Strategic orientation and performance in Dedicated Biotechnology Firms

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Abstract: Studies have shown that market orientation has been associated with superior performance in several industries. However Dedicated Biotechnology Firms (DBFs), and other technology-based firms operate in turbulent environments where knowledge, alliances and being first to establish technical leadership are paramount. The importance of technological orientation is exaggerated. This international empirical study examines the relationship between market and technological orientation and firm performance, including new product success. A new scale to capture technological orientation is developed and validated but no relationship between this and firm performance is found. Results show the cross-cultural validity of the scale for market orientation and positive association between some measure of performance and the level of market orientation.

Keywords: market orientation; technological orientation; biotechnology; performance.

Reference to this paper should be made as follows: Hynes, N. and Mollenkopf, D.A. (2006) 'Strategic orientation and performance in Dedicated Biotechnology Firms', *Int. J. Technology Marketing*, Vol. 1, No. 2, pp.243–264.

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1 Introduction

Dedicated Biotechnology Firms (DBFs) represent an important source of new growth for most developed economies (Baruch, 1997; Oakey, 1994; Rothwell, 1984). The number of DBFs has increased dramatically over the past two decades and these firms are earning more revenue and employing more people than their earlier predecessors (Ernst and Young, 2004). The biotechnological breakthroughs of the 1980s and 1990s are now resulting in commercially viable products, affecting a wide range of end markets and benefiting many areas of society. For example, there are now new and less expensive cures for disease through production of therapeutic proteins such as insulin or interferon (Woiceshyn and Hartel, 1996a). Other breakthroughs have been seen in end markets as diverse as agricultural or veterinary markets, the food and drinks industry, farming, plastics and materials technology.

DBFs face different issues than firms in more mature industries because of the characteristics of both the firms themselves and the environment in which they operate. They operate in turbulent environments where they face fast changing competition and also new or different forms of competition. In this industry, the interaction between firms and Universities/other research institutes is very important and this is characterised by a strong reliance on strategic alliances and networks (Woiceshyn and Hartel, 1996b; Bengtsson and Kock, 2000; Renko and Tikannen, 2002). The firms themselves are often either very small, or offshoots of large companies, and are often initially dependent on a single technology. The importance of this technology results from a combination of rapid market and technological change, decreasing product life cycles and long product development periods.

The exceptionally long and expensive product development process in biotechnology is due to several different issues. First, the products may be dependent on new or developing technologies; these are initially based on scientific ideas. Second, government regulations may cause another delay. Government departments are often incapable of dealing with the rapidly increasing number of patent applications (Woiceshyn and Hartel, 1996b). Public fears and action can also add to an increase in regulations. Third, once the product or service is commercialised, a DBF's product faces a turbulent marketplace where the sheer speed of technological change, and the establishment of technological standards often result in a 'winner takes all' scenario (Flanagan, 1993; Lambe and Spekman, 1997; Hill, 1997). Indeed, technological change can be so extreme that it can be 'competence destroying' resulting in a whole new generation of product (Hamilton et al., 1990). Therefore, DBFs need to strive for continual innovation and require a minimum level of development work, simply in order to keep abreast of technological change (Davies and Brush, 1997). In addition to these issues, many smaller DBFs also face problems in retaining key development staff and gaining venture capital (Baruch, 1997).

Research has shown that a strong strategic orientation can affect business performance and in the turbulent marketplace facing DBFs, the balance between focusing outwardly on the marketplace and simultaneously focusing on the technology of the firm can be critical. Previous research has highlighted the importance of a market orientation in achieving superior performance. In addition, the strategic management of technology is vitally important in determining the success of these firms and affects strategy, structure, and the way in which these firms deploy their resources (Kazanjian and Drazin, 1989).

This study examines the relationship between market orientation, technological orientation and firm performance within DBFs. In order to do this, a comprehensive literature review into these forms of strategic orientation is conducted, a new scale to measure technological orientation is developed and a multinational study of DBFs is conducted. This paper contributes on a theoretical basis in terms of extending the knowledge of these forms of strategic orientation and also has strong implications for DBFs because market orientation (as defined by a set of attitudes and beliefs) has been associated with superior performance. If so, DBFs with limited resources may find they can become more market-oriented by changing beliefs and behaviours rather than through resource allocation.

The next section provides background literature and rationale for this research by discussing strategic orientation, market orientation and technological orientation, then looking at the issue of DBFs and strategic orientation. Section 3 discusses methodological issues, followed by a discussion of results in Section 4. Section 5 discusses both theoretical and managerial implications, as well as future research opportunities.

2 Background and model development

2.1 Strategic orientation: definition and measurement

Strategic orientation has been defined as a set of behaviours to operationalise the firm's strategy (Venkatraman, 1989). Previous research has focused on defining different typologies of strategic orientation and in examining the relationship between a particular strategic orientation and the performance of the firm. The term 'strategic orientation' has been used very widely and is sometimes used as an 'umbrella' term to encompass different forms of orientation. Table 1 summarises some of the research on strategic orientation, and shows the variation in underlying dimensions upon which each typology is based. It is not a comprehensive review of the literature but illustrates the quite different bases on which researchers have built their definitions of strategic orientations.

From Table 1, it can be seen that some typologies are based on the balance of influence between stakeholders within an organisation (e.g., Greenley and Foxall, 1998) whereas others are based on whether the firm was internally or externally oriented (Wright et al., 1995). These differences illustrate an important criticism of typologies: it is relatively easy to find a single dimension on which a typology can be based and which will support any given philosophical orientation (Carper and Snizek, 1980).

Table 1 Examples of strategic orientation typologies

Type of strategic orientation	*Author* (*s*)	*Basis of typology*
Stakeholder orientations: customer, competitor, employee, shareholder	Greenley and Foxall (1998)	Influence groups
Internal, external	Wright et al. (1995)	
Market/competitive/customisation and international	Dess and Robinson (1984)	Functional/ resource-based
Long-term vs. short-term financial	Doyle and Hooley (1992)	
Technical/marketing	Cooper (1985)	
Technology/market	Oakey (1991)	
Entrepreneurial orientation	Lumpkin and Dess (1996), Knight (1997), Covin and Slevin (1989) and Khandwalla (1977)	Combination of functional/ resource-based and cultural attributes
Innovation orientation	Lumpkin and Dess (1996)	
Customer, competitor, technological	Gatignon and Xuereb (1997)	
Marketing/entrepreneurial	Miles and Arnold (1991)	
Aggressiveness, analysis, defensiveness, futurity, proactiveness, riskiness	Venkatraman (1989)	Cultural or underlying attitudes and beliefs
Market	Narver and Slater (1990), Kohli and Jaworski (1990), Greenley (1995) and Ruekert (1992)	
Prospector, analyser, defender	Miles and Snow (1978)	
Clan, adhocracy, hierarchy and market	Deshpande et al. (1993)	

Another problem with the use of typologies is methodological. Each form of strategic orientation must be operationalised and measured; typical methods include resource allocation, behaviours, and underlying attitudes and beliefs. The use of different measures can cause confusion in comparing research, and this is illustrated in a recent comprehensive review of one form of strategic orientation, 'market orientation'. Homburg and Pflesser (2000) consider the confusion between defining the term as beliefs, attitudes, intentions, realisations and/or behaviours to be an unresolved issue. Notwithstanding the difficulties in both definition and measurement of strategic orientation, it remains an important area to research because the level of strategic orientation has been associated with superior firm performance. This relationship is discussed in more depth in the following section.

2.2 Market orientation

Market orientation has been defined as

> "the organization culture that most effectively and efficiently creates the necessary behaviors for the *creation of superior value for buyers and thus, continuous superior performance of the business.*" (Narver and Slater, 1990, p.21)

Market orientation as defined by Narver and Slater (1990) consists of three behavioural sub-components: *Customer Orientation* refers to the ability to create value for the buyer by understanding their needs, which requires an in-depth understanding of all levels of the supply channel; *Competitor Orientation* means that the firm understands the strategies and capabilities of the competition; and *Interfunctional Coordination* refers to the integration of the firm's resources and alignment of functional areas within the business so that superior value can be created for customers.

There are many studies that examine market orientation and provide evidence for a positive association with performance (See Table 2). In general, the research suggests that firms that are highly market-oriented perform better than those that are less market-oriented (Narver and Slater, 1990; Kohli and Jaworski, 1990; Doyle and Hooley, 1992). Although very little of this research has focused on DBFs or even the wider group of technology-based firms, there is some evidence to suggest that this relationship is also valid for DBFs. A UK study focusing solely on DBFs found a positive association between the level of market orientation and firm performance (Appiah-Adu and Ranchhod, 1998). In addition, an earlier study using a sample of SBUs from a large high-technology company found substantial differences in the levels of market orientation across SBUs, and a positive association between market orientation and business performance (Ruekert, 1992).

New Product success is a common indicator for firm performance and is of great importance to DBFs. Atuahene-Gima (1995) and Ramaseshan et al. (2002) found a positive association between new product success and market orientation. However, Greenley (1995) found that above a certain level of technological change, market orientation is negatively associated with new product success. Since DBFs operate in highly turbulent technological environments, this would suggest that market orientation is negatively related to their success. Greenley (1995) considers this finding counterintuitive, and suggests that it may be because for new technologies, existing customer preferences may not be a guide to new product success. This idea is also supported in more recent literature on radical and discontinuous change and technology-based markets which suggests that in certain markets, a market orientation will hinder firms, because it will focus their efforts on incremental change and therefore result in firms becoming uncompetitive (Mohr, 2001).

2.3 Technological orientation

The term 'technological orientation' has been examined in several studies and although these lend support to the construct of technological orientation, there is no commonly adopted scale, as there is with market orientation. The related streams of literature such as that concerning technology strategy, and entrepreneurial orientation also provide definitions and terms that appear to be closely related to the notion of technological orientation. These are summarised in Table 3.

Table 2 Empirical studies concerning market orientation

Empirical study	*Industry/firm type*	*Country*	*Business performance measure used*	*MO -performance association found*
Rameshan et al. (2002)	179 mixed firms	Singapore	Ten subjective measures	Strong positive association between MO and NP success
Pelham (2000)	1200 Industrial manufacturing firms	USA	Four subjective measures	Strong positive association
Appiah-Adu and Ranchhod (1998)	62 Biotechnology companies	UK	Four subjective measures	Three out of four performance measures showed a positive association with MO
Han et al. (1998)	134 banks	USA	Innovation and performance	Mixed but some support for a positive association between MO and innovation and performance
Gatignon and Xuereb (1997)	Cross section of firms	–	New product performance	Mixed
Pelham (1997)	Small industrial manufacturing firms	USA	12 subjective performance measures	Mixed
Atuahene-Gima (1996)	275 mixed firms; manufacturing and service	Australia	Innovation performance	Mixed but some positive association between customer and competitor orientation and innovation performance
Pelham and Wilson (1996)	Small firms	USA	NP success (two factors) and growth/share (three factors) subjective measures	Positive
Fritz (1996)	X-section 250 firms	Germany	Four subjective measures	Positive association between market orientation and performance (also for other strategic orientations)
Greenley (1995b)	1000 large UK firms (>5000 employees)	UK	Subjective measures	Mixed
Atuahene-Gima (1995)	275 mixed firms	Australia	Subjective measure of new product market success	Strong positive association between MO and NP success
Slater and Narver (1994)	81 and 36 SBUS of two firms (1 forestry, 1 manufacturing)	USA	Three subjective measures	Non-linear relationship between MO and ROA
Diamantopolous and Hart (1993)	190 manufacturing firms	UK	Dummy variable based on above/below average	Weak association. mixed results
Kohli and Jaworski (1993)	MSI/Top 1000 and AMA membership list	USA	Subjective and objective measures	Positive relationship with overall performance
Ruekert (1992)	Five SBUs of a large high technology firm	USA	Only two SBUs tested – low and high performing as judged on profitability over past five years	Positive – MO found to be a discriminating factor between high and low performing firms
Narver and Slater (1990)	140 SBUs of one forestry firm	USA	Competitiveness and customer satisfaction-subjective	Positive

Table 3 Empirical studies concerning technological orientation and related terms

Authors	*Term used*	*Definition*
Gatignon and Xuereb (1997)	Technological orientation	That the firm is R&D oriented, proactive in acquiring new technologies and that it uses sophisticated technologies in its new product development
Barczak (1994)	Technological orientation	New products are technically complex; Strong R&D orientation
		New products are technologically derived; New products are high risk
		New product process is dominated by technical personnel
	Technological innovativeness	Use of state of the art development and production technologies
		Proactive in finding new technologies
Zahra and Covin (1994)		The firm's technological innovation posture and capabilities
		The definition of a firm's dominant technology thrust and goals
		The extent of globalisation of its technology strategy
		Technology sourcing
		The nature of technological investments and organisational mechanisms relating to technological resources
Weisenfeld-Schenk (1994)	Technology policy	The acquisition of know how – either internally or externally
		The management of technological innovations
		The degree of aiming at technological leadership
Dodgson and Rothwell (1991)	Technology strategy	An understanding within the company – of the importance and potential of technology for competitive position …
Covin and Slevin (1991)	Entrepreneurial orientation	Five dimensions of: innovativeness, risk taking, proactiveness, aggressiveness and independent and autonomous action

Table 3 Empirical studies concerning technological orientation and related terms (continued)

Authors	*Term used*	*Definition*
Ford (1988)	Technology strategy	Must centre on the policies, plans and procedures for:
		Acquiring knowledge and ability; Managing that knowledge and ability
		Exploiting that knowledge and ability
Cooper (1985)	Technological sophistication, orientation and innovativeness	New products employ sophisticated development technologies; new products are high technology ones
		New products are highly innovative ones; program is a leading edge of corporate strategy
		New products are technically complex; firm is proactive in acquiring new development technologies
		New products employ state of the art development technologies; new products are high risk ventures
		New products employ state of the art production technologies; firm is strongly R&D oriented
		Firm is proactive in generating new product ideas; new products offer unique features to customers
		Program is offensive (vs. defensive) – aimed at gaining market share
		New projects are venturesome (as opposed to 'sure bets')

There is also some limited support for the association between these constructs and firm performance (Barczak, 1994; Cooper, 1985; Gatignon and Xuereb, 1997). For example, Gatignon and Xuereb (1997) found that the relationship between technological orientation and innovation performance was positive but dependent on demand uncertainty. Although Gatignon and Xuereb (1997) did not focus on technology-based firms, they suggest that firms that are highly technologically oriented show a higher performance than those that are not. Barczak (1994) also found that technological orientation was associated with a high level of new product performance, and Berry (1996) suggests that during the early life cycle stages, technological considerations are of critical importance. Roberts (1990) concurred by providing evidence to show that technology-based firms initially succeed or fail based on their technological capability, but that after a period of time, it is the marketing capability that is crucial for success.

2.4 DBFs and strategic orientation

Most studies stemming from the entrepreneurial/technology-based literature point to the fact that technology-based companies are commonly 'technologically oriented' (Roberts, 1990; Oakey and Cooper, 1991; Berry, 1996; Pavia, 1990). In fact, it could be argued that the over-riding importance of technology, and the fact that they employ many R&D staff and spend a lot of money on development, means that all technology-based firms are 'technologically oriented' at least to some extent. However, this argument highlights the problems between comparing streams of research into strategic orientation since the market orientation studies are based on measuring attitudes, beliefs and behaviours as opposed to resource allocation. Any study, which uses resource-based measures of 'technological orientation' may not capture the degree to which the firm places importance on the underlying beliefs about the importance of technology. Indeed, using resource measures alone, most DBFs would appear to be technologically oriented simply because they tend to employ a great number of R&D staff and spend money in product development. However, not all firms place the same degree of importance on certain aspects of the business; some are very short-term financially oriented, others are most concerned with customers; and others with technology.

The problem of resource-based measures can be clearly illustrated in the following discussion. Empirical studies by Carson (1985) and Sashittal and Wilemon (1996) provide evidence that for technology-based firms, 'marketing' is not a distinctive process and that it goes on outside the marketing department, more consistent with the new marketing paradigm (Gronroos, 1994). Therefore, not only can resource-based measures potentially over-represent the technological orientation of a DBF, but can also potentially under-represent the market orientation of a DBF without a dedicated marketing department. However, notwithstanding these differences in terminology, definition and measurement, the results from these studies illustrate two very important factors. The first is that a firm can be concurrently market and technologically oriented, and the second is that there is evidence that both orientations are important to the success of the firm.

In summary, there is substantial empirical support for market orientation leading to superior performance deriving mostly from non technology-based studies and some limited research into the biotechnology industry. There is also some support for the idea that market orientation will in fact hinder technology-based firms because it might prevent the sort of technological change required to remain competitive in a market characterised by discontinuous technological change. Overall it is expected that there will be a positive relationship between performance and market orientation in DBFs, and therefore it is hypothesised that:

> *H1: The level of market orientation of a DBF is positively associated with the level of business performance.*

There is both conceptual and empirical evidence to suggest that the technological skills and focus upon these skills is critical to the success of a DBF or TBF (e.g., Workman, 1993; Mohr, 2001). In addition, Oakey et al. (1990) and Roberts (1990) have provided initial evidence that TBFs are at least initially, 'technologically oriented'. Gatignon and Xuereb (1997) also support the positive association between technological orientation and performance, therefore:

> *H2: The level of technological orientation of a DBF is positively associated with the level of business performance.*

3 Methodology

Questionnaires were mailed in the Spring of 1999, to a sample of 1307 biotechnology firms in the UK, USA, Australia and Canada, drawn mainly from *The Biotechnology Directory* (Coombs and Alston, 1997). Letters were personalised and addressed to the MD/CEO. A number of methods were used to increase the response rate, including sending reminder letters, guaranteeing anonymity, and offering the respondent a summary of the research results. The overall response rate, as shown in Table 4, was 7.5% after adjusting for non-deliverable questionnaires, which is consistent with other international survey response rates (Harzing, 1997). The pattern of responses varies from country to country but is consistent with prior research findings in that the response rate in Europe is higher than in the USA (Harzing, 1997). Because the sample was mainly drawn from an international directory, a certain percentage of the information was out of date, and this was reflected in the low response rates and the number of undeliverable questionnaires. The majority (77%) of the respondents were CEOs/MDs with the remaining respondents all at a senior level.

Table 4 Survey response rates

Country	*Total mailed*	*Undeliverable*	*Usable responses*	*Non-usable responses*	*Response rate* (%)
Australia	77	9	9	1	13
Canada	156	27	11	2	8
UK	223	27	35	12	18
USA	851	96	32	6	5.0
Total	1307	159	87	21*	7.5

*Includes three responses that were removed owing to missing values.

3.1 Construct scales

In order to be able to capture the importance of beliefs about the importance of technology to the success of a DBF and compare this to the market orientation studies, both 'market orientation' and 'technological orientation' needed to be defined and measured comparably. Whilst extant literature shows a high degree of overlap in ideas between the strands of research, there is no widely accepted or adopted construct of technological orientation and this gap is addressed in this study by developing a new construct. Gatignon and Xuereb (1997) used a 2-item scale to capture technological orientation and this study aimed to develop a scale more comparable to that of the market orientation literature, based on attitudes, beliefs and behaviours, whilst also being reliable and valid, and building on the work concerning related constructs of entrepreneurial orientation and technological focus as shown in Table 3.

Market orientation

This study used Greenley's (1995) adaptation of the Narver and Slater (1990) market orientation scale. This is divided into three sections and includes sub-scales for customer orientation, competitor orientation and interfunctional coordination. Items were measured on a five point Likert type scale, and included several randomly reverse coded questions.

The Greenley adaptation was used as the wording had been tested within a non US-based study and was therefore deemed more appropriate to an international audience.

Technological orientation

For this study, a new 14-item scale for technological orientation was developed. The construct of technological orientation developed in this research draws from a range of previous studies, including research on entrepreneurial orientation (Covin and Slevin, 1991), technology strategy (Zahra et al., 1994) and the extensive amount of work on market orientation, following that by Narver and Slater (1990) and Kohli and Jaworski (1990, 1993). This scale was developed to be applicable to all industries including the biotechnology industry. Technological orientation is proposed as a construct with three sub-dimensions.

- *Research and development focus.* This dimension aims to capture how much of a firm's strategy is derived from the technological focus of the firm. This dimension builds on the work of Gatignon and Xuereb (1997) and Cooper (1985), both of whom include a dimension of R&D focus in their definitions. Cooper puts forward the idea of a firm being 'strongly R&D oriented' whilst Gatignon and Xuereb (1997) refer to this as 'the use of technology' and 'generating new product ideas' capturing the degree to which the aims and objectives of the firm are driven from the R&D function or another function.

- *Use or development of state of the art technology.* This dimension aims to capture the way in which the firm seeks to find out about, develop and/or use technology. This tries to capture the underlying aim of some firms to be the 'first' in their field, or the best technically in their field. It draws strongly on the elements of the 'use of sophisticated technologies' (Gatignon and Xuereb, 1997) and 'the firm is proactive in acquiring new technologies' (Cooper, 1985). This implies that the company must not only be aware of technological developments through continual monitoring, but also be active in acquiring and using this knowledge. In order to be at the forefront of technological development or use, a firm must be knowledgeable about developments in technology. Therefore, the firm must actively monitor what is going on around them in terms of competitor's technology.

- *Interfunctional coordination and dissemination of information.* Whilst it is important that the firm gain knowledge of technological developments, the use of such information and knowledge is limited if it is not disseminated throughout the organisation. This dimension of technological orientation refers to the flow and use of technological information and knowledge; and processes set up to facilitate the flow of ideas both into and out of the organisation. This may also be related to the amount of information sought from the outside world, including discoveries and competitors. Some firms may place a high value on competitive information or on the information gained at scientific conferences and the development of future technologies; others may simply plow on with their own area of research with less regard for the outside world. The classic issue of lack of communication between R&D and marketing is also captured within this dimension (Shanklin and Ryans, 1984; Gupta et al., 1986a, 1986b; Song and Parry, 1992). Therefore, this definition of technological orientation, the 'interfunctional coordination' dimension aims not only to capture the marketing/R&D interface, but also to capture a more generic

transfer of technological information throughout the company. This dimension closely resembles the dimension of 'interfunctional coordination' of Narver and Slater's market orientation (1990) and that of dissemination of information from Kohli and Jaworski (1990). Whilst 'market orientation interfunctional coordination' has the ultimate goal of creating superior value for customers, 'technological orientation interfunctional coordination' has the ultimate goal of being able to proactively develop, acquire and/or use new technologies. It encompasses the transfer of both technological information and knowledge.

Business performance

Measures of firm performance were captured as six subjective statements concerning how well the company had performed over the past three years in regards to sales growth, new product success, increasing profitability, profitability compared to competitors, sales, and return on investment. These were also combined to form an overall composite firm performance measure by calculating the average across all six scores. Although there is some debate as to whether subjective measures are truly representative of objective performance, subjective measures have been shown to be comparable to objective measures in several studies (Greenley and Foxall, 1998; Golden, 1992; Verhaage and Waarts, 1988). In addition, Chakravarthy (1986) found that traditional profitability measures were inadequate to discriminate excellent from moderate performance. Six measures were chosen, which reflect previous research into the market orientation–performance relationship and also reflect the nature of the Biotechnology industry where bottom line profitability may be a long-term rather than short-term objective.

3.2 Reliability and bias

The questionnaire was pre-tested on both a New Zealand sample and using an expert panel. Data were examined for non-response and common method bias. Inter-country bias was checked using one way ANOVAs on each of the main variables (market orientation, technological orientation) by grouping the responses by country. No significant bias or inter-country differences were evident.

Reliability of scales was tested using Cronbach's alpha coefficient, which was greater than 0.7 for the complete scales although slightly lower for the sub-components (Churchill, 1979; Nunnally, 1967). Although the sub-components of the scale for Technological Orientation are lower than hoped for, they are above the value of 0.6 for a new scale (Churchill, 1979; Nunnally, 1967). The market orientation scale showed a high degree of reliability although the sub-component of competitor orientation did not. The biotechnology industry tends towards firms having a high level of strategic alliances and inter-firm cooperation, and this may account for the low reliability of this sub-component within this sector. Owing to the low reliability of some sub-components, analysis was only conducted using the entire scales. Scale reliabilities are provided in Table 5.

Table 5 Summary of descriptive results and scale reliability

Scale/sub-component	*Items*	*Mean*	*S.D.*	*Coefficient alpha*
Market orientation	*12*	*3.72*	*0.49*	*0.81*
Customer orientation	6	3.89	0.66	0.74
Competitor orientation	3	3.12	0.59	0.58
Interfunctional coordination (mkt)	3	3.81	0.70	0.77
Technological orientation	*10*	*3.80*	*0.50*	*0.71*
R&D focus	2	4.07	0.76	0.64
Use of state of the art technology	4	3.70	0.71	0.67
Interfunctional coordination (tech)	4	3.75	0.76	0.66
Business performance	*6*	*3.20*	*0.70*	*0.80*

4 Results and discussion

4.1 Market orientation and performance

Individual regression models were run using the independent variables of firm market and technological orientation against the six dependent variables of firm performance (sales growth, new product success, market share, return on investment, and higher profitability and increasing profitability) as shown in Table 6.

Table 6 Summary of regression models

	Dependent variables			
Independent variables	*Composite measure*	*Market share*	*New product success*	*Sales growth*
Full model				
Market Or. (std. beta coeff.)	0.39**	0.47***	0.24	0.35
Technological Or. (std. beta coeff.)	0.08	–0.233	–0.09	–0.23
Model R^2	0.12	0.14	0.09	0.08
Adjusted R^2	0.10	0.12	0.07	0.06
Model F	*5.19***	*6.20***	*3.95**	*3.47**
Reduced model				
Market Or. (std. beta coeff.)	0.34**	0.35**	0.26*	0.26*
Model R^2	0.11	0.12	0.07	0.07
Adjusted R^2	0.10	0.11	0.06	0.06
Model F	*10.02***	*10.51***	*5.56**	*6.03**

*$p \leq 0.05$.

**$p \leq 0.01$.

***$p \leq 0.001$.

Market orientation was shown to have a significant and positive effect on certain performance measures; these were the composite performance measure, market share, new product success and sales growth. This supports previous research that the market orientation–performance relationship is seen within the biotechnology industry (Appiah-Adu and Ranchhod, 1998). In addition, the respondents for this study were from a number of countries and so the fact that market orientation was related to performance in this sample suggests that this relationship is sustained throughout DBFs in these various countries. This is contradictory to some previous findings and propositions (Greenley, 1995; Mohr, 2001). A recent study by Renko et al. (2005) suggests the need for market orientation scales to be tailored for use within scientific industries, and whilst this study did find an association between market orientation and performance, that relationship may become clearer and better defined with the use of such a tailored scale. Such a scale may also better differentiate between types of strategic orientation.

Market orientation was not associated with higher return on investment, or higher or increasing profitability. A possible explanation for this is the nature of the industry. Because the industry is in the early stages of the industry life cycle, a focus on the market could lead in the short term to higher sales growth, and a perceived increase in market share, but not to increased return on investment or profitability. The long product development times required for dedicated biotechnology products may mean that many firms are still not profitable, or achieving the levels of profitability they desire, so that however market-oriented they are, the only indicator of this over a short term (less than 10-year period) is increased sales, market share, or new product success.

An alternative explanation is based upon the types of measures; the measure of business performance asked the respondent to judge the performance of their firm relative to their competitors, and over the past three years. The three measures that showed a positive relationship with market orientation are 'external' measures, involving perceptions surrounding market share, new product success and sales growth. These are measures that are more publicly accessible and about which it is likely that most respondents would have some knowledge or opinion of their competitor's performance. However the other three measures (ROI/Higher or improving Profitability) are based on information that is not always available or known by people outside the firm, therefore the respondents may not have been able to judge how well their firm was performing relative to competitors on these scales.

In contrast to these findings, Appiah-Adu and Ranchhod (1998) found no relationship between market orientation and new product success in their study of the biotechnology industry. They explain this by the fact that patents and product approval processes are critical in the biotechnology industry, and therefore that new product success is affected by many other more important factors. However, they did find a relationship between growth in market share and market orientation, although they point out that market shares in the biotechnology industry are in specific niche areas and technologies. This is confounded by the fact that it takes many years to commercialise a product, during which time, there may be a latent demand for the product, and the new product will inevitably do well in the initial phases of its life cycle. Overall, Appiah-Adu and Ranchhod (1998) concluded that there was a positive relationship between market orientation and overall performance, which concurs with the findings of this research. Indeed, the mixed results across various performance indicators are reflective of previous research. For example, Greenley (1995) found that market orientation was positively associated with ROI, new product success and sales growth *only* when an interaction term (environmental

turbulence) was introduced. Gatignon and Xuereb (1997) found that certain elements of market orientation (customer and competitor orientation) were more significant under certain market conditions and with certain performance indicators. A more recent study by Cumby and Conrod (2001) suggest that for firms such as DBFs, it is worth examining non-financial measures of performance, as traditional measures are not always appropriate and it may be better to develop some non-financial performance indicators. Overall, there is some support for the notion that market orientation is positively associated with business performance, therefore providing support for H1.

4.2 Technological orientation and performance

Nearly all respondent firms considered themselves to be technologically oriented, thus confirming the importance of technology in the overall strategy of DBFs. However, somewhat surprisingly, technological orientation, as defined and measured in this study has no apparent relationship with any performance indicators. Therefore H2 is rejected. There are several possible explanations for this finding.

Firstly, this finding could indeed reflect reality and the level of technological orientation of DBFs is not related to their business performance, but this seems unlikely given the central importance of technology in these firms. In previous research, Gatignon and Xuereb (1997) found that only in certain market conditions was technological orientation related to performance, although their finding was not from a technology-based industry. It is possible that the environment of DBFs is perceived to be similar amongst all respondents, thereby making comparisons with Gatignon and Xuereb's (1997) findings difficult.

An alternative explanation is that technological orientation may play a different role in the performance of a DBF. If technological orientation is not associated with business performance, it may be because being technologically oriented is in fact a pre-requisite in this industry so that most firms which are not technologically oriented simply do not survive, making the requirement to be technologically oriented a necessary hurdle, but not one which differentiates a company's performance. This idea is partially supported by the descriptive findings, which show only 3 out of the 87 firms believed themselves *not* to be technologically oriented (i.e., their average score was below 3.0 on the 5 point likert-type scale; 3.0 being neither agree nor disagree).

However, there are other possible explanations for the apparent lack of relationship between technological orientation and performance. There could have been a measurement or methodology issue. The scale developed for this study may not accurately measure the concept of technological orientation as proposed in this study, or it may not be applicable to the biotechnology industry. More likely than this are issues with the design of the field research. The snapshot view obtained in this study of performance may not be sufficient to accurately measure the effect of any form of strategic orientation. In any industry, the effect of strategic orientation is predicted to be long term, and in the case of the biotechnology industry, this effect may be further 'delayed' or exaggerated because of the very long product development and commercialisation processes. It is also possible that the types of performance measure chosen in this study somehow mask a relationship between technological orientation and performance, because they include financial or market-based measures that are more likely to be connected with marketing, rather than technology. Perhaps, if the number of new products launched per year, or the number of patent applications lodged were used

as measures, the technological orientation–business performance relationship would have been more clearly illuminated.

Finally, another explanation was proposed in recent work by Harris and Ogbonna (1999) who point out that organisational culture may not be unitary in nature, so that the accomplishment of a market-oriented culture or indeed any other culture that is dependent on the development of cultural dominance may be difficult, if not impossible. If this is true, there are implications for both this work and indeed all other previous work on strategic orientation and performance. Using one respondent in a firm might confound the issue because there may be a market-oriented sub-culture in one area of the firm, but not others. It may also be that the respondent's position (in this study, MD/CEO) leads them to believe in the importance of a market-oriented or another type of culture, and they may simply be reconfirming their own beliefs. An alternative method would be to collect data from multiple respondents within an organisation.

5 Implications

Overall, the high levels of market and technological orientation of DBFs suggest that firms perceive both these elements to be important in their overall strategy. A strong focus on the market appears to lead to higher firm performance, even in a sector where technology is of central importance. This study lends weight to the argument that it is the underlying attitudes, beliefs and behaviours held about markets and customers rather than the level of resources allocated to each functional area that is important. For smaller DBFs this is a significant finding as they may not have dedicated marketing or sales resources but can still be market-oriented. This implies DBFs should maintain or develop a company culture that reflects the central importance of the customer and competitors, as well as technology.

Previous researchers such as Mohr (2001) argue both for and against the need for technology-based companies to have a customer-led market orientation. She suggests that a strong focus on existing customers who may be 'myopic' in terms of needs, could lead to reduced performance. This contrasts with the findings in this study. This idea of myopia can be seen to be directly applicable to certain technology-based markets, but biotechnology may represent a special case because the biotechnology world is itself small and many of the decision makers, customers, and marketers are highly qualified scientists. Therefore the idea that they are not *au fait* with latest developments and somehow are myopic seems unlikely. In addition, many biotechnology products are produced and sold on a business-to-business basis, but it may also be because biotechnology has not reached the stage in its life cycle where it can converge with technologies outside its own field. This idea is also supported by Salavou (2002) who provides evidence that incremental product innovation can lead to enhanced profitability. However, these ideas are not conflicting with each other or with the findings in this study since the level of innovation of new products was not measured in any way. In this study, it does not appear that customer myopia is a problem for DBFs, because the level of market orientation is positively associated with business performance.

The study contributes on a theoretical level by providing additional support for the market orientation/performance relationship. This is confirmed not only within a technology dominated sector, but also on a multinational basis. Although several studies have been conducted around the world, this is one of the first, which includes data from

many countries within a single industry. The study also contributes theoretically by developing and empirically testing a new definition of a form of strategic orientation (technological), and it appears that whilst technological orientation does not directly affect performance, the overall level within DBFs is high, and this relationship is worthy of further investigation.

Future research should examine the generalisability of these results to other TBFs and other industries, and should also aim to validate or further develop a scale for technological orientation. The ability to capture the nature of a firms' overall strategy, based on the firm's underlying attitudes and beliefs is very important as it allows evaluation of different strategies and comparisons to be made between firms.

Future research should also address scale improvement of market and technological orientation. Nearly all respondent firms considered themselves to be market or technologically oriented to some degree, with average scores from the multi-item scale above 3.0 (neutral score). Few previous studies show the range of scores, although Pelham (2000) does report a mean market orientation score of 6.5 on a 7 point likert scale, suggesting that in his study too, most firms deemed themselves to be market-oriented. This is interesting because it brings into question the whole idea of whether in fact all firms are indeed market-oriented to some degree. Has business education been so 'successful' that nearly all DBFs aspire to be 'market' or 'technologically' oriented? In this study, as in most previous research attempting to capture beliefs and underlying attitudes, it is not possible to make any judgement on whether the reported figures reflect aspiration or reality. This suggests the need for further development of a scale to better distinguish between firms.

6 Conclusion

This study set out to examine the relationship between market and technological orientation in DBFS. It has provided a literature review of existing work on both market and technological orientation and positioned this within the context of strategic orientation, highlighting the need for constructs capturing strategic orientation to be comparable in both definition and measurement. As part of the study, a new scale to capture technological orientation has been developed and tested on a multinational level. The study also provided multinational empirical evidence for the market orientation–performance relationship within the biotechnology industry.

References

Appiah-Adu, K. and Ranchhod, A. (1998) 'Market orientation and Performance in the biotechnology industry: an exploratory empirical analysis', *Technology Analysis and Strategic Management*, Vol. 10, No. 2, pp.197–210.

Atuahene-Gima, K. (1995) 'An exploratory analysis of the impact of market orientation on new product performance: a contingency approach', *Journal of Product Innovation Management*, Vol. 12, No. 4, pp.275–293.

Barczak, G. (1994) 'Gaining superior performance of new products in the telecommunications industry', *Journal of Business and Industrial Marketing*, Vol. 9, No. 4, pp.19–32.

Baruch, Y. (1997) 'High technology organization – What it is, what it isn't', *International Journal of Technology Management*, Vol. 13, No. 2, pp.179–195.

Bengtsson, M. and Kock, S. (2000) 'Coopetition in business networks – to cooperate and compete simultaneously', *Industrial Marketing Management*, Vol. 29, No. 5, pp.411–426.

Berry, M.M.J. (1996) 'Technical entrepreneurship, strategic awareness and corporate transformation in small high- tech firms', *Technovation*, Vol. 16, No. 9, pp.487–498.

Carper, W.B. and Snizek, W.E. (1980) 'The nature and types of organizational taxnomies: an overview', *The Academy of Management Review*, Vol. 5, No. 1, pp.65–74.

Carson, D.J. (1985) 'The evolution of marketing in small firms', *European Journal of Marketing*, Vol. 19, No. 5, pp.7–16.

Chakravarthy, B.S. (1986) 'Measuring strategic performance', *Strategic Management Journal*, Vol. 7, No. 5, pp.437–458.

Churchill, G.A. (1979) 'A paradigm for developing better measures of marketing constructs', *Journal of Marketing Research*, Vol. 16, February, pp.64–73.

Coombs, J. and Alston, YT.R. (Eds.) (1997) *The Biotechnology Directory*, Macmillan Press.

Cooper, R.G. (1985) 'Industrial firms' new product strategies', *Journal of Business Research*, Vol. 13, pp.107–121.

Covin, J.G. and Slevin, D.P. (1989) 'Strategic management of small firms in hostile and benign environments', *Strategic Management Journal*, Vol. 10, No. 1, pp.75–87.

Covin, J.G. and Slevin, D.P. (1991) 'A conceptual model of entrepreneurship as firm behavior', *Entrepreneurship: Theory and Practice*, Vol. 16, No. 1, pp.7–25.

Cumby, J. and Conrod, J. (2001) 'Non-financial performance measures in the Canadian biotechnology industry', *Journal of Intellectual Capital*, Vol. 2, No. 3, pp.261–272.

Davies, W. and Brush, K.E. (1997) 'High-tech industry marketing: the elements of a sophisticated global strategy', *Industrial Marketing Management*, Vol. 26, No. 1, pp.1–13.

Deshpande, R., Farley, J.U. and Webster Jr., F.E. (1993) 'Corporate culture, customer orientation, and innovativeness in Japanese firms: a quadrad analysis', *Journal of Marketing*, Vol. 57, No. 1, pp.23–37.

Dess, G.G. and Robinson, R.B.J. (1984) 'Measuring organizational performance in the absence of objective measures: the case of the privately-held firm and conglomerates business unit', *Strategic Management Journal*, Vol. 5, pp.265–273.

Diamantopolous, A. and Hart, S. (1993) 'Linking market orientation and company performance; preliminary evidence on Kohli and Jaworski's framework', *Journal of Strategic Marketing*, Vol. 1, pp.93–121.

Dodgson, M. and Rothwell, R. (1991) 'Technology strategies in small firms', *Journal of General Management*, Vol. 17, No. 1, pp.45–55.

Doyle, P. and Hooley, G.J. (1992) 'Strategic orientation and corporate performance', *International Journal of Research in Marketing*, Vol. 9, No. 1, pp.59–73.

Ernst and Young (2004) www.ey.com, http://www.ey.com/global/content.nsf/International/Biotechnology_Reports_2004, accessed 2/2/2005.

Flanagan, P. (1993) 'Marketing high tech: lessons for everyone', *Management Review*, Vol. 3, pp.27–29.

Ford, D. (1988) 'Develop your technology strategy', *Long Range Planning*, October, pp.85–95.

Fritz, W. (1996) 'Market orientation and corporate success: findings from Germany', *European Journal of Marketing*, Vol. 30, No. 8, pp.59–74.

Gatignon, H. and Xuereb, J-M. (1997) 'Strategic orientation of the firm new product performance', *Journal of Marketing Research*, Vol. 34, No. 1, pp.77–90.

Golden, B.R. (1992) 'SBU strategy and performance: the moderating effects of the corporate-SBU relationship', *Strategic Management Journal*, Vol. 13, No. 2, pp.145–158.

Greenley, G.E. (1995) 'Market orientation and company performance: empirical evidence from UK companies', *British Journal of Management*, Vol. 6, No. 1, pp.1–13.

Greenley, G.E. and Foxall, G.R. (1998) External moderation of associations among stakeholder orientations and company performance', *International Journal of Research in Marketing*, Vol. 15, No. 1, pp.51–69.

Gronroos, C. (1994) 'Quo Vadis, marketing? towards a relationship marketing paradigm', *Journal of Marketing Management*, Vol. 10, pp.347–360.

Gupta, A.K., Raj, S.P. and Wilemon, D. (1986a) 'A model for studying R&D-marketing interface in the product innovation process', *Journal of Marketing*, Vol. 50, No. 2, pp.7–17.

Gupta, A.K., Raj, S.P. and Wilemon, D. (1986b) 'R&D and marketing managers in high-tech companies: are they different?', *IEEE Transactions on Engineering Management*, Vol. EM-33, No. 1, pp.25–32.

Hamilton, W.F., Vila, J. and Dibner, M.D. (1990) 'Patterns of strategic choice in emerging firms: positioning for innovation in biotechnology', *California Management Review*, Vol. 32, No. 3, pp.73–86.

Han, J.K., Kim, N. and Srivastava, R.K. (1998) 'Market orientation and organizational performance: is innovation a missing link', *Journal of Marketing*, October, Vol. 62, pp.30–45.

Harris, L.C. and Ogbonna, E. (1999) 'Developing a market oriented culture: a critical evaluation', *Journal of Management Studies*, Vol. 36, No. 2, pp.177–196.

Harzing, A-W. (1997) 'Response rates in international mail surveys: results of a 22 country study', *International Business Review*, Vol. 6, No. 6, pp.641–665.

Hill, C.W.L. (1997) 'Establishing a standard: competitive strategy and technological standards in winner-take-all industries', *Academy of Management Executive*, Vol. 11, No. 2, pp.7–25.

Homburg, C. and Pflesser, C. (2000) 'A multiple layer model of market-oriented organizational culture: measurement issues and performance outcomes', *Journal of Marketing Research*, Vol. XXXVII, November, pp.449–462.

Kazanjian, R.K. and Drazin, R. (1989) 'An empirical test of a stage of growth progression model', *Management Science*, Vol. 35, No. 12, pp.1489–1503.

Khandwalla, P.N. (1977) *The Design of Organizations*, Harcourt Brace Jovanovich, New York.

Knight, G.A. (1997) 'Cross-cultural reliability and validity of a scale to measure firm entrepreneurial orientation', *Journal of Business Venturing*, Vol. 12, No. 3, pp.213–225.

Kohli, A.K. and Jaworski, B.J. (1990) 'Market orientation: the construct, research propositions, and managerial implications', *Journal of Marketing*, Vol. 54, No. 2, pp.1–18.

Kohli, A.K. and Jaworski, B.J. (1993) 'Market orientation: antecedents and consequences', *Journal of Marketing*, Vol. 57, No. 3, pp.53–70.

Lambe, C.J. and Spekman, R.E. (1997) 'Alliances, external technology acquisition, and discontinuous technological change', *Journal of Product Innovation Management*, Vol. 14, No. 2, pp.102–116.

Lumpkin, G.T. and Dess, G.G. (1996) 'Clarifying the entrepreneurial orientation construct and linking it to performance', *Academy of Management Review*, Vol. 21, No. 1, pp.135–172.

Miles, M.P. and Arnold, D.R. (1991) 'The relationship between marketing orientation and entrepreneurial orientation', *Entrepreneurship Theory and Practice*, Summer, Vol. 35, pp.49–65.

Miles, R.E. and Snow, C.C. (1978) *Organizational Strategy, Structure and Process*, McGraw-Hill, New York.

Mohr, J. (2001) *Marketing of High-Technology Products and Innovations*, Prentice-Hall, Upper Saddle River, New Jersey.

Narver, J.C. and Slater, S.F. (1990) 'The effect of a market orientation on business profitability', *Journal of Marketing*, Vol. 54, No. 4, pp.20–35.

Nunnally, J. (1967) *Pyschometric Theory*, McGaw-Hill, New York.

Oakey, R. (1991) 'Innovation and the management of marketing in high technology small firms', *Journal of Marketing Management*, Vol. 7, pp.345–356.

Oakey, R. (1994) *New Technology Firms in the 1990s*, Paul Chapman Publishing Ltd., London.

Oakey, R., Faulkner, W., Cooper, S. and Walsh, V. (1990) *New Firms in the Biotechnology Industry: their Contribution to innovation and Growth*, Pinter Publishers, London.

Oakey, R.P. and Cooper, S.Y. (1991) 'The relationship between product technology and innovation performance in high technology small firms', *Technovation*, Vol. 11, No. 2, pp.79–90.

Pavia, T.M. (1990) 'Product growth strategies in young high-technology firms', *Journal of Product Innovation Management*, Vol. 7, No. 4, pp.297–309.

Pelham, A.M. (1997) 'Mediating influences in the relationship between market orientation and profitability in small industrial firms', *Journal of Marketing Theory and Practice*, Vol. 5, No. 3, pp.55–76.

Pelham, A.M. (2000) 'Market orientation and other potential influences on performance ion small and medium-sized manufacturing firms', *Journal of Small Business Management*, Vol. 38, No. 1, pp.48–67.

Pelham, A.M. and Wilson, D.T. (1996) 'A longitudinal study of the impact of market structure, firm structure, strategy, and market orientation culture on dimensions of small-firm performance', *Journal of the Academy of Marketing Science*, Vol. 24, No. 1, pp.27–43.

Ramaseshan, B., Albert, C., Soon, P.L. (2002) 'The effect of market orientation on new product performance: a study among Singaporean firms', *Journal of Product and Brand Management*, Vol. 11, No. 6, PP.309–409.

Renko, M. and Tikkanen, J. (2002) *Strategic Orientations in Networked High Technology Product Development*, http://www.tukkk.fi/innomarket/Reports/0415.pdf.

Renko, M., Carsrud, A. and Brannback, M. (2005) 'Building market orientation in biotechnology SMEs: balancing scientific advances', *International Journal of Biotechnology*, Vol. 7, No. 4, p.250.

Roberts, E.B. (1990) 'Evolving toward product and market-orientation: the early years of technology-based firms', *Journal of Product Innovation Management*, Vol. 7, No. 4, pp.274–287.

Rothwell, R. (1984) 'The role of small firms in the emergence of new technologies', *Omega*, Vol. 12, No. 1, pp.19–29.

Ruekert, R.W. (1992) 'Developing a market orientation: an organizational strategy perspective', *International Journal of Research in Marketing*, Vol. 9, No. 3, pp.225–245.

Salavou, H. (2002) 'Profitability in market-oriented SMEs: does product innovation matter?', *European Journal of Innovation Management*, Vol. 5, No. 3, pp.164–171.

Sashittal, H.C. and Wilemon, D. (1996) 'Marketing implementation in small and midsized industrial firms: an exploratory study', *Industrial Marketing Management*, Vol. 25, No. 1, pp.67–78.

Shanklin, W. and Ryans, J. (1984) 'Organising for high tech.', *Harvard Business Review*, Vol. 62, November–December, pp.164–171.

Slater, S. and Narver, J.C. (1994) 'Does competitive environment moderate the market orientation-performance relationship?', *Journal of Marketing*, Vol. 58, January, pp.46–55.

Song, X.M. and Parry, M.E. (1992) 'The R&D-marketing interface in Japanese high-technology firms', *Journal of Product Innovation Management*, Vol. 9, No. 2, pp.91–112.

Venkatraman, N. (1989) 'Strategic orientation of business enterprises: the construct, dimensionality, and measurement', *Management Science*, Vol. 35, No. 8, pp.942–962.

Verhaage, B.J. and Waarts, E. (1988) 'Marketing planning for improved performance: a comparative analysis', *International Marketing Review*, Vol. 5, No. 2, pp.21–30.

Weisenfeld-Schenk, U. (1994) 'Technology strategies and the Miles and Snow typology: a study of the biotechnology industries', *R&D Management*, Vol. 24, No. 1, pp.57–64.

Woiceshyn, J. and Hartel, D. (1996a) 'Predicting value-added progress of biotechnology firms: an exploratory story', *Journal of Engineering and Technology Management*, Vol. 13, No. 2, pp.163–187.

Woiceshyn, J. and Hartel, D. (1996b) 'Strategies and performance of Canadian biotechnology firms: an empirical investigation', *Technovation*, Vol. 16, No. 5, pp.231–243.

Workman Jr., J.P. (1993) 'Marketing's limited role in new product development in one computer systems firm', *Journal of Marketing Research*, Vol. 30, No. 4, pp.405–421.

Wright, P., Kroll, M., Pray, B. and Lado, A. (1995) 'Strategic orientations, competitive advantage and business performance', *Journal of Business Research*, Vol. 33, No. 2, pp.143–151.

Zahra, S. and Covin, J.G. (1994) 'Domestic and international competitive focus, technology strategy and company performance: an empirical analysis', *Technology Analysis and Strategic Management*, Vol. 6, No. 1, pp.39–53.

Zahra, S.A., Sisodia, R.S. and Das, S.R. (1994) 'Technological choices within competitive strategy types: a conceptual integration', *International Journal of Technology Management*, Vol. 9, No. 2, pp.172–195.

Appendix: Scales

Market orientation

Customer orientation
Our business objectives are driven primarily by customer satisfaction
Commitment to serving customer needs is monitored
Our strategies are driven by beliefs about creating customer value
Our firm's marketing strategies are to a great extent driven by our understanding of possibilities for creating value for customers
We measure customer satisfaction frequently and systematically
Close attention is given to after sales service
Competitor orientation
Sales people share information on competitors' strategies
We respond slowly to competitive actions that threaten us (reverse coded)
Our senior managers regularly discuss competitors strengths and weaknesses
Interfunctional coordination
Our senior managers regularly visit customers
Information on customers, marketing success, and marketing failures is communicated across functions in the firm
All of our business functions are integrated in serving the needs of our target markets
Managers understand how everyone can contribute to creating customer value

Technological orientation

Sub-component/item
R&D focus
Our business objectives are driven primarily by a desire to produce the best technological product
Our firm's strategies are based on our knowledge of and use of technology
All our top managers understand the technology involved in our products
Many of our R&D projects are NOT likely to result in saleable products (reverse coded)
Our R&D concentrates more on applied rather than basic research (reverse coded)
Use of state of the art technology
We monitor our use of the latest technology in our processes and in our products
We make sure we are using the best technology in our new product development
All of our business functions are integrated in order to develop new technology
Our new products are always at the state of the art technology
Interfunctional coordination
Information about technological developments in shared within our company
Our sales, research and development people share information about competitors' technology
Our senior managers regularly discuss competitors technology