

THE INTEGRATION APPROACH: INTEGRATING TECHNOLOGY STRATEGY WITH BUSINESS STRATEGY IN THE AIRLINE INDUSTRY

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Abstract

Technology has emerged as a key component in solving complex strategic issues. Much of the relevant literature recognises technology as the driving force behind the fast rate of change in many markets. Consequently, organisations are becoming increasingly dependent on advanced technology to improve their performance. At the same time organisations need to be extremely flexible in order to meet the demands of customers quickly, accurately and cost-effectively. To benefit from the potential of technology in highly dynamic environments, there is a need to integrate technology strategy with business strategy. This research explores the integration between technology strategy and business strategy in the airline industry.

The literature on technology, technology strategy, corporate strategy, business strategy, competitive advantage and the integration of technology strategy with business strategy is critically evaluated and shortcomings of the literature are identified. The literature review was evaluated and identifies gaps and possible future directions. This indicated a need for a systematic way of linking technology and business strategies. Thus an Integration Model is proposed consisting of three stages involving business strategy, competitive strategy and technology strategy. The literature review and the Integration Model identified the importance of technology assessment in formulating a technology strategy and the need for a supportive tool to aid this process.

Keywords: Technology strategy, Business strategy, Competitive strategy, Airline industry, Holistic integration approach.

1 INTRODUCTION

Effective strategic thinking is becoming the key element for the success of any organisation in today's highly competitive business world, and technology has emerged as a central component in solving complex strategic issues. Yet, when researching the role of technology, it is evident that technology can sometimes be a double-edged sword. While organisations are becoming increasingly dependent on using advanced technology as a tool for improving their performance in areas such as design, speed of delivery, quality, etc., technology can equally be the reason behind many failures, if its deployment is ineffective.

What causes failure of technology deployment? Technology can often be very costly but of limited scope when deployed in various areas of a business, as its flexibility remains limited, no matter how sophisticated it may be. This is problematic, as markets become increasingly heterogeneous, requiring organisations to be extremely flexible in order to accommodate the demands of the customers quickly, accurately and cost-effectively. Therefore, inadequate

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assessment of technology and its related priorities may hinder the ability of an organisation to meet customer expectations.

Higher levels of investment in technology do not necessarily guarantee the desired growth rate or profitability of a business. Summarising the arguments of Bond (2002) and Roberts (2001), this can be due to:

1. Lack of objective technology assessment.
2. Inappropriate acquisition methods.
3. Ineffective implementation.
4. Inability to sustain long-term continuous improvement.

Al-Harbi (1996) in discussing the effects of such factors concluded that the process of deploying technology requires a comprehensive understanding of the dynamics that govern changes of direction and priorities within the market. The aim of technology strategy¹ should therefore be to identify the critical technologies that contribute most to the success of a business.

The service sector is increasingly facing such pressures, in particular, the airline industry. This is because in the airline industry a large number of services and products converge toward one goal, namely, to serve customers when travelling both nationally and internationally. In order to keep pace with the ever-increasing rate of change in any market, management needs to be able to respond quickly and cost-effectively when taking decisions. Mistakes can prove costly. There is no room for trial and error or experimentation. Developing the most appropriate strategy is only achievable if management is both well informed and properly equipped.

When undertaking this research, it soon became evident that most of the relevant literature dealt with the issue of strategy development using a conceptual approach. Only a few researchers had considered applying their conceptual thinking in practice (e.g. Bayona, Garcia-Marco and Huerta, 2001; Rieck and Dickson, 1993; Stratmann, 1999). Moreover, there is a lack of literature addressing the issue of the application of technology strategy in the context of a service industry.

In some respects it is easier to monitor and quantify the effects of the application of technology in the manufacturing sector. If a manufacturing organisation wishes to increase productivity, a common strategy is to acquire appropriate technology, to, say, allow it to produce more units of its products more efficiently. To quantify the effects of such an investment can be easier in manufacturing than in the service sector, where the impact of a technology may be more diffuse.

Hence, previous researchers on investment in technology have concentrated mainly on the manufacturing sector rather than the service sector. To redress this imbalance, the authors have both focused on the technology strategy literature using the existing literature to develop a model of the relationship between technology and business strategy with a view to developing a tool to assist service organisations to evaluate their technology needs and develop a sustainable technology strategy (These and some other issues, including the

¹ Based on various definitions of technology strategy, most appropriately define as: *the strategic management and use of technology to achieve corporate and/or organisational goals* (Althonayan, 2003)

supportive Technology Assessment Tool, will be examined in greater depth in subsequent research).

The essence of a *business strategy* is an integrated set of actions in pursuit of a sustainable competitive advantage. Thus, integrating technology strategy with business strategy will be more effective since business strategy is concerned with markets and products where technology plays a major role in these areas. Corporate strategy, on the other hand, is concerned with the perception, direction and scope of an organisation in a corporate context. In addition, most of the literature (Adler (1989; Andrews, 1980; Ellis and Williams, 1995; Kantrow, 1980; Vernet and Arasti, 1999) agreed that technology strategy should be linked with business strategy. Consequently, the authors have concluded that linking technology strategy with business strategy is not only more effective, but also more appropriate in the context of this research.

2 AIMS

The purpose of the research was to review theoretical findings from the field of strategic management and on the basis of these findings, present a holistic integration approach to overcome the shortcomings of previous approaches that combine a new model which links business and technology strategy, together with a technology assessment.

The aims of the research were:

To provide researchers and practitioners with frameworks for linking technology strategy with business strategy, which will contribute to improved concepts and models in the field of strategic management.

To evaluate the effectiveness of integrating technology strategy with business strategy and to enable organisations to create an effective, more flexible business strategy that is based on a wider understanding of the parameters which affect the dynamics and uncertainty of the environment in which they operate.

The literature has been critically evaluated, covering the key literature in technology strategy and its integration with business strategy. Furthermore, a model for integrating technology strategy with business strategy was proposed based on the literature shortcomings.

3 METHOD

When deciding on a research method to investigate a particular problem, the crucial factor is the suitability of the method chosen for achieving the task. The selection process needs to be rigorous and should avoid employing methods which may be favoured but would be entirely inappropriate. As Bryman (1989) states, 'Each design and method should be taken on its merits as a means of facilitating (or obscuring) the understanding of particular research problems.' (Bryman, 1989:255)

The authors' task has been to identify those methods best suited to achieve the study aims and answer the research questions OK. As Trow (1970b) observed, 'No research method has any inherent superiority over others, since all have strength and weaknesses.' (Trow, 1970b: 143).

When deciding the research approach, both qualitative and quantitative research have their advantages and disadvantages; consequently researchers choose the approach which they believe to be more suitable to fulfil their research purpose. As Bulmer (1988) noted: 'different investigations may have different preferences and lean in one direction or another, but there are no general principles which can be adduced in favour of one or another style of research' (Bulmer, 1988: 160).

The research design, steps and approach chosen within this research has been a combination of both theory and application, and has included a critical review and evaluation of the

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literature followed by fieldwork within an airline company. The initial method applied in this phase was process mapping based on physical observation of business processes, followed by semi-structured interviews. The outcome has been used to address those issues that remained open in the theory phase.

The authors used criteria of both internal and external validity, adapted within the context of a qualitative study, while seeking to ensure that the findings had reliability and a reduced risk of bias.

While data collection through a questionnaire was considered, the inherent disadvantage of this method is that it would not have been able to provide such a variety and depth of data as that gained through face-to-face interviews. Much of the detail and substance in the data would have been missed. The literature also recommends that interviews are the most appropriate data collection method when undertaking qualitative research (King, et al. 1994; Jones, 1991 and McCracken, 1988). To enhance reliability the author chose a range of data collection methods including: literature survey, exploratory discussions, documental data, experiential data, process mapping and in-depth interviews. Moreover, to strengthen the reliability of data, a cross-checking method was adopted between various sources of data, for example, in the case of the technology, market and environment factors, between literature review, process mapping and semi-structured and validatory interviews. Therefore, an attempt was made to achieve the convergence of multiple sources of evidence to address the potential problem of "construct validity" of this explorative research (Yin, 1994: 92).

4 INTEGRATING TECHNOLOGY STRATEGY WITH BUSINESS STRATEGY

It is evident from the available literature that there is a need to reinforce the integration between technology strategy and business strategy. As Kantrow (1980) has pointed out, technological decisions are of paramount importance to business; therefore, they must be made in the fullest context of each company's strategic thinking. Similarly, Andrews (1980) identified technology strategy as a pattern of decisions that sets the technological goals and the principal technological means for achieving both the technological and business goals of the organisation.

Building on Rosenbloom's (1978) framework, which highlights the interactions of three levels of analysis of technological change (the environment, the organisation and discrete innovation); Adler (1989: 30) outlined the nature of the relationship between business strategy and technology strategy as follows:

- 'the analysis of business strengths and weaknesses finds its parallel in the identification of distinctive technological competencies;
- business opportunities and threats have parallels in strategic technology areas;
- business mission has a parallel in technology posture;
- business objectives have a parallel in measurable technology objectives;
- business strategy has its parallel in a technology strategy which identifies a vector characterising the projected development path of the organisation's technology offers and capabilities;

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- just as business strategy is translated into business policy, this technology strategy is translated into technology policy.

Adler's contribution shows that the elements of business strategy are mirrored in technology strategy, thus providing a foundation for integration.

Vernet and Arasti (1999) argued that the relationship between technology strategy and business strategy in an organisation supports two opposite directions as shown in **Figure 1. Two Directions in Bringing Together the Technology Strategy and the Business Strategy.**

1. Using current organisation technological competencies to elaborate or implement a competitive advantage; and
2. Developing new technological competencies to support the current competitive strategy² of the organisation.

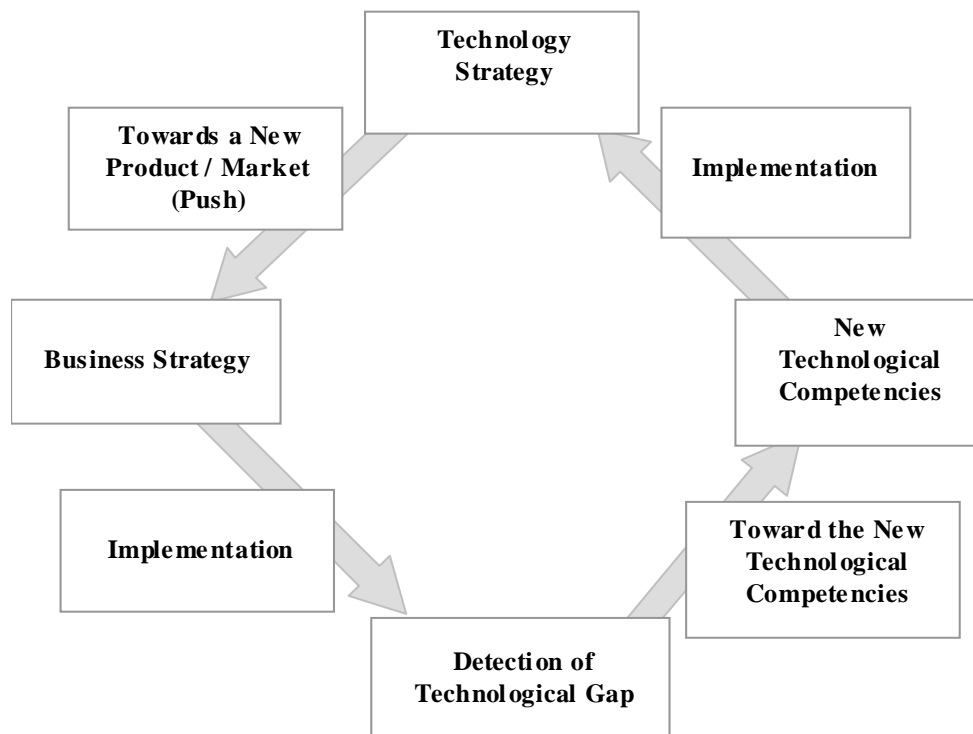


Figure 1. Two Directions in Bringing Together the Technology Strategy and the Business Strategy. *Source:* Vernet and Arasti, 1999.

When technology strategy supports business strategy, it must be tailored to the organisation's overall strategic objectives. Technology strategy, in this case, defines how a company can most effectively improve its technological competencies to accomplish its business strategy and to achieve a sustainable competitive advantage.

² The adoption of a unique position in the marketplace, with particular regard to the relative positioning and strategies of competitors through targeting a specific market and marketing mix.

This is known as ‘strategic management of technology’ (Jones, Green and Coombs, 1994).

Technology strategy initiates business strategy, because technology strategy implementation leads to new technological competencies, and based on these new competencies a company can choose a new corporate or business strategy. This is known in the literature as ‘*competence/technology-based strategic planning*.’ (Joly and Thérin, 1996; Stalk *et al*, 1992)

Vernet and Arasti (1999) pointed out that to increase understanding of how companies can establish a coherent technology strategy, a number of steps have to be taken. The first stage in this process is to identify important technologies in which to invest. This would help to ensure that companies acquire the most appropriate strategic technologies and improve their competitiveness. This further supports the authors’ argument that there is a need for a technology assessment tool. Harris *et al* (1983) and Little (1981) suggest that the use of technology may be implemented by a company to protect their long-term position by preventing other companies from entering a market, structuring a technological lead, or even to procure a ‘progressive image’. In this sense, the employment of technology is a valuable addition to an organisation’s overall strategy to enhance development and aid in the exploitation of competitive opportunities.

The utilisation of technology as a means of creating a sustainable competitive advantage is evident in both the management and economics literature. Technology is perhaps the single most important source of major market share changes amongst competitors and is probably the most recurrent cause-of-demise of entrenched dominant organisations (Porter, 1983). Its implementation can create or destroy profits (Frohman, 1985), or it can create new industries and transform or destroy existing ones. It is a vital force in the competitive environment of the modern business (Maidique and Patch, 1988). In fact, most of the literature upholds the importance of the relationship between technology strategy and business strategy. This section, therefore, will explore the link between technology and competitive strategies between specific dimensions of technology and business strategies.

Porter (1983) pointed out that as far as the linkages are concerned, the choices made between competitive strategy and technology must be compatible, thus reinforcing one another. Miller (1988), however, proposed that the link should focus directly on the empirical relationships among technology and business strategy. He observed that, ‘Research actually documenting the relationships between technology, strategy, and performance has been slower to develop than our sense of the need for such research. Several streams of research exist which link bits of technology to pieces of strategy or performance, but too little effort has been given to integrating such works. The result of this disparity is that while we may feel certain that strategy and performance are strongly tied to technology, we probably feel uncertain as to how various links mesh with one another in some “big-picture” sense’ (Miller, 1988:239).

According to Al-Harbi (1996), the nature of this link is usually articulated in the organisation’s technology strategy. It takes the form of a structured plan that guides long-term decisions on a number of issues such as technology development, acquisition development and investment.

Two types of research which integrate technology strategies with business strategies could be identified from the literature as:

Conceptual and
Empirical

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Although most of the models so far share the common objectives of integrating the content (dimensions or characteristics) of technological and strategic choices, there is no agreement on these dimensions or characteristics. Table 1, originally developed by Zahra and Covin (1993), summarises the different approaches in the form of cells.

Cell 1: Conceptual orientation with unidimensional scope

This cell describes specific dimensions of technology policy and their relations with dimensions of business strategy. Technology dimensions depicted include:

An organisation's technological resources, types of R&D programmes (Foster, 1986; Zahra and Fescina, 1991),

R&D spending (Schoonhoven, 1984),

Internal vs. external sources of technology (Ford, 1988),

Organisational policies for the development and use of technology (Camillus, 1984).

It should be pointed out that these studies have been influential in cataloguing the crucial dimensions of technology policy that should fit a specific strategy.

Cell 2: Conceptual orientation with multi-dimensional scope

Cell 2 depicts the integrative models that suggest a link between different dimensions of technology strategy and business strategy – an approach adopted by many researchers. This approach will be discussed in detail in the next section.

Orientation	Scope	
	Unidimensional	Multi-dimensional
Conceptual	Camillus (1984), Ford (1988), Foster (1986), Fufeld (1989), Schoonhoven (1984), Zahra and Fescina (1991)	Maidique and Patch (1988), Porter (1983, 1985)
Empirical	Armour and Teece (1980), Hambrick <i>et al.</i> (1983)	Ettlie (1983), Ettlie <i>et al.</i> (1984), Miller (1988)

Table 1. An Overview of Past Research on the Link between Business and Technology Strategies. *Source:* Adapted from Zahra and Covin (1993).

Cell 3: Empirical orientation with unidimensional scope

The authors cited in Cell 3 focused their efforts on examining empirical links between the intensity of product innovation and business strategy. Results confirmed that Prospectors increased product innovation more than Defenders (Hambrick et. al, 1983). This and similar studies have developed the field by conducting empirical tests to determine the performance implications of the integration between particular dimensions of technology and business strategies.

Cell 4: Empirical orientation with multi-dimensional scope

There have been three studies in this cell; perhaps, a contributing factor is the methodological difficulty inherent in conceptualising and testing the multivariate relationships of the link between technology and strategy. Miller (1988) exemplifies this stream of research. He

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focused on the delineation of technology settings. To aid separation of these settings, he considered three elements:

Production methods,

Rate of innovation, and

Product sophistication.

Cluster analysis revealed six technological settings. Examination of the differences in business strategy variables (e.g., advertising and promotion) affecting these settings revealed that business strategy variables influenced company performance differently. In each setting, Miller suggests that there was the implication of a need for establishing integration between particular dimensions of technology strategy and business strategy in order to produce successful performance.

As indicated earlier within this paper, the authors strongly recommend integrating technology strategy with business strategy rather than with corporate strategy. Linking technology strategy with business strategy will be more effective since business strategy is concerned with both the market and the products where technology has a major impact in these areas, especially in the airline business. Conversely, corporate strategy is concerned with organisational scope and corporate parenting. As noted earlier, most of the literature (e.g. Adler, 1989; Kantrow, 1980; Maidique and Patch, 1988; Vernet and Arasti, 1999), suggested that technology strategy should be integrated with business strategy. Therefore, integrating technology strategy with business strategy is the most logical path.

5 FRAMEWORK FOR INTEGRATING TECHNOLOGY STRATEGY WITH BUSINESS STRATEGY

An organisation that undertakes product innovation without a strategy, according to Cooper (2000), is like fighting a war without a military strategy. A business without product innovation and a technology strategy will inevitably make a number of ad hoc project decisions independently of one another, often with disastrous consequences. In such a situation, a business may overstretch its development resources in areas that are not strategically important, or it might find itself in unrelated or unwanted markets, products and technologies.

Success in today's global markets is dependent on a number of factors. One of the most important of these is integration between an organisation's technology strategy and its business strategy. Zahra and Das (1998) argued that the implementation of this integration would ensure the effective use of technological resources to obtain competitive advantage. This integration is vital to determine and identify viable options for technology strategy in the context of different business strategies.

One possible approach is to define an organisation's business and competitive strategies and then develop the various factors of its technology. To ensure success, both the technology and business strategies must fit with one another. This would imply that the choices of technology dimension and its factors are consistent with the dominant business strategy of the organisation.

It is necessary to develop an understanding of how technology factors may vary with the organisation's business and competitive strategies, and how they can use technological resources to achieve competitive advantage.

The authors concluded that there is an urgent need for a comprehensive approach that combines a new model which links business and technology strategy with a new Assessment

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Matrix for technology strategy. Such a model should be a tool to facilitate the implementation of a new approach to integrating technology strategy with business strategy. The first part of the model is shown in Figure 2: The Integration Model Linking Technology Strategy with Business Strategy.

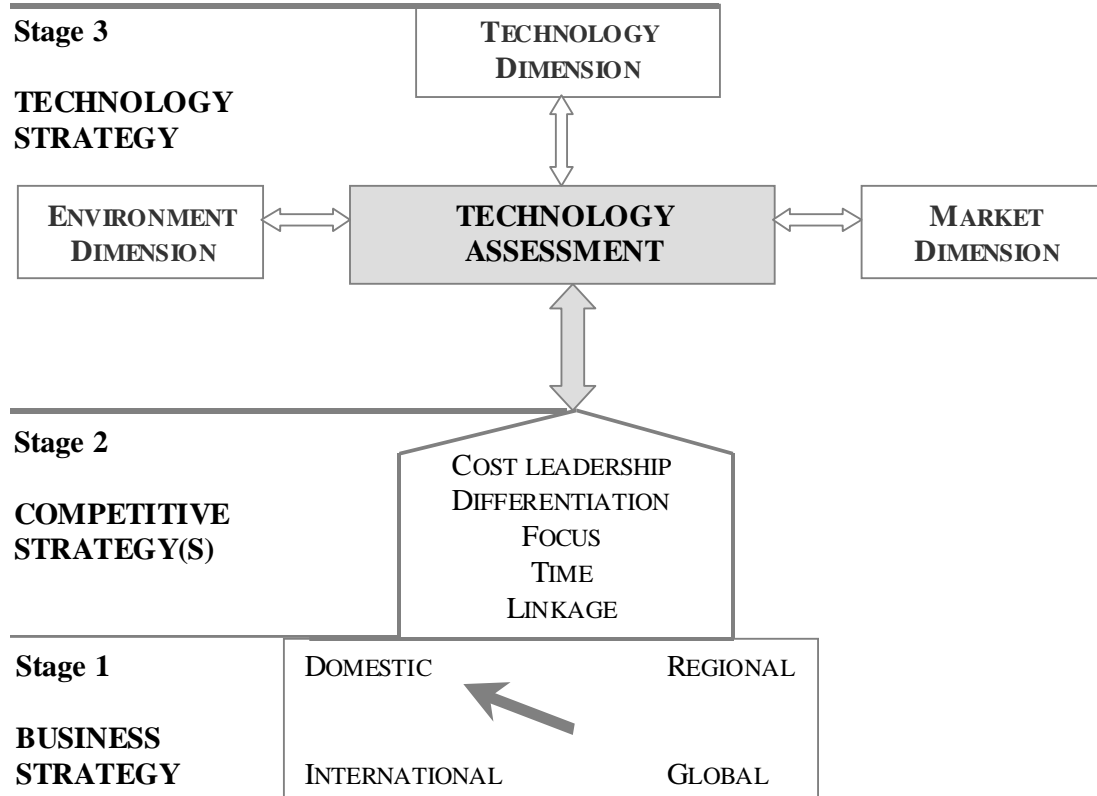


Figure 2: The Integration Model Linking Technology Strategy with Business Strategy.

Source: Originated by the authors.

The Integration Model (Figure 2) prescribes that technology strategy should have three stages of strategic choices with those within business strategy and competitive strategy leading on to those within technology strategy. The model begins with identifying the choice of business strategy. The first stage in the business strategy is to decide in which sector the strategy will be deployed: Domestic, Regional, International or Global. However, Zahra and Das (1998) did not explain these strategic alternatives in any depth because they did not consider them in the context of other work such as that of Porter (1980), although even Porter did not link his generic competitive strategies directly to what he referred to as ‘geographic segments’. Ellis and Williams (1995) when discussing geographic segments and competitive strategies, also did not identify a clear linkage between the two.

Once business strategy has been established, it should be linked to competitive strategy (cost, differentiation, focus, time, linkage). Porter (1985) and Al-Harbi (1996) only proposed the first three (cost, differentiation and focus), while other researchers argued that more competitive strategy dimensions like time and linkage should be added (Ellis and Williams, 1995; Johnson and Scholes, 2002). The authors too have added time and linkage as these are

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seen as essential factors to the operation of organisations within the service sector, particularly airlines, where many processes are linked and involve time “schedules” which directly affect the competitive dimensions. One of the advantages of the model presented in **Figure 2: The Integration Model Linking Technology Strategy with Business Strategy.** is its adoptability to the current business environment. As many researchers have argued, there are basic techniques which can be applied in order to obtain a sustainable competitive advantage (e.g. Al-Harbi, 1996; Porter, 1985 and Ellis and Williams, 1995). As with the first stage, this second stage is linked to the third and final stage, technology strategy.

In the technology assessment stage of developing a technology strategy an organisation will need to go through a technology assessment exercise, where the impact of the market and the environment will have to be considered. This would require each of the technology, market and environment dimensions to be broken down into a series of factors. These factors will be discussed in proceeding paper which discusses the Technology Assessment Tool. Considering the environment in the assessment stage is important because the literature suggested that technology strategy processes start with the environment scan and internal scrutiny (Chiesa and Manzini, 1998). The external environment can also affect the airline industry.

The final stage in the process is to relate each dimension to the other two to identify the priority of each technology factor for a business. Having determined the relevance and degree of importance of each factor, the linkage between the technology, market and environment dimensions would give an organisation a comprehensive multi-dimensional approach to technology assessment.

After the technology assessment has been completed, an organisation could then apply the holistic approach (Figure 3) of Al-Harbi (1996) by going on to the next steps defined by him of acquisition, implementation and improvement, in order to achieve an effective technology strategy.

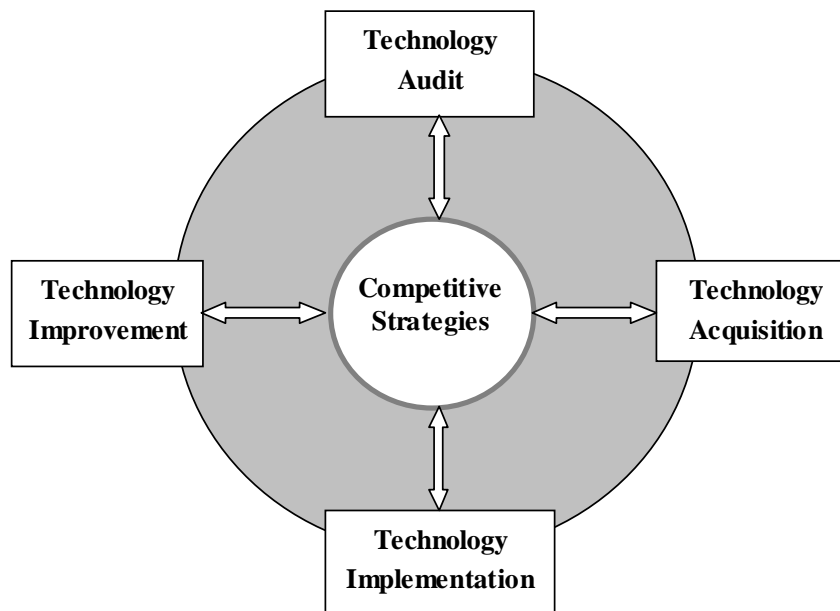


Figure 3. Al-Harbi's Framework for Technology Strategy Development.

Source: Al-Harbi (1996).

Al-Harbi suggested that technology is a key aspect in all strategic decision-making processes and that technology minimises the technical complexity of products and processes in highly

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dynamic and uncertain environments. In order to maximise the benefits of exploiting the potential of technology in highly dynamic environments, Al-Harbi proposed an integrated holistic approach for developing technology strategies.

This approach contains four major Technology Strategy stages:

Assessment,

Acquisition,

Implementation,

Improvement.

The Integration Model (Figure 2), therefore, helps practitioners decide which strategy should be considered at each stage and it helps researchers identify what they should research to guide practitioners with their theoretical strategies.

When applying the integration model to a business a technology assessment tool is needed to provide a comprehensive method for facilitating the link between technology strategy and business strategy. Thus the Integration Model has both a Visionary-Prescriptive element, and would have an Implementational-Prescriptive element, as embodied in the three dimensional tool which will be developed from the third stage of the Integration Model in the form of a Technology Assessment Matrix, which will be presented in further research.

6 LIMITATIONS OF THE RESEARCH

The research has been ambitious both in its nature and scope when investigating technology strategy and its integration with business strategy within a limited period of time and under unique operating conditions using a cross-section of sample companies in different continents. Fortunately, there is a need for this research, as recognised by the airlines approached, and the authors did not encounter too many difficulties when identifying candidate airlines to participate in this research. Nevertheless, several obstacles needed to be overcome and certain choices had to be made that imposed inevitable limitations on this research.

Due to the timescale and scope of this research some limitations were necessary to complete this research:

This research had to be confined to the service sector;

The fieldwork was limited to airlines. Only international and regional airlines were approached, although it should be noted that they do represent the majority of the airlines operating worldwide;

The size of the sample was, of necessity, limited. Five airlines were interviewed, three international, namely, Saudi Arabian Airlines, AA, and Malayan Airlines and two regional, BMI and LUXAIR;

The process mapping only covered passenger related processes with one airline (Saudi Arabian Airlines).

The Integration Model for linking technology and business strategy has been tested empirically but has not been implemented in practice.

7 CONCLUSIONS

Effective strategic thinking is a key element for the success of any organisation in today's highly competitive business world. Furthermore, effective utilisation of resources is generally

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appreciated to be a key to achieving competitiveness, and it is recognised that such a goal can be achieved using various strategies.

Technology has emerged as a key component in solving complex strategic issues. Much of the relevant literature recognises that technological advancement is the driving force behind the fast rate of change in many markets. Organisations are becoming increasingly dependent on new developments in technology to improve their performance. To benefit from the potential of technology in highly dynamic environments, researchers and business managers constantly need to recognise both the importance of technology and the role technology can play as a potential strategic weapon aimed at achieving competitive advantage.

Consequently, methods assisting the deployment of effective technology are important in the search for new ways to sustain competitiveness. In order to keep pace with changes taking place within their market, management needs to respond quickly and effectively when taking decisions. However, developing the most appropriate strategy is only achievable if management is both well informed and properly equipped. Markets are becoming increasingly heterogeneous, so organisations need to be extremely flexible in order to accommodate the demands of their customers quickly, accurately and cost-effectively. An error of judgement at the technology need assessment stage, therefore, may hinder the ability of an organisation to meet customer expectations.

The authors had become increasingly aware of the competitive pressure upon airlines and decided to devote this research to seeking ways to assist companies to evaluate the relationship between technology and business strategy.

References

- Adler, P. (1989) 'Technology Strategy: A Guide to the Literature', *Research in Technological Innovation, Management and Policy*, 4, pp. 25-151.
- Adler, P., Riggs, H. and Wheelwright, S. (1989) 'Product Development Know-How: Trading Tactics For Strategy', *Sloan Management Review*, 31:1 7-18.
- Al-Harbi, A. (1996) *An Integrated Holistic Approach for Developing Effective Technology Strategy in Highly Competitive Environment with Reference to SABIC's Operations*, Ph.D. Degree, Brunel University.
- Althonayan, A. (2003) *Integrating Technology Strategy with Business Strategy in the Airline Industry*, Ph.D. Degree, Brunel University.
- Andrews, K. R. (1980) *The Concept of Corporate Strategy*, Homewood, II: Richard Irwin.
- Bayona, C., Garcia-Marco T. and Huerta E, (2001) 'Firms' motivations for cooperative R&D: An empirical analysis of Spanish firms', *Research Policy*, 30:8, 1289-1307.
- Bond, D. (2002) 'Top Airline Performers Take Different Paths to Success', *Aviation Week & Space Technology*, 157:1, 57-60.
- Bryman, A. (1989) *Research Methods and Organization Studies*. London: Unwin and Hyman.
- Bulmer, M. (1988) *The Chicago school of sociology: Institutionalisation, Diversity and the Rise of Sociological Research*, Chicago University Press.
- Camillus, J.C. (1984) 'Technology-Driven and Market-Driven Life-Cycles: Implications for Multinational Corporate Strategy', *Columbia Journal of World Business*, 19:2, 56-60.
- Chiesa, V. and Manzini, R. (1998) 'Towards A Framework for Dynamic Technology Strategy', *Technology Analysis & Strategic Management*, 10:1, 111-129.

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- Ellis, J. and Williams, J. (1995) *International Business Strategy*, London, Financial Times Management.
- Ford, D. (1988) 'Develop Your Technology Strategy', *Long Range Planning*, 21:5, 85-95.
- Ford, D. (1988) 'Develop Your Technology Strategy', *Long Range Planning*, 21:5, 85-95.
- Foster, R. (1986) *Innovation – the Attacker's Advantage*, New York: Summit Books.
- Frohman, A.L. (1985) 'Putting Technology into Strategic Planning', *California Management Review*, 27:2, 48-59.
- Hambrick, D.C., MacMillan, I.C., and Barbosa, R.R. (1983) 'Business Unit Strategy and Changes in the Product R&D Budget', *Management Science*, 29:7, 757-760.
- Harris, J., Shaw, R. and Sommers, P. (1983) 'The Strategic Management of Technology', *Planning Review*, 11:1, 28-35.
- Johnson, G. and Scholes, K. (2002) *Exploring Corporate Strategy* (6th edn.), Harlow, Essex, Financial Times, Prentice Hall, Pearson Education Ltd.
- Joly, D. and Thérin, F. (1996) 'Technology Strategy: Toward a Resource-Based Approach', ASAC (Admissive Science Association of Canada), May, Montreal.
- Jones, C. (1991) *Qualitative Interviewing*. In: Allan, C. and Skinner, C. (1991) *Handbook for Research students in the social sciences*. London: The Falmer Press
- Jones, O., Green, K., and Coombs, R. (1994) 'Technology management: Developing a critical perspective', *International Journal of Technology Management*, 9:2, 156-171.
- Kantrow, A.M. (1980) 'The Strategy-Technology Connection', *Harvard Business Review*, 58:4, 6-8.
- King, G., Keohane, R. and Verba, S. (1994) *Designing Social Inquiry*, Princeton University Press, Princeton NJ.
- Little, A.D. (1981) *The Strategic Management of Technology*, Boston, Arthur D. Little, Inc.
- Maidique, M. and Patch, P. (1988) *Corporate Strategy and Technological Policy* in Tusman, M.L. and Moore, W.L. (ed) *Readings in the Management of Innovation* Marshfield, MA, Pitman, pp. 273-285.
- McCracken, G. (1988) *The long interview*, London, Sage Publications
- Miller, A. (1988) 'A Taxonomy of Technological Settings with Related Strategies and Performance levels', *Strategic Management Journal*, 9:3, 239-259.
- Porter, M. (1980) *Competitive Strategy*, New York, The Free Press.
- Porter, M. (1983) 'The Technological Dimension of Competitive Strategy', In R.S. Rosenbloom (ed.), *Research on Technological Innovation, Management and Policy*, 1, 1-33.
- Porter, M. (1985) *Competitive Advantage: Creating and Sustaining Superior Performance*, New York, The Free Press.
- Rieck, R.M and Dickson, K.E. (1993) 'A Model of Technology Strategy', *Technology Analysis & Strategic Management*, 5:4, 397-412.
- Roberts, E. (2001) 'Benchmarking Global Strategic Management of Technology', *Research Technology Management*, 44:2, 25-36.

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THE INTEGRATION APPROACH: INTEGRATING TECHNOLOGY STRATEGY WITH BUSINESS STRATEGY IN THE AIRLINE INDUSTRY

- Rosenbloom, R.S. and Abernathy, W.J. (1982) 'The Climate for Innovation in Industry: The Role of Management Attitudes and Practices in Consumer Electronics', *Research Policy*, 11:4, 209-225.
- Schoonhoven, C.B. (1984) 'High Technology Firms: Where Strategy Really Pays Off', *Columbia Journal of World Business*, 19:4, 5-16.
- Stalk G., Evans, P. and Shulman, L. (1992) 'Competing on Capabilities: The New Rules of Corporate Strategy', *Harvard Business Review*, 70:2, 57-69.
- Stratmann T., (1999) What Do Medical Services Buy? Effects OF Doctors Visits On Work Day Loss', *Eastern Economic Journal*, 25:1, 1-16.
- Vernet, M. and Arasti, M. (1999) 'Linking Business Strategy to Technology Strategies: A Prerequisite to The R&D Priorities Determination', *International Journal Technology Management*, 18:3-4, 293-307.
- Yin, R. K. (1994) *Case Study Research: Design and Methods*, Beverly Hills, Sage Publications.
- Zahra, S. and Fescina, M. (1991) 'Will Leveraged Buyouts Kill U.S. Corporate Research & Development?', *The Executive*, 5:4, 721.
- Zahra, S.A. and Covin, J.G. (1993) Business Strategy, Technology Policy and Firm Performance, *Strategic Management Journal*, 14:6, 451-478.
- Zahra, S. and Das, S. (1998) 'Technology Strategies for Companies Operating in Global Markets', *Journal of Transnational Management Development*, 4:1, 25-50.

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