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Four decades of new product development research: an integrative review

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Abstract: Changes in global market conditions and regulatory policies have led to a greater focus on new product development (NPD). To survive and compete in the market, organisations need to develop a comprehensive understanding of NPD, including the past and present trends in NPD research. This study attempts to address this need by analysing scholarly literature on NPD published in last four decades, i.e. 1976–2017. Unlike previous literature reviews that focused on specific NPD aspects such as performance measurement or model selection/evaluation, this study adopts a holistic perspective. By analysing 381 articles on NPD, we shed light on the underlying research trends, common research characteristics as well the gaps in research and potential directions for future NPD research.

Keywords: literature review; new product development; innovation; product design.

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1 Introduction

The survival and growth of organisations today depends on the innovations that drive new product development (NPD). NPD promotes the creation of intellectual property (IP) within organisations in the form of patents, copyrights, industrial designs and trademarks, and these in turn serve as an entry barrier to competitors (Pandey and Dharni, 2014). Organisations such as 3M, IBM and Bosch generate a substantial share of their revenue from the IPs that they register each year. Guo (2008) and Krishnan and Ulrich (2001) found that NPD helps marketing organisations address market opportunities and thus enables them to enhance their sales and profitability. In fact, NPD has been recognised as a key determinant of a firm’s competence – one that influences the strategic business planning of organisations (Booz et al., 1982; Crawford, 1997; Urban and Hauser, 1993; Cooper, 2001; Ulrich and Eppinger, 2011). These advantages have made NPD one of the most keenly researched topics within the field of management.

However, understanding NPD and its related dimensions has remained a major challenge for marketing organisations (Nandkeolyar et al., 2017; Page, 1993). According to a survey report published by the Product Development and Management Association (PDMA), the success rate of NPD in marketing organisations in USA has remained stagnant (at about 58%) despite the use of new methods and techniques. To overcome this stagnation and improve the success of NPD, marketing and management researchers have proposed solutions in the form of new practices. For instance, some scholars have called for greater emphasis on the design and commercialisation of new products (Kaul and Rao, 1995; Srivastava et al., 2009; Pandey and Singh, 2012). In the past, researchers such as Montoya-Weiss and Calantone (1994), Henard and Szymanski (2001) and Pattikawa et al. (2006) have focused on the *performance* of new products. Interestingly, unlike marketing researchers, management experts have focused on product innovation (Guo, 2008), product development decisions (Krishnan and Ulrich, 2001) and innovativeness terminology (Garcia and Calantone, 2002). They have also explored other factors related to NPD such as the speed of NPD and new product performance (Montoya-Weiss and Calantone, 1994; Poolton and Barclay, 1998; Henard and Szymanski, 2001; Ernst, 2002; Chen et al., 2010). Other than these factors, the issue of change management (Wright, 1997; Pandey and Jaiswal, 2014) has also been investigated by

marketing researchers. Although these studies have explored various aspects of NPD, a systematic review of NPD, which can summarise the past and current research trends, has not yet been undertaken (Page and Schirr, 2008).

Given the need, this study has been carried out to fulfil two purposes. First, the study aims to extend the contributions of earlier researchers who have reviewed the literature on NPD. As this calls for an extensive examination, this study has evaluated 381 articles (selected from a pool of 427 abstracts of published studies) selected on the basis of various parameters. The second purpose of this study is to understand the theoretical evolution of NPD research over a period of four decades.

2 Review of previous studies

First, we selected existing literature review papers on NPD. The first literature review on NPD was published in 1994, though scholarly contributions to the domain began as early as 1976. To date, six literature reviews have been published, focusing on various factors of NPD. Details of these reviews, published between 1994 and 2017, are presented in Table 1.

Table 1 Summary of previous literature reviews

| <i>Author, year</i> | <i>Number of articles, criteria for inclusion</i> | <i>Dimensions considered in the review</i> |
|-----------------------------------|---|---|
| Montoya-Weiss and Calantone, 1994 | 47, empirical studies | Considered relationship between multiple explanatory variables and a dependent variable in the context of new product's performance and functionality. |
| Brown and Eisenhardt, 1995 | Framework-based study, empirical and conceptual studies | Emphasised on the strategic role of product development. The role of communication on the web and disciplined problem solving was also explored. |
| Krishnan and Ulrich, 2001 | 200, ISI Citation Index and recommendations of 50 researchers | Underlying thematic alignment between the academic domains (marketing, organisations, engineering design, and operations management) in product development decisions was examined. |
| Page and Schirr, 2008 | 815, Ten leading journals | Methodological aspects (levels of analysis, research design, analytical techniques, conceptual levels) and journal-specific parameters (broad topics explored, progress of the journal, 8 leading domains related to NPD were also taken into consideration. |
| Benito-Osorio et al., 2012 | Conceptual study, empirical studies | Emphasis on Product diversification and performance; Performance Impact of home country environment and time. This paper reported about usefulness of various models (premium diversification model, discount diversification model and U-inverted model) for examining the impact of product diversification on performance. |
| Kalluri and Kodali, 2014 | 1127, Keywords | Emphasis of research on NPD, organisational context, Level of innovation, NPD Frameworks, New Product Performance, NPD research design and NPD relevant best practice element. |

We found that the majority of the older reviews were theme-oriented e.g. Krishnan and Ulrich (2001) focus on decisions related to NPD. Most of the past researchers focused on methodological dimensions and selected articles accordingly. Not surprisingly, the scope of the previous reviews was narrow. They did not consider dimensions such as the spatial distribution of NPD research, the contributions of the top ten journals and the prominence of an academic discipline in NPD research. Even though the number of papers published on NPD has increased significantly in the past two decades, few of them are literature reviews.

Given the existing scenario, we developed the following objectives for our systematic literature review:

- To understand the scholarly contributions to NPD as well as the research dimensions explored by previous NPD researchers.
- To categorise the different perspectives relevant to NPD research between 1976 and 2017.
- To identify potential research gaps and propose future research directions for NPD.

3 Methodology

According to Porter et al. (2002), one of the drawbacks of a typical literature review is that it considers only a limited number of scholarly works (about 20 to 100) and therefore is unable to offer a comprehensive picture of the research context being reviewed. Research profiling, on the other hand, is an approach that presents a macro-level analysis of the research literature (Porter et al., 2002). It allows researchers to consider a wide range of scholarly articles (100 to 20,000), and the selection can be specific to a particular term, citation, title or keywords. Experts analyse bibliographic sources for occurrence/co-occurrence patterns of the term or topic considered for review to understand the various research dimensions.

While traditional literature reviews present the outcomes of the analysis in textual form, research profiling enables textual, numerical and graphical representations of the results. Further, it helps explore underlying research patterns in the existing body of knowledge. The rigour of research profiling can be enhanced by the use of analytical software such as Vantage Point, as has been used in this work. By establishing better linkages between the existing scholarly articles, the approach helps better understand context or domain-specific knowledge.

It is important to add that research profiling is not an alternative to the traditional literature review (Porter et al., 2002). Instead, it augments traditional review approaches to provide a better understanding of the phenomenon (Choi et al., 2011). Given the above advantages, we used the technology-assisted research profiling method for this study. We used text mining as a strategy to select relevant data. Text mining treats text (like abstracts) as data and uses the data for exploring occurrence/co-occurrence patterns via an analytical software. In this study, we used 381 relevant research records (identified from 427 abstracts) as data and Vantage Point (the text mining software) as the analytical software. Along with occurrence and co-occurrence of terms, other parameters such as journal title, article type, geographical context and prominent authors were used to identify the most influential NPD research sources worldwide.

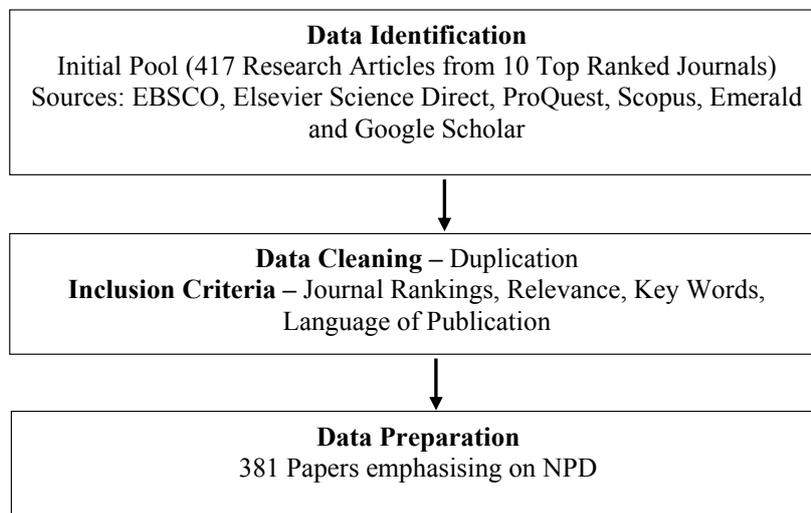
3.1 Data preparation

Various types of raw data were used for research profiling, including scholarly articles related to NPD. Porter and Cunningham (2004) reported that abstracts, which serve as data for text mining, can be identified by defining keywords. Accordingly, pre-defined keywords were used for finding abstracts related to NPD. Scientific databases such as EBSCO, Elsevier Science Direct, ProQuest, Scopus and Emerald as well as search engines like Google Scholar were used for finding relevant scholarly articles.

3.1.1 Criteria for inclusion

Past literature reviews suggested that NPD research began after 1975. Therefore, we chose 1975 as the starting year for study selection and covered a span of 40 years, i.e. from 1975–1976 to 2016–2017. To enhance the relevance of the search and selection criteria, we relied on journal rankings of various reputed organisations viz. Australian Business Deans Council, Association of Business Schools, Academy of Marketing Science and SCImago Journal Rankings. From these rankings, a select few journal titles that focused on NPD research were identified. Only scholarly articles published in these select journals were considered for the review. The research profiling (bibliometric) approach uses a ‘subject index term’ instead of a keyword, to allow for a broad scan of relevant research papers (Porter et al., 2002). We used the following subject index terms to find articles on NPD: ‘new product’, ‘product development’, ‘product innovation’ and ‘product design’. The process of data preparation and data screening is presented in Figure 1.

Figure 1 Initial data screening



Initially, a set of 417 research articles was extracted from the top ten journals, ranked according to citation index and journal rankings. These articles were identified from the aforementioned scientific databases and search engines. The data were cleaned to avoid duplication, which resulted in a refined set of 381 scholarly articles.

Typically, raw data, such as author details, author affiliations, the title of the scholarly article, keywords and abstracts, are input into a text mining software, which further uses advanced natural language processing for analysing the data. In research profiling, raw data (article/abstracts) are analysed on the basis of the ‘occurrence of a term’ (Porter et al., 2002). The raw data for this study were collected from 381 scholarly articles, stored in an MS Excel worksheet, and this worksheet was input into the text mining software.

4 Results of data analysis

Research on NPD gathered pace in the early 1990s, and it grew into an established research domain in a span of two decades (1995–1996 to 2016–2017). Key trends in NPD research identified from our analysis are summarised below.

4.1 General research trends

We found that all the top ten journals had contributed substantially to NPD research in the last two decades (Figure 2). A decade-wise analysis showed that initially, NPD research was not a priority, especially among marketing scholars. However, with time, scholarly contributions from marketing experts to NPD began to grow and expand. Since 1995, both developing and developed markets have experienced the impact of innovations, and to retain their respective market positions, organisations in these countries have turned to NPD. This could be one of the reasons for the significant increase in the contributions to NPD research over the last two decades. In fact, nearly 89% (340 out of 381) of the articles on NPD were published in last two decades (1998–2017) (Figure 2). The year- and journal-wise classification of the scholarly articles is presented in Figures 3 and 4 respectively.

Figure 2 Decade-wise classification

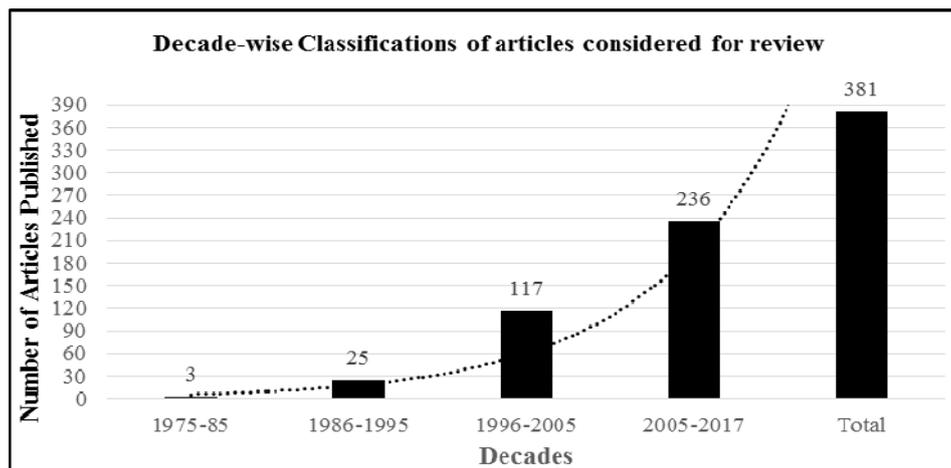


Figure 3 Year-wise classification

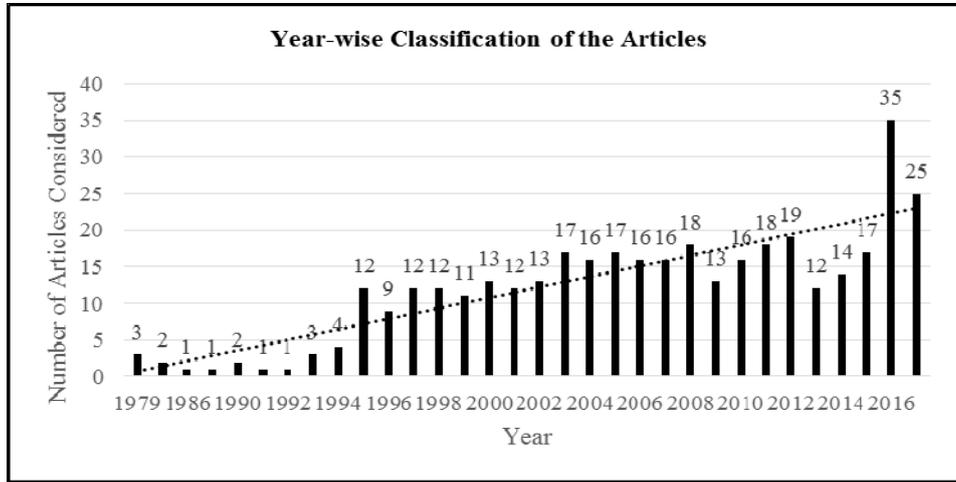
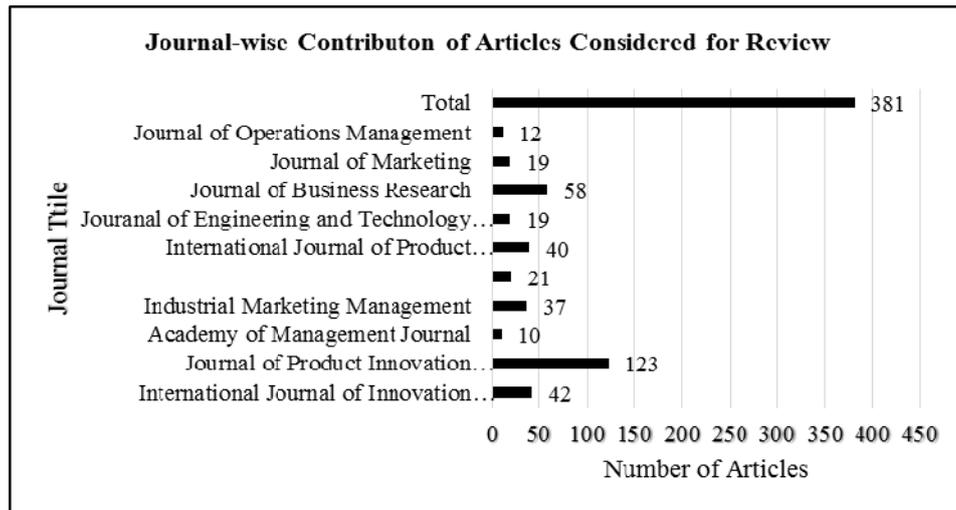


Figure 4 Journal-wise contribution



Almost 79% of the NPD articles were published in marketing journals such as *Journal of Marketing*, *Journal of Product Innovation Management*, *International Journal of Product Development*, *International Journal of Innovation Management* and *Industrial Marketing Management*. Interestingly, these journals constitute 83% of the top ten journals that focus on NPD research. Further, among these, three journals – *Journal of Business Research*, *Journal of Product Innovation Management* and *International Journal of Innovation Management* – accounted for 58% of the all articles published. Collectively, the trends showed that NPD was a prominent area of research within the marketing domain.

Figure 6 Number of articles published in top ten countries

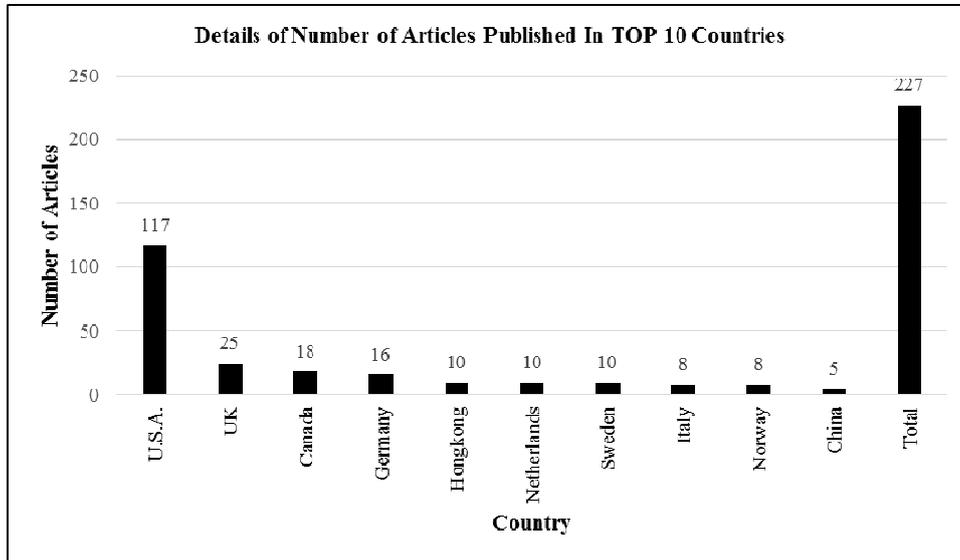
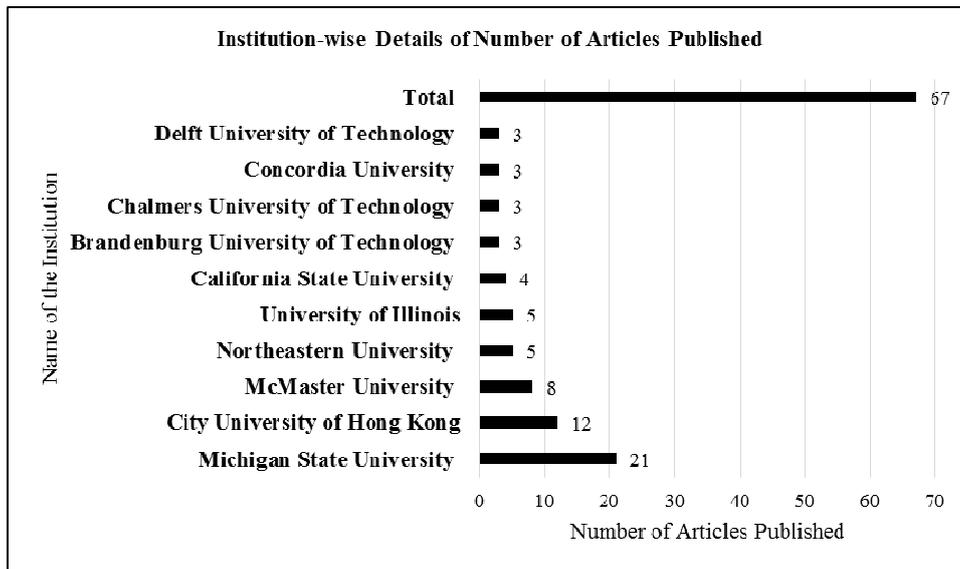


Figure 7 Institution-wise details



4.4 Leading institutes

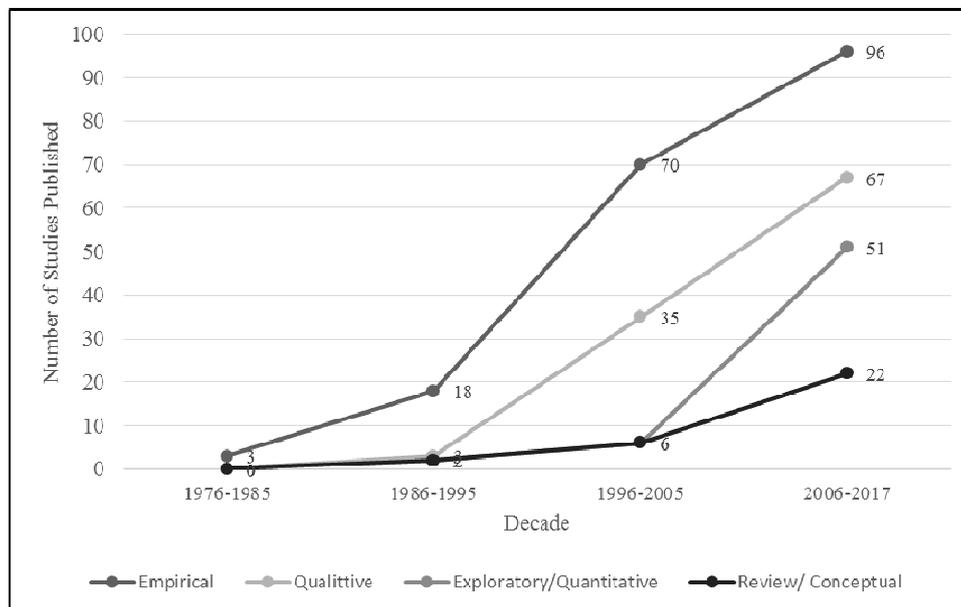
Apart from identifying the regions at the forefront of NPD research, we also examined the institutions working in the field of NPD. The results showed that the top ten institutes produced 18% of all the NPD research. The Michigan State University, USA, was at the

top of the list, publishing the highest number of research papers (Figure 7). Interestingly, most of the influential authors were affiliated with these institutes. For instance, Roger J. Calantone, Kwaku Atuahene-Gima and Robert G. Cooper belonged to the Michigan State University (USA), City University of Hong Kong (Hong Kong) and McMaster University (Canada), respectively.

4.5 Research approaches

This study also scanned research papers to determine the prominent research approaches used by NPD researchers (Figure 8). Most researchers preferred empirical research methods, and this trend was consistent across all four decades.

Figure 8 Research approaches considered by past researchers



Qualitative and quantitative research methods were the second and third most popular research methods. The choice of methods suggests that researchers in the past focused more on the impact of organisational factors on NPD processes and success than on consumer/customer factors.

4.6 Keyword analysis

Natural language processing can be used to analyse free text portions (abstracts) and structured text fields (keywords) to determine the key research themes within a particular topic (Porter et al., 2002; Porter and Cunningham, 2004, Pandey and Maheshwari, 2017). However, a drawback associated with using text portions and fields is that it may lead to noise and redundancy. Therefore, before conducting a keyword analysis, researchers use techniques such as data cleaning, fuzzy matching, and term clumping to improve data quality. In the present study, we extracted key phrases from the abstracts, titles and

authors' keywords of the selected 381 articles and cleaned them using text/term clumping. This resulted in a list of 40 words related to NPD research. These terms were further verified on the basis of past experience, repetition or frequency of occurrences in the text, expert knowledge and application-specific requirements (Porter and Cunningham, 2004).

The set of 40 keywords was used as input for cluster analysis. The resulting Aduna cluster represented each research theme as a node and the number of articles associated with the theme as bubbles. Further, the cluster map also showed overlapping research themes. For easier interpretation, in this study, the clustering results are presented in a tabular format (Table 2). The results showed that 'introduction of a new product' was the most prominent research theme, cited in the abstracts of 73% of the articles. Most of the NPD research was focused on the central theme of 'Introduction of new product'. The next two important themes in NPD research were 'New product decision – considers organisation-specific dimensions' and 'New product success – considers strategy-specific dimensions'.

From these dominant themes, we identified commonalities and proposed three crucial dimensions that were important to better understand the field of NPD research. These dimensions are also presented in Table 2.

Table 2 Cluster analysis

| <i>Perspectives</i> | <i>Dimensions</i> | <i>Research studies</i> | <i>Perspective-wise classification</i> |
|--------------------------|---------------------------------------|-------------------------|--|
| New Product Introduction | Customer Value | 35 | 44 |
| | Customer Requirement | 4 | |
| | Customer Preferences | 3 | |
| | Customer Behaviour | 2 | |
| New Product Decision | NPD/Innovation Decision and Processes | 72 | 147 |
| | Technical Ability | 33 | |
| | NPD Time/Speed/Success Factors | 18 | |
| | Organisation Performance | 24 | |
| New Product Success | Challenge/Competitive | 29 | 104 |
| | Operational Strategy | 37 | |
| | Marketing | 13 | |
| | Strategic Performance | 25 | |
| Total | | | 295 |

5 Conclusion and future directions

This study presents an attempt to analyse, classify and discuss the state of NPD research over the last four decades. We analysed 381 articles, selected according to predefined parameters, to understand the evolution and current research trends in NPD. The study also leveraged non-traditional literature review approaches such as research profiling and keyword analysis to enhance its scientific rigour and explore newer perspectives in NPD.

In the last four decades, NPD research has evolved significantly. The last two decades, in particular, have witnessed a rapid growth in NPD research in developed countries – in terms of perspectives and publications. Although reviews of NPD literature have been conducted in the past, most have been unidirectional and non-comprehensive. The strengths of this review lie in its holistic approach towards past and current NPD research and its use of unconventional analytical methods such as research profiling. In addition to the spurt in NPD research, our analysis also showed that marketing researchers have started taking a keen interest in the subject.

While these trends in NPD research are valuable on their own, they also offer useful insights into new research avenues that can be explored by researchers. For instance, given that most of the NPD research is based in western countries, scholars could explore the different themes of NPD within developing/emerging countries such as China, India and Brazil. These countries have witnessed considerable innovations and product improvements such as reverse innovation, frugal innovation and co-creation of products through crowdsourcing. Hence, it is likely that exploring NPD in these regions could offer many interesting, counterintuitive and insightful results.

This review also confirmed that past researchers explored multiple explanatory variables in the context of new product performance, the strategic role of product development and the cross-functional role of various management functions such as marketing, engineering design and operations management. Interestingly, not many studies on NPD have focused on customer-related factors or their impact on NPD success. It would be worthwhile for researchers from both emerging and developed markets to explore this opportunity and investigate the impact of customer-related factors in various cultural settings.

Most of the extant works on NPD have relied on empirical methods of research (Figure 8). It is likely that the lack of a consumer-specific perspective has prevented the use of qualitative methods, such as interviews (vendor, buyer and seller) and observation, which can offer new insights on NPD-related aspects. Mixed methods approaches may also be useful in validation studies.

Future researchers may use this NPD review as a reference point for their work and for grounding new theories. Academicians proposing new theories and methodologies for conducting NPD research should consider publishing their works in leading NPD journals such as *Journal of Product Innovation Management*, *International Journal of Innovation Management*, *International Journal of Product Development*, *Industrial Marketing Management* and *Journal of Marketing*, so that new knowledge related to NPD is disseminated widely and used by academics and practitioners. Lastly, this review may help marketing managers identify sources of valuable information on NPD.

References

- Benito-Osorio, D., Guerras-Martín, L.A. and Zuñiga-Vicente, J.A. (2012) 'Four decades of research on product diversification: a literature review', *Management Decision*, Vol. 50, No. 2, pp.325–344.
- Booz, Allen and Hamilton (1982) *New Product Management for the 1980's*, Booz, Allen & Hamilton, Inc., New York.
- Brown, S.L. and Eisenhardt, K.M. (1993) 'Product development: past research, present findings, and future directions', *The Academy of Management Review*, Vol. 20, No. 2, pp.343–378.

- Chen, J., Damanpour, F. and Reilly, R.R. (2010) 'Understanding antecedents of new product development speed: a meta-analysis', *Journal of Operations Management*, Vol. 28, No. 1, pp.17–33.
- Choi, D.G., Lee, H. and Sung, T.K. (2011) 'Research profiling for "standardization and innovation"', *Scientometrics*, Vol. 88, No. 1, pp.259–278.
- Cooper, R. (2001) *Winning at New Products: Accelerating the Process from Idea to Launch*, 3rd ed., Perseus Publishing, Massachusetts.
- Crawford, C. (1997) *New Product Management*, 5th ed., Richard D. Irwin, Illinois.
- Ernst, H. (2002) 'Success factors of new product development: a review of the empirical literature', *International Journal of Management Review*, Vol. 4, No. 1, pp.1–40.
- Garcia, R. and Calantone, R. (2002) 'A critical look at technological innovation typology and innovativeness terminology: a literature review', *The Journal of Product Innovation Management*, Vol. 19, No. 2, pp.110–132.
- Guo, L. (2008) 'PERSPECTIVE: an analysis of 22 years of research in JPIM', *The Journal of Product Innovation Management*, Vol. 25, No. 3, pp.249–260.
- Henard, D.H. and Szymanski, D.M (2001) 'Why some new products are more successful than others', *Journal of Marketing Research*, Vol. 38, No. 3, pp.362–375.
- Kalluri, V. and Kodali, R. (2014) 'Analysis of new product development research: 1998–2009', *Benchmarking: An International Journal*, Vol. 21, No. 4, pp.527–618.
- Kaul, A. and Rao, V. (1995) 'Research for product positioning and design decisions: an integrative review', *International Journal of Research in Marketing*, Vol. 12, No. 4, pp.293–320.
- Krishnan, V. and Ulrich, K.T. (2001) 'Product development decisions: a review of the literature', *Management Science*, Vol. 47, No. 1, pp.1–21.
- Montoya-Weiss, M.M. and Calantone, R. (1994) 'Determinants of new product performance: a review and meta-analysis', *The Journal of Product Innovation Management*, Vol.11, No. 5, pp.397–417.
- Nandkeolyar, D., Pandey, N., Kiran, R. and Kumar, S. (2017) 'Why do Indian SMEs fail and succeed? Insights from auto-component industry', *International Journal of Indian Culture and Business Management*, Vol. 15, No. 1, pp.82–99.
- Page, A.L. (1993) 'Assessing new product development practices and performance: establishing crucial norms', *The Journal of Product Innovation Management*, Vol. 10, No. 4, pp.273–290.
- Page, A.L. and Schirr, G.R. (1993) 'Growth and development of a body of knowledge: 16 years of new product development research, 1989–2004', *The Journal of Product Innovation Management*, Vol. 25, No. 3, pp.233–248.
- Pandey, N. and Dharni, K. (2014) *Intellectual Property Rights*, 1st ed., PHI Learning, Delhi.
- Pandey, N. and Jaiswal, A.K. (2014) 'Change management: a case of state power utility in India', *Asian Case Research Journal*, Vol. 18, No. 1, pp.61–80.
- Pandey, N. and Maheshwari, V. (2017) 'Four decades of coupon research in pricing: evolution, development, and practice', *Journal of Revenue and Pricing Management*, Vol. 16, No. 4, pp.397–416.
- Pandey, N. and Singh, G. (2012) *Marketing Issues in SMEs: Cases from India*, 1st ed., Pearson Education, Delhi.
- Pattikawa, L.H., Verwaal, E. and Harry, R.C. (2006) 'Understanding new product project performance', *European Journal of Marketing*, Vol. 40, No. 11, pp.1178–1193.
- Poolton, J. and Barclay, I. (1998) 'New product development from past research to future application', *Industrial Marketing Management*, Vol. 27, No. 3, pp.197–212.
- Porter, A.L. and Cunningham, S.W. (2004) *Tech Mining: Exploiting New Technologies for Competitive Advantage*, 1st ed., New Jersey.
- Porter, A.L., Kongthong, A. and Lu, R. (2002) 'Research profiling: improving the literature review', *Scientometrics*, Vol. 53, pp.351–370.

- Srivastava, V., Pandey, N. and Sharma, H. (2009) 'Identifying product attributes through conjoint analysis with special reference to Color Doppler', *Journal of Medical Marketing*, Vol. 9, No. 4, pp.319–328.
- Ulrich, K.T. and Eppinger, S.D. (2011) *Product Design and Development*, 5th ed., McGraw-Hill, New York.
- Urban, C. and Hauser, J. (1993) *Design and Marketing of New Products*, 2nd ed., Prentice-Hall, New Jersey.
- Wright, I.C. (1997) 'A review of research into engineering change management: implications for product design', *Design Studies*, Vol. 18, No. 1, pp.33–42.