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AN INTEGRATED MODEL OF INNOVATION VALUE CHAIN FOR SUSTAINABLE COMPETITIVE ADVANTAGE IN HIGH-TECH INDUSTRY

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ABSTRACT

Measuring innovation outputs has been accomplished mainly through the relationship between innovation management and product design and development, especially for patenting. Today, companies are facing increased turbulence and complexity in the business environment, such as globalization, digitalization and mobilization. To meet these challenges, both the popular and the academic press are advising companies to focus their attention toward innovation in order to create and sustain competitive advantage. A firm's performance depends on how much its managers can mobilize the knowledge resources of individuals and teams in its value chain and how well they can turn these resources into activities that lead to value creation in hyper-competitive markets.

Knowledge management literature reveals the increasing importance of innovation in those high-tech manufacturing firms, in which knowledge turns into the main source of competitive advantage. Innovation in high-tech firms is progressively turning into a systematic process, especially for determined high-tech industries such as electronic products.

The study aims to develop an integrated model of innovation value chain (IVC), the model integrates knowledge management and innovation management in high-tech Industries from a knowledge-based theory perspective and integrates IVC to reach value creation and then to achieve sustainable competitive advantage. IVC is a thinking tool which can be used to define those enterprises involved in innovation activities such as product development. Each link in the chain needs to add value to innovation. IVC helps think through the often-complex relationships in product development and look for improvements in relationships (with suppliers, customers, partners and competitors) and partnerships.

The integrated model inputs from knowledge-based competition (Globalization, digitalization and mobilization) to integrate IVC to reach value creation (employees', suppliers', partners' customers' and competitors' value) and then to achieve the outcome: sustainable competitive advantage. The importance of the proposed model was theoretically discussed for practitioners and future researchers. The integrated IVC model can act as a list of items for high-tech Industries to address when adopting innovation value chain. This helps to ensure that the essential issues and approaches are covered during implementation. For academics, it provides a common language for them to discuss and study the approaches crucial for the success of innovation value chain in high-tech Industries.

Keywords: knowledge management, knowledge-based innovation, high-tech industries, Innovation value chain

INTRODUCTION

Measuring innovation outputs has been accomplished mainly through the relationship between innovation management and product design and development, especially for patenting (Pavitt, 1984). Today, companies are facing increased turbulence and complexity in the business environment, such as globalization, digitalization and mobilization. D'Aveni (1994) categorises the situation in its extreme form as hyper-competition. To meet these challenges, both the popular and the academic press are advising companies to focus their attention toward innovation in order to create and sustain competitive advantage.

From value chain to value grid

Porter's basic model describes an industrial organization buying raw materials and transforming these into physical products. In 1985, when Porter introduced the Value Chain, around 60% of most western economies' workforces were active in service industries. In 2006, most service industries in western countries employ over 80% of the workforce.

Critique on the Value Chain model and its applicability to services organizations has since been voiced by both academics and practitioners. See for example (Peppard and Rylander, 2007) and (Van Middendorp, 2005). Porter's focus on 'either or' strategies and competition as the main driving force in any industry, are not that well suited to the complexity of most industries today. Collaboration in addition to competition and differentiation in addition to low cost are common drivers. Furthermore, Porter is focused on the tangible outcomes of cost, revenue, margin and basic configuration of business activities. The Value Network may be the mental model that embraces the linear Value Chain Model and that adds an extra dimension for those seeking to make sense of complexity as we see it in organizations and their environment today.

More recently, the term "value grid" has been developed to highlight the fact that competition in the value chain has been shifting away from the strict linear view defined by the traditional 'value chain' model (Pil and Holweg, 2006).

The value chain in its original sense was defined as a sequence of value-enhancing activities. In its simplest form, raw

materials are formed into components, which are assembled into final products, distributed, sold, and serviced. Frequently, the activities span multiple organizations. This orderly progression of activities allows managers to formulate profitable strategies and coordinate operations.

However, it can also put a stranglehold on innovation at a time when the greatest opportunities for value creation (and the most significant threats to long-term survival) often originate outside the traditional, linear view. Traditional value chains may have worked well in landline telecommunications and automobile production during the last century, but today innovation comes in many shapes and sizes—and often unexpectedly.

Pil and Holweg hence argue for seeing value creation as multidirectional rather than linear. Given the constant tension between opportunity and threat, firms need to explore opportunities for managing risks, gaining additional influence over customer demand, and generating new ways to create customer value. Nokia, for example, is legendary for having the foresight to lock in critical components that were in short supply, allowing it to achieve significant market share growth. However, a few years ago it suffered a setback when competitors used the same strategy to take advantage of shifts in the demand for LCD displays.

Protection against such fickle reversals calls for a more complex view of value—one that is based on a grid as opposed to the traditional chain. The grid approach allows firms to move beyond immediately recognizable opportunities and across industry lines. This permits managers to identify where other companies—perhaps even those engaged in entirely different value chains—obtain value, line up critical resources, or influence customer demand. The new paths can be vertical; horizontal; and even diagonal. Successful managers need to learn how to assemble multi-faceted value grids that leverage new opportunities and respond to new threats.

Innovation value chain in high-tech industries

Innovation - the introduction of new products or processes - involves sourcing, transforming and exploiting knowledge to improve the performance of the innovating business. The study calls this process the innovation value chain. Modelling the innovation value chain for a large group of manufacturing firms in Taiwan highlights the drivers of innovation, productivity and firm growth. The study finds strong positive links between different forms of knowledge sourcing (R&D, supply chain links, links with universities etc). Each of these forms of knowledge sourcing also makes a positive contribution to innovation in both products and processes although public knowledge sources have only an indirect effect on innovation. In the exploitation phase, innovation in both products and processes contribute positively to company growth, with product innovation having a short-term ‘disruption’ effect on labour productivity. Modelling the complete innovation value chain highlights the structure and complexity of the process of translating knowledge into business value.

In high-tech manufacturing firms, there is an increasing importance of innovation, in which knowledge turns into the main source of competitive advantage (Miles, 1993). The importance of knowledge as a source of competitive advantage is still higher for those sectors on which innovations are being continually developed (Decarolis and Deeds, 1999; Pisano, 1994). Also, knowledge management is crucial for the successful launching of new products (Li and Calantone, 1998) and for the innovation process (Powell *et al*., 1996). Therefore, organisations base competition on efficiency when acquiring (Nonaka and Takeuchi, 1995), transmitting and integrating (Grant, 1996a; Zander and Kogut, 1995) and applying (Spender, 1996) knowledge.

Today, economic competition has become increasingly important in international commerce. High-tech dominates economic competition. Governments around the world realise that only by strengthening technological innovation, possessing their own intellectual properties and grasping high-tech resources can they take the initiative in economic competition. Therefore, technologically advanced countries adopt various policies to protect their intellectual property rights. They try to achieve a market monopoly through a technology monopoly. This is spurring the public to place greater value on knowledge-technological resources. They realise that in the future world, knowledge is the most important basis for economic growth. A country’s “capability of creation, distribution and use of knowledge” (Hongjin, 1997) will become the core of its competitive power.

Innovation in high-tech firms is progressively turning into a systematic process, especially for determined high-tech industries such as electronic products. Specific departments for management of R&D activities are created (Gadrey *et al*., 1994). Also, a greater contact with customers increases the role that customers play in the innovation process (Czepiel *et al*., 1985). Therefore, both R&D departments and customers become the main source of inputs for innovation.

However, innovation patterns in high-tech manufacturing are for organisational and process innovations, The impossibility of patenting this kind of innovation and, therefore, protecting the returns generated out of these innovations shortens the life cycle of innovations dramatically (Barras, 1990). Hence, the innovation process must be intensive because innovations are implemented and copied at such a speed that continuous innovation efforts are required to keep up with a determined degree of differentiation in order to support the firm’s strategy (Voss, 1992).

The study aims to develop an integrated model of innovation value chain, the model integrates knowledge management and innovation management in high-technology industry from a knowledge-based theory perspective and integrates IVC to reach

value creation and then to achieve sustainable competitive advantage. The details are as follows.

LITERATURE REVIEW

The definition of high-tech Industries

The definition of high-tech is based on the percentage of high "human-capital" jobs in an industry. High human-capital jobs include engineers, technicians, scientists, mathematicians or some combination thereof (Markusen *et al.*, 1986). By this definition, there are 100% high-tech industries. One of the most important advantages of this definition over others is that human skills correlate highly with other indicators of "technological" performance, such as R&D (Berman *et al.*, 1994), stock of capital, information intensity and, more importantly for the study, innovations.

There is no widely accepted standard definition of high-tech industries. The criteria used to define high technology ranges from judgment to technology-oriented employment and research and development spending. The choice of a definition for technology should be dependent on how the research will be used, as well as data availability. The definition applied in this study updates Hecker's (1999) definition, which includes employment in technology-oriented occupations and more narrowly, employment directly involved in R&D. According to the updated Hecker definition, industries qualify as high-tech if they possess at least double the percentage of employment in technology-oriented occupations as that of the average for all R&D companies, and if their percentage of employment in R&D is at least 80% of the average of all R&D performing companies. The firms defined as high-tech can be updated over time to incorporate newly emerging research, development and technology sectors.

In summary, the study adopted above definitions of high-tech industries as "industries qualify as high-tech industries if they possess at least double the percentage of employment in technology-oriented occupations as that of the average for all R&D companies, and if their percentage of employment in R&D is at least 80% of the average of all R&D performing companies.

The genesis of knowledge-based competition

Lang (2001) assumed that two intertwined strategic forces are compelling companies to reconsider fundamental business assumptions.

1. Globalisation
2. Digitisation with connectivity brought about by revolutions in information processing, telecommunication (or infocom) and Internet technologies.

These two forces – more aggressive global competition and accelerating technological change – translate into competition that is increasingly knowledge-based. This increasingly knowledge-based nature of competition is driving change in how value chains are being managed within and across firms. Managers will certainly have to augment their ability to manage diversity, complexity and ambiguity in employee, supplier and customer relationships in the New Economy (Lang, 2001). Driven by these two forces, we are in the midst of an economic transition from an era of competitive advantage based on information to one based on knowledge creation.

Furthermore, Lang (2001) assumed some perspectives for the knowledge-based nature of competition:

1. In most businesses today, most value added is in the form of knowledge, not material. But in most firms, the bulk of management time and attention is still spent on tangibles. Today, intangibles such as customer service, innovation, speed, agility, etc. are more important than tangibles such as equipment, materials and hardware.
2. But, too often, too little time and attention are focused on managing the soft elements of knowledge like creativity, customer love, foresight, fun, cultivation of talent, etc. There is huge hidden value in such companies that is not visible in traditional accounting.
3. Increasingly, larger investments are being made in these hidden assets. Such investments concern customer relations, information technology, networks and competence, for example; or, in a word, knowledge.
4. To survive in the knowledge economy, new business models must be created, because many business axioms of the old economy are no longer applicable. Scarcity is a non-issue for digital assets. As such, the competitive dynamics of digital products differ greatly from that of physical products. In cyberspace, new economies of scales and economies of scope prevail (Rayport and Sviokla, 1995).

A firm's performance depends on how much its managers can mobilise the knowledge resources of individuals and teams in its value chain and how well they can turn these resources into activities that lead to value creation in hyper-competitive markets. Challenges presented by the knowledge economy make it necessary for organisations to harness the competencies of its knowledge workers, customers and suppliers, if sustainable competitive advantage is to be achieved, as illustrated in Figure 2-1. (Lang, 2001)

Figure 2-1: New management imperatives
Source: Lang (2001)

Lang (2001) argues that there are linkages between aspects of the New Economy, including globalisation and digitisation, knowledge generation and competencies. Harnessing worker, customer and supplier competencies within the context of knowledge-based competition is the response that is called for.

The coming of globalised knowledge-based competition demands that management must attend to its knowledge workers, suppliers and customers in a new way. The real value of information systems lies in connecting people to people to enable them to share what expertise and knowledge they have at the moment, given that cutting-edge knowledge is always changing. The solution is not to try to warehouse everything your workers ever knew but to connect questions to answers or to people who can help you find answers (Stewart, 1997).

Innovation value chain (IVC)
Rather than reflexively importing innovation best practices, managers should adopt a tailored, end-to-end approach to generating, converting, and diffusing ideas. Eexecutives in large companies often ask themselves, "Why aren't we better at innovation?" Morten and Julian (2007) assumed some advices to answer this question. After all, there is no shortage of sound advice on how to improve:

1. Come up with better ideas.
2. Look outside the company for concepts and partners.
3. Establish different funding mechanisms.
4. Protect the new and radically different businesses from the old.
5. Sharpen the execution. (Morten and Julian, 2007)

Such strategic counsel, however, is based on the assumption that all organizations face the same obstacles to developing new products, services, or lines of business. In reality, innovation challenges differ from firm to firm, and otherwise commonly followed advice can be wasteful, even harmful, if applied to the wrong situations. (Morten and Julian, 2007)

Likewise, companies can't just import the latest fads in innovation to cure what's ailing them. Instead, they need to consider their existing processes for creating innovations, pinpoint their unique challenges, and develop ways to address them. The study offers a comprehensive framework—"the innovation value chain"—for doing just that.

In practice, the innovation value chain is derived from the findings of five large research projects on innovation that Morten and Julian (2007) undertook over the past decade. They interviewed more than 130 executives from over 30 multinationals in North America and Europe. They also surveyed 4,000 nonexecutive employees in 15 multinationals, and they analyzed innovation effectiveness in 120 new-product-development projects and 100 corporate venturing units.

IVC is a thinking tool which can be used to define those enterprises involved in innovation activities such as product development. Each link in the chain needs to add value to innovation. IVC helps think through the often-complex relationships in product development and look for improvements in relationships (with suppliers, customers, partners and competitors) and partnerships. (See Figure 2-2.)

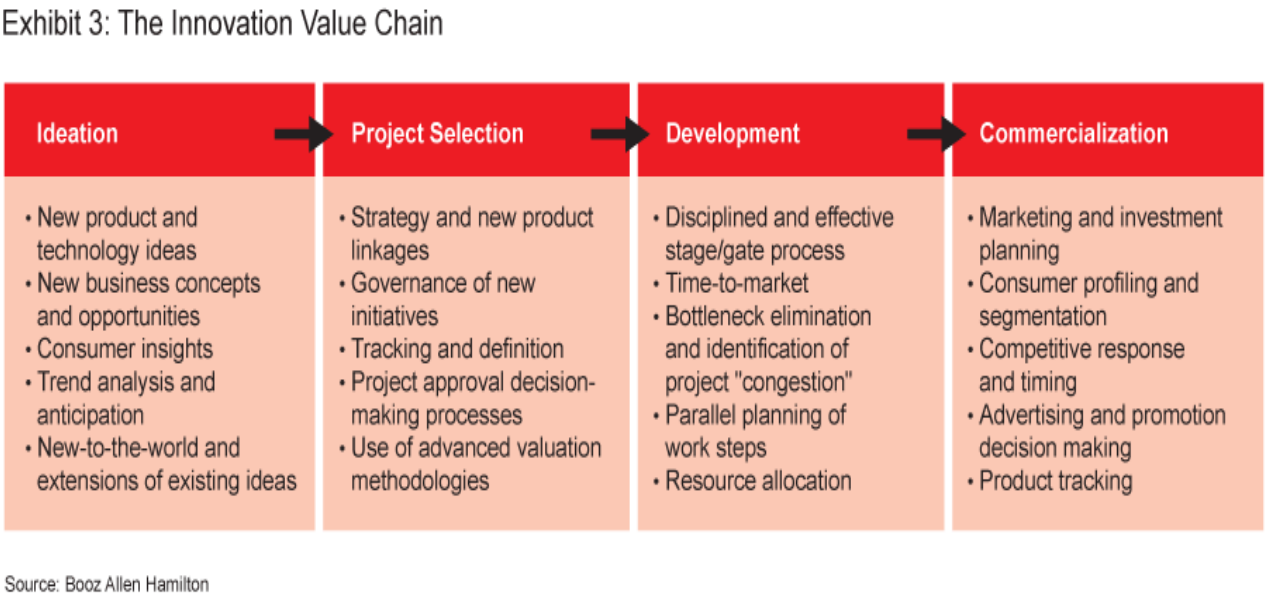

Figure 2-2: The innovation value chain
Source: Booz Allen Hamilton (2004)

Booz Allen Hamilton (2004) indicated that raising the inherent innovation effectiveness curve requires senior management to understand that innovation is not a discrete activity, but a multifunctional capability that requires several types of competencies. In fact, executives ought to look at successful innovation as the expression of a well-organized value chain or value web. An innovation capability requires owning or sourcing four critical sets of capabilities: ideation, project selection, development, and commercialization. Since a chain is only as strong as its weakest link, the innovation effectiveness curve cannot be raised unless all four elements are mastered.

This value chain is relevant for any development process, whether for consumer products, industrial equipment, or services. The best practices adopted by superior innovators along each link of the chain also, in the experience of Booz Allen Hamilton (2004), transcend industry boundaries.

THE DEVELOPMENT OF AN INTEGRATED IVC MODEL FOR SUSTAINABLE COMPETITIVE ADVANTAGE IN HIGH-TECH INDUSTRIES

Based on above literature review and discussions, and combined the theoretical models from Stewart (1997), Lang (2001), Booz Allen Hamilton (2004) and Morten and Julian (2007), the study developed an integrated model of IVC for sustainable competitive advantage in high-tech Industries as figure 3-4. The integrated model inputs from knowledge-based competition (Globalization, digitalization and mobilization) to integrate IVC to reach value creation (employees', suppliers', partners' customers' and competitors' value) and then to achieve the outcome: sustainable competitive advantage.

Morten and Julian (2007) proposed the innovation value chain view presents innovation as a sequential, three-phase process that involves idea generation, idea development, and the diffusion of developed concepts. Across all the phases, managers must perform six critical tasks—internal sourcing, cross-unit sourcing, external sourcing, selection, development, and companywide spread of the idea. The study increases "commercialization" into the IVC. Each is a link in the chain. Along the innovation value chain, there may be one or more activities that a company excels in—the firm's strongest links. Conversely, there may be one or more activities that a company struggles with—the firm's weakest links. (See the Figure 3-1)

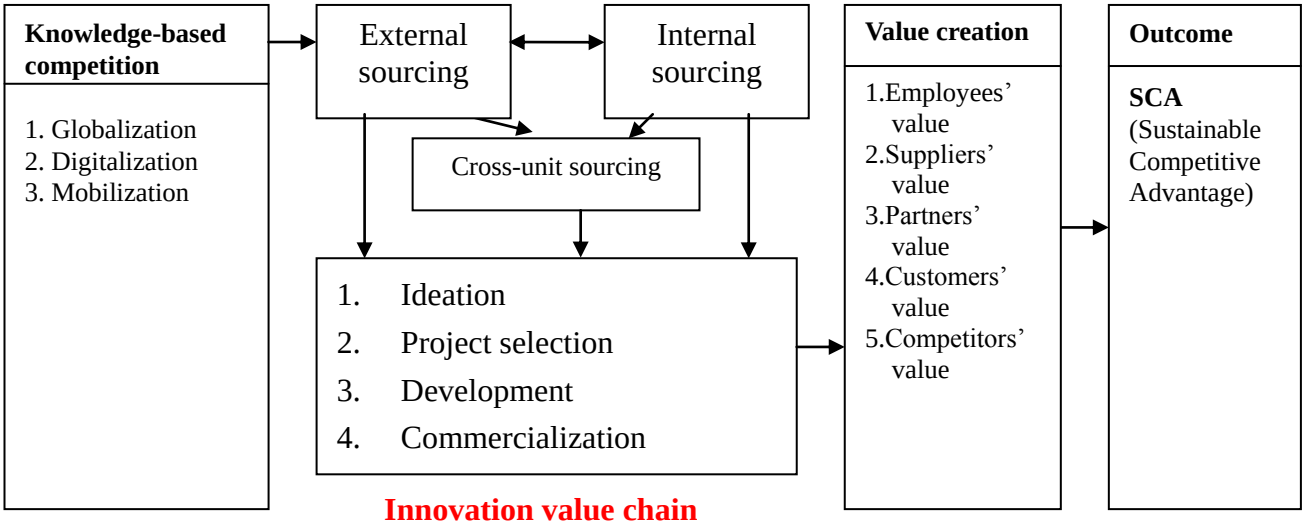

Figure 3-1: An integrated model of KBI and IVC for sustainable competitive advantage in high-tech Industries

CONCLUSIONS AND RECOMMENDATIONS

Throughout this paper a broad managerial perspective is taken to innovation, as distinct from solely that of technical innovation and R&D (Research and Development). Thus, the dimensions of innovation value chain (IVC) include internal and external sourcing and cross-unit sourcing into ideation and then to project selection to development, finally to commercialization. Only through the processes of IVC, high-tech industries can create value then to achieve SCA.

In summary, the study developed an integrated model of innovation value chain to explore how high-tech industries apply KM to implement the innovation process and integrate IVC as an integrated flow of knowledge and innovation to reach value creation and then to achieve sustainable competitive advantage. The integrated model can be an easy-to-follow innovation model for high-tech Industries to address when adopting innovation value chain. This helps to ensure that the essential determinants and approaches for innovation process are covered during knowledge-based competition, IVC and value creation to achieve SCA. For industries, it provides a practical and complete business model for them to be reference and study the innovation approaches, which are crucial for the success of innovation value chain in high-tech Industries.

The study provides valuable insights and recommendations for the owners/ managers in Industries, academics and practitioners for future research. The integrated innovation model is to assist high-tech Industries to leverage knowledge assets for innovation, internal and external supporting structure for supporting and accumulating innovation capacity to reach value creation through IVC and then to achieve sustainable competitive advantage.

The study suggests high-tech Industries to utilize the innovation value chain then the company has about itself and its customers, partners and suppliers, and applying it to the marketplace. Then, these companies, even if very small, have the opportunity to outmaneuver all bigger players and come in ahead of last year's champions. For the limited resources, personnel and monetary, high-tech Industries especially need to construct their innovation model step by step and to integrate KM, innovation to accumulate innovation capacity and therefore to form corporate core competence (Prahalad and Hamel, 1990) to maintain sustainable competitive advantage. Furthermore, due to the integrated IVC model, the study suggests the future researchers are able to do the empirical study for more high-tech industries to obtain a generalization results in specific industries. Also, the integrated IVC model can be used to do case study or empirical study for the other industries.

REFERENCE

[1] Barras, R. (1990) "Interactive innovation in financial and business services: the vanguard of the service revolution", *Research Policy*, Vol. 19, No. 3, pp.215-37.

[2] Berman, E., Bound, J. and Grillinches, Z. (1994) "Changes in the demand for skilled labor within US manufacturing evidence from the Annual Survey of Manufacturers", *Quarterly Journal of Economics*, Vol. 109, pp. 367–97.

[3] Booz Allen Hamilton (2004) "*Raising Your Return on Innovation Investment*", http://www.strategy-business.com/resilience/rr00007?pg=2

[4] Czepiel, J., Solomon, M. and Surprenant, C. (1985) *The Service Encounter*, Lexington.

[5] Decarolis, D. M. and Deeds, D. L. (1999) "The impact of stocks and flows of organizational knowledge on firm performance: an empirical investigation of the biotechnology industry", *Strategic Management Journal*, Vol. 20, pp.953-968.

[6] Gadrey, J., Gallouj, S., Lhiullery, S. and Weisntein, O. (1994) "Les Critères Défissant l"activité de Recherché-Développement et les cas des Enterprises de Service", *Université des sciences et technologies de Lille*, Lille.

[7] Grant, R. M. (1996) "Toward a knowledge-based theory of the firm", *Strategic Management Journal*, Vol. 17, pp. 109-22.

[8] Hecker, Daniel (1999) "High-technology employment: A broader view", *Monthly Labor Review*, June, pp. 18–28.

[9] Hongjin, (1997) "Estimating Net Benefits of Reallocation: Discrete Choice Models of Sport and Commercial Fishing", *Marine, Resource Economics*, Vol. 12, pp. 307-327.

[10] Inkpen, A. and Crossan, M. (1996) "Believing is seeing: joint ventures and organizational learning", *Journal of Management Studies*, Vol. 32, No. 5, pp. 595-618.

[11] Johanson, J. and Vahlne, J. (1977) "The internationalization process of the firm. A model of knowledge development and increasing foreign market commitments", *Journal of International Business Studies*, Vol. 8, pp. 23-32.

[12] Kanter, R. M. (1983) *The Change Masters*, New York, NY.

[13] Kanter, R. M. (1989) *When the Giants Learn to Dance*, London.

[14] Katsoulacos, Y. (1988) "On incentives and corporate policies", *Aussenwirtschaft*, pp. 141-150.

[15] Keen, P. W. (1991) "Every Manager's Guide to Information Technology", *Harvard Business School Press*, Boston, MA.

[16] Kent, C. A., Sexton, D. L. and Vesper, K. H. (1982) *Encyclopaedia of Entrepreneurship*, Prentice-Hall, Englewood Cliffs, NJ.

[17] Klein, K. and Sorra, J. (1996) "The challenge of innovation implementation", *Academy of Management Review*, Vol. 21, No. 4, pp. 1055–1080.

[18] Kogut, B. (1988) "Joint ventures: theoretical and empirical perspectives", *Strategic Management Journal*, Vol. 9, pp. 319-322.

[19] Kotler, P. (1983) *Principles of Marketing*, Prentice-Hall, Englewood Cliffs, NJ.

[20] Lang, Josephine Chinying (2001) "The genesis of knowledge-based competition", *Journal of Organisational Change Management*, Vol. 14, No. 6.

[21] Leonard-Barton, D. (1992) "The factory as a learning laboratory", *Sloan Management Review*, pp. 23-38.

[22] Levinthal, D. and March, J. G. (1994) "The myopia of learning", *Strategic Management Journal*, Vol. 14, pp. 95-112.

[23] Li, T. and Calantone, R. J. (1998) "The impact of market knowledge competence on new product advantage: conceptualization and empirical examination", *Journal of Marketing*, Vol. 62, pp. 13-29.

[24] Markusen, A., Hall, P. and Glasmeier, A. (1986) *High Tech America: The What, How, Where and Why of the Sunrise Industries*, Allen & Unwin Publishers, Boston, MA.

[25] Marshall, L. (1997) "Facilitating knowledge management and knowledge sharing: new opportunities for information professionals", *Online*, Vol. 21, No. 5, pp. 92–8.

[26] Martin, C. R. Jr, Horne, D. A. (1993) "Service innovation: successful versus unsuccessful firms", *International Journal of Service Industry Management*, Vol. 4, No. 1, pp. 49-65.

[27] McAdam D. (2000) *Identity Work Processes in the Context of Social Movements: Clarifying the Identity/Movement Nexus*. In: Stryker S., Owens T., White R. W. (eds.) Self, Identity and Social Movements. University of Minneapolis Press, Minneapolis, MN.

[28] McLuhan, M. (1967) *Media*, Pan Nordstedts, Stockholm.

[29] Miles, I. (1993) "Services in the new industrial economy", *Futures*, Vol. 25, pp. 653-72.

[30] Morten T. Hansen and Julian Birkinshaw (2007) "The Innovation Value Chain", *Harvard Business review*, June, Harvard Business School Publishing Corporation.

[31] Mytelka, L. (1991) *Strategic Partnerships and the World Economy*, Pinter Publishers, London.

[32] Nelson, R. R. and Winter, S. G. (1982) *An Evolutionary Theory of Economic Change*, Cambridge University Press, Cambridge, MA.

[33] Nonaka, I. and Takeuchi, H. (1995) *The Knowledge Creating Company*, Oxford University Press, New York, NY.

[34] Nooteboom, B. (1999) *Inter-Firm Alliances, Analysis and Design*, Routledge, London.

[35] Nystrom, H. (1979) *Creativity and Innovation*, Wiley, Chichester.

[36] OECD (1992) *Technology and the Economy: The Key Relationships*, OECD, Paris.

[37] Page, A. (1993) "Assessing new product development practices and performance: establishing crucial norms", *Journal of Product Innovation Management*, Vol. 10, pp. 273-90.

[38] Pavitt, K. (1984) "Sectoral patterns of technical change. Towards a taxonomy and a theory", *Research Policy*, Vol. 13, pp. 343-73.

[39] Pennings, J.M., Barkema, H. and Douma, S. (1994) "Organizational learning and diversification", *Academy of*

Management Journal, Vol. 37, No. 3, pp. 608-640.
[40] Peppard and Rylander (2007) "From value chain to value network: insights for mobile operatiors", *European management journal*, Vol. 24, No. 2.
[41] Pil, F. K. and Holweg, M. (2006) "Evolving from value chain to value grid", *MIT Sloan Management Review*, Vol. 47, No. 4, pp. 72-80.
[42] Pinchot, G. (1985) *Intrapreneuring*, New York, NY.
[43] Pisano, G. P. (1994) "Knowledge, integration and the locus of learning: an empirical analysis of process development", *Strategic Management Journal*, Vol. 15, pp. 85-100.
[44] Polanyi, M. (1958) *Personal Knowledge*, Routledge & Kegan Paul, New York, NY.
[45] Porter, M. E. (1985) *Competitive advantage: creating and sustaining superior performance*P33 The Free Press.
[46] Porter, M. (1990) *The Competitive Advantage of Nations*, New York, NY.
[47] Porter, M. E. and Stern, S. (1999) *The New Challenge to America"s Prosperity: Findings from the Innovation Index*, Council on Competitiveness, Washington, DC.
[48] Powell, W. W., Koput, K.W. and Smith-Doerr, L. (1996) "Interorganizational collaboration and the locus of innovation: networks of learning in biotechnology", *Administrative Science Quarterly*, Vol. 41, pp.116-45.
[49] Prahalad, C. K. and Hamel, G. (1990) "The core competences of the corporation", *Harvard Business Review*, pp.79-91. (1994), in Rumelt, R.P., Schendel, D.E., Teece, D.J. (Eds),Fundamental Issues in Strategy – A Research Agenda, Boston, MA.
[50] Prusak, L. (1997) *Knowledge in Organisations*, Butterworth-Heinemann, Oxford.
[51] Rayport, J, and Sviokla, J. J. (1995) "Exploiting the virtual value chain", *Harvard Business Review*, pp.75–85.
[52] Richardson, G. B. (1972) "The organisation of industry", *The Economic Journal*, Vol. 82, pp.327.
[53] Slater, S. F. and Narver, J. C. (1994) "Does competitive environment moderate the market orientation-performance relationship?", *Journal of Marketing*, Vol. 58, pp.46-55.
[54] SMEA (2005), *Small and Medium Enterprises Administration*, MOEA, Taiwan government, http://www.moeasmea.gov.tw/eng/index.asp
[55] Soderquist, K., Chanaron, J. and Motwani, J. (1997) "Managing innovation in French small and medium sized enterprises: an empirical study", *Benchmarking for Quality Management and Technology*, Vol. 4, No. 4, pp. 259-72.
[56] Spender, J. C. (1996) "Making knowledge the basis of a dynamic theory of the firm", *Strategic Management Journal*, Vol. 17, pp. 45-62.
[57] Stewart, A. (1989) *Team Entrepreneurship*, Sage, Newbury Park, CA.
[58] Stewart, T (1997) *Intellectual Capital: The New Wealth of Organizations*, Currency, New York, NY.
[59] Sundbo, J. (1997) "Management of innovation in services", *The Service Industries Journal*, Vol. 17, No. 3, pp. 432-55.
[60] Sveiby, K. E. (1992) "Strategy formulation in knowledge-intensive industries", in Hussey (Eds), *International Review of Strategic Management*, Vol. 3.
[61] Sveiby, K. E. (1994) "Towards a knowledge perspective on organisation", PhD dissertation, University of Stockholm.
[62] Sveiby, K.E. (1997) *The New Organisational Wealth – Managing and Measuring Knowledge-Based Assets*, Berrett-Koehler, San Francisco, CA.
[63] Sveiby, K.E., Risling, A. (1986) Kunskapsföretaget (The Knowhow Company), Liber.
[64] Sveiby, K. E. (2001) "A knowledge-based theory for strategy formulation: towards a knowledge-based theory of the firm", *Journal of Intellectual Capital*, Vol. 2, No. 4.
[65] Van Middendorp (2005) "Value network analysis, strategic planning faces the music, ICMag, Intellectual Capital Magazine, opening issue as Business Ecosystems and value networks analysis", *ICC*, Italy.
[66] Voss, C., Johnston, R., Silvestro, R., Fitzgerald, L. and Brignall, T.J. (1992) "Measurement of innovation and design performance in services", *Design Management Journal*, pp. 40-6.
[67] Williamson, O. (1975) *Markets and Hierarchies: Antitrust Analysis and Implications*, The Free Press, New York, NY.
[68] Wittgenstein, L. (1995) *Philosophical Investigations*, Blackwell, Oxford.
[69] Zand, D. (1997) *The Leadership Triad: Knowledge, Trust and Power*, Oxford University Press, London.
[70] Zander, U. and Kogut, B. (1995) "Knowledge and the speed of the transfer and imitation of organizational capabilities: an empirical test", *Organization Science*, Vol. 6, No. 1, pp.76-92.