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Critical success factors for new product development in the Hong Kong toy industry

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Abstract

Hong Kong's manufacturers have become some of the world's most efficient toy producers, and are also the world's biggest exporter of toys. However, the Hong Kong toy industry is mainly Original Engineering Manufacturing (OEM) and does not invest large amounts in R&D activities such as the development of new toy designs and the creation of new toys. With increasing competition from Mainland China and other Asian countries, it is important for Hong Kong companies to invest more in R&D and to develop their own design capabilities or more value-added edges which cannot be substituted easily by their competitors. Therefore, this research paper aims to explore the critical success factors (CSFs) for new product development (NPD) in the Hong Kong toy industry, and, novelly, examines both the project and functional levels. Using the Biblical Metaphor Model, this research identifies a group of critical success factors for each phase of NPD. Moreover, the research also reveals which factors have been implemented and which have not. The implications from this research, therefore, are rather obvious, and companies should be able to easily identify the areas in which improvement is needed in the future. Since the research is custom-designed for the Hong Kong toy industry, and previous research indicates that NPD is both country- and industry-specific, the specific results should not be applied to other industries in other countries. However, the actual research design and data analysis framework could be used to investigate the same problem in other industries.

Keywords: Critical success factor; New product development; Toy industry; Hong Kong

1. Introduction

The toy industry is one of Hong Kong's oldest and largest export industries, and it is generally agreed that Hong Kong is the world's leader in toy exporting. In 1996, its production output had reached HK$ 2.5 billion (HKTDC, 1999). One of the strengths of Hong Kong's toy industry lies in its ability to incorporate technology and skills from other industries such as clothing, electronics, and metal industries. Building on their base in plastic moulded toys, Hong Kong's toys manufacturers have added production skills from such industries. As a result, they have been able to upgrade the quality of their goods and obtain good profits. The second advantage of Hong Kong toy companies has been the movement of their locations of production to Mainland China and other Asian countries such as Thailand, Malaysia and the Philippines, so that product costs can be dramatically reduced. As a result, Hong Kong's role is shifting towards quality control, management, marketing, and new product design.

As well as their leadership in toy exporting, Hong Kong's toys manufacturers have also become some of the most efficient toy production managers in the world, particularly when toy production involves components made of different materials. Through their Original Engineering Manufacturing (OEM) contracts, Hong Kong's toy manufacturers are also well informed about the market trends in the major toy markets of the US, Western Europe, and Japan.

The market for toys is huge and remains promising. It is anticipated that the demand for toys will increase every year (HKTDC, 1999, 2000). In addition to high-tech toys, toys such as intelligent games and traditional toys will always have their place; no matter what happens in the field of technology, it is likely, for example, that girls will always want to comb a doll's hair, to touch the doll, or dress her. However, Hong Kong's toy exports have recently dropped in all the major current markets as shown in Table 1. Besides the financial crisis, there are other reasons. Hong Kong's toy industry relies on OEM contracts. More than two-thirds of sales are derived from licensing and contract

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Table 1
Market shares and growth rates of Hong Kong toy exports to its main markets

Market	1997		1998		1999	
	Share (%)	Growth (%)	Share (%)	Growth (%)	Share (%)	Growth (%)
USA	48.4	+13	50.2	−2	49.3	−3
EU	22.1	+9	22.6	−4	24.6	+8
Japan	7.0	+28	6.3	−15	3.6	N/A
Chinese mainland	4.0	+32	3.6	−16	3.6	N/A
ASEAN	2.1	+2	1.1	−49	1.4	+25

manufacturing for overseas toy companies (HKTDC, 1996). Many of Hong Kong toy companies do not invest much in R&D, such as the development of new toy designs or the creation of new toys. The lack of R&D and the tendency to produce under OEM contracts have also hindered the development of Hong Kong brand names, although there are a few internationally recognized Hong Kong brand names, such as Playmates, Videotech, and Universal Matchbox. Since the holders of brand names capture a significant percentage of a product's added value at the retail level, Hong Kong toy companies generally operate at relatively low profit margins.

A threat over the next few years will come from increased competition from toy manufacturers in Mainland China and selected companies from Southeast Asia. In Mainland China, the reform of state-owned enterprises could create dynamic, profit-motivated toy companies with a strong outward orientation. These companies will compete for OEM contracts currently held by Hong Kong companies. Therefore, it is important for Hong Kong companies to invest more in R&D, and to develop their own design capabilities or more value-added edges which cannot be easily substituted by their competitors. However, the history of Original Design Manufacturing (ODM) is relatively short, and experience in toy design and development is limited.

The research reported in this paper aims to explore the success factors for new product development (NPD) in Hong Kong toy companies. Research on the critical success factors (CSFs) for NPD is substantial (Balachandra and Friar, 1997; Cooper and Kleinschmidt, 1995; Spivey et al., 1997). However, researchers from Germany, Japan, Italy. and the USA have found that each country has traditional strengths and weakness in NPD (Jürgen, 2000). For example, the USA has particular strengths in the PC industry, Italy and Germany in the machine industry, and Japan and Germany in motor vehicles. These findings imply that NPD may be country-specific. There also seems to be little industry consensus on what constitutes 'best practice' concerning NPD (Jürgen, 2000, p.11). This implies that the successful factors for NPD are industry-specific. Recent research on NPD has tended to focus on specific industries, for example, the semiconductor industry (Iansitia and Westa, 1999), auto industry (Dröge et al., 2000), electronics industry (Orihata and Watanabe, 2000), and the food industry (Ilori et al., 2000).

With its global market, short product life-cycle (as short as a couple of months), small R&D team for each new product (one or two persons), and cross-border manufacturing in China and other Asia countries, the Hong Kong toy industry should specialize in NPD. However, no research investigation has been conducted on the success factors for NPD in Hong Kong toy companies. The research reported in this paper was designed especially to explore the success factors for NPD in the Hong Kong toy industry.

The paper is organized as follows. After this introduction, the relevant studies from the literature are reviewed in the second section. Research methodology and empirical data are reported in the third section, followed by data analysis and results in the fourth section. In the fifth section the results are discussed and implications explored. The final section summarizes the research.

2. Literature review

2.1. Critical success factors for NPD

Proficiency in NPD can contribute to the success of many companies. According to Poolton and Barclay (1998), 'if companies can improve their effectiveness at launching new products, they can double their bottom line. It's one of the areas left with the greatest potential for improvement.' Many studies have focused on CSFs associated with the success or failure of NPD. A selection of such research studies is reviewed below and summarized in Table 2.

Lynn et al. (1999) developed a model of the determinants of new product development success. They sent informants a series of cases and asked them to identify 11 key factors as shown in Table 2. Lester's (1998) study identified a range of potential problems that can derail well-intentioned NPD efforts. By working through these problems, Lester discovered 15 CSFs in five areas of new product development. Poolton and Barclay (1998) identified a set of six variables that have consistently been identified in the literature as being

Table 2
Critical success factors for NPD identified by previous researchers

	Critical success factors
Lynn et al. (1999)	Having a structured new product development process
	Having a clear and shared vision on the team
	Developing and launching a product within the proper time frame
	Refining a product after launch and having a long-term view
	Possessing the optimal team skills
	Understanding the market and its dynamics
	Securing top management support for the team and the team's vision
	Applying lessons learned from past projects
	Securing good team chemistry
	Retaining team members with relevant experience
Lester (1998)	Senior management commitment
	The culture of the organization
	Cross-functional teams
	Focus on adding value to the efforts of the venture team
	Provide strategy and fundamental guidelines
	Share a common understanding of the process
	Innovation requires expertise, skills, and motivation
	Generating good ideas
	Team formation events
	A detailed project tactical plan
	Clear goals and milestone measurements
	Shift to an external focus to run the new product venture
	Understanding in the venture team
	Communication to management
	The insight gained through reassessment efforts
Poolton and Barclay (1998)	Top management support for innovation
	Long-term strategy with innovation focus
	Long-term commitment to major projects
	Flexibility and responsiveness to change
	Top management acceptance of risk
	Support for an entrepreneurial culture
Cooper (1999)	Solid up-front homework to define the product and justify the project
	Build in the voice of the customer
	Seek differentiated, superior product
	Sharp, stable, and early product definition
	A well-planned, adequately researched, and proficiently executed launch
	Build tough go/kill decision points into your process
	Dedicated, supported cross-functional teams with strong leaders
	An international orientation: international teams, global products
	Provide training on new product management
	Define standards of performance expected
	Cut back the number of projects underway
	Install a process manager

associated with successful NPD. Cooper and Kleinschmidt (1995) studied hundreds of cases to reveal what makes the difference between winners and losers in the process of NPD. He extracted 12 common denominators of successful new product project and seven possible reasons (blockers) offered by managers for why the success factors are invisible and why projects seem to go wrong or are otherwise not well executed.

The factors proposed by these four studies are not exactly the same, and it is in fact difficult to generate a common set of CSFs for NPD. It is even harder to generate these factors for any specific industry. There are many other studies on CSFs or drivers for NPD (Balachandra and Friar, 1997; Cooper and Kleinschmidt, 1995; Spivey et al., 1997), but which are not reviewed one by one here. Montoya-Weiss and Calantone (1994) reviewed 47 research studies of the determinants of new product performance and found that each of these studies attempted to identify the factors that improve NPD success rates. However, each used a somewhat different method and produced different factors, thereby providing results that are useful but sometimes inconsistent with, or even contradictory to, other studies' results. What they do share however is a general focus on what is necessary for successful NPD. It is not clear, though, whether the factors identified by previous research can be applied to the toy industry in Hong Kong due to its particular unique characteristics.

Another difference in these studies is the level (or unit) of study. Most of the studies were applied at the company level and asked questions that can be answered by general managers. However, many practical issues are at the operational and functional level. To further understand these two issues, concerning industry specialty and the level or unit of research in NPD, the phases of NPD are discussed below.

2.2. Phases and concurrence of NPD

NPD is a complicated and time-consuming process in which several different activities are involved. The NPD process has been defined both by companies and the literature in terms of several distinct phases (Rosenthal, 1992):

Phase 1—Ideas Generation and Conceptual Design.
Phase 2—Definition and Specification.
Phase 3—Prototype and Development.
Phase 4—Commercialization.

It is widely recommended that NPD should overcome the phase-based process and shift to the integrated and concurrent approach. When recognizing the benefits of concurrent engineering (CE), some researchers believe that all activities and phases will merely 'phase out', leaving the focus on parallel issues. However, even in the CE environment, these physical phases or activities remain and are not completely mixed or blurred. The difference is that these activities are not sequential but are rather in parallel (although not completely in parallel) and are better co-ordinated by performing some of

Table 3
A matrix framework incorporating both phases and integrated, cross-functional product development

	Ideas generation and conceptual design	Definition and specification	Prototype and development	Commercialization
Top management			Candidate critical success factors?	
Marketing				
Engineering				
Quality				
Integration mechanism				
Cross-functional issues				

the downstream activities at earlier stages Anderson (1996). Concurrent engineering encourages consideration of downstream issues at an early stage and the starting of some of the downstream activities earlier than before, but does not imply 100% concurrence of all physical NPD activities. If one were to visit good examples of NPD with CE, it would be found that engineers and managers do not have cross-functional meetings every day. Very often, they do their own work at their own department, in which traditional activities and functions are still performed. The 100% parallel process as described in some studies (e.g., Andreasen and Hein, 1987) does not actually exist in reality.

Over-emphasizing the importance of the concurrent features of NPD may dilute its essential work. Without a distinction between the different phases or activities, people may forget what is their own work and it may be difficult to control or monitor the progress of the development project. Without an understanding of the basic phases and activities of NPD, research on NPD may be based only at company or project level without probing into activities on the floor. The process of NPD should be a balance of individual functions and cross-functional activities. Therefore, it is important first to understand the definition and management of the four phases as shown in Table 3, and then to understand how they should be overlapped or paralleled, as illustrated by the model of a Hong Kong case company in Fig. 1.

Cross-functional activities are only one part of an NPD process. Engineers and staff do not have to share

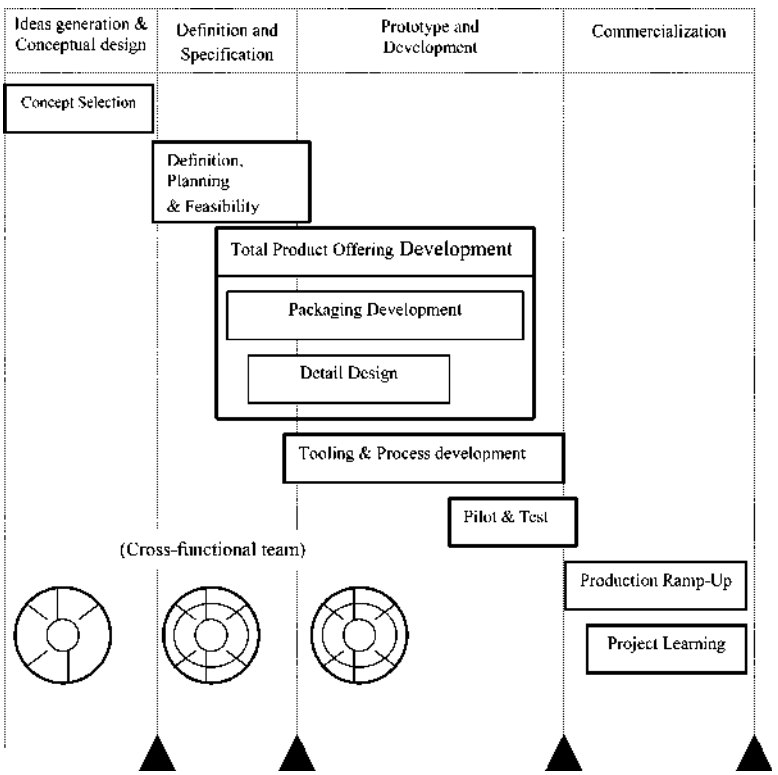

Fig. 1. An operational model for NPD in toy companies: parallel/overlapping activities in the background of phases.

information and knowledge every moment. Communication and co-ordination exist for the purpose of servicing their own work. CSFs identified by previous research are not relevant to all activities of a NPD process. For example, the right time to launch a project is related mainly to the marketing department and the final phase of NPD. In this study, those CSFs are allocated into each of the phases. The details of the allocating process are discussed in the next section on research method.

3. Research method

3.1. The variables and design

The research design of this study differs from previous research on CSFs for NPD. All previous research identified CSFs by causal correlation between candidate factors and NPD performance that were measured in terms of variables such as the market share of new products and the success rate of new products. However, this approach is not suited for this study, for several reasons. First, Hong Kong toy companies are relatively new to ODM and R&D. Therefore, historical data on NPD performance, such as the percentage of profit from a new product in the past or market share of new products, are difficult to obtain. Second, the research is applied down to the phase level. Activities or factors at the phase level may not have linear and direct relations with the final performance measurement. Considering these specialties, this research was based on the Delphi method by asking engineers and managers who are directly involved in each phases of NPD. The assumption, simply expressed, is that we believe that they know the process of NPD better than anybody else.

3.2. The questionnaire

A draft of the questionnaire was prepared based upon the CSFs identified by previous researchers (Table 2). All the possible CSFs were allocated to each of the four phases. An internal survey was conducted in one of the major Hong Kong toy companies to test whether the CSFs were relevant to the work at each phase and whether they were easily understood and answered. The informants were also asked to delete those factors that were not relevant to their work and add those that were relevant but which had hitherto not been included in the draft survey.

The returned questionnaires showed that the respondents found some factors were not clearly described and some terms could not be easily or fully comprehended. Also, some factors were not relevant to the toy industry. Furthermore, some questions could be answered only by senior staff such as general managers, directors, or senior engineering managers. In response to these comments from the internal survey, a second version of the questionnaire was designed, the items of which are shown in Table 5.

Table 4
Distribution of informants

Informants	No.	Percentage
Senior Management	8	15.7
R&D Manager	5	9.8
Engineering Manager	2	3.9
Project Manager	9	17.6
Quality Manager	1	2
R&D/Project Engineer	26	51
Total	51	100

The final questionnaire was divided into two parts. The first part enquired about basic information concerning the respondent, such as his or her involvement in the new product development, work experience, job position, and the nature of the product being developed. The second part of the questionnaire asked about the importance of each CSF among four product development phases. The respondents were also required to measure the extent of implementation of these factors. Both the degree of importance and the extent of implementation were measured using a 1–5 scale.

3.3. The survey

A total of 90 copies of the questionnaire were sent to eight toy companies in Hong Kong with which one of the authors has a contact. These companies included the four biggest in Hong Kong. The intended informants were those managers and engineers involved in NPD. A total of 55 questionnaires were returned within three weeks time, although only 51 of these were answered in the correct format. Of these 51 returned questionnaires, 51% were answered by R&D or project members, 17.6% by project managers, and 15.7% by senior management (Table 4). To ensure there was no bias from any group of respondents, *F*-tests of all the variables controlled by the respondent were conducted. Only for two variables were significant differences found, being ‘taking risk’ and ‘senior management support’. However, when the means of the each group of respondents were analyzed, it was found that the means of quality managers were significantly lower than those of others. However, as there was only one respondent who was a quality manager, this difference can be ignored.

4. Data analysis and results

The importance and degree of implementation of all the candidate factors in each phase were ranked by

Table 5
The importance and implementation of candidate factors in each phases of NPD

	Candidate CSF	The degree of Importance		The extent of implementation		Clusters
		Rank 1	Mean 1	Rank 2	Mean 2	
Phase I	Clearly defined target market	1	4.25	3	3.27	1
	Innovativeness of the product to the market	2	4.18	11	3.08	2
	Leadership of project leader	3	4.12	7	3.16	2
	Support by R&D skilled people	4	4.12	10	3.10	2
	Ideas generation by brain storming	5	4.12	9	3.12	2
	Cross-functional co-operation	6	4.08	15	2.86	2
	Flexibility and responsiveness to change	7	4.04	8	3.14	2
	Customer focus	8	4.00	4	3.24	3
	Cross level communication	9	3.96	12	3.06	4
	The team has a clear vision of the market	10	3.96	13	3.06	4
	Project budgets established	11	3.94	1	3.41	3
	Senior management commitment	12	3.94	2	3.39	3
	The willingness to take risk on NPD	13	3.88	14	2.94	4
	Technology capable	14	3.86	6	3.22	3
	Screening ideas by historical analogy.	15	3.63	5	3.24	3
Phase II	Implementation of quality standards	1	4.35	1	3.67	1
	Clear project goal	2	4.22	2	3.29	1
	The project team has a clear vision of project	3	4.18	9	2.94	3
	Leadership of project leader	4	4.12	6	3.10	3
	Consider issues in early stage	5	4.00	3	3.24	1
	Define the performance of the products	6	4.00	7	3.06	3
	Feasibility study of the NP to be developed	7	4.00	10	2.90	3
	A well established operational procedure	8	3.98	8	3.00	3
	Cross-functional co-operation	9	3.94	12	2.90	4
	Technical support by R&D people	10	3.90	11	2.90	4
	Senior management commitment	11	3.78	5	3.16	2
	Senior management delegation	12	3.73	4	3.22	2
	Provide training on NP management to staff	13	3.71	13	2.53	4
Phase III	Project is well scheduled & strictly monitored	1	4.25	8	3.24	1
	Internal communication within the project team	2	4.24	1	3.73	2
	Clear understanding of the operation	3	4.18	7	3.27	1
	Technical support by project and/or tooling staff	4	4.02	5	3.31	1
	Internal testing on product	5	4.00	12	2.98	1
	Product review meeting	6	3.98	10	3.10	1
	Produce pilot product	7	3.96	3	3.33	4
	Cross-functional co-operation	8	3.82	13	2.92	3
	Meet customer needs as per previous spec.	9	3.80	4	3.31	4
	Senior management commitment	10	3.73	9	3.12	3
	External laboratory test	11	3.69	2	3.37	4
	Shorten the time for prototyping	12	3.45	11	3.06	3
	Shorten the time for tool building	13	3.34	6	3.27	4
Phase IV	Delivery of the NP to customers on time	1	4.39	1	3.75	1
	Right time to launch	2	4.35	3	3.63	1
	Competitive product cost	3	4.22	2	3.69	1
	Availability of sale force, distribution resources	4	4.02	8	3.35	4
	A well established marketing plan	5	4.02	9	3.33	4
	The project team has a clear vision of market	6	3.98	10	3.29	4
	Senior management commitment	7	3.96	6	3.43	4
	Availability of production resources & persons	8	3.96	12	3.25	2
	Meet product specification	9	3.92	4	3.55	3
	Quick responsiveness to customer requirements	10	3.90	7	3.37	3
	Market testing	11	3.90	5	3.45	3
	Strong advertising promotion efforts	12	3.88	13	3.24	2
	Cross-functional co-operation	13	3.82	11	3.29	2

Table 6
The different combinations of importance and implementation: a framework for data analysis

	High importance	Low importance
High implementation	Promised Land	Changing Wine into Water
Low implementation	Broken Promises	Wandering in the Wilderness

the means of the degree of importance, as shown in Table 5. In each phase, the lowest means of all the factors exceed 3.4. This implies that all factors are important. However, the degrees of importance of the factors in each phase are still significantly different. *t*-Tests of the differences between the top and bottom factors for the four phases are $t = 4.16$ ($P < 0.001$), $t = 4.84$ ($P < 0.001$), $t = 5.22$ ($P < 0.001$) and $t = 4.21$ ($P < 0.001$), respectively. Taking the two variables (importance and implementation) into consideration, it was found that there are four types of factors associated with NPD in Hong Kong toy companies. They are 'high importance and high implementation in practice', 'high importance but low implementation', 'low importance but high implementation', and 'low importance and low implementation'. These four types of factors correspond to the four categories in the Biblical model of Hottenstein and Dean (1992), as shown in Table 6.

Factors in each phase were divided into four categories in the Biblical model. The division was made using *K*-means cluster analysis with the ranks of degree of importance and extent of implementation as two classification characters. The clusters are shown in Table 5 (far right-hand column). The factors were reorganized according to the cluster analysis and the Biblical model as shown in Table 7.

According to this Biblical model, only those factors that are in the category of the 'Promised Land' (i.e., high importance and high implementation) are the real, contributing factors. Those factors in the category of 'Broken

Table 7
Classification of factors into the Biblical model

	'Promised Land'—high importance, high implementation	'Broken Promises'—high importance, low implementation	'Changing Wine into Water'—low importance, high implementation	'Wandering in the Wilderness'—low importance, low implementation
Phase I	Clearly defined target market	Innovativeness of the product to the market Leadership of project leader Support by R&D skilled people Ideas generation by brain storming Cross-functional co-operation	Customer focus Project budgets established Senior management commitment Technology capable Screening ideas by historical analogy	Cross-level communication Team has a clear vision of the market The willingness to take risk on NPD
Phase II	Implementation of quality standards Clear project goal Consider issues at early stage	Project team has a clear vision of the project Leadership of project leader Define the performance of the products Feasibility study of the NP to be developed A well established operational procedure	Senior management commitment Senior management delegation	Cross-functional co-operation Technical support of R&D people Provide training on NP management to staff
Phase III	Internal communication within the projec team	The project is well scheduled and strictly monitored Clear understanding of the operation Technical support by project and/or tooling staff Internal testing on product Product review meeting	Produce pilot product Meet customer needs as per previous specification External laboratory test Shorten the time for tool building	Cross-functional co-operation Senior management commitment Shorten the time for prototyping
Phase IV	Delivery of NP to customers on time Right time to launch Competitive product cost	Availability of sales force, distribution resources A well established marketing plan Project team has a clear vision of the market Senior management commitment	Meet product specification Quick responsiveness to customer requirements Market testing	Availability of production resources and skilled persons Strong advertising and promotion efforts Cross-functional co-operation

Promises' are important but not implemented sufficiently and need to be improved in the future. Factors in the category of 'Changing Wine into Water' identify the areas in which companies are wasting their efforts on unimportant issues. Factors in the 'Wandering in the Wilderness' category are not relevant. The factors in each phase are analyzed below.

4.1. Idea generation and conceptual design (Phase I)

According to the respondents, the highly important factors at this stage include 'clearly defined target market', 'innovativeness of the product to the market', 'leadership of project leader', 'support by R&D skilled people', 'ideas generation by brain storming', 'cross-functional co-operation', and 'flexibility and responsiveness to change'. Among these high important factors, only one of them ('clearly defined target market') was implemented sufficiently (degree of importance rank = 1 and extent of implementation rank = 3) and falls into the category of 'Promised Land'. The other six factors all fall into the category of 'Broken Promises' indicating that, although these factors are important, they have not been sufficiently implemented in practice.

On the other hand, some factors that the companies themselves emphasize are actually not important according to the respondents. These factors include 'customer focus' (companies' rank 4 versus respondents' rank 8), 'project budget estimation' (rank 1 versus rank 11), 'senior management commitment' (rank 2 versus rank 12), the 'technology capable in production' (5 versus 14), and 'screening ideas by historical analogy' (5 versus 15). The inference is that companies should not put too much effort into these particular areas.

According to the respondents, 'cross-level communication', 'the team has a clear vision of the market', and 'the willingness to take risk' are not important, nor do companies emphasize them in reality. This is probably because the technology and cost of a small toy are not very high and the risk is not as high as in high-tech., big size, and expensive products such as PCs or cars. Factors falling into the category of 'Wandering in the Wilderness' may not be very relevant to this phase.

4.2. Definition and specification (Phase II)

Three factors for this phase fall into the category of 'Promised Land'. They are 'implementation of quality standards' (importance = 1 versus implementation = 1), 'clear project goal' (2 versus 2), and 'consider issues at early stage' (5 versus 3). The quality of toys is very important since toys are mostly exported to international markets while the standards in Europe and America are very high and strict. Project management seems much more important at this stage.

Five other important factors, however, fall into the category of 'Broken Promises'. They are 'the project team has a clear vision of project', 'leadership of project leader', 'define the performance of the products', 'feasibility study of the NP to be developed', and 'a well established operational procedure'. These indicate the areas in which future improvement should be made by engineers in R&D functions.

On the other hand, the management issues at company level, such as 'senior management commitment' and 'senior management delegation', were identified as factors that were least important but fully implemented. Therefore, these issues should not constitute areas for future improvement. This may be due to the small scale of toy NPD teams and projects. It is worth noting that respondents think that companies emphasized senior management more than project management. Cross-level communication, technical support, and training are identified as factors that are least important and least implemented, indicating that they are not particularly relevant for NPD in this phase.

Compared with the first phase, the degree of importance and the extent of importance in this phase are in balance. The correlation is significant at the 0.01 level, $r = 0.51$.

4.3. Prototype and development (Phase III)

After design and specification, the main work moves into the production area. In this phase, only one factor, 'internal communication within the project team' (importance = 2 versus extent = 1), falls into the category of 'Promised Land'. The other five highly important factors fall into the category of 'Broken Promises'. They are: 'the project is well scheduled and strictly monitored', a 'clear understanding of the operation', 'technical support by project and/or tooling staff', 'internal testing on product', and 'product review meeting'. These factors are not implemented consistently with the degree of their importance, and are the areas for future improvement in this phase.

In this prototype and development stage, much effort is put into: 'producing the pilot product'; 'meeting customer needs as per the previous specifications'; 'conducting external laboratory tests'; and 'shortening the time for tool-building'. However, according to respondents, these four factors are not the highly important issues at this stage. Their importance to implementation ratios are rank 7 versus rank 3, 9 versus 4, 11 versus 2, and 13 versus 6 respectively. Take 'external laboratory test' as an example. It is very important to conduct the external test for the purposes of toy export. However, internal quality standards and quality management are much more important. If efforts are put into the final external test instead of into internal preventive activities, it is putting the cart before the horse.

Factors that are not relevant in this stage include 'cross-functional co-operation', 'senior management commitment', and 'shorten the time for prototyping'. For example, a ball with very simple components does not need special efforts to produce its prototype. Tooling and production should have been considered while the product was designed so cross-functional co-ordination are not that important at this stage, but rather in an earlier stage as identified in Phase I.

4.4. Commercialization (Phase IV)

It is at the commercialization stage that importance and implementation are most consistent. For the factors in the category of 'Promised Land' the ranks for importance and implementation are very close. The most important factors are 'delivery of the NP to customers on time' (importance rank = 1 versus implementation rank = 1), 'the right time to launch' (2 versus 3), and 'competitive product cost' (3 versus 2). In other words, people at this stage do the right things.

Those factors not relevant include 'the availability of production resources and skilled person', 'strong advertising and promotion efforts', and 'cross-functional co-operation'. In this last stage, the main tasks are taken over by the marketing staff and the co-operation levels in the toy companies are reduced.

There are some factors that are identified as falling under the categories of 'Broken Promises' and 'Changing Wine into Water', as shown in Table 7. Factors in these other categories are also consistent in terms of importance and implementation. In fact, the correlation between the degree of importance and the extent of implementation in the commercialization phase is significant at the level of 0.01 ($r = 0.81$). With its special historical and cultural background, Hong Kong has become a bridge between the East and the West, and its strength in commercialization and marketing has been an advantage not only for Hong Kong toy companies but also other industries.

5. Discussion and implications

5.1. Critical success factors for NPD

This research has revealed the CSFs for NPD in HK toy companies. Using the Delphi method and the Biblical model to incorporate the degree of importance and the extent of implementation of various factors, the research revealed those important factors that were not sufficiently implemented in practice. It also revealed those factors that were well implemented but not important. With this classification, the implications to be drawn from the research are very clear. By using the Biblical model, companies will discover where their efforts should be put in the future. Furthermore, the efforts in each phase are also clearly identified, which makes job classification in NPD easier and clearer. The research method has an advantage in that it not only identifies the CSFs, but also measures the efforts that companies put into them. Causal relationship research in contrast does not tell us whether the identified CSFs have been fully implemented by industry people, nor whether they know the factors have been implemented. This research study suggests that there may be a disparity or gap between the factors that are important and those that are implemented. The implementation of CSF will take time and there may be a learning effect.

By examining the distribution of factors in the Biblical model, it was found that only 8 out of the 54 factors (15%) belong to the 'Promised Land', while 20% fall under the 'Broken Promises' category. This suggests that much work is needed to improve NPD in HK toy companies. On the other hand, 14% of the factors fall into the category of 'Changing Wine Into Water', namely, consuming resources meaninglessly. It is highly recommended that companies shift from putting effort into factors that are not important to those that are.

5.2. The balance between phases and integration

This research has incorporated not only the phases but also the integration features of NPD. The results of the study should discourage companies and researchers from studying only the phases or only the integration aspects. Both the framework (i.e., Fig. 1 and Table 3) and the detailed factors cover both phases and cross-functional issues. However, it was found that cross-functional issues are more important in the early stage of NPD, especially during the first phase corresponding to idea generation and conceptual design. This reminds us of the saying that 'a good beginning is half the success'. Gradually through the process of NPD, the individual issues become relatively more important while cross-functional issues get relatively less important. In the last phase, cross-functional co-operation was listed as the least important factor.

Comparing the four phases, it was found that work within the specification and commercialization phases (the second and fourth phases respectively) is more effective than in the other two phases. There are many more factors in the 'Promised Land' but fewer in the 'Changing Wine into Water' categories in these two phases. Also, there is a positive correlation between the degree of importance and the extent of implementation in these two phases (see sections 4.2 and 4.4). In contrast, the first phase (i.e. idea and conceptual selection) and the third phase (i.e. prototype development) are relatively weak in the HK toy industry, and constitute the areas of NPD for which future improvement is most needed.

5.3. The balance between company level and project level

Previous research has focused mainly on the company level and has therefore identified CSFs for the company instead of the projects. That type of research reflects the opinions of top managers rather than of people on the floor. It is hard for people working at the operational level to draw implications from such studies. Implications such as where and when the CSFs should be implemented, and who should implement them, are not clear.

For HK toy companies, it seems that project level management is more important than company level management in NPD. In fact, the leadership, goal, vision, and communication of the project team are in the most important factor group, whilst senior management issues are classified into less important categories at both the early and later stages of NPD. It is difficult to determine whether this is a general, wider characteristic or is limited to the HK toy industry which has small and simple products. Again, however, the importance is relative. Although project level issues are more important than those at the company level in HK toy companies, it does not mean that they are not important at all. It is suggested that companies and researchers should retain a balance between company and project level issues.

6. Limitations and future research

This research was designed for the Hong Kong toy industry and revealed patterns of CSFs particular to that industry. Therefore, the results concerning CSFs are limited to this industry and should not be applied to other cases. However, the framework that was used in this study may be applied to investigate the same issue in other industries.

Concerning the research methodology used, this research has been able to reveal not only the critical factors, but also the extent to which these factors have been implemented in practice. Compared with previous research methodologies that have identified CSFs by examining causal relationships, the research design used provides obvious implications for where future efforts should be placed. However, every method has its advantages and disadvantages (Yin, 1994). The limitation of this Delphi survey concerns aspects of validity and reliability. It is based on the assumption that the respondents are familiar with NPD processes. In future research, performance for each phase and the whole company should be identified and measured so that follow-up research on the relationship between factors and performance can be conducted. To increase the detail of information and enrich it, case studies should be made.

This research was designed to investigate NPD in traditional, low-technology toys. Although there will always be a market for traditional toys, there is increasingly a movement to high-tech toys and games both in Hong Kong and in the rest of the world. In the high-tech environment, the CSFs may be different. For example, technology capability in the production process was not identified as a highly important factor. However, in the high-tech toy NPD situation, it may be. Therefore, research should be conducted to investigate CSFs for NPD in high-tech toy companies.

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