competitive factors on the basis of the Nature of the industry has been accepted (Table 4).

The ANOVA results are significant for F1: Threat of new competition, F2: Threat of substitute products or services, F5: Bargaining power of customers (buyers) and F6: Rivalry among existing firms. The results are not significant for F3: Bargaining power of suppliers and for F4: Intensity of competitive rivalry. Thus the hypothesis H_2: that there is a significant difference among the Competitive factors on the basis of V Scale of the firms is partially accepted.

Finally, the last stage was to determine the key factors of competiveness. The dependent variable has been the sales and the independent variables have been the six competitive factors identified through the factor analysis (Table 5).

From the factors influencing the market share, F1: Threat of new competition and F2: Threat of substitute products or services emerge as the important predictors. Two variables, viz. F4: Intensity of competitive rivalry and F6: Preparedness for Competition have lower beta values. The bargaining power of suppliers has a negative vale depicting an inverse relation with the market share. Predominantly, if the market share improves, the suppliers will not be able to exert their influence. What is surprising is that the Bargaining power of buyers does not emerge as a predictor for the model. Adding up of the predictors increased the predictability of the model as the value of adjusted R^2 increased from 0.375 to 0.796. Thus these independent variables predict 79.6% of the variation. The ANOVA results are significant for all these independent variables. F4: Intensity of competitive rivalry and F6: Preparedness for Competition are significant at 5% level, while F1: Threat of new competition, F2: Threat of substitute products or services and F3: Bargaining power of suppliers are significant at 0.01% level. Many of the recent failures in business depict the lack of preparedness of firms. The above results highlight that though the Beta value for preparedness is low, but it has emerged as a significant predictor in the model.

The factor F5: Bargaining power of customers (buyers) has not emerges as significant predictor. Thus the Hypothesis H_3: Sales of the firms are influenced more by the Sellers' Competitive factors than by

Table 4. ANOVA Results for the Scale of the firms and Competitive factors

		Sum of squares	df	Mean square	F	Sig.
F1: Threat of new competition	between groups	1.064	1	1.064	6.508	0.013*
	within groups	10.952	67	0.163		
	total	12.015	68			
F2: Threat of substitutes/services	between groups	5.481	1	5.481	56.116	0.000***
	within groups	6.544	67	0.098		
	total	12.026	68			
F3: Bargaining power of suppliers	between groups	.068	1	0.068	0.329	0.568
	within groups	13.916	67	0.208		
	total	13.984	68			
F4: Intensity of competitive rivalry	between groups	0.078	1	0.078	0.350	0.556
	within groups	15.008	67	0.224		
	total	15.086	68			
F5: Bargaining power of customers (buyers)	between groups	7.855	1	7.855	30.967	0.000***
	within groups	16.995	67	0.254		
	total	24.850	68			
F6: Preparedness for change	between groups	1.279	1	1.279	8.650	0.004**
	within groups	9.906	67	0.148		
	total	11.185	68			

***$p < 0.001$; **$p < 0.01$; *$p < 0.05$

the Buyers' Competitive factors, has been accepted. Thus, there is still a focus on the sellers' strategies to lure buying.

The factor F1: Threat of new competition has higher Beta value (0.662) than F2: Threat of substitute products or services (0.636). Thus the hypothesis H_4: Sales of the firms are influenced more by the Threat of new entrants than by the Threat of substitute products/

services and the Intensity of competitive rivalry has been accepted.

CONCLUSION

The factors of competitiveness are: Threat of new competition; Threat of substitute products or services;

Table 5. Competitive Factors Influencing Market share

Model	*R*	*R* square	Adjusted *R* square	Std. error	Durbin-Watson
1	0.620[a]	0.384	0.375	0.84472	
2	0.860[b]	0.739	0.731	0.55409	
3	0.882[c]	0.778	0.767	0.51538	
4	0.892[d]	0.796	0.784	0.49696	
5	0.900[e]	0.811	0.796	0.48324	1.419

Model		Sum of squares	df	Mean square	ANOVA(F)	sig.
1	regression	29.845	1	29.845	41.826	0.000[b]
	residual	47.807	67	0.714		
	total	77.652	68			
2	regression	57.389	2	28.695	93.464	0.000[c]
	residual	20.263	66	0.307		
	total	77.652	68			
3	regression	60.387	3	20.129	75.782	0.000[d]
	residual	17.265	65	0.266		
	total	77.652	68			
4	regression	61.846	4	15.462	62.606	0.000[e]
	residual	15.806	64	0.247		
	total	77.652	68			
5	regression	62.940	5	12.588	53.905	0.000[f]
	residual	14.712	63	0.234		
	total	77.652	68			

Coefficients[a]

	Unstandardized coefficients		Standardized coefficients	*t*	Sig.
	B	Std. Error	beta		
(Constant)	2.348	0.058		40.358	0.000
F1: Threat of new competition	0.662	0.059	0.620	11.305	0.000***
F2: Threat of substitutes/ services	0.636	0.059	0.596	10.861	0.000***
F3: Bargaining power of suppliers	−0.210	0.059	−0.196	−3.583	0.001***
F4: Intensity of competitive rivalry	0.146	0.059	0.137	2.500	0.015*
F6: Preparedness for Change	0.127	0.059	0.119	2.164	0.034*

a = Dependent variable: Market share

Predictors: b = F1: Threat of new competition, c = F2: Threat of substitutes/services, d = F3: Bargaining power of suppliers, e = F4: Intensity of competitive rivalry, f = F6: Preparedness for competition

***$p < 0.001$; *$p < 0.05$

Bargaining power of suppliers; Intensity of competitive rivalry; Bargaining power of customers; Rivalry among existing firms. The result of the factor analysis has been validated through the author-factor matrix. There are a number of studies where the individual factors have been identified. The Porter's (2008) model of distinctive strategies has been well accepted in the marketing literature. The present study adds upon that literature by the aggregative analysis. Some of the factors identified for competitiveness have been related to the Porter model which has been used as a base. The empirical results through the factor analysis have helped in identifying their importance. The supportive literature regarding the Competitor Factor Matrix highlights that the Threat of new competitor, Intensity of competitive rivalry and Bargaining power of customers (buyers) emerge as important factors. The results of the regression analysis depict that F1: Threat of new competition; F2: Threat of substitute products or services; F3: Bargaining power of suppliers; F4: Intensity of competitive rivalry; and F6: Preparedness for Competition emerge as important predictors of the market share. Furthermore, F1: Threat of new competition and F2: Threat of substitute products/services are more important that other factors. Gaining competitive advantage through creating value for customers has become the major interest in the field of strategic marketing has been widely accepted in the literature (Woodruff 1997; Huber et al. 2001). The earlier works by Bains (1968) on the industrial organisation paradigm also bear testimony to these factors. The choice of an appropriate competitive market strategy will help the firms in creating value for customers and help to attain the competitive advantage. The present research focuses along with these areas on F6: Preparedness for Competition. According to Adler and Shenber (1990) every change requires changes and adaptation in human skills, procedures, organisational structures, strategy and culture. Thus change is also an important factor in the current changing scenario, when we are witnessing a transformation in organisations, due to the invasion of the information and communicational technologies.

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Contact address:

Ravi Kiran, School of Behavioral Sciences and Business Studies, Thapar University, Patiala-147004, Punjab, India
e- mail: rkiran@thapar.edu; kiranravee@gmail.com