Hurdles and Favorable Factors for Innovation Management: Challenges and Opportunities for Indonesia

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Abstrak

Hingga saat ini, inovasi di Asia masih merupakan subjek yang belum menjadi perhatian utama banyak pihak. Namun demikian, banyak perubahan telah dan sedang terjadi di Asia dan inovasi akan menjadi mesin utama penggerak pertumbuhan ekonomi di wilayah ini. Pertanyaannya, bagaimana manajemen inovasi di negara-negara Asia Tenggara; bagaimana manajemen inovasi pada perusahaan-perusahaan di Asia Tenggara? Bagaimana Indonesia mengejar ketertinggalannya? Dalam konteks ini, satu-satunya cara untuk terus hidup dan makmur di pasar adalah dengan melakukan inovasi. Tulisan ini menunjukkan konteks manajemen inovasi di Asia dan faktor yang mempengaruhi implementasi manajemen inovasi di wilayah ini. Penulis menunjukkan faktor yang menghambat implementasi inovasi dan faktor organisasional yang memfasilitasi pelaksanaan salah satu prinsip manajemen inovasi, serta bagaimana integrasi organisasi dapat berefek langsung terhadap kinerja inovasi. Tulisan yang dikembangkan dari hasil studi De Meyer & Garg (2005) dan studi eksplorasi penulis diakhiri dengan kesimpulan tantangan dan peluang manajemen inovasi di Asia dan skenario riset lanjutannya.

Keywords:* *innovation management, organizational integration, Asia, Southeast Asia

Introduction

Innovation is the economically successful introduction of a new technology or a new combination of existing technologies in order to create a drastic change in the value/price relationship offered to the customer and/or user[1]. Innovation results in a drastic change in the value creation system. Changing in the value creation is the result of change in the business model, i.e., changing the target consumer/user, changing the value delivered to the consumer/user, and changing how the value is created. These three changes should be internally consistent.

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The higher the level of successful innovation, the more value will be created for the economy. Comparing selected countries in Asia as shown in Table 1, most of the countries are still low-income and low middle-income.

The large number of population in some countries indicates the market potential, the potential demand side and the potential productive labor supply. Regarding the gross national income (GNI) per capita, the number indicates that not all countries have high income per capita to support the high quality of life, comparing to the income per capita of Japan and Singapore. The various levels of life expectancy at birth (LEB) show some different market potential in each country; asking for companies to create different products for different target consumer/user and asking for companies to help increase the higher and healthier LEB. Many supply-driven products/services can be created. Many demand-driven products can be proposed.

It is essential that innovation starts with a customer/user. Innovation exists only if a consumer or user is convinced that there has been a drastic change in what he or she perceives as value for price. The innovative companies can contribute to the country's quality of life. The higher the quality of life, the lower should be the under-five mortality rate and the higher should be the adult literacy rate (see Table 1). The attention of companies to the demographic indicators of a country can (and should) inspire them to create new products/services that will increase the people's quality of life (demand-driven products/services). The trend is that people become intelligent and conscious consumers/users.[2]

Table 1 also indicates that countries with high population and high income per

capita tend to have high carbon-dioxide emission (CDE). The high-techness of a country tends to have high CDE in proportion with, among others, the number of population and the amount of income per capita. Again, companies are challenged to create product/services that can increase the quality of life, reducing polluted emissions of every product used, producing efficient and healthier cars, etc. These key indicators give inputs to companies about what, when, where, and how to innovate.

Table 2 shows indicators of economic activity in selected countries. It demonstrates that most of these countries have low level of economic activity. Indonesia has low agricultural productivity comparing to Malaysia, Philippines, Singapore, Thailand, Japan, and Sri Lanka. Table 2 also indicates that the more industrialized the country, the higher the value added of industry and service. In 2004 Malaysia's industry value added is the highest in the region; Singapore's and Japan's service value added are the two highest in the region.

The countries with low value added have opportunities to increase their sectional value added. Successful innovation pushes/allows increasing value added in industry and service. The more the country's companies innovate successfully in products/process/services, the higher the value added they can bring to the country.

Table 3 indicates the diffusion and creation of technology in selected countries. Most of the countries have low level of technology diffusion and low level of technology creation. Countries with high technology creation (indicators in columns 5-8) tend to have high technology diffusion (columns 2-4). The technology diffusion and creation inform us the level of innovation in each country. For example, Singapore and Japan are countries with high innovation rate. Malaysia is forthcoming.

The number of telephone mainlines, cellular subscribers, and internet users indicate the level of technology diffusion in the country (Table 3). The following indicators indicate the gap level between the actual and potential level of technology creation: the number of people who were granted patents and who received royalties and license fees, the country's R&D expenditure as a percentage of GDP, and the number of researchers in R&D. The actual level of technology creation is not as high as the potential level of technology creation if we take into account the population size in each country.

Based on the above description, Southeast Asian countries have large opportunities to innovate. With these opportunities, the countries face big challenges. Many successful companies (Asian and non-Asian companies in Asia) have already had innovation capabilities. They reside in high and upper-middle income countries like Japan, Singapore and Malaysia. They keep innovating. They are expanding their markets. They are outsourcing part of their economic activities to other companies located within their country or other countries in the region. Some successful innovative companies reside in other countries in the region. They reside in low-income markets.

From this standpoint, we raise questions on how to exploit the opportunities and how to face challenges. To answer the questions, firstly we need to understand the factors that can facilitate innovation in product/process/service organizations and to understand the hurdles to innovation. If the hurdles are not overcome, reduced or eliminated, they can hinder any innovation efforts.

Table 1. Key Indicators of Development in Selected Asian Countries

Country (World Bank Classification 2006)	Population Millions 2004	GNI per Capita Dollars 2004	GDP Purchasing Power Parity Billions 2004	Surface Area Thousand Sq. Km 2004	Adult Literacy Rate % Ages 15 and above 2004	CO2 emissions (metric tons per capita) 2002
Brunei (HIC)	0.388	NA	16.91	5.8	92.67	17.67
Cambodia (LIC)	13.8	350	36.61	181.4	73.61	0.04
Indonesia (LIC)	218	1140	673.6	384	90.38	1.44
Lao PDR (LIC)	5.8	390	16.27	83	68.73	0.23
Malaysia (UMC)	24.9	4520	173.49	124	88.69	6.32
Myanmar (LIC)	50	NA	80.78	106	89.89	0.16
Philippines (LMC)	81.6	1170	70.75	34.4	92.6	0.94
Singapore (HIC)	4.7	24,760	79.3	3.3	92.56	13.74
Thailand (LMC)	63.7	2490	70.52	21.2	92.65	3.7
Vietnam (LIC)	82.2	540	70.29	23.2	90.28	0.82
China (LMC)	1,300	1500	71.44	31	90.92	2.74
India (LIC)	1,080	620	63.46	65 2	61.01	1.16
Japan (HIC)	128	37,050	81 6	3 8	NA	9 43
Sri Lanka (LMC)	19.4	1010	74.42	14.1	90.68	0.54

Source: World Bank (2006) www.worldbank.org/data/

Table 2. Economic Activity in Selected Countries

Country	Value added as % of GDP Agricultural 2004	Value added as % of GDP Industry 2004	Value added as % of GDP Services 2004	High-tech exports % of manufactured exports 2004	Time required to start a business (days) 2004 (2006)
Cambodia	32.91	28.16	37.93	0.16	94 (86)
Indonesia	15.39	43.72	40.89	16.13	151 (151)
Lao PDR	46.77	27.52	25.71	NA	198 (198)
Malaysia	9.49	50.43	40.08	55.36	30 (30)
Philippines	13.66	32.46	53.9	63.85	50 (48)
Singapore	0.11	35.16	64.72	58.93	6 (6)
Thailand	10.07	43.49	46.44	NA	33 (33)
Vietnam	21.76	40.09	38.15	NA	50 (50)
China	13.11	46.23	40.67	29.81	48 (48)
India	21.13	27.15	51.72	4.86	89 (71)
Japan	1.31 (2003)	30.54 (2003)	68.16 (2003)	23.68	31 (31)
Sri Lanka	17.81	26.79	55.4	1.49	50 (50)

Source: World Bank (2006): www.worldbank.org/data/
The data for the selected indicators are not available for Brunei and Myanmar.

What challenges do the countries and companies in the region face? What should managers, policy makers, and management educators do?

The following text describes the challenges and insights being worth communicating to the innovation stakeholders in Southeast Asia. The description is based on a recent study on innovation management in Asia by Arnoud De Meyer and Sam Garg.

Table 3. Technology: Diffusion and Creation

Country	Telephone mainlines per 1,000 people, 2002 (2000)	Cellular subscribers per 1,000 people, 2002 (2000)	Internet users per 1,000 people, 2002 (2000)	Patents granted to residents (per million people), 2000-2003	Receipts of royalty and license fees ($US per person), 2002 (2000)	Payments for royalty and license fees ($US per person), 1997-2002 (1997-2000)	Researchers in R&D (per million people), 1990-2003 (1990-2000)
Brunei	256	401	102.3	NA	NA	NA	NA (282)
Cambodia	3 (3)	28 (35)	2.2 (2)	NA	NA	NA	NA
Indonesia	37 (39)	55 (67)	37.7 (39)	0 (0)	NA	NA	130
Lao PDR	11 (12)	10 (20)	2.7 (3)	NA	NA	NA	NA
Malaysia	190 (182)	377 (442)	319.7 (344)	NA	0.5 (0.8)	0.4 (0.7)	150 (294)
Myanmar	7 (7)	1 (1)	0.5 (1)	NA	NA	NA	NA
Philippines	42 (41)	181 (270)	44	NA (0)	NA	NA	156
Singapore	463 (450)	796 (852)	604.4 (508)	27 (58)	NA (47.3)	2.1 (2.2)	4,052 (4,362)
Thailand	106 (105)	260 (394)	77.6 (111)	3	0.1	0.1 (0.2)	74 (289)
Vietnam	48 (54)	23 (34)	18.5 (43)	NA (0)	NA	NA	274
China	167 (209)	181 (216)	46 (63)	5 (5)	0.1	1.1 (1.2)	584 (833)
India	40 (46)	12 (25)	15.9 (17)	0 (0)	NA	NA (0.8)	157 (120)
Japan	568 (472)	637 (679)	448.9 (483)	884 (882)	91.6 (96.3)	3.1 (3.1)	5,321 (5,085)
Sri Lanka	47 (48)	46 (73)	10.6 (13)	0 (0)	NA	0.2	191 (157)

Source: *Human Development Report* (HDR) 2004, pp.180-3; HDR 2005, pp.282-6.

Innovation Management in Southeast Asia

Thinking about innovation and implementing innovation in Asia is crucial. Why? First, not many countries in Asia have good indicators of technology diffusion and technology creation, value added of agriculture/industry/service, etc. (see Table 3). Second, globalization of everything is taking place. European and American companies (or companies from developed or high income markets or countries, name them 'West') go to 'East' (mostly low income markets) not only to market their products or services, but also to extend their production and R&D, tapping local resources and creating more value added to their products or services. Firm's globalization should challenge any country's companies to stay profitable and at the same time responsible companies in the long run. To innovate is the key to stay competitive and unique.

Third, the "poverty" of a country creates further "poverty" (poor image, poor products, poor quality of human resources, etc). Unless this vicious cycle is broken, this "underdog status" and "mentality" will become acute and true. Innovation, breaking the rules of "traditional image" of most part of these countries, is critical. De Meyer & Garg (2005) report the findings of their study on the aforementioned hurdles of innovation management in Asia based on a two-phased research study on innovation management in Asia. They did 35 case studies[iv] and obtained survey data from 336 senior managers operating in Asia. The senior managers were asked to give their opinions on 32 statements about the key success factors that would affect innovation management (in a positive or negative way). The survey items reflect more the hurdles than the success factors. (See De Meyer & Garg 2005:35-6.) The authors unveiled the hurdles of innovation that are hypothetically faced by Asian and non-Asian companies in Asia. Making the hurdles emerge on the surface will help apply the ("universal") principles of innovation management in Asia and help diagnose what is wrong with and in their implementation.

The following text demonstrates result from their observation on innovation management in Asia and my observation on organizational integration.

De Meyer & Garg underlined eight principles of innovation management that are applicable worldwide for all types of organizations. The challenge is in their applicability in the countries and companies of the region and in their application within the context of Asian innovation management. Eight challenges were identified. (1) Have Southeast Asian countries and companies had excellent *leadership* to lead the innovation inspiration and implementation? If not, how do they cope with the problem of leadership? (2) Have they been able to *calculate risk* of any innovation implementation? (3) Have they been *creative?* (4) Have they felt the need for *integration?* (5) Have they been able to manage project successfully? (6) Have they searched for any *relevant information* as the crucial resource for effective innovation? (7) Have they guaranteed *the protection* for results of creative efforts? And (8) have they well understood the current and potential *market?* Are they able to change the business models to create higher value?

Box 1 outlines the interdependent principles of innovation management. De Meyer & Garg's findings show that the implementation of the principles of innovation management in Asia was hindered by several difficulties.

The question, how do the countries and organizations in Asia cope with the challenges and allow the principles of innovation to grow, develop, and sustain in the region?

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This section describes favorable factors to innovation at the macro and micro levels. At the macro level, we gratefully acknowledge the contribution of De Meyer & Garg (2005). At the micro level, we refer to Fontana (2003) on organizational integration, the fourth principle of innovation management. Both levels of description have implications to managers, policy makers, and management educators. The managers are to diagnose the extent to which the principles of innovation management are present and have been implemented in their organizations. They must be able to answer the questions on how to plan, how to organize, how to lead, and how to evaluate the practice of innovation management in their companies.

The policy makers are to evaluate the country's conditions and ask whether the country has already had enough support for the innovation implementation. The policy makers are to ensure the support for the emergence of innovation by local people or local companies. As an illustration of a challenge for policy makers: the indicator of *time (number of days) required to start a business* (Table 2 Column 6) shows the hurdles for innovation implementation. What is the root of the problem? How do we use opportunities of innovation?

The management educators are to popularize the principles of innovation management to actors of innovation and to future actors of innovation. They are to feed forward and/or to give feedback to any effort of innovation by developing relationships with the business world and showing relevancies of the collaboration between the education and the business world for the good of the society.

In managing innovation, Southeast Asian countries need consider the difficulties to overcome within the context of Southeast Asia and each country in Southeast Asia. De Meyer & Garg (2005) show five hurdles within the context of Asian region; Fontana (2003) shows them within the context of organizational integration. In sum, any organizational factors facilitating innovation must consider contextual factors of its environment (country, culture, mindset, market, customer profile, demographic profile, etc.).

The presence of innovation hurdles is the factor that differentiates the implementation of innovation management in West countries (without those hurdles) from the one in East/South Asian countries (De Meyer & Garg 2005:29). The five categories of hurdles are presented below.[v]

First, the scarcity of resources needed for innovation (e.g., number of researchers in R&D, time required to start a business, low income markets). Most of the countries lack of qualified people needed to create innovation in the region. De Meyer & Garg (2005:30) show lower numbers of scientists/engineers in several countries in proportion to the total population of each country. The dominant mind-set is "cost reduction" rather than "new value creation." Most Asian managers still think too often in terms of product maps rather than process and process capability maps so that only low value creation is gained. High value creation demands changing the business models (i.e., change consistently the target customers, value delivered to customer, and the how to create the customer value).

Box 1. Principles of Innovation Management

1. There is no innovation without leadership.
2. Innovation requires calculated risk management.
3. Innovation is triggered by creativity.
4. Innovation requires organizational integration.
5. Success in innovation requires excellence in project management.
6. Information is the crucial resource for effective innovation.
7. The results of creative efforts need to be protected.
8. Successful innovation is rooted in a good understanding of the market.

Second, markets that stimulate innovation are geographically and/or culturally far away or are too small. They have little knowledge about brand building and about developing sophisticated distribution channels or advertising. There are high physical distance between the buyers and producers, lack of market knowledge, and lack of market knowledge needed to develop new products or process or services. They have unreliable market data and/or market research.

Third, existing industrial policies are aimed at catching up with the industrialized world rather than at seeking value creation through innovation (macro economy issues matter more than micro economy issues do). Governments favor public firms, privileged firms and entrepreneurs. For illustration, most of the countries require more time to start a business; in 2005 Singapore needed only 6 days vs. Indonesia needed 151 days to start a business. The practices emphasize more on creating economics rents than creating economic values.

Fourth, many organizations have innovation-averse organizational cultures; as a consequence there is self-fulfilling prophecy of an underdog mentality and a hierarchical organization that hinders creativity. Many firms in Asia are either family owned or have a strong family culture where low cognitive distance is counterproductive to innovation. Asian goods were often perceived in industrialized countries as cheap goods, low-cost and low-value work thus low quality in export markets is sometimes reinforced by the poor self-image of Asian companies. Low value creation activities are dominant in trading, exploiting information asymmetry and property (land) deals.

Fifth, there is a considerable lack of appreciation for intangibles in Asia. Brand building is open neglected or reduced to find a cute name. There is absence of good design capabilities. Table 3 shows the low number of patents that are granted to residents and the low receipts of royalties and license fees; on the other hand they have to pay the royalties and the licenses (negative balance) to high-income markets/ countries.

After having presented the results of De Meyer & Garg's case studies on how innovation management in Asia, Table 4 shows the favorable and unfavorable factors to innovation management in the region as perceived by the senior managers. On one hand, the managers still find positive factors existing in their companies such as the quality of managers, engineers, designers, and a strong emphasis on efficiency attitude. On the other hand, they find some factors as barriers: quick imitation by competitors, inadequate protection of intellectual property rights, insufficient project management capabilities, etc. The managers also perceive some of the favorable and unfavorable factors as challenges to their innovation management implementation (see Table 5).

De Meyer & Garg identified ten underlying factors of hurdles (challenges!) that explain the differences in opinions in the sample of 336 senior managers. In the order of decreasing importance, the ten underlying factors[vi] are: (1) the absence of an environment in Asia in which it is easy to operate as an innovator; (2) the underdog mentality of the Asian company; (3) the lack of some knowledge resources; (4) the inertia created by the forces of tradition in Asian business; (5)

the lack of basic management models and lessons specifically applicable to innovation management in Asia; (6) the negative impact of government; (7) no perceived need to innovate; (8) the lack of external pressure and business rewards for innovation; (9) the lack of good market understanding; and (10) the traditional cost reduction attitude.

Of the ten factors aforementioned, researchers only find significant differences on factor "no perceived need to innovate." *Non-Asian managers felt that the perceived need to innovate was lower* than managers of Asian firms did. For other nine factors, both Asian and non-Asian managers have no difference in perception.

After having explained the differences between the respondents, De Meyer & Garg explored to what extent the 336 respondents with common characteristics could be grouped. They found four distinct groups with strong common characteristics (Table 6).

De Meyer & Garg's study results underlined four headings that are worth paying our attention.

Firstly, we can identify a set of factors that are specific to Asia and that influence the implementation of innovation management in Asia. Secondly, we can determine the factors (among the ten factors) on which managers in Asia differ in their opinion about innovation management. Thirdly, we can conclude that there are minor differences between managers from Asian and non-Asian companies in interpreting the ten factors mentioned above. And fourthly, we can group Asian/non-Asian companies in Asia into different groups that need special approach/solution to innovation management implementation as not all companies/respondents see the importance of the factors specific to Asian management in the same way.

Innovation starters need more basic management education on innovation and project management. *Traditional fighters* need to be able to escape the traditional Asian heritage and perhaps the infusion of new employees coming from different environments can help. *The poor in knowledge resources* need access to engineers, designers, managers and knowledge. They may benefit from initiatives by the government or private organizations that enable technology and people transfer. And *the stuck in the muck* may request changes in government policies that enable innovative behavior. De Meyer & Garg concluded that the principles of innovation management in Asia are the same as else-where, but that the implementation of these principles may differ [from Asian to non-Asian countries and from country to country].

This study has implications to managers, policy makers, and management educators. Managers, policy makers, and management educators can help Asian companies to become more innovative (adapted to the different characteristics of each innovation type group). Management educators, in collaboration with local managers and policy makers, can extend this study to the country-specific environment. Further study should focus on each country by involving various companies (country and non-country companies).

For managers, it is useful to know the type(s) of innovation of their companies. For policy makers, it is useful to know the maps of the country's and companies's innovation types, innovation implementation and results, and policy that should be introduced to facilitate the

Table 4.
Managers's opinion of positive and negative factors to innovation management in Asia
(De Meyer & Garg 2005:39)

Most positive factors (Favourable Factors)	Most negative factors (Hurdles/Difficulties to overcome)
• Quality of managers • Quality of engineers • Quality of designers • Quality of competitive intelligence • Asian customers perceive Western goods to be better than Asian ones • Strong cost reduction attitude	• Quick imitation of innovative products by competitors • Inadequate protection of IPR • Insufficient project management capabilities • Inability to reconfigure existing capabilities into new products • Unsophisticated existing customer base • Lack of reliable marketing data

Table 5.
Managers's opinion of challenges for innovation management in Asia
(De Meyer & Garg 2005:39)

Least often cited top challenges	Most often cited top challenges
• Mainstream international business media focus on negative news from Asia • Geographical distance from Western markets • Asian customers perceive Western goods to be better than Asian ones • Lack of pressure from financial markets • Western markets look down on Asian goods	• Disengaged employees • Strong cost reduction attitude • Insufficient project management capabilities • Inability to reconfigure existing capabilities into new products • Inadequate IPR protection • Inadequate risk capital

Table 6. De Meyer & Garg's typology of Innovators

Type of innovators	Have trouble with (hurdles to overcome)	Have less problems with
Innovation starters	Appropriate management methods for innovation Lack of a perceived need to innovate	Underdog mentality Inertia due to traditional Asian management style Lack of external rewards for innovation
Traditional fighters	Underdog mentality Inertia due to traditional Asian management style	Availability of knowledge resources Lack of a perceived need to innovate
Poor in knowledge resources	Availability of knowledge resources	Appropriate management methods for innovation
Stuck in the muck	External rewards for innovation Influence of the government Underdog mentality	Availability of knowledge resources Appropriate management methods for innovation Cost reduction attitude

country's innovation. For management educators, it is useful to know the whole big picture and prepare for the teaching materials that can help facilitate the process of innovation management and the implementation of innovation management principles.[viii]

The following section describes briefly the findings of a survey on factors facilitating the achievement of organizational integration in innovation process. The units observed were R&D (Research and Development) and manufacturing in product organizations. The section presents the favorable factors to organizational integration and the hurdles of organizational integration.

Organizational Integration

The challenge of organizational integration is not exclusive to Asian firmsperhaps large non-Asian firms suffer even more from a lack of organizational integration (De Meyer & Garg 2005:138).

Organizational integration is one of the basic principles of innovation management. A survey (Fontana 2003) explored 17 factors that facilitate the organizational integration in new product development process (innovation process). The survey also observed the integration gap existing in the organization's innovation process, as perceived by the actors of innovation (project leaders or team leaders).

Box 2 shows the presence of integration gap between R&D and manufacturing during the innovation process. The gaps were obvious: the degree of expected organizational integration had not been achieved; the achieved organizational integration was not the expected one. Nineteen areas of R&D and manufacturing integration were observed. We see greater integration gaps in downstream or implementation phase of innovation process than in upstream or initial phases of innovation process. The absence of favorable factors was hypothesized to influence the presence of this gap.

The 17 factors that facilitated the integration are grouped into contextual organizational factors, organizational structure factors, organizational climate factors, and individual factors. We hypothesized that the presence of favorable factors can lower the integration gap and help organizations achieve their innovation performance. Of the 17 factors, nine factors explain more than 40% of the variance (see Table 7).

I summarize below the factors that facilitate the innovation process.[x]

Favorable Factors to Innovation

- **Contextual factors**

The following three factors are contextual: organizational strategy, environmental uncertainty, and product/process newness.

Organizational strategy. The prospectors, the companies who focus on innovation and growth, will require higher organizational integration both in the initial and implementation phases of the innovation process than the other strategists will. Innovation is facilitated if the organizational strategy focuses on innovation and growth. Leadership matters!

Environmental uncertainty. The presence of environmental certainty is a necessary condition to achieve the required organizational integration. This is particularly necessary for the organizational integration in the implementation phases. Innovation is the way to cope with the world of uncertainty. Organizational integration facilitates the organizations to cope with the environmental uncertainty so that the innovation can be implemented.

Product/process newness. The higher the product/process newness or innovativeness, the higher the need for information on manufacturing specifications or supplier limitations or both. The higher the product/process newness, the higher the needs for cross-functions involvement before freezing product design. The lower the product/process newness, the higher the need for organizational integration to ensure the manufacturability and the production cost efficiency of the modified products.

Doing innovation in Asia needs to consider more contextual factors both in the country level and in the organizational level.

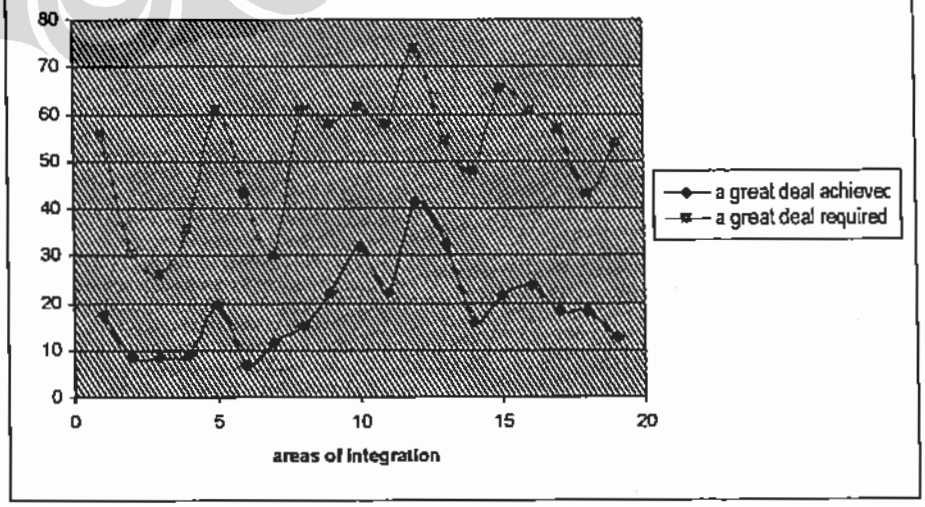
- **Organizational factors**

The study found that structural dimensions affect differently the organizational integration. While formalization is necessary in the implementation phase of innovation process, participation in the decision-making process is necessary in the initial phase of innovation process.

The higher degree of *formalization* facilitates the organizational integration that will be achieved in the implementation phase.[xi] (2) The findings validate the hypothesis that the greater the degree of *autonomy* in decision-making process, the greater the degree of organizational

Box 2. Integration Gaps

"a great deal is required but not yet achieved"



integration that will be achieved. (3) The higher the degree of *participation* in the decision-making process on adopting new product ideas and programs, the greater the degree of integration that will be achieved during the idea/concept generation and concept/product development phases. The higher the degree of participation in the decision-making on the modification of the existing products, the higher the degree of integration that will be achieved in the implementation phase of innovation process.

(4) *Cross-functional modes of coordination* facilitate the organizational integration. There is positive association between types of coordination modes applied in the innovation process and the degree of integration that will be achieved. The organizations who implement the cross-functional team mode will achieve more organizational integration than those who implement the manufacturing sign-off mode, integrator mode, or product/process mode will.

(5) *Senior management* plays significant roles in facilitating the organizational integration. The more the senior management recognizes formally the need for integration from the beginning to the final phases of innovation process, the greater the degree of integration that will be achieved. The more the senior management rewards jointly the innovation cross-functional team for innovation success from the beginning of the process, the greater the degree of integration that will be achieved. The more the senior management encourages risk-taking behaviour in the concept/product development phase, the greater the degree of integration that will be achieved. (6) The findings validate the hypothesis that the more *harmonious* the cross-functional *relationship*, the greater the degree of integration that will be achieved. (7) Having perceived that a great deal of organizational integration is needed cannot guarantee or predict the degree of integration that will be achieved. The facts that the product development personnel have had exposure to business (courses, training, etc.) cannot either predict the degree of integration that will be achieved. (8) The higher the degree of *feedback mode of communication* between the upstream and downstream functions in the innovation process, the higher the organizational integration that will be achieved. The more an organization practices the integrated problem-solving mode, the higher the organizational integration that will be achieved. And (9) the higher the *upstream group's capability* in solving problems, the higher the organizational integration that will be achieved.

Table 7. Favorable factors to organizational integration are dominated by organizational factors[i]

Organizational structure: • The degree of autonomy (80.87% variance) • The degree of formalization (71.45% variance) • The degree of participation (56.65% variance)
Organizational climate: • The senior management encouraging risk-taking behaviour (72.34% variance) • Upstream group's capability in providing downstream-friendly solution (71.63% variance) • Upstream group's capability in solving problem quickly (66.94% variance) • R&D/manufacturing relationship (52.16% variance) • The senior management recognizing formally the need for integration (41% variance)[ii]
Individual factors: • Tolerance for ambiguity (55.46% variance)

- **Individual factors**

The following factors are individually attached to each organizational unit involved in the innovation process. (1) The higher the *tolerance for ambiguity*, the higher the organizational integration that will be achieved in the idea generation phase. The lower the tolerance for ambiguity, the higher the organizational integration that will be achieved in the implementation phase, e.g., in designing products for manufacturability. (2) The more the *preference* for a highly functional product that is elegantly engineered than a manufacturable product that works, the lower the organizational integration that will be achieved. The more the preference for a high-risk, high-return project, the higher the organizational integration that will be required. (3) Shorter organizational *time orientation* forces greater degree of integration achievement than longer time orientation does. The shorter the *time orientation*, the greater the organizational integration that will be required, especially in the phase of product design development for manufacturability. The higher the time allocation for involvement of different units in the product design development for manufacturability phase, the higher the degree of integration that will be achieved, and the shorter the time needed to finish the project, etc.

Table 8a to Table 8d summarize the findings of the effects of the factors on the required and achieved degree of integration.[iii]

The findings indicate: different organizational factors affect differently the organizational integration in different phases of the innovation process. Leadership, which is not deeply covered in this study, plays role in orchestrating various organizational factors that can facilitate innovation process in different phases. As an illustration, the findings suggest that organization needs higher tolerance of ambiguity to achieve organizational integration during the idea/concept generation phase than in the product-process design for manufacturability phase. Thus, different levels of tolerance of ambiguity can affect "equally well" the achievement of organizational integration in different phases of the innovation process.

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A creative breakthrough becomes an innovation when it has led to economic success for the firm. When innovating we need to make the distinction between

technical, commercial and economic success. Technical success means that we are able to translate our dream or idea into a real product, service, system, or process. This is the step of invention. It requires a lot of hard work and creativity, and is clearly a necessary condition for success in innovation. But many technically successful products have ended up on the waste dump (see De Meyer & Garg 2005:14).

I tested the direct effects of organizational integration on innovation performance, with the hypothesis "the lower the gap between ideal organizational integration and actual organizational integration, the higher the innovation performance." I used five innovation performance constructs: product conceptualization performance, product development performance, time-for-development performance, product introduction performance, and product sales performance. The results are briefly summarized in Table 8d.

The findings provoke statements such as the following. (1) Lack of R&D/manufacturing organizational integration in the initial phases will affect the time needed for product development (time-for-development performance). (2) Lack of organizational integration in different phases of innovation process will extend the time needed for innovation. (3) Lack of R&D/manufacturing organizational integration in the product-process design for manufacturability phase will affect the *product development performance and the product introduction performance.* (4) Lack of organizational integration in different phases of innovation will affect the *product development performance* and the *product introduction performance.* (5) Organizations will face innovation performance trade-offs in achieving *product development performance* and *product introduction performance* (when integration gaps are low in the *product-process design for manufacturability phase*) or achieving time-for-development performance (when integration gaps are high in the pre-test/validation phase). (6) Organizations will face trade-offs in implementing R&D/Manufacturing integration in *the product-design development phase* or in the *product-process design for manufacturability phase*. R&D/manufacturing integration is more urgent in product-process design for manufacturability phase. Organizations will face innovation performance trade-offs if the organization integration between and/or among units is not well-managed. Insight: different units of an organization need to integrate in different degrees and in different phases of innovation process. Leadership matters!

Table 8a. Summary of results: contextual factors and organizational integration

The required degree of integration is	REQ1	REQ2	REQ3	REQ4	REQ5
An increasing function of prospector strategy	NO**				
An increasing function of reactor strategy	YES*			NO**	
An increasing function of the perceived level of (external) environmental uncertainty			NO**	NO**	NO**
An increasing function of radical project (prospector, reactor)	YES*	YES*	NO**		NO**
An increasing function of radical project (analyzer, defender)		YES*	NO**		NO*
An increasing function of incremental project				YES**	

Significant levels: ***p<.01, **p<.05, *p<.10
REQ1: required integration in the planning phase of the innovation process
REQ2: required integration in the idea/concept generation phase of the innovation process
REQ3: required integration in the product-design development phase of the innovation process
REQ4: required integration in the product-process design for manufacturability phase of the innovation process
REQ5: required integration in the pre-test/validation phase of the innovation process

Table 8b. Summary of results: organizational factors (structure) and organizational integration

The achieved integration is	ACT1	ACT2	ACT3	ACT4	ACT5
An increasing function of formalization					
An increasing function of autonomy1				NO**	
An increasing function of autonomy2	NO**	YES*	YES**	YES**	
An increasing function of participation		YES*	YES**		
An increasing function of cross-functional team mode	NO*			YES*	YES**

Significant levels: ***p<.01, **p<.05, *p<.10, *p<.15
Autonomy1: actions are taken without the approval of a superior
Autonomy2: small matters not have to be referred to someone higher-up for a final answer
ACT1: achieved integration in the planning phase of the innovation process
ACT2: achieved integration in the idea/concept generation phase of the innovation process
ACT3: achieved integration in the product-design development phase of the innovation process
ACT4: achieved integration in the product-process design for manufacturability phase of the innovation process
ACT5: achieved integration in the pre-test/validation phase of the innovation process

Barriers to Organizational Integration

I observed several barriers to organizational integration. These barriers were perceived by the managers/survey participants. The observed barriers are grouped in three categories: organization barriers, political barriers, and cultural barriers. The items of barriers listed below are limited to the items perceived by 10% or more of the respondents (see Box 3 - Box 5).

Physical Distance

Forty-one percent of respondents perceived physical distance as a barrier to integration ("different locations between product and process engineers"). The issue related to the question whether low physical distance facilitates the organizational integration.

Co-location between R&D and manufacturing or between design and manufacturing in innovation process can facilitate the communication between people from different functions. However the absence of co-location is not always a barrier to integration. Some research findings suggest that co-location of manufacturing with marketing or R&D does not promote collaboration; department co-location

Table 8c. Summary of results: organizational factors (climate) and organizational integration

The achieved integration is	ACT1	ACT2	ACT3	ACT4	ACT5
An increasing function of Senior Management (SM) recognition of cross-functional integration in general					NO**
An increasing function of SM recognition of organizational integration	YES*				
An increasing function of SM recognition of inter-functional personnel rotation		YES**	NO**	NO**	
An increasing function of SM encouragement for risk-taking behaviour			NO**		
An increasing function of SM jointly rewarding the innovation team		YES**	YES*		
An increasing function of management blaming one function or another for product failures	NO**				
An increasing function of harmonious inter-functional relationships	NO**	YES*	YES*		YES*
An increasing function of serial mode of communication			NO*		
An increasing function of integrated mode of communication		YES**	YES**	YES**	
An increasing function of upstream group's capability			YES*	YES*	YES*
An increasing function of one's tolerance of ambiguity	YES***	NO**	NO**	NO*	
An increasing function of preference for risky projects					YES**
An increasing function of very short-term time orientation			NO*		
An increasing function of short-term time orientation					YES*

Significant levels: ***p<.01, **p<.05, *p<.10, *p<.15

Table 8d. Summary: integration gaps and innovation performance

INTEGRATION GAP	AFFECTS NEGATIVELY PERFORMANCE IN	AFFECTS POSITIVELY PERFORMANCE IN
INITIAL PHASE: in planning phase	time-for-development*	
INITIAL PHASE: In idea/concept generation phase	time-for-development**	
IMPLEMENTATION PHASE: In product design development phase		product development** product introduction**
IMPLEMENTATION PHASE: In product-process DFM phase	product development*** product introduction***	
IMPLEMENTATION PHASE: In pre-test/validation phase		*time-for-development**

Significant level: ***p<.01, **p<.05, *p<.10

does not necessarily have a beneficial effect on interaction, collaboration, performance, and satisfaction. Socio-integrative mechanisms (such as cross-functional teaming and co-location) are positively related to designmanufacturing integration for new designs only.

In sum, co-location (to reduce the physical distance, permanently or temporarily) can be used to increase the quantity and quality of cross-functional communication as proximity is a powerful shaper of relationships. However, the implementation of co-location is not simple because co-location can increase communication with one group and decrease it with others. As a trade-off decision, organization designers need to look to the strategy and the work flow for help in making this decision. For instance: when the business unit is reducing time-to-market for new products and employing simultaneous engineering, the product design group would be located with manufacturing people.

Cultural Barriers

Interms of design for manufacturability, when particular cultural values and underlying assumptions have evolved over the years to define the social worlds of the design and manufacturing engineers, these socially constructed meanings are apt to endure even when management begins to espouse the philosophy of cooperation and customer orientation.

The respondents's opinions and perceptions of the barriers to integration between R&D and manufacturing give some insight on possible explanations to factors influencing R&D/manufacturing integration in particular and organizational integration in general.

Concluding Remark

First, macro economy and demographic indicators show challenges and opportunities for innovation in each country and in companies in the country/ region. Many countries in Southeast Asia can learn from successful countries in the region. Second, the success of innovation process depends on the implementation of eight principles of innovation management. Organizational integration is one of them. Third, innovation management principles are applicable in every organization and country. Fourth, organizations are facing innovation hurdles that should be overcome. And fifth, favorable factors to innovation management are to create and develop from within the countries and organizations. These factors are the principles of innovation management and the conditions of "how" each principle of innovation management can be present and stay productively within the organizations that must innovate or that want to innovate.

Using the two-phased research and study instrument on innovation management (De Meyer & Garg 2005), further research will extend the number of cases under study by inviting more companies in Southeast Asia (Asian and non-Asian firms that will be selected on their successful innovative and failed innovative products and/or services offered to the market). A research network (in collaboration with concerned organizations) should be organized to study innovation management in each country of Southeast Asia. The research aims at gaining information and insights from the observations on how companies implementing Innovation Management lessons (1) that are applicable worldwide; that are needed for broad localization

Box 3. Organization Barriers

- Different locations between product and process engineers (41.3% of 46 NPDQ respondents)
- Different budgeting practices (26.1%)
- Organization's emphasis more on efficiency and minimizing information-processing requirements (23.9%)
- No organizational ability to rapidly absorb change (19.6%)
- Lack of early manufacturing equipment vendor involvement in the product design stage (19.6%)
- Different criteria for performance evaluation (17.4%)
- R&D's lack of time to establish close relationships with Manufacturing (17.4%)
- Separate purchasing departments of manufacturing and process engineering (17.4%)
- Different working locations between R&D and Manufacturing people (13%)
- Highly mechanistic organization (10.9%)

Box 4. Cultural Barriers

- Manufacturing's excessive focus on production cost (37%)
- R&D's people reluctance to understand Manufacturing's language (34.8%)
- R&D's different working environment/atmosphere from Manufacturing's (34.8%)
- Poor communication between R&D and Manufacturing (28.3%)
- Manufacturing people not understanding R&D's language (26.1%)
- Different languages spoken: product engineers speak the language of engineering analysis and test results whereas Manufacturing engineers speak the language of machining processes and manufacturing efficiency (23.9%)
- Different value systems: R&D people value a highly functional product that is elegantly engineered whereas Manufacturing people value a manufacturable product that works at minimum cost (17.4%)
- Manufacturing's "wait and see "attitude (15.2%)
- Unreliable data from Manufacturing (13%)
- Elitism in R&D (10.9%)
- Different educational backgrounds (10.9%)

Box 5. Political Barriers

- Emphasis on individual competitiveness over teamwork (39.1%)
- Conflicting career/Design for Manufacturability goals: R&D people's orientation more toward their profession than toward product and company (34.8%)
- Conflicting interdepartmental goals (28.3%)
- Lack of incentive for Manufacturing to take risks (26.1%)
- R&D people's rare visit to the plants (23.9%)
- Product engineer's considerable power over product specifications (19.6%)
- Conflicting customer-supplier goals (15.2%)
- R&D's lack of knowledge of manufacturing implications on design decisions (15.2%)
- Product engineer's great deal of formal authority (10.9%)

in Asia; and (3) that are needed for broad localization in each Southeast Asian country. The types of innovators identified by De Meyer & Garg (2005) can be re-explored within the context of each Southeast Asian country. While the study of De Meyer & Garg (2005) focused on item factors that were observed as unique to Asian innovation management, further study can observe the "behavior" of organizational factors within the context of Asian and non-Asian companies in each Southeast Asian country. U

Endnotes

i Definition in De Meyer & Garg (2005:12).

ii The groups are: low income (LIC), $745 or less; lower middle income (LMC), $746-2,975; upper middle income (UMC), $2,976-9,025; and high income, $9,206 or more. GNI: Gross National Income; NA: data not available.

iii Consumer and user may not be the same. In the case of an industrial product, the customer is a company; the user is the employee who does not often have any power over the purchasing decision. It also applies to consumer products. When we evaluate how the potential innovation makes a difference in the value/price relationship, we need to take into account the perception of the buyer-customer and/or user (see further De Meyer & Garg 2005: chapter 2).

iv The authors studied cases of 35 companies located in 11 Asian countries (3 companies in China; 2 in Hong Kong; 7 in India; 1 in Indonesia; 1 in Malaysia; 3 in Philippines; 5 in Singapore; 5 in South Korea; 1 in Sri Lanka; 2 in Taiwan; and 5 in Thailand).

v Those five categories of observations were based on their interviews led to an abundance of potential hypotheses about what really hinders innovation management in Asia. The results of their interview were translated in 32 statements about the key success factors that would affect innovation management in a positive and negative way (see De Meyer & Garg 2005:35, Box 3.2).

vi Factors 1 to 5 explain more than 40% of the variance.

vii To my observation, until today not many books on innovation have been written based on the context of where the innovation is taking place...many hurdles that are specific to some country or region or types of companies have not been taken into account.

viii The factors in Table 7 are the results of the exploratory factor analyses on the constructs with reflective indicators under mild skewness conditions. Based on the analysis of correlation between the independent and dependent unidimensionalities (constructs) from the exploratory factor analyses, I obtained significant results of correlation between or among the indicators rather than between or among the constructs.

ix This factor covers the items of senior management investment in design tools and methods that create a language in which R&D and Manufacturing can communicate and interact; senior management valuing the cooperation and collaboration between R&D and Manufacturing; senior management investing in education, training, and experience to assure the depth and quality of the skills and capabilities of R&D and Manufacturing people; and senior management providing opportunities to R&D personnel to understand manufacturing's concerns in new product development process.

x Readers who are interested in detail findings of the correlation-based analysis can contact the author.

xi Most of the findings on *formalization achieved integration* invalidated the hypothesis that "the lower the degree of formalization, the higher the organizational integration that will be achieved."

xii Readers who are interested in detail findings of the analysis using partial least squares path modeling can contact the author.

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