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Full Length Research Paper

An innovative new product development strategy: The Key success paths approach

Mei-Fang Wu[1]*, Pao-Long Chang[2] and Singa Wang Chiu[3]

[1]Department of Industrial Engineering and System Management, Feng Chia University, Taiwan, Republic of China.
[2]Department of Business Administration, Feng Chia University, Taiwan, Republic of China.
[3]Department of Business Administration, Chaoyang University of Technology, Taichung 413, Taiwan.

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Given the rapid changes in the high-tech industry and fierce global competition in the market, shortening the life cycle of a product is necessary. Such a backdrop highlights the role of new product development (NPD). Many studies have explored how the outcomes of NPD projects are affected by key success factors (KSFs). In this paper, we investigated key success paths (KSPs) approach by creating and implementing various combinations of KSFs and NPD outcomes. Specifically, we consider the idea that KSPs drive NPD strategies in achieving high performance in terms of outcomes through multiple combinations that may be based on the competitive advantages of companies and industries. In addition, we apply fuzzy-set qualitative comparative analysis (QCA) along with the fs/QCA software tool to analyze the causal relationship between KSFs and NPD outcomes. We obtain multiple results, including verification of the KSP concept. KSPs approach help allocate resources and appropriately enriched information, and should be chosen using a combination of multiple KSFs based on a company's competitive advantages to successfully attain desired outcomes.

Key words: New product development, key success factors, qualitative comparative analysis, fuzzy set theory, key success paths.

INTRODUCTION

Amid intense global competition, the sustainability and profitable growth of companies often depend on product diversity, differentiation and innovation. The shortening of product life cycle (Faure, 2009; Lu and Yang, 2004) highlights the crucial role that new product development (NPD) plays in increasing enterprise competitiveness (Cooper, 1996; Cooper and Kleinschmidt, 1991, 1993; Millsona and Wilemon, 2006; Ries and Ries, 2004). NPD efforts also indicate that innovation competencies affect the performance of companies, particularly those belonging to the high-technology sector (Cheng and Wu, 2011; Duystersc and Hagedoorn, 2001; Hagedoorn and Cloodt, 2003; Henderson and Cockburn, 1994).

Most NPD managers want to fully understand in the actual factors of specific NPD projects that lead to successful or failed performance outcomes (Griffin and Page, 1993: 291).

Previous studies on product innovation management focus on identifying key success factors (KSFs) (Cooper and Kleinschmidt, 2007; Di Benedetto, 1999; Griffin and Page, 1993). KSFs are necessary ingredients of the management information systems, unique characteristics and heuristic tools that help managers sharpen their thinking and principal skills, as well as augment the resources required to be successful (Ketelhőhn, 1998).

The KSFs in NPD include formulating proposals related to product differentiation, pre-developing filtering tasks, hearing the voice-of-the-customer, sharply defining product features and benefits, resourcing, successfully executing ideas, indentifying go/kill points, creating project teams, resourcing strength, adopting international orientation and encouraging the active involvement of senior management (Cooper and Edgett, 2006).

Research on KSFs for successful NPD indicates that any one of the success factors are neither sufficient nor necessary for success, and a few major groups of KSFs represent some amount of independence in influencing success versus failure (Cooper and Kleinschmidt, 2007; Di

*Corresponding author. E-mail: mfwu@fcu.edu.tw. Tel: +886424517250 or +886955041647. Ext. 3627. Fax: +886424510240.

Benedetto, 1999).

Exploring, extracting and understanding the causal relationship among NPD, KSFs and performance outcomes are significant to enterprise product strategies. However, many studies focus on exploring what KSFs are and how they affect the outcomes; these have not adequately revealed the recipes or combinations of KSFs that facilitate the achievement of successful NPD outcomes. Resolving such issues are more beneficial as compared to employing post-determination models.

This paper aims primarily to explore and elucidate key success paths (KSPs) approach by creating and implementing paths among the KSFs of NPD outcomes, and using KSPs to drive NPD strategies toward the achievement of high performance outcomes. The KSPs may also serve as a “navigator” that provides multiple-combination KSFs and enables the adjustment of KSF performance levels (e.g., configurations) for companies and industries.

Consequently, NPD strategists need to acquire wisdom beyond the net effects of the independent influences of KSFs. Configurations represent alternative combinations of causal conditions that are indicators of sufficiency for the success or failure of NPD projects (Ragin, 2008a). Research on alternative decision configurations is particularly useful for strategists and researchers devoted to NPD (Woodside, 2010b).

The objectives of this article also include the following: (1) to illustrate the qualitative comparative analysis (QCA) of the grounded theory thinking processes; (2) to build and test causal recipes/combinations based on a fuzzy set QCA method with focus on the causal conditions and outcomes of NPD and (3) to describe key success paths and key failure paths (KSPs/KFPs) approach.

Following this introduction, Section 2 presents the literature reviews and Section 3 describes the algorithm frameworks of the QCA and fuzzy set QCA method, as well as explores KSP theory. Section 4 verifies the arguments that support the KSP concept. An empirical study is used for illustration, and the guideline for adjusting KSFs to achieve successful outcomes of NPD strategies is provided. Section 5 concludes the paper by presenting the findings of the empirical study; discuss the research limitations, and offering recommendations for future research.

LITERATURE REVIEW

The literature review discusses three concepts: (1) NPD and NPD processes, (2) key success factors (KSFs) and (3) qualitative comparative analysis (QCA) method.

NPD and NPD processes

The success factors of NPD include effective organization, proficient marketing, well-executed R&D processes, well-interfaced functions and coordinated and high-level management support systems (Cooper and Kleinschmidt, 1987; Myers and Marquis, 1969; Roberts and Burke, 1974). The factors for success and failure (Cooper, 1980; Cooper et al., 2004; Parry and Song, 1994; Rothwell et al., 1974; van der Panne et al., 2003; Zirger and Maidique, 1990) are associated with cooperation, communication and organizational integration (van der Panne et al., 2003). NPD processes are categorized into a 13-step sequence (Cooper and Kleinschmidt, 1986), 4-step process (Stefanovitz et al., 2010) and 8-step process (Thieme et al., 2003). Combining all the NPD processes discussed in literature reveals that the most common stages are the pre-development, development and launch and post-launch stages (Cooper and Kleinschmidt, 1986; Crawford, 1991; McQuarrie and McIntyre, 1986; von Hippel, 1986). The competitive activities and process proficiencies in the pre-development stage are significantly correlated with the success factors that were identified by researchers (Parry and Song, 1994; Wu and Chang, 2011).

Key success factors (KSFs)

KSFs are the determinants that must be explicitly defined for the business to flourish and for the goals of managers to be attained (Bullen and Rockart, 1981). KSFs are also defined as the necessary ingredients of management, unique characteristics and being heuristic tools for managers and a description of the major skills and resources required to be successful in a given market (Ketelhöhn, 1998).

A substantial body of research has been devoted to exploring and utilizing KSFs in companies and industries. These cover fields such as NPD, project management, supply chain, alliance strategy, KM technology and organizational performance. Sixteen papers published in international journals between 1984 and 2010 concentrate on the application of NPD with KSFs. All the topics and contexts are shown in Table 1.

On the basis of the summary of these papers, we determine NPD KSFs to be the following: superior skills in marketing research; strong market orientation and product innovation; strong sales force; high quality of sales effort; good launch management; excellent launch timing, high-quality and rigorous NPD processes; clear and well-communicated new product strategies; adequate resources for new products; senior management commitment to new products; senior management accountability; strategic focus and synergy; high-quality development teams; cross-functional teams; expert analytical skills; resource availability; R&D spending levels; expected profitability; technological opportunity and support; product superiority needs; solid and upfront homework; early and sharp product definition; focus and project prioritization; organizational

Table 1. Summary of key success factors researches in NPD.

KSFs for NPD	Author	Journal
1. Environmental analysis, analysis of industry structure, industry/business experts, analysis of competition, analysis of dominant firm in the industry, company assessment, temporal/intuitive factors and PIMS (Profit Impact of Market Strategies) results.	(Leidecker and Bruno, 1984)	Long Range Planning
1. Financial performance, opportunity windows and market share.	(Cooper and Kleinschmidt, 1987a)	R&D Management
1. Product superiority, project definition and early, pre-development activities 2. In the NPD process and synergy both in marketing and technical.	(Cooper and Kleinschmidt, 1987b)	Journal of Product Innovation Management
1. Project mission, top management support, project schedule/plan, client consultation, personnel, technical tasks, client acceptance, monitoring and feedback, communication, trouble-shooting. 2. Key Factors for each stage of the Project life cycle: a. Conceptual Stage: mission, client consultation b. Planning Stage: mission, top management support, client acceptance Execution Stage: mission, trouble-shooting, schedule/plan, technical tasks, client consultation d. Termination Stage: technical tasks, mission, client consultation	(Pinto and Prescott, 1988)	Journal of Management
1. The evidence reveals that new product success and failure is often decided before the new product project even enters the product development phase. Second, should and have improved the effectiveness of these early and crucial stages of the innovation process.	(Cooper, 1988)	Industrial Marketing Management
1. Profitability, market share, meeting objectives, impact on the company and speed to market. 2. Need for product superiority, strong market orientation, solid up-front homework, early and sharp product definition, a cross-functional team approach, focus and project prioritization, quality of execution, and a systematic stage-and-gate new product process.	(Cooper, 1994)	International Marketing Review
1. High-quality new product development process, clear and well-communicated new product strategy, adequate resources, senior management commitment, an entrepreneurial climate for product innovation, senior management accountability, strategic focus and synergy, high-quality development teams; and cross-functional teams.	(Cooper and Kleinschmidt, 1995)	Journal of Product Innovation Management
1. Senior management commitment, organizational structure and processes, attractive new product concepts, venture teams able to communicate effectively and project management able to focus on reducing uncertainties.	(Lester, 1998)	Research Technology Management
1. Strategic activities: superior skills in marketing research, sales force, distribution, promotion, R&D, engineering, cross-functional teams making decisions, and getting logistics involved. 2. Tactical activities: high quality of selling effort, advertising, technical support; good launch management, good management of support programs and excellent launch timing relative to customers and competitors.	(Anthony and Benedetto, 1999)	Journal of Product Innovation Management

structure and processes; long-term view of product development and stable project vision. Applications to other disciplines include the following:

1. Project management (SchindlerandEppler, 2003; Clarke, 1999);
2. Supply chain management (Ragatz et al., 1997;

Table 1. Contd.

1. Key success factors (KSFs) is a key strategic one in management. 2. Understanding and developing KSFs enables a company to enter an industry successfully, differentiate between themselves with generic strategies and operate optimally between higher perceived value and lower delivered costs.	(Werner, 1998)	European Management Journal
1. Doing the right projects and doing projects right	(Cooper, 1999)	Journal of Product Innovation Management
1. Having a long-term view of product development, having a stable project vision, and following a rigorous NPD process can improve new product success rates.	(Lynn et al., 1999)	Industrial Marketing Management
1. Task design, group composition, organizational context, internal processes, external processes and group psychosocial traits.	(Holland et al., 2000)	International Journal of Management Reviews
1. Expected profitability, technological opportunity, development riskand appropriability conditions.	(Astebro, 2004)	IEEE Transactions on Engineering Management
1. Profitability and impact 2. High-quality new product development process, new product strategy for the business unit, resource availability, and R&D spending levels.	(Cooper and Kleinschmidt, 2007)	Research Technology Management

2000; Hoffmannand Schlosser, 2001);
4. KM technology (Rainerand Hall, 2002; CummingsandTeng, 2003)**;**
5. Organizational performance (Rangon, 1997; Ghosh et al., 1998; Poon and Wagner, 2001; Rai et al., 1996);
6. ERP/BPR (Al-Mashari and Zairi, 1999; Nah et al., 2001).

KSFs are important conditions that occur whether a company succeeds or fails. Do all key factors have to be exhaustive and manifest outstanding performance for the outcomes of NPD to be a success? This paper discusses and explores KSP theory on the basis of the causal relationship among KSFs (Cooper, 1995) and NPD outcomes, proposes the argument that KSP drives NPD strategy in achieving successful outcomes.

Qualitative comparative analysis (QCA) methods

The QCA method, which is the most important technique in grounded theory, is ideally suited for studying explicit connections. This method helps researchers to identify conceptual boundaries, pinpoints the fit and relevance of recipes and specifies the conditions with linkage to other recipes. After deciding which recipes best explain what happens, these are treated as concepts useful for understanding many relationships or issues in a data set (Strauss and Corbin, 1990). The algorithm framework and process steps under the QCA method are shown in Figure 1. The useful features of QCA are its ability to enable the analysis and examination of complex causation relationships, which are defined as a condition in which an outcome may be caused by several different recipes of causally relevant conditions to identify the decisive recipes and unravel causal complexity. Grounded theorists follow a systematic set of methods to discover reality and construct a true, testable, predictable and ultimately verifiable “theory” of it (Strauss and Corbin, 1998).

The algorithm framework of grounded QCA is shown in Figure 1, and is described as follows:

Step 1

Research goals and objectives are set up. The research goal or objective should first be set up as that of qualitative or quantitative research, and the study scope should be defined to endow focus to the study.

Step 2

Theoretical arguments are proposed. Arguments or hypotheses are proposed on the basis of the goals and objectives. Most researchers seek to develop important and new theories to contribute to academic and practical usage.

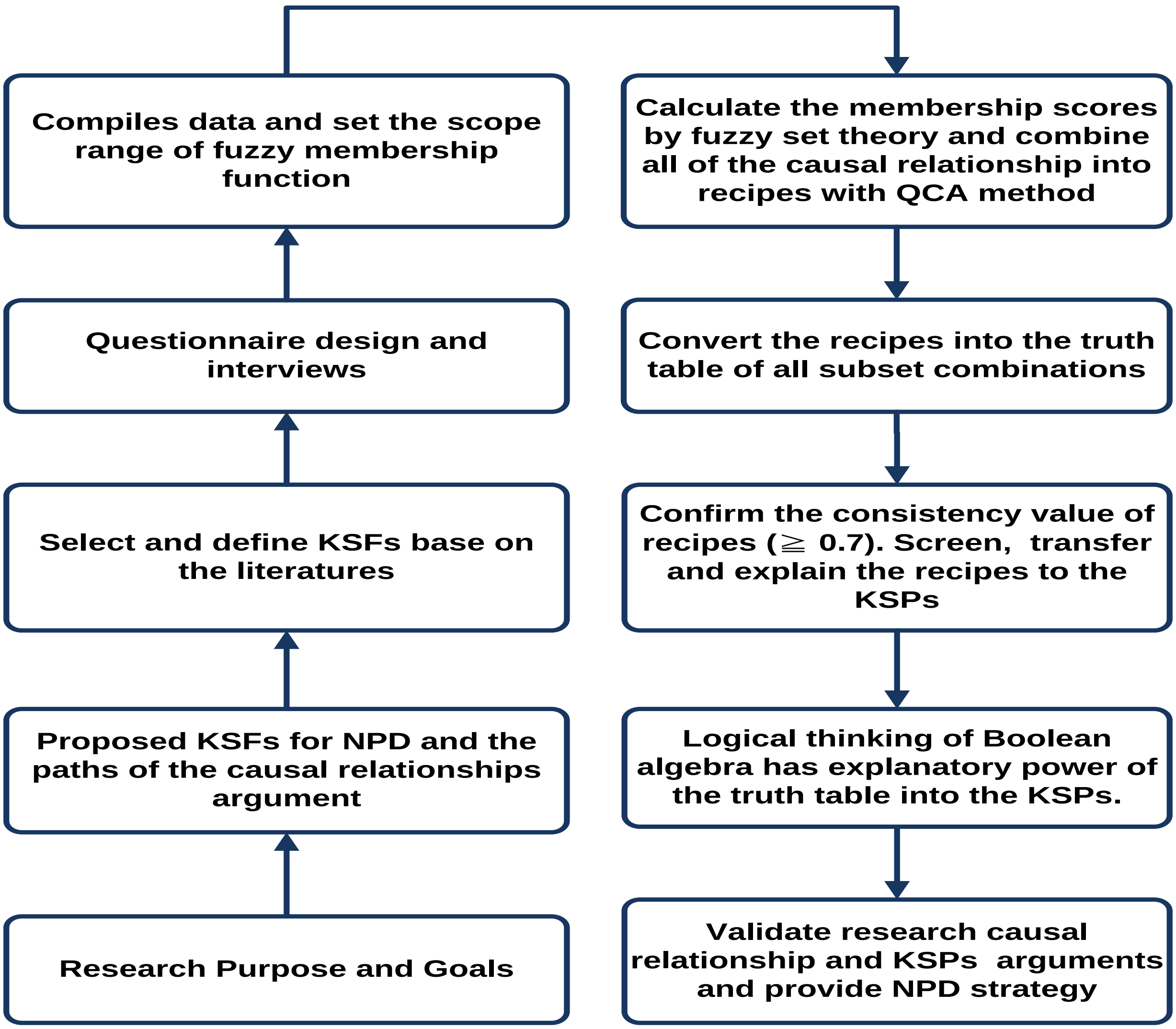

Figure 1. Algorithm framework and process flow.

Step 3

Research data are collected. Using the aforementioned arguments as bases, without departure from the topic boundaries, researchers begin to thoroughly and freely interview relative cases to collect research data until saturation is reached. Data saturation is reached when an increasing number of responses from interviews have become similar to the data that have reached saturation.

Step 4

Collected data are converted to text. The researchers converted the interview data (audio content and relevant information) into scripts verbatim. The interview data are voice based and need to be converted into text word for word. The length of the conversion process is five to ten times longer than that of the interview.

Step 5

Coding is performed. The researchers extract the causal conditions, also known as the KSFs, from occurring events or themes through careful and repeated reading of scripts and linking of the outcomes of these themes.

Step 6

Causal relationships are constructed. Researchers construct the relationships between causal conditions/KSFs and outcomes of events and themes on the basis of the coding process.

Step 7

New theory is explored. The researchers compare all causal relationships individually among the causal conditions and outcomes using the grounded QCA method. The researchers analyze, thresh and disclose how the specific combination of causal conditions leads to particular outcomes, and then deduce and explore new theories.

Step 8

The reproducibility and feasibility of the new theory is verified. Reproducibility and feasibility are basic and important requirements for new theories. After confirmation and verification, academic research can propose new study methods and provide practical usage and prediction of outcomes for business operations management.

In short, grounded theory uses QCA to explore new theories, thereby providing interpretations of causal relationships by collecting, analyzing and coding data for the development and establishment of theoretical frameworks. Most qualitative researchers use this method to add legitimacy to their investigations (Glaser and Strauss, 1967).

Coding work is the most basic research tool and skill in the field of social science. Coding sustains study on all causal conditions/KSFs through the examination of each recipe and definition of activities or events within it through line-by-line coding (Glaser, 1978). However, although coding work is highly professional, it is also time consuming. The intensely competitive market, shortened product life cycles, speed- and efficiency-emphasizing environment in business management and industry development make the lengthy coding work cost-inefficient and time consuming. Therefore, this paper adopts the concept of fuzzy QCA (Ragin, 2008b), develops this further into an algorithm framework and process flow, and divides the causal conditions into different levels of standards, so that KSP is more suitable for usage with practical applications of the NPD strategy of an industry. The differences between the fuzzy QCA and grounded QCA methods include the following:

1. The selection and definition of KSFs from literature reviews are not taken exactly from grounded QCA coding work.
2. Data collection is bound under specifically designed questionnaires rather than being based on free interviews.
3. The setup of the fuzzy range scope for fuzzy membership function, calculation of membership score and logic concept of Boolean algebra are used to convert and categorize membership scores into truth tables with multiple combinations and different levels of standards instead of grounded QCA.

FUZZY QUALITATIVE COMPARATIVE ANALYSIS (FUZZY SET QCA) METHOD

The algorithm framework and process flow of fuzzy set QCA are shown in Figure 2, and described as follows:

Step 1

Research purposes and goals are set up. This step is similar to that in grounded QCA. For example, the research purpose of this paper is to explore the fine strategy, known as KSPs of NPD for a business and an industry.

Step 2

The arguments of the new theory are proposed. We put forward the idea that KSP theory is a navigator that guides the NPD strategy toward achieving successful outcomes. The KSPs shorten NPD process time, reduce NPD costs, increase operating income, etc. Moreover, this paper advocates for companies, using their own competitive advantages to choose multiple and fitted KSPs, and more properly adjust their current combinations of KSFs to promote higher returns on investment and boost market share.

Step 3

KSFs are selected and defined. We select and define KSFs from literature reviews to avoid the lengthy process time involved in grounded QCA. Thus, the research process is focused on the study purpose, and the design causal relationship questionnaire is associated with the KSFs for preparations for data collection.

Step 4

Data are collected. The fuzzy QCA algorithm process uses a questionnaire to interview respondents involved in the relevant cases and collect data.

Step 5

The fuzzy range scope is established. To provide a valuable and accurate causal relationship among all possible combinations of KSFs and outcomes, the division of KSFs and outcomes into different levels is necessary. We use fuzzy set theory and establish the fuzzy range scope for membership functions to calculate membership scores.

Step 6

The membership scores are calculated. A membership score indicates the degree of membership of the KSFs and outcomes in different levels. In this step, all original data are transferred into membership scores for the evaluation of the degree of membership. The format of membership scores is shown in Table 2.

Step 7

Data are converted into a truth table. For easy interpretation of the

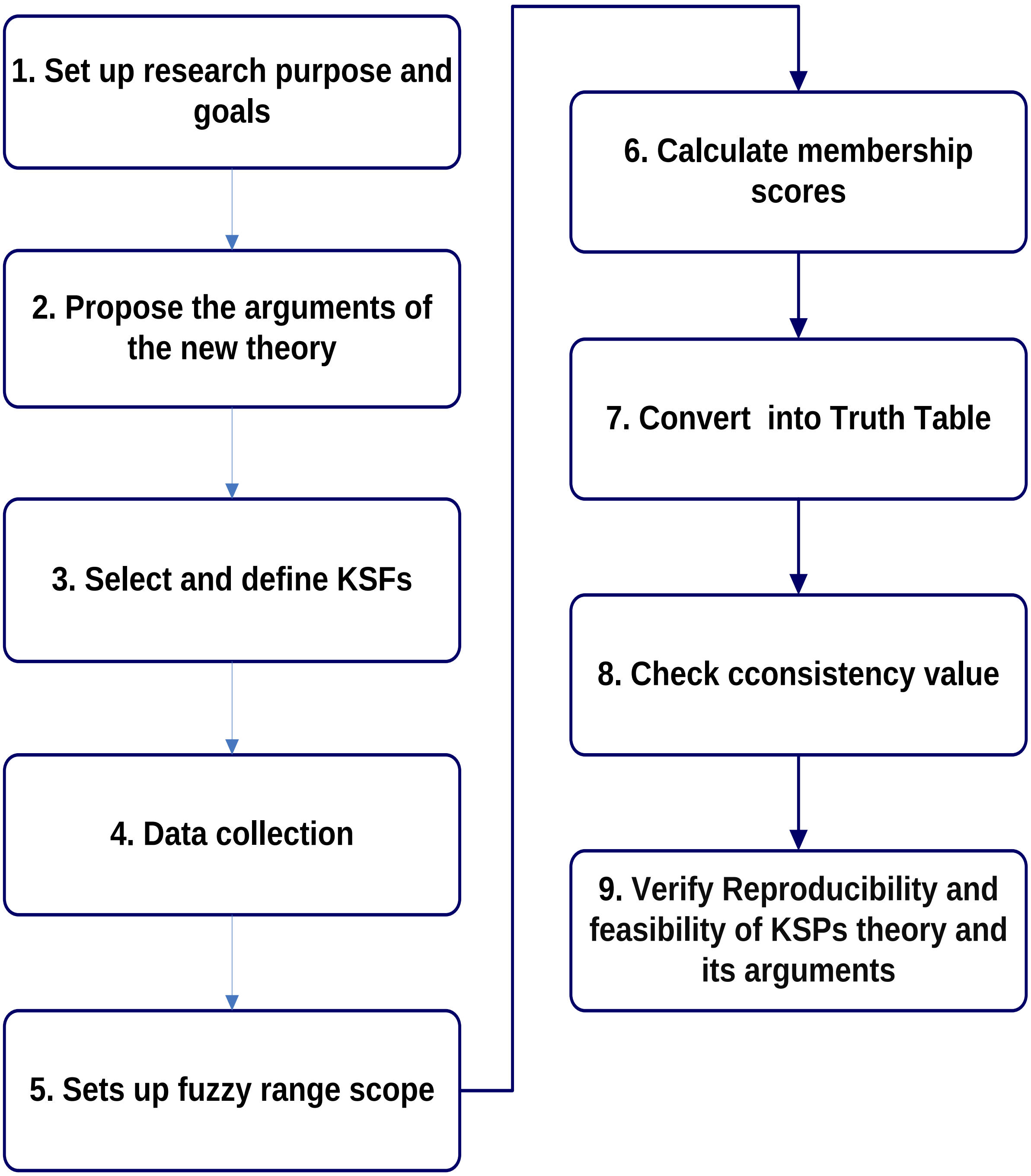

Figure 2. Fuzzy set qualitative comparative analysis (fuzzy set QCA) algorithm frameworks and process flow.

KSFs and outcome levels of each causal relationship, we use the logic concept of Boolean algebra to transform membership scores into a truth table. Each row on the truth table represents specific causal relationship among KSFs and outcomes at multiple combinations and different performance levels. All causal relationships in the truth table are $2^{K * M}$, where K represents the number of KSFs and M denotes the number of levels. For example, if there are five KSFs, each KSF is divided into three performance levels. After this, all causal relationships are determined to be $2^{5 * 3}$ (32,768). The format of the fuzzy truth table is shown in Table 3.

Step 8

The consistency value is verified. Consistency measures the degree to which the entire KSF combinations of causal relationships are subsets of the outcomes. Coverage measures how much of the outcome is covered (or explained) by each KSF combination by the causal relationships as a whole. These measures are computed by examining the original fuzzy membership score in light of the causal relationships (Ragin, 2008a).

Table 2. Membership score of five cases of NPD.

Case	X_1	$\sim X_1$	X_2	$\sim X_2$	X_3	$\sim X_3$	X_4	$\sim X_4$	Y
1	0.75	0.25	0.8	0.2	0.6	0.4	0.7	0.3	0.8
2	0.5	0.5	0.9	0.1	0.7	0.3	0.6	0.4	0.7
3	0.1	0.9	0.7	0.3	0.75	0.25	0.6	0.4	0.2
4	0.9	0.1	0.8	0.2	0.1	0.9	0.85	0.15	0.85
5	0.6	0.4	0.8	0.2	0.65	0.35	0.9	0..1	0..65

Table 3. Fuzzy truth table of four possible recipes of NPD.

Recipe/Path	X_1	$\sim X_1$	X_2	$\sim X_2$	X_3	$\sim X_3$	X_4	$\sim X_4$	Y	Consistency	Coverage
1st	1	0	1	0	1	0	1	0	1	1	0.594
2nd	1	0	1	0	1	0	0	1	1	1	0.313
3rd	1	0	1	0	0	1	1	0	1	1	0.609
4th	0	1	0	1	0	1	0	1	1	0.933	0.219

The consistency criterion represents the accuracy of a high score in simple or complex KSF combinations in identifying high scores in the outcome conditions. Therefore, each causal relationship requires verification through the examination of the consistency value. A consistency value indicates how closely KSF combinations approximate a perfect outcome relationship. Consistency is analogous to significance metrics in statistical hypothesis testing. The formula of consistency and coverage are as follow:

$$\text{Consistency } (Xi \leqq Y) = \frac{\sum \min (Xi\,.Y)}{\sum \min Xi} \quad (1)$$

$$\text{Coverage } (Xi \leqq Y) = \frac{\sum \min (Xi\,.Y)}{\sum Yi} \quad (2)$$

where X_i represents multiple (i) of causal condition (X), and Y_i denotes multiple (i) of outcome (Y). Five steps are involved in the calculation of the value of each possible recipe consistency:

1. First, the lowest value is analyzed; this value represents the value of min (X_i) among the common causal conditions.
2. Second, the lowest values of the causal condition and outcome Y of membership score are compared; these values serve as the value of min (X_i, Y_i).
3. Third, all of the lowest values of the causal condition are summarized; these are the value of $\sum$min (X_i).
4. Fourth, the sum of the lowest X_i andY_i is obtained; the result represents the values of $\sum$min (X_i, Y_i).
5. Finally, the consistency value is calculated using Equation 1.

When the consistency value of causal relationships exceeds the threshold criteria of 0.7, the causal relationship identifies the KSPs mentioned in this paper (Ragin, 2004).

Step 9

The reproducibility and feasibility of KSP theory and its arguments are verified. A rigorous theory and its arguments must exhibit verifiable reproducibility and feasibility, and should be examined through practical study before being established.

The algorithm framework of evolutionary fuzzy QCA provides the methodology for exploring multiple relationships among KSFs and NPD outcomes. Not all of these combinations have exploratory power to explain the causal relationships. The combinations should enable the examination of the consistency value using threshold criteria that should be greater than 0.7 (Ragin, 2004).

KSPs are causal relationships with a consistency value greater than 0.7, and therefore have sufficient exploratory power for KSFs and NPD outcomes. Meanwhile, the KSFs in KSPs may be combined with different performance levels to drive NPD strategy toward successful outcomes.

The adage “all roads lead to Rome” indicate that there are always paths that guide businesses in pursuing successful NPD outcomes. Such outcomes are accomplished by combining multiple KSFs at different performance levels. The selection decision of KSPs should be based on current competitive advantages. More than one benchmarking path can be used in driving NPD strategies toward successful outcomes.

KSP theory not only provides guidelines for NPD strategies, but is also applicable in many research disciplines, thereby enabling the identification of suitable KSFs combinations and accomplishment of specific outcomes.

EMPIRICAL ANALYSIS

We interviewed three empirical cases belonging to the high-tech industry using a questionnaire designed specifically for KSFs. The practical cases are located in Taichung Science Park in Taiwan, and the respondents are senior managers and NPD department staff. We simplify and verify KSP and its arguments using the three cases. The empirical study is based on a step-by-step fuzzy QCA algorithm process in deriving KSPs.

Steps 1 and 2

The purpose of this paper is to explore KSPs, and propose the argument that more than one KSP of NPD

Table 4. Original data of three cases from questionnaire.

Causal conditions/KSFs	Empirical case		
	1	2	3
R: Adequate resources for NPD	3	8	2
E: Expenditure on NPD	7	8	9
S: New product strategy for business	7	2	8
P: NPD process	7	2	8
Y_i:Sales growth rate of NPD	5	4	8

Table 5. Membership scores in three performance subsets level of three cases.

Case	Causal conditions/KSFs												Outcome		
	R			E			S			P			Y		
	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L
Case 1	0.09	0.11	0.80	0.60	0.30	0.10	0.60	0.30	0.10	0.60	0.30	0.10	0.10	0.85	0.05
Case 2	0.85	0.05	0.10	0.70	0.25	0.05	0.30	0.10	0.60	0.30	0.10	0.60	0.20	0.75	0.05
Case 3	0.20	0.20	0.60	0.75	0.10	0.15	0.70	0.25	0.05	0.70	0.25	0.05	0.80	0.15	0.05

drives NPD success and sustains the profitable opportunities of an operation.

Steps 3 and 4

The third step of the algorithm process is the selection and definition of the KSFs of the NPD strategy. We extract four KSFs from this study (Cooper, 1999).

3. Adequate resources-manpower and money for new products (R).
4. R&D spending on new products (E).
5. Well-defined new product strategy for the business unit (S).
6. High-quality new product process (P).
7. Outcome of NPD (Y).

The questionnaire is designed based on the research purposes and four KSFs. Moreover, interviews involving three high-tech cases are conducted to reduce the complexity of the causal relationships and make the research process more easily understood. The collected data are shown in Table 4.

Steps 5 and 6

The KSFs and outcomes should be divided into three performance levels to aid the exploration of the multiple combinations of causal relationships. After this, the fuzzy range scope must be set up after data collection for fuzzy membership function. The next step is to calculate the fuzzy membership score for all of the collected data using the triangular membership function. The membership scores of the KSFs with three performance levels of three cases are shown in Table 5.

Step 7

The seventh step is to transform the membership scores into the fuzzy truth table for easy reading and understanding of the complex relationships among KSFs and outcomes. A fuzzy truth table algorithm is based on the logic concepts of Boolean algebra. Crisp set judgment of the truth table is based on the membership degree of fuzzy membership scores.

To identify and categorize three subsets into high, medium and low performance levels of KSFs and outcomes, the frequency criterion for the membership score should be greater than 0.51. The fuzzy truth table is shown in Table 6.

Step 8

There are 4,096 possible causal relationships. The eighth step entails the calculation and measurement of the consistency and coverage values for all the relationships. This step should accomplish two major tasks: the calculation of the consistency value according to Equations 1 and 2, and setting of the criteria threshold at 0.7 to filter all the causal relationships (Ragin, 2004). Given that the consistency value is lower than 0.7, the causal relationship should be excluded. To smoothly extend the algorithm framework, we continually use the fuzzy membership scores in Table 5. The calculation steps for the consistency value are shown in Table 7.

In Table 7, the consistency values of the 1st, 2nd, 3rd, 5th and 6th causal relationships are greater than 0.7,

Table 6. Fuzzy truth table of six recipes for illustration.

Recipe/ Combination	R			E			S			P			Y			Consist	Coverage
	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L		
1st	1	0	0	1	0	0	1	1	0	1	0	0	1	0	0	0.831	0.445
2nd	1	0	0	0	1	0	1	1	0	1	0	0	1	0	0	0.886	0.355
3rd	1	0	0	0	1	0	1	0	0	0	1	0	1	0	0	1.00	0.264
4th	0	0	1	0	1	0	1	0	0	0	1	0	1	0	0	0.600	0.273
5th	0	0	1	0	0	1	1	0	0	0	0	1	1	0	0	0.800	0.182
6th	0	0	1	0	0	1	0	0	1	0	0	1	1	0	0	0.750	0.136

indicating that the relationships among the KSFs and outcomes are close and have perfect explicit connection.

Step 9

The final step is to ascertain which causal relationships fit the research purposes, and that the minimum criterion value of consistency should be greater than 0.70 (Ragin, 2004). We explore all possible success and failure causal relationships using the fs/QCA software, and identify the successful and failed causal relationships as KSPs and key failure paths (KFPs), respectively.

Table 8 presents all the 15 KSPs with high performance outcomes and Table 9 show all the five KFPs with low performance outcomes in Boolean algebra matrix format for the NPD strategy.

Each line of KSPs in Table 8 is a “navigator” that leads the way to high performance outcomes with different combinations of KSFs in the NPD strategy. The KSPs indicating “all roads lead to Rome” is verified; the companies are able to achieve successful outcomes with different performance level combinations of KSFs. The four KSFs for each KSP are examined, as shown in Table 8. The findings are as follows:

1. The minimum requirements of necessity condition are that R (adequate resources-manpower and money for new products) and E (R&D spending on new products) should be kept in the medium performance level.
2. The second necessity condition is that S (well-defined new product strategy for the business unit) and P (high-quality new product process) both remain at medium performance and may lead to a high performance outcome.
3. The KSFs of S and P may have a trade-off; one of them shows only low performance, but the other must be maintained at a high performance level.
4. If the 12th KSP ($R_H \cdot E_M \cdot S_L \cdot P_L = Y_H$) is compared with the 13th KSP ($R_H \cdot E_H \cdot S_H \cdot P_H = Y_H$) on resource investment in different performance levels, the consistency value of the former is 0.872, greater than that of the latter (0.831). The findings encourage the company to realize that it still has a chance to pursue high performance outcomes, although its NPD resources are not as considerable as those of a large company.

The findings from the re-examination of each KFP (Table 9) indicate the following:

1. Although the performance levels of R, E and S in the 1st and 2nd KFPs remain at the medium performance level, the outcome is still a failure.
2. The low performance KSFs of R, E and S in the 3rd and 4th KFPs result in failed outcomes.
3. All the KSFs are in the low performance level, thereby generating failed outcomes.

Therefore, the company needs to explore appropriate ways to address the poor performance outcomes. Merging Tables 8 and 9 shows how the company re-checks the KSF combinations of KSPs to identify a method for adjusting its performance level. Such a move allows the company to achieve successful NPD strategy outcomes.

Each company should choose KSPs that fit them based on their own differential competitive advantages. They should never give up and should always try their best to explore ways to adjust the performance levels of KSFs. The comparison of KSPs and KFPs is shown in Table 10. The summary of the conclusions in Table 10 shows that if the NPD strategy of the company fails (as in the 1st KFP); the company should upgrade the P factor from low to medium performance to shift the outcome of the NPD. If the company NPD strategy still fails, (as in the 2nd KFP), then the company needs to upgrade the P KSF from low to medium performance level to achieve success. Moreover, the 3rd KFP should also have the three KSFs, R, E and S upgraded from low to medium performance level. In the 4th KFP, the two factors of S and P remain equal, and factor R must be upgraded from low to high performance, while factor E must be upgraded from low to medium performance to achieve success. Finally, in the 5th KFP, factor S and P should remain equal, and factor R must be upgraded from low to high performance, while factor E must be upgraded from low to medium performance level, as that in the 4th KFP. The adjustment processes of KSFs illustrated in Table 10 are drawn as paths in Figure 3.

Table 7. Consistency and coverage of six recipes of success outcome for illustration.

Recipe	R	E	S	P	Y	1st Recipe : $R_H \bullet E_H \bullet S_H \bullet P_H = Y_H$			
Level	**H**	**H**	**H**	**H**	**H**	**min Xi**	**min Xi,Yi**	**Consistency**	**Coverage**
Case 1	0.09	0.6	0.6	0.6	0.1	0.09	0.09		
Case 2	0.85	0.7	0.3	0.3	0.2	0.3	0.2	0.831	0.445
Case 3	0.2	0.75	0.7	0.7	0.8	0.2	0.2		
Σ					1.1	0.59	0.49		
	R	**E**	**S**	**P**	**Y**	**2nd Recipe : $R_H \bullet E_M \bullet S_H \bullet P_H = Y_H$**			
Level	**H**	**M**	**H**	**H**	**H**	**min Xi**	**min Xi,Yi**	**Consistency**	**Coverage**
Case 1	0.09	0.3	0.6	0.6	0.1	0.09	0.09		
Case 2	0.85	0.25	0.3	0.3	0.2	0.25	0.2	0.886	0.355
Case 3	0.2	0.1	0.7	0.7	0.8	0.1	0.1		
Σ					1.1	0.44	0.39		
	R	**E**	**S**	**P**	**Y**	**3rd Recipe : $R_H \bullet E_M \bullet S_H \bullet P_M = Y_H$**			
Level	**H**	**M**	**H**	**M**	**H**	**min Xi**	**min Xi,Yi**	**Consistency**	**Coverage**
Case 1	0.09	0.3	0.6	0.3	0.1	0.09	0.09		
Case 2	0.85	0.25	0.3	0.1	0.2	0.1	0.1	1	0.264
Case 3	0.2	0.1	0.7	0.25	0.8	0.1	0.1		
Σ					1.1	0.29	0.29		
	R	**E**	**S**	**P**	**Y**	**4th Recipe : $R_L \bullet E_M \bullet S_H \bullet P_M = Y_H$**			
Level	**L**	**M**	**H**	**M**	**H**	**min Xi**	**min Xi,Yi**	**Consistency**	**Coverage**
Case 1	0.8	0.3	0.6	0.3	0.1	0.3	0.1		
Case 2	0.1	0.25	0.3	0.1	0.2	0.1	0.1	0.6	0.273
Case 3	0.6	0.1	0.7	0.25	0.8	0.1	0.1		
Σ					1.1	0.5	0.3		
	R	**E**	**S**	**P**	**Y**	**5th Recipe : $R_L \bullet E_L \bullet S_H \bullet P_L = Y_H$**			
Level	**L**	**L**	**H**	**L**	**H**	**min Xi**	**min Xi,Yi**	**Consistency**	**Coverage**
Case 1	0.8	0.1	0.6	0.1	0.1	0.1	0.1		
Case 2	0.1	0.05	0.3	0.6	0.2	0.05	0.05	1.00	0.182
Case 3	0.6	0.15	0.7	0.05	0.8	0.05	0.05		
Σ					1.1	0.20	0.2		
	R	**E**	**S**	**P**	**Y**	**6th Recipe : $R_L \bullet E_L \bullet S_L \bullet P_L = Y_H$**			
Level	**L**	**L**	**L**	**L**	**H**	**min Xi**	**min Xi,Yi**	**Consistency**	**Coverage**
Case 1	0.8	0.1	0.1	0.1	0.1	0.10	0.10		
Case 2	0.1	0.05	0.6	0.6	0.2	0.05	0.05	1.00	0.136
Case 3	0.6	0.15	0.05	0.05	0.8	0.05	0.05		
Σ					1.1	0.20	0.20		

DISCUSSION

This paper has three research limitations. First, the data in this paper are based on three high-technology cases. All the findings represent only the characteristics of high-technology industries; thus, these may be too narrow and may not be generalizable to other industries. The second limitation of this study is that it divides causal conditions and outcomes into three performance levels with a fuzzy set triangular range to calculate the fuzzy membership score using limited data. We therefore recommend that future research extend KSP to cover different industries in multiple performance levels to develop more fine-grained perspectives, and enhance the understanding of successful NPD outcomes. Considering various industries and KSFs with more comprehensive views, and examining causal relationships among causal conditions (KSFs) and outcomes (Y) of NPD would help

Table 8. Key success paths (KSPs) of NPD.

High performance level of outcomes in Boolean algebra					
KSPs	**R**	**E**	**S**	**P**	**Consistency**
1	M	H	H	H	0.972222
2	M	H	H	M	0.972222
3	M	H	M	H	0.972222
4	M	H	M	M	0.972222
5	M	M	M	H	0.961538
6	M	M	M	M	0.961538
7	M	M	H	H	0.961538
8	M	M	H	M	0.961538
9	H	M	H	H	0.886364
10	H	M	L	H	0.871795
11	H	M	H	L	0.871795
12	H	M	L	L	0.871795
13	H	H	H	H	0.830508
14	H	H	H	L	0.772727
15	H	H	L	H	0.772727

Table 9. Key failure paths (KFPs) of NPD.

Low performance level of outcomes in Boolean algebra					
KSPs	**R**	**E**	**S**	**P**	**Consistency**
1	M	M	M	L	0.75
2	M	H	M	L	0.75
3	L	L	L	M	0.75
4	L	L	L	H	0.75
5	L	L	L	L	0.75

Table 10. KSFs performance level adjustment.

Number of KS/FPs	Outcome level of Y	R	E	S	P	Consistency
1st	Low	M	M	M	L	0.750
6th	High	M	M	M	M	0.962
2nd	Low	M	H	M	L	0.750
4th	High	M	H	M	M	0.972
3rd	Low	L	L	L	M	0.75
6th	High	M	M	M	M	0.962
4th	Low	L	L	L	H	0.75
10th	High	H	M	L	H	0.871795
5th	Low	L	L	L	L	0.75
12th	High	H	M	L	L	0.871795

adjust NPD strategies to become more suited and specific to a particular set of circumstances. Finally, this paper selects adequate resources-manpower and money for new products (R), R&D spending on new products

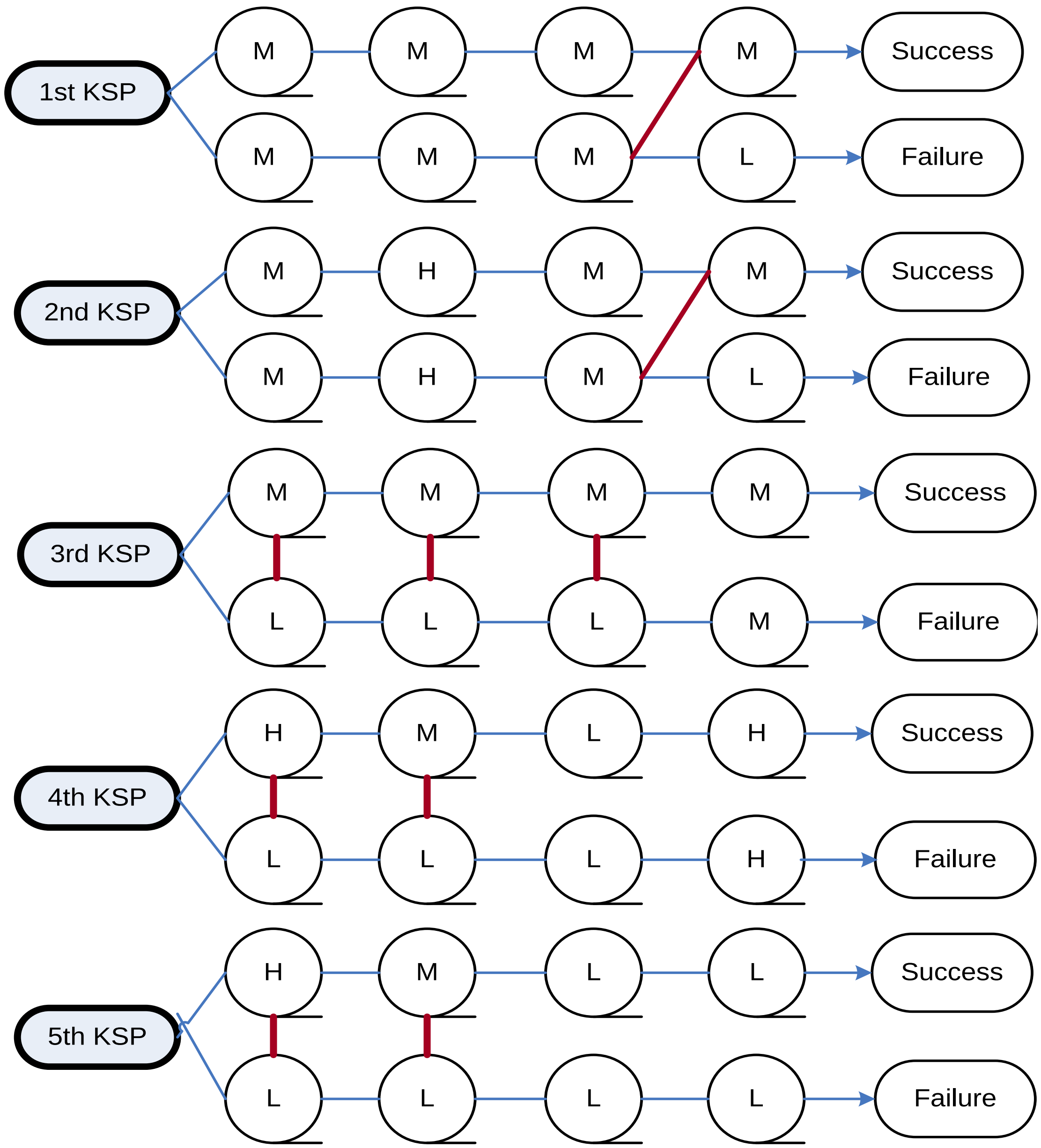

Figure 3. Adjustment processes of KSFs combination in KSPs.

(E), well-defined new product strategy for the business unit (S) and high-quality new product process (P) to be the KSFs in exploring KSP approach. Different KSFs may lead to various causal relationships and will structure different KSP. We recommend that future research use literature reviews or professional interviews to appropriately choose KSFs.

Conclusion

This paper explores KSP approach to provide guidelines for NPD strategy. QCA is an important and basic tool in grounded theory for establishing new theories by comparing and coding interview data. Such comparison and coding enables causal conditions to be categorized into subsets, thereby facilitates the identification and elucidates relationships among causal conditions and performance outcomes. However, coding is a time-consuming process that does not fit competitive and effective businesses. Therefore, we select and define appropriate KSFs from literature reviews, and use an evolutionary algorithm framework and the process flow of fuzzy QCA to divide KSFs and outcomes into multiple performance levels for more explicit and precise practical application. KSP is a “navigator” of the NPD strategy given the multiple combinations that may be chosen, as well as the differential competitive advantage base of the companies. The research algorithm process of the fuzzy QCA framework may be used to generalize practical application and cross-discipline usage beyond NPD study fields. The KSPs connects causal conditions and success/failure outcomes, and their consistency pertains to the degree of causal relationship interdependency. KSP theory is a useful and contributive theory that drives NPD toward achieving outstanding outcomes with KSPs approach, and avoids the inaccuracy of focusing only on the KFPs of the NPD strategy. The KSPs also play multiple predictor roles that guide NPD strategies in upgrading one or more KSF performance levels to achieve success. The findings of this empirical study confirm that the adage “all roads lead to Rome” holds true. “Roads” in this paper represent the KSPs, while “Rome” represents the successful outcomes of the NPD strategy.

In light of the verification of the KSPs and KFPs, the evolutionary fuzzy QCA method is robust and simple for the exploration of the new theory, particularly in causal relationships of forecasting and classification, because this methodology does not require the pre-specification of a functional form or any particular statistical distribution assumptions about the variables of the model. The surprising findings are that two KSFs of R (the adequate resources-manpower and money for new products), and E (R&D spending on new products) should remain equal or above the medium performance level to achieve a successful outcome. Factor S (well-defined new product strategy for the business unit) and P (high-quality new product process) may have a trade-off. If one of them shows only low performance, the other must be maintained at a high performance level to achieve high performance outcomes. Five points summarize the advantages of KSP approach in the NPD strategy. First, managers and staff of the NPD department can explore and follow the KSPs approach to pursue successful NPD outcomes. These KSPs can yield different combinations of causal conditions, which can be based on their own differential competitive advantages. Second, KFPs provide guidelines for preventing the NPD strategy from failing. Third, some of the KSFs are necessity conditions that should be maintained at minimum performance levels for KSPs. Fourth, integrating KSPs with KFPs helps find ways to adjust and upgrade the performance levels of the KSFs and convert the KFPs into the KSPs of the NPD strategy. Finally, benchmarking, $R_H \cdot E_H \cdot S_H \cdot P_H = Y_H$, is not the only way to achieve NPD success. That is, the high performance level of all the KSFs leads to successful outcomes, but the other combinations of KSFs, such as $R_H \cdot E_M \cdot S_L \cdot P_L = Y_H$, may also lead to successful outcomes. The low performance levels of all the KSFs definitively lead failed outcomes, but the other combinations of different performance levels of the KSFs, such as $R_M \cdot E_H \cdot S_M \cdot P_L = Y_L$, may also lead to failed outcomes. The research points in this paper are the most important views that provide unique academic contributions to NPD strategies.

This paper sheds light on KSP approach in the NPD strategy. Overall, the empirical findings indicate that KSPs are the important navigators of the NPD strategy in the pursuit of successful outcomes. KSPs approach serve as a guide in adjusting the combination of KSFs for NPD strategy performance.

REFERENCES

Anthony B, Benedetto A (1999). Identifying the Key Success Factors in New Product Launch. J. Prod. Innov. Manag., 16(6): 530-544.

Astebro T (2004). Key success factors for technological entrepreneurs' R&D projects. IEEE Trans. Eng. Manage.., 51(3): 314-321.

Bullen CB, Rockart JF (1981). A Primer on Critical Success Factors. CISR Working Paper # 69, Center for Information Systems Research, Sloan School of Management, MIT, Cambridge, MA.

Cheng, FT, Mei-Fang Wu, M (2011). Construct multi-characteristics quality performance measurement diagram in high-tech industry. Int. J. Phy. Sci., 6(2): 267-272.

Clarke A (1999). A practical use of key success factors to improve the effectiveness of project management, Int. J. Proj. Manage., 17(3): 139-145.

Cooper RG (1980). Project New Prod: What Makes a New Product a Winner. Quebec Industrial Innovation Center, Montreal, Quebec, Canada.

Cooper RG (1988). Pre-development activities determine new product success. Ind. Mark. Manage., 17(3): 237-247.

Cooper RG (1994). New Products: The Factors that Drive Success. Int. Mark. Rev., 11(1): 60–76.

Cooper RG (1996). Overhauling the new product process. Ind. Mark. Manage., 25: 465–482.

Cooper RG, (1999). From experience the invisible success factors in product innovation. J. Innov. Manage., 16: 115-133.

Cooper RG, Edgett SJ (2006). Stage-Gate and the Critical Success Factors for New Product Development. Prod. Dev. Inst., pp. 1-6.

Cooper RG, Edgett SJ, Kleinschmidt EJ (2004). Benchmarking bets NPD practices III. Res. Technol. Manag., 47: 43–55.

Cooper RG, Edgett SJ (2006). Stage-Gate and the Critical Success Factors for New Product Development. Prod. Dev. Inst., pp. 1-6.

Cooper RG, Kleinschmidt EJ (1986). An investigation into the new product process: Steps, deficiencies, and impact. J. Prod. Innov. Manag., 3: 71–85.

Cooper RG, Kleinschmidt EJ (1987a). What makes a new product a winner: Success factors at the project level R. R & D Manag., 17(3): 175-189.

Cooper RG, Kleinschmidt EJ (1987b). New products: What separates winners from losers. J. Prod. Innov. Manag., 4(3): 169-184.

Cooper RG, Kleinschmidt EJ (1991). New product processes at leading industrial firms. Ind. Mark. Manag., 20: 137–148.

Cooper RG, Kleinschmidt EJ (1993). Major New Products: What Distinguishes the Winners in the Chemical Industry. J. Prod. Innov. Manag., 10: 90–111.

Cooper RG, Kleinschmidt EJ (1995). Benchmarking the firm's critical success factors in new product development. J. Prod. Innov. Manage., 4(3): 169-184.

Cooper RG, Kleinschmidt EJ (2007). Winning Businesses in Product Development: The Critical Success Factors. Res.-Technol. Manage., pp. 1-15. May-June

Cooper RG, Kleinschmidt EJ, Elko J (1987). What separates winners from losers, J. Prod. Innov. Manag., 4(3): 169–184.

Crawford CM (1991). New Products Management. Richard D. Irwin Inc., Homewood, Ill.

Cummings JL, Teng BS (2003). Transferring R&D knowledge: the key

factors affecting knowledge transfer success. J. Eng. Technol. Manag., 20(1-2): 39-68.
Di Benedetto CA (1999). Identifying the Key Success Factors in New Product Launch. J. Prod. Innov. Manag., 16: 530-544.
Faure C (2009). Attribution Biases in the Evaluation of New Product Development Team Members. J. Prod. Innov. Manag., 26: 407–423.
Ghosh BC, Liang TW, Meng TT, Chan B (2001). The key success factors, distinctive capabilities, and strategic thrusts of top SMEs in Singapore. J. Bus. Res., 51(3): 209-221.
Glaser BG, Strauss AL (1967). The discovery of grounded theory. Chicago: Aldine, USA., pp. 198-199.
Glaser BG (1978), Theoretical sensitivity: Advances in the methodology of grounded theory. Sociology Press, Mill Valley, California, USA.
Griffin A, Page A (1993). An interim report on measuring product development success and failure. J. Prod. Innov. Manag., 10(4): 291-308
Hagedoon J, Cloodt M (2003). Measuring innovative performance: Is there an advantage in using multiple indicators? Res. Pol., 32(1): 1365–1379.
Henderson R, Cockburn I (1994). Measuring competence: Exploring firm effects in pharmaceutical research. Strat. Manag. J., 15(1): 63–84.
Hoffmann WH, Schlosser R (2001). Success Factors of Strategic Alliances in Small and Medium-sized Enterprises - An Empirical Survey. Long Range Plann., 34(3): 357-381.
Holland G, Gaston G, Gomes G (2000). Critical success factors for cross-functional teamwork in new product development. Int. J. Manag. Rev., 2(3): 231-259.
Ketelhöhn W (1998). What is a key success factor? Eur. Manag. J., 16(3): 335-340.
Lester DH (1998). Critical success factors for new product development. Res. Technol. Manage., 41(1): 36-44.
Leidecker B, Bruno L (1984). Identifying and using critical success factors. Long Range Plann., 17(1): 23-32.
Lu Y (2004). The R&D and marketing cooperation across new product development stages: An empirical study of Taiwan's IT industry. Ind. Mark. Manag., pp. 593–605.
Lynn A, Valentine W (1999). Key Factors in Increasing Speed to Market and Improving New Product Success Rates. Ind. Mark. Manag., 28(4): 319-326.
Mashari MA, Zairi M (1999). BPR implementation process: An analysis of key success and failure factors. Bus. Process Manag. J., 5(1): 87-112.
McQuarrie Q, McIntyre M (1986). Focus groups and the development of new products by technologically driven companies: Some guidelines. J. Prod. Innov. Manag., 1: 40–47.
Miller S (1997). Implementing strategic decisions: Four key success factors, Organ. Stud., 18(4): 577-602.
Millson MR, Wilemon D (2006). Driving new product success in the electrical equipment manufacturing industry. Technovation, 26: 1268-1286.
Monczka RM, Petersen KJ, Handfield RB, Ragatz GL (1998). Success Factors in Strategic Supplier Alliances: The Buying Company Perspective. Dec. Sci., pp. 553–557.
Nah FFH, Lau JLS, Kuang J (2001). Critical factors for successful implementation of enterprise systems. Bus. Proc. Manag. J., 7(3): 285-296.
Parry ME, Song XM (1994). Identifying new product successes in China. J. Prod. Innov. Manag., 11: 15–30.
Pinto P, Prescott P (1988). Variations in critical success factors over the stages in the project life cycle. J. Manag., 14(1): 5-18.
PoPo P, Christian W (2001). Critical success factors revisited: Success and failure cases of information systems for senior executives. Dec. Supp. Syst., 30(4): 393-418.
Ragatz GL, Handfield RB, Scannell TV (1997). Success Factors for Integrating Suppliers into New Product Development, J. Prod. Innov. Manag., 14(3): 190–202.
Ragin CC (2000). Fuzzy-set Social Science. Chicago: University of Chicago Press. USA .
Ragin CC (2004). Between Complexity and Parsimony: Limited Diversity, Counterfactual Cases, and Comparative Analysis.
Ragin CC (2008a). Redesigning Social Inquiry Fuzzy Sets and Beyond. The University of Chicago Press, Chicago, USA .
Ragin CC (2008b). Configurational Comparative Methods: Qualitative Comparative Analysis (QCA) and Related Techniques. SAGE, Thousand Oaks, USA.
Rai A, Borah S, Ramaprasad A (1996). Critical Success Factors for Strategic Alliances in the Information Technology Industry: An Empirical Study. Dec. Sci., 27(1): 141–155.
Rainer, A, Hall T (2002). Key success factors for implementing software process improvement: A maturity-based analysis. J. Syst. Softw., 62(2): 71-84.
Rangon A (1997). Linking organizational effectiveness, key success factors and performance measures: An analytical framework. Manag. Account. Res., 8(2): 207-219.
Ries A, Ries L (2004). The Origin of Brands: Discover the Natural Laws of Product Innovation and Business Survival. Harper Business, New York.
Rothwell R, Freeman C, Horlsey A, Jervis VTP, Robertson AB, Townsend J (1974). SAPPHO updated—project SAPPHO phase II. Res. Pol., 3: 258–291.
Schindler M, Eppler MJ (2003). Harvesting project knowledge: A review of project learning methods and success factors. Int. J. Project. Manag., 21(3): 219-228.
Stefanovitz JP, Nagano MS, Santos FCA (2010). Influence of the technological innovation degree on knowledge creation: Evidence from a Brazilian firm. Afr. J. Bus. Manag., 4(5): 631-643.
Strauss A, Corbin J (1990). Basics of qualitative research: Grounded theory procedures and techniques. London: Sage.
Strauss A, Corbin J (1998). Basics of qualitative Research: Techniques and Procedures for Developing Grounding Theory, SAGE Publications Inc., California, USA, 2nd Edition.
van der Panne G, van Beers C, Kleinknecht A (2003). Success and failure of innovation: A literature review. Int. J. Innov. Manag., 7: 309–338.
von Hippel E (1986). Lead users: A source of novel product concepts. Manag. Sci., 32: 791–805.
Werner K (1998). What is a key success factor? Eur. Manag. J., 16(4): 335-340.
Whipple JM, Frankel R (2000). Strategic Alliance Success Factors, J. Supply Chain Manag., 36(3): 21–28.
Woodside AG (2010a). Key Success and Failure Paths in Fashion Marketing Strategies. J. Global Fish Mark., 1(1): 1-8.
Woodside AG (2010b). Bridging the chasm between survey and case study research: Research methods for achieving generalization, accuracy, and complexity. Ind. Mark. Manag., 39: 64-75.
Wu MF, Chang PL (2011). Assessing Mechanism For Pre-Development Stage Of New Product Development By Stage-Gate Model. Afr. J. Bus. Manage., 5(6): 2445-2454.
Zirger BJ, Maidique M (1990). A model of new product development: An empirical test. Manag. Sci., 36: 867–883.