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Success Factors of Product Innovation: An Updated Meta-Analysis*

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Assessing factors that predict new product success (NPS) holds critical importance for companies, as research shows that despite considerable new product investment, success rates are generally below 25%. Over the decades, meta-analytical attempts have been made to summarize empirical findings on NPS factors. However, market environment changes such as increased global competition, as well as methodological advancements in meta-analytical research, present a timely opportunity to augment their results. Hence, a key objective of this research is to provide an updated and extended meta-analytic investigation of the factors affecting NPS.

Using Henard and Szymanski's meta-analysis as the most comprehensive recent summary of empirical findings, this study updates their findings by analyzing articles published from 1999 through 2011, the period following the original meta-analysis. Based on 233 empirical studies (from 204 manuscripts) on NPS, with a total 2618 effect sizes, this study also takes advantage of more recent methodological developments by re-calculating effects of the meta-analysis employing a random effects model. The study's scope broadens by including overlooked but important additional variables, notably "country culture," and discusses substantive differences between the updated meta-analysis and its predecessor.

Results reveal generally weaker effect sizes than those reported by Henard and Szymanski in 2001, and provide evolutionary evidence of decreased effects of common success factors over time. Moreover, culture emerges as an important moderating factor, weakening effect sizes for individualistic countries and strengthening effects for risk-averse countries, highlighting the importance of further investigating culture's role in product innovation studies, and of tracking changes of success factors of product innovations. Finally, a sharp increase since 1999 in studies investigating product and process characteristics identifies a significant shift in research interest in new product development success factors.

The finding that the importance of success factors generally declines over time calls for new theoretical approaches to better capture the nature of new product development (NPD) success factors. One might speculate that the potential to create competitive advantages through an understanding of NPD success factors is reduced as knowledge of these factors becomes more widespread among managers. Results also imply that managers attempting to improve success rates of NPDs need to consider national culture as this factor exhibits a strong moderating effect: Working in varied cultural contexts will result in differing antecedents of successful new product ventures.

Over the past three decades, considerable empirical research has focused on new product success (NPS) factors. Several studies have presented clear empirical evidence that successful product innovations have payoffs in both operating cash flows as well as in higher firm valuations by equity markets; yet developing such innovations can be risky and costly. Research has shown that only one out of four new product development (NPD) projects is successful (Cooper, 1990). Due to the high failure rate of product innovation and the increasing number of NPDs, identifying success factors for new product innovations is essential.

The large number of NPS studies with heterogeneous and sometimes even contradictory findings, calls for ways to synthesize and generalize the evidence about key factors determining NPS. To this point, salient meta-analyses by Montoya-Weiss and Calantone (1994) and by Henard and Szymanski (2001) synthesize findings on the success factors of NPD. Montoya-Weiss and Calantone (1994) identified both development process factors such as proficiency of marketing activities and protocols, and

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strategic factors, like product advantage and product market strategy as important drivers of NPS. The more recent meta-analysis of Henard and Szymanski (2001) both refines and expands this set to include product characteristics (product advantage, product meeting customer needs, product technological sophistication), firm strategy (order of entry, dedicated human resources, dedicated R&D resources), firm process (predevelopment task proficiency, marketing task proficiency, technological and launch proficiency), and marketplace characteristics (market potential).

One should note that substantial changes in NPD success factors may have developed from a rapidly changing economic environment, or from changes in research approaches. The subfield of NPD within innovation lacks original theory and has essentially been a race to explain variance in outcomes, success versus failure, or to predict success/failure or some function derived from the activity such as cash flow. Thus, variables are borrowed or lifted from a variety of theories, contingencies, local or industry-based conditions, etc. Regardless, the field has been one of the few areas where continued advances in the science (academic and near academic modeling) have supported the actual practice of NPD, due to a close relationship of academics and consultants who translate the best of the models to application.

The key objective of this research is to provide an updated and extended meta-analytic investigation of the factors affecting NPS. Using Henard and Szymanski's (2001) study as the most recent vetted research statement, this study steps forward from the effective date of that assessment of the field collection by meta-analyzing articles published from 1999 through 2011 to determine whether their empirical generalization still holds in the recent market environment; alternatively, it might uncover whether the science of NPS has changed direction or increased efficacy.

To assess the science since the Henard and Szymanski (2001) study's findings, this research first engages an assessment of their findings by creating a metricized baseline, based on 233 empirical studies on NPS, with a total 2618 effect sizes. Taking advantage of more recent methodological developments (Borenstein, Hedges, Higgins, and Rothstein, 2009; Hunter and Schmidt, 2004; Schulze, 2004), it recalculates effects of the meta-analysis, employing a random effects model. It also broadens the study's scope by including important additional variables, notably "country culture" (based on data from 17 countries), and discusses substantive differences between the updated meta-analysis and its predecessor, emphasizing the finding that most effect sizes are weaker and further reduce over time. These findings highlight the importance of a broader investigation of success factors of NPS. Many studies have moved away from a purely a-theoretical view of the success process and have adopted the resource-based view as the most referred theory basis.

Method

Study Retrieval

For this meta-analysis to appropriately build on that of Henard and Szymanski (2001), the literature search covered the period from 1999 through 2011 (the previous meta-analyses cover studies up to and including 1998). Identification of relevant studies, to provide the data basis, for the meta-analysis was done using an approach consisting of the recommendations of several authors (e.g., Hunter and Schmidt, 2004; Rosenthal, 1994; Stock, 1994), and closely following methods used in previous meta-analyses. The approach employed the following steps:

BIOGRAPHICAL SKETCHES

Dr. Heiner Evanschitzky is Professor and Chair of Marketing at Aston University, U.K. His research revolves around Service-Profit-Chain issues with particular interests including service marketing, retailing, relationship marketing, and research methods. His work has been published in leading journals such as *Journal of Marketing*, *Journal of the Academy of Marketing Science*, *Journal of Retailing*, *Journal of Product Innovation Management*, *Journal of Service Research*, *Journal of Business Research*, and others.

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Dr. Roger J. Calantone is the Eli Broad Chaired University Professor of Business, and he directs the Institute for Entrepreneurship & Innovation. He has published a number of academic articles and five books. His articles appear in journals such as *Marketing Science, Management Science, Journal of Marketing, Journal of Marketing Research, Academy of Management Journal, Journal of Operations Management, Journal of the Academy of Marketing Science, Journal of Product Innovation Management, IEEE Trans. on Engineering Management, Strategic Management Journal*, and others.

Ms. Yuanyuan Jiang, M.Sc., is an overseas study advisor in the Shanghai University of Finance and Economics, and a visiting researcher at the Aston University, U.K. She received a BA in Marketing Management from Staffordshire University, U.K., and an M.Sc. in International Marketing from Strathclyde University, U.K. Her research interests focus on new product development and innovation, and relationship marketing.

1. Keyword searches of electronic databases (e.g., ABI/INFORM, Emerald, Elsevier, EBSCO) using terms such as "new product development," "product innovation," and "new product performance," and Google Scholar;
2. Referencing an article by Page and Schirr (2008) who manually searched and reviewed 815 journal articles on new product development published between 1989 and 2004;
3. Issue-by-issue searches of journals identified by Page and Schirr (2008) as sources for empirical research related to NPD (*Academy of Management Journal, IEEE Transactions, Industrial Marketing Management, International Journal of Research in Marketing, Journal of Business Research, Journal of International Marketing, Journal of Marketing, Journal of Marketing Research, Journal of Product Innovation Management, Journal of the Academy of Marketing Science, Marketing Letters, Technovation, R&D Management*);
4. Contacting 66 authors of conceptual and empirical studies on NPD/NPS to ask for assistance identifying relevant articles;
5. Posting two requests for assistance identifying relevant articles on the electronic list server for marketing academics (ELMAR);
6. Examining references from relevant publications to locate additional studies.

This search resulted in 204 usable manuscripts. Some of the manuscripts reported on more than one relevant sample (e.g., different country samples), while others were based on data from one individual sample. Eventually, this study used 233 independent samples that reported on one or more antecedents to NPS. All manuscripts are listed in Appendix A.

Coding Procedure

Coding was done in concordance with the taxonomy provided by Henard and Szymanski (2001), which distinguishes characteristics of the product, the strategy, the process, and the marketplace. Other meta-analyses on NPD use an additional category related to organizational characteristics (Montoya-Weiss and Calantone, 1994; Pattikawa, Verwaal, and Commandeur, 2006). Because the studies in this meta-analysis provide a large number of effect sizes related to this category, six predictors related to organizational characteristics were added to the taxonomy as well as three further predictor variables that appeared frequently in the studies, resulting in a total of 33 predictive antecedents (see Appendix B for an overview and definitions).

Two coders independently coded the predictor variables according to instructions in a coding sheet. Coding conformity was achieved in 93.8% of the cases, and the few differences were resolved through discussion. The coders also coded moderator variables as discussed below, and the agreement rate was 96%.

Meta-Analytic Procedures

The studies provide 2618 effect sizes in total. Most studies did provide correlation coefficients (a total of 2230) that were selected as the effect size metric for the meta-analysis. In addition, statistics from regression analyses were coded. Some bivariate regressions reported R^2-values only, which were transformed into correlation coefficients by taking the square root. Moreover, standardized regression coefficients were used. In the case of bivariate regressions, these equal the correlation coefficient, and in the case of multivariate regressions, the coefficients were computed following the recommendations given by Peterson and Brown (2005), as $r = \beta + .05\,\lambda$ where λ is an indicator variable that equals 1 when β is nonnegative and 0 when β is negative. The size of the transformed coefficients did not differ from the size of the 2230 correlation coefficients ($t = 1.63$, $p > .10$), indicating the appropriateness of transforming regression statistics into correlation coefficients.

Several meta-analytic procedures to compute mean effect sizes were performed. Consistent with prior related works, (Henard and Szymanski, 2001) (1) the simple mean, (2) the sample size-adjusted mean, and (3) the sample size and reliability-adjusted mean were reported for each predictor variable. Reliability adjustments consider reliability coefficients of the dependent and independent variables (Hunter and Schmidt, 2004). A conservative .8 reliability estimate was applied to objective measures (i.e., single-item measures) (Bommer, Johnson, Rich, Podsakoff, and MacKenzie, 1995; Dalton, Daily, Certo, and Roengpitya, 2003; Hunter and Schmidt, 2004).

Henard and Szymanski's (2001) study reported if the mean values reached significance, an availability bias, the total variance, and sampling error variance. To compare results of this study to the baseline study, a z-statistic for the sample size and reliability-adjusted mean was provided. A further chi-square homogeneity test (Hedges and Olkin, 1985, p. 235) examined whether the nonsampling error variance (i.e., total variance minus sampling error

variance) is significant. In case of significance of the mean value, a fail-safe *N* ("availability bias") was calculated to show how many nonsignificant results must be added in order to prove the significance of the integrated effect size as a random error (Rosenthal, 1979).

To broaden the scope relative to baseline, statistics of effect size integration were brought up to date. First, the reliability and sample size-adjusted mean for dependent measures (that is, multiple effect sizes per study) was adjusted. Henard and Szymanski (2001) used model level correlations, treating multiple correlations for the same predictor within a study as independent values. To assume independence of measures that are actually dependent can bias integrative test results, since the sum of samples underlying each measure is used as a basis for integration instead of a single sample where several measures are taken. This overestimates sample size and, thus, underestimates sampling error (Hunter and Schmidt, 2004). Therefore a weight for dependent measures per study, where each sample size is weighted by the ratio 1 to the number of effect sizes per study, measuring the same predictor, was considered.

Second, a random-effects perspective (Shadish and Haddock, 1994) to compute a mean effect size was used. Henard and Szymanski (2001) base mean computations on a fixed-effects approach, but when significant unexplained variance results (as is the case for all mean effect sizes in their meta-analysis), a fixed-effects approach is less effective because it ignores the unexplained variance in the computation of standard errors and confidence intervals. Consequently, fixed-effects models overstate the degree of precision and significance in meta-analysis findings (Hunter and Schmidt, 2000). Therefore, a random-effects approach to both the reliability-adjusted mean and the reliability and dependent measure-adjusted mean values was used, along with *z*-values for both mean values.

Moderator Regression Model

Moderators consistent with the baseline study were used to explain the heterogeneity of effect sizes: multi-item versus single-item performance measures, subjective versus objective performance measures, senior management support versus project manager support, short-term versus long-term performance data, services versus goods, high-technology versus low-technology markets, and Asia versus North America and Europe (using Henard and Szymanski's [2001] rationale for similar cultural values as reason to add Europe, because part of the data originated from European samples).

The moderator variables are used as predictors in a regression model in order to explain the significant heterogeneity of the effect sizes of dependent variables which are based on a sample of at least 30 effect sizes and that yielded a significant mean effect size. Following a random-effects perspective, the method of moments was applied where the residual sum of squares of an ordinary least squares (OLS) regression of the moderator model was used to estimate the random variance (Raudenbush, 1994). The total variance (conditional variance of the effect size due to sampling error plus random variance of the population effect size) was then used as a weight in a weighted regression analysis.

Results

Summary of Key Findings

Table 1 presents the mean effect sizes for the relationship between predictor variables and new product performance.

A comparison of integration approaches shows differences between fixed-effects means that consider dependent variables and fixed-effects means that neglect them. Almost no differences between dependent and independent measures emerge under the random-effects approach, because the effect-size variance considers both between-study and within-study variance. The correction for dependent variables affects within-variance only, which is relatively low compared to between-study variance under the random-effects approach. Therefore, the results of both random-effects means are nearly the same. The consideration of heterogeneity of effect sizes, the invulnerability for problems of dependent measures, and the superiority in terms of significance tests support the random-effects model as preferred. Hence, in the following, results of the random-effects model are reported.

First, several nonsignificant predictors are found. In particular, product meeting customer needs, product price, product innovativeness, order of entry, project/organization size, and degree of centralization did not impact NPS. The strongest positive effects are obtained for market orientation and product advantage.

At a more aggregate level, categories of process and strategy characteristics are the most important predictors of NPS, while organization is less important. Interestingly, marketplace characteristics play a negligible role as success factors of new products.

Table 2 presents the results of the moderator regression model for predictors based on a sample of at least 30 effect sizes.

Table 1. Mean Effect Sizes for the Relationship between Predictor Variables and New Product Success

	Fixed Effects, Independent Measures								Fixed Effects, Dependent Measures				Random Effects			
Predictor	*K*	N_1	Simple Mean *r*	Sample-Size adj. m.	Reliability adj. m.	*z*-test	Homogeneity test	Availability bias	M	N_2	Reliability adj. m.	*z*-test	Reliability adj. m.	*z*-test	Depend. Meas. adj. m.	*z*-test
Product characteristics	*202*	*43,957*	*.19*						*81*	*20,881*						
Product advantage	86	20,853	.32	.36	.35	56.43***	616.86***	72,043	42	8668	.33	33.55***	.35	15.19***	.34	16.08***
Product meets customer needs	8	1489	.05	.08	.08	3.40***	51.70***	9	6	1146	.05	2.03*	.05	.73	.05	.67
Product price	4	498	.11	.10	.10	2.50*	15.72***	4	2	249	.10	1.77	.11	1.02	.11	1.02
Product technological sophistication	17	2461	.09	.03	.03	1.60	38.75**	–	10	1588	.03	1.15	.09	2.08*	.08	2.04*
Product innovativeness	83	18,331	.11	.10	.10	14.16***	1244.70***	3906	46	9670	.10	10.40***	.11	1.11	.11	1.12
Strategy characteristics	*361*	*88,812*	*.22*						*102*	*27,889*						
Marketing synergy	34	9358	.17	.17	.17	17.54***	210.96***	3362	14	3499	.16	10.55***	.18	5.51***	.18	6.24***
Technological synergy	43	9130	.20	.25	.25	26.35***	245.66***	7047	15	2725	.22	12.85***	.21	6.66***	.21	7.97***
Order of entry	10	1917	.03	.03	.05	.22	88.07***	–	5	957	.05	1.60	.03	.26	.03	.34
Dedicated human resources	64	20,730	.29	.23	.23	36.91***	367.46***	28,951	19	3620	.28	18.21***	.31	9.02***	.29	11.17***
Dedicated R&D resources	37	4952	.25	.25	.25	19.35***	205.12***	3586	23	3351	.24	15.30***	.25	3.25**	.25	3.69***
Company resources	92	26,598	.18	.20	.20	36.54***	653.02***	30,033	36	7282	.20	18.81***	.18	7.95***	.18	9.79***
Strategic orientation	67	13,068	.23	.25	.25	30.71***	507.37***	17,247	31	5293	.24	18.95***	.25	8.19***	.24	8.17***
Process characteristics	*1232*	*213,008*	*.22*						*177*	*60,281*						
Structured approach	56	8560	.19	.21	.21	21.14***	481.41***	6787	26	4476	.23	16.82***	.22	6.03***	.20	5.54***
Predevelopment task proficiency	184	29,883	.26	.25	.25	47.49***	1041.60***	121,581	58	10,473	.28	31.68***	.28	10.20***	.26	10.25***
Marketing task proficiency	71	13,868	.24	.24	.23	30.20***	624.86***	19,053	20	3339	.30	18.76***	.28	7.68***	.25	7.72***
Technological proficiency	191	30,288	.14	.15	.14	27.51***	1296.18***	37,352	33	5374	.22	17.60***	.13	2.03*	.08	1.83
Launch proficiency	63	9404	.28	.25	.25	26.58***	552.35***	16,467	17	2734	.17	9.73***	.29	9.07***	.29	8.92***
Reduced cycle time	42	6387	.15	.20	.19	17.34***	509.03***	2241	21	3801	.24	16.49***	.17	2.51**	.15	2.12**
Market orientation	188	32,466	.31	.29	.28	56.17***	1329.37***	198,928	58	9296	.30	31.11***	.34	20.46***	.31	17.78***
Customer input	47	7759	.20	.18	.18	17.67***	767.08***	4645	10	1767	.10	4.56***	.20	2.44**	.20	2.41**

Table 1. *Continued*

	Fixed Effects, Independent Measures								Fixed Effects, Dependent Measures				Random Effects			
Predictor	*K*	N_1	Simple Mean *r*	Sample-Size adj. m.	Reliability adj. m.	*z*-test	Homogeneity test	Availability bias	M	N_2	Reliability adj. m.	*z*-test	Reliability adj. m.	*z*-test	Depend. Meas. adj. m.	*z*-test
Cross-functional integration	189	38,881	.20	.16	.16	34.89***	1150.70***	62,493	58	8842	.23	23.82***	.23	10.17***	.20	9.93***
Cross-functional communication	133	25,752	.23	.20	.20	35.92***	748.29***	53,135	38	5618	.27	22.21***	.24	7.02***	.23	7.36***
Senior management support	98	14,709	.22	.20	.20	26.52***	575.77***	21,534	36	5889	.21	17.99***	.23	7.80***	.22	5.88***
Marketplace characteristics	*281*	*55,227*	*.09*						*68*	*18,402*						
Likelihood of competitive response	71	15,560	−.02	−.02	−.02	3.51***	140.13***	129	9	1633	−.01	.34	−.01	.26	−.02	1.96*
Competitive response intensity	80	14,466	.12	.10	.10	13.52***	554.81***	4930	38	6784	.06	5.26***	.12	3.90***	.12	3.59***
Market potential	35	8958	.20	.25	.25	27.13***	156.19***	5309	20	3715	.21	14.54***	.21	8.18***	.21	8.63***
Environmental uncertainty	97	16,498	.10	.07	.06	8.88***	787.86***	4072	35	6524	.05	4.51***	.08	3.41***	.10	3.64***
Organizational characteristics	*542*	*82,515*	*.13*						*96*	*27,170*						
Organizational climate	80	9567	.24	.25	.25	26.67***	344.97***	16,168	23	3638	.23	15.42***	.30	8.66***	.25	8.72***
Project/organization size	106	20,567	.06	.05	.05	7.83***	510.52***	2072	48	9391	.04	4.67***	.06	1.16	.06	1.18
Organizational design	176	24,756	.09	.08	.08	14.17***	877.58***	12,067	35	5467	.09	7.02***	.09	3.00**	.10	4.15***
External relations	107	19,359	.20	.20	.20	30.81***	677.14***	29,716	24	4430	.14	10.20***	.21	5.76***	.20	7.36***
Degree of centralization	31	2783	−.02	−.04	−.04	2.13*	146.83***	4	15	1460	−.05	2.11*	−.03	.60	−.02	.42
Degree of formalization	28	3663	.12	.12	.12	8.34***	86.38***	509	15	1897	.12	5.78***	.13	4.15**	.12	3.69***

K = number of correlations; N_1 = Cumulative *n* across correlations; N_2 = Cumulative *n* across independent samples; M = number of independent samples.
Significant at * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 2. Moderator Regression Analysis

	Intercept	Multi- versus Single-item measure β (S.E.)	Subjective versus Objective Criteria β (S.E.)	Senior versus Project Manager β (S.E.)	Short- versus Long-term performance β (S.E.)	Services versus Goods β (S.E.)	Asia versus N. America/Europe β (S.E.)	High-tech versus Low-tech β (S.E.)	$Q_{explained}$	Maximum VIF
Product advantage	.70 (.13)***	−.11 (.07)	.01 (.15)	.01 (.06)	.04 (.08)	−.28 (.15)$^{+}$	−.10 (.06)	.06 (.09)	12.20^{+}	3.14
Dedicated human resources	−.25 (.30)	.16 (.06)*	–	−.04 (.07)	−.27 (.21)	–	.09 (.09)	.53 (.30)$^{+}$	33.83***	1.99
Dedicated R&D resources	.22 (.33)	−.09 (.11)	−.05 (.18)	−.19 (.17)	−.37 (.35)	.12 (.27)	.03 (.12)	.13 (.18)	11.11	3.33
Company resources	.34 (.16)	−.01 (.10)	.01 (.13)	.10 (.09)	.04 (.15)	−.23 (.19)	.05 (.10)	−.02 (.15)	4.19	2.54
Strategic orientation	−.17 (.18)	−.05 (.27)	.43 (.32)	.06 (.10)	.15 (.11)	–	−.01 (.09)	.06 (.08)	10.47	3.90
Structured approach	.34 (.31)	.05 (.14)	−.15 (.22)	−.18 (.10)$^{+}$	.10 (.15)	−.03 (.19)	−.04 (.10)	.13 (.28)	8.06	6.40
Predevelopment task proficiency	−.07 (.11)	.04 (.05)	.10 (.08)	.10 (.04)*	.05 (.05)	−.02 (.07)	.12 (.04)**	.23 (.08)***	34.74***	1.75
Marketing task proficiency	.06 (.33)$^{+}$	−.01 (.15)	−.32 (.25)	−.21 (.12)$^{+}$	.15 (.09)	−.29 (.16)$^{+}$	.21 (.13)$^{+}$	.25 (.11)*	18.77**	4.32
Technological proficiency	.15 (.23)	.06 (.05)	−.20 (.20)	.14 (.05)	.11 (.06)$^{+}$	.14 (.12)	.20 (.08)**	−.04 (.08)	31.14***	3.39
Launch proficiency	.24 (.20)	.21 (.11)$^{+}$	−.18 (.11)	−.17 (.11)	.15 (.09)	–	−.05 (.10)	−.04 (.02)$^{+}$	10.50^{+}	2.23
Reduced cycle time	−.17 (.74)	.21 (.13)	.15 (.46)	.32 (.16)$^{+}$	−.27 (.27)	−.28 (.37)	−.21 (.24)	.34 (.25)	12.34^{+}	1.70
Market orientation	.34 (.15)*	−.05 (.07)	.07 (.11)	−.09 (.06)	−.11 (.06)$^{+}$	.03 (.09)	.06 (.06)	−.07 (.06)	8.76	1.40
Customer input	.08 (.11)	.21 (.10)*	–	.03 (.09)	–	–	−.09 (.31)	–	4.21	1.04
Cross-functional integration	.18 (.13)	−.12 (.05)**	−.07 (.11)	.06 (.04)	−.02 (.06)	−.05 (.08)	.04 (.05)	.10 (.06)$^{+}$	25.26***	1.38
Cross-functional communication	.19 (.19)	.01 (.06	.08 (.21)	.12 (.06) *	.16 (.10)	−.15 (.10)	.20 (.07)**	.05 (.07)	27.42***	2.34
Senior management support	.14 (.26)	−.03 (.08)	.41 (.16)*	.01 (.07)	−.28 (.12)*	−.26 (.18)	.13 (.10)	−.01 (.09)	14.02*	1.91
Competitive response intensity	.48 (.16)**	−.05 (.07)	−.06 (.09)	−.05 (.07)	−.02 (.10)	−.13 (.17)	.06 (.07)	−.20 (.09)	11.60	1.63
Environmental uncertainty	.12 (.20)	.15 (.07)*	−.02 (.15)	.01 (.06)	−.03 (.08)	.04 (.08)	.10 (.08)	−.18 (.07)*	21.31**	1.73
Organizational climate	−.09 (.20)	–	.13 (.17)	.03 (.07)	.09 (.09)	.28 (.11)*	−.22 (.09)**	.13 (.09)	40.69***	5.03
Organizational design	.29 (.12)*	−.05 (.06)	−.10 (.10)	.11 (.05)*	−.18 (.08)*	−.10 (.11)	−.11 (.05)*	.11 (.07)$^{+}$	21.25**	2.91
External relations	.24 (.09)**	.17 (.06)*	–	−.02 (.07)	.31 (.06)***	−.17 (.07)*	.11 (.06)$^{+}$	−.12 (.06)*	50.36***	1.68

The moderator value listed first represents the 1 dummy code, the second value represents 0.
"–" indicates that the predictor is a constant for the particular data set or is dropped due to collinearity problems.
Significant at $^{+}$ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Results indicate that effects of human resources, launch proficiency, customer input, environmental uncertainty, and external relations on NPS are stronger for multi-item measures than for single item, while the effect of cross-functional integration is stronger for single-item measures than for multi-item. Effects of senior management support are stronger for subjective performance criteria than for objective ones; effects of predevelopment task proficiency, reduced cycle time, cross-functional communication, and organizational design are stronger when senior managers report data. The effects of structured approach and marketing task proficiency are stronger when project managers report data; effects of technological proficiency and external relations are stronger for short-term performance measures, whereas effects of market orientation, senior management support, and organizational design are stronger on long-term performance measures. The effects of organizational climate are stronger for services than for goods, whereas effects of product advantage, marketing task proficiency, and external relations are stronger for goods than for services. Effects of organizational climate and organizational design are stronger in North America and Europe than in Asia; effects of predevelopment task proficiency, marketing task proficiency, and technological proficiency, cross-functional communication, and external relations are stronger in Asia than in North America and Europe. The effects of dedicated human resources, predevelopment task proficiency, marketing task proficiency, cross-functional integration, and organizational design are stronger for high-tech than for low-tech markets; and, finally, effects of launch proficiency, environmental uncertainty, and external relations are stronger for low-tech than for high-tech markets.

Comparison with Henard and Szymanski (2001)

Using the fixed-effects approach of this meta-analysis, the sample size and reliability-adjusted means with corresponding values in Henard and Szymanski (2001) can be summarized and compared (Table 3). Table 3 also provides the more appropriate random-effects means. Although the fixed and random-effects models produce only minor variation, the findings of the random-effects model are more likely nonsignificant, as they are based on larger variances, thus larger potential standard errors than are the fixed-effects model findings.

Initially, it can be noted that all mean correlations are significantly weaker ($p < .05$) in the present meta-analysis except for reduced cycle time. In addition, this meta-analysis revealed a stronger positive effect size for cross-functional communication and a weaker negative effect for likelihood of competitive response. The effect size for competitive response intensity moves from negative to positive. Cumulative sample size was used for computing a test value.

Broadening the Study Scope

The analysis revealed that "region" is the moderator with the highest explanatory power. Therefore, additional analyses of the relationship between national culture and size of the effects were conducted. With data from 25 different countries (in total, 2144 effect sizes, excluding effect sizes from multiple-country samples) Hofstede's (2001) country index scores were used to measure cultural orientations on five cultural dimensions: individualism, long-term orientation, masculinity, power distance, and uncertainty avoidance.

Recognizing that multicollinearity problems may stem from the small number of countries being unable to simultaneously test the influence of several cultural dimensions, correlation coefficients for each cultural dimension for the relationship between effect size and index scores were substituted for the usual multiple regression model. The analysis was split along the main categories of the taxonomy. Studies applying Hofstede's (2001) indices as predictor variables commonly control for economic development, because such levels are strongly related to national culture. Therefore partial correlations, controlling for gross domestic product (GDP) per capita in U.S. dollars were computed. To account for the 10-year time frame of the studies (with economic development varying both between cultures and over years), country GDP values from the year of publication were used, except for publications from early 2011 where the GDP from 2010 was used as newer GDP estimates were not yet available.

Results displayed in Table 4 reveal several significant effects.

As an initial finding, the overall effects of the success factor categories are weaker for individualistic countries ($r = -.07$, $p < .01$). We recognize significant differences between countries along the individualism/collectivism continuum, particularly for strategy and marketplace categories. Uncertainty avoidance shows the opposite effect. Apparently, risk-averse countries have stronger effects on NPS ($r = .17$, $p < .01$); strategy, process, and marketplace are significantly stronger predictors of NPS. Furthermore, long-term orientation shows weaker effects on NPS ($r = -.16$, $p < .01$), particularly for process, marketplace, and organizational predictors. Finally, power distance leads to weaker effects on NPS ($r = -10$, $p < .01$), particularly for process and organizational predictors.

Table 3. Updated and Extended Meta-Analytic Results

Predictor	Szymanski and Henard (2001) Fixed Effects	Our Study Fixed Effects	Random Effects	Test for Difference[1]
Product characteristics				
Product advantage	.48	.35	.34	15.48***
Product meets customer needs	*.50*	.08	.05 n.s.	16.78***
Product price	*.35*	.10	.11 n.s.	5.38***
Product technological sophistication	*.41*	.03 n.s.	.08	11.43***
Product innovativeness	.24 n.s.	.10	.11 n.s.	5.87***
Strategy characteristics				
Marketing synergy	.34	.17	.186	13.92***
Technological synergy	.31 n.s.	.25	.21	4.41***
Order of entry	*.42*	.05 n.s.	.03 n.s.	11.85***
Dedicated human resources	*.52*	.23	.29	13.49***
Dedicated R&D resources	*.45*	.25	.25	4.90***
Company resources	–	.20	.18	
Strategic orientation	–	.25	.24	
Process characteristics				
Structured approach	.25	.21	.20	2.59**
Predevelopment task proficiency	.46	.25	.26	22.70***
Marketing task proficiency	.50	.23	.25	23.12***
Technological proficiency	.43	.14	.08 n.s.	20.69***
Launch proficiency	.43	.25	.29	12.09***
Reduced cycle time	*.22*	.19	.15	.81
Market orientation	.43 n.s.	.28	.31	16.21***
Customer input	.43 n.s.	.18	.20 n.s.	11.65***
Cross-functional integration	.23 n.s.	.16	.20	5.71***
Cross-functional communication	.09 n.s.	.20	.23	–12.94***
Senior management support	.27	.20	.22	4.57***
Marketplace characteristics				
Likelihood of competitive response	*–0.37*	–.02	–.02	–10.74***
Competitive response intensity	–0.08 n.s.	.10	.12	–11.41***
Market potential	0.54	.25	.21	20.73***
Environmental uncertainty	–	.06	.10	
Organizational characteristics				
Organizational climate	–	.25	.25	
Project/organization size	–	.05	.06 n.s.	
Organizational design	–	.08	.10	
External relations	–	.20	.20	
Degree of centralization	–	–.04	–.02 n.s.	
Degree of formalization	–	.12	.12	

All effects are significant at least at .05 level unless otherwise noted.
All fixed-effects means are sample-size and reliability-adjusted means except for figures in italics where the sample-size adjusted mean is provided. The fixed-effects means are based on independent measures; the random-effects means are based on dependent measures.
[1] A test for pooled correlations is applied to the fixed-effects means of both meta-analyses.
Significant at ** $p < .01$, *** $p < .001$.

Discussion

Summary and Implications

The focus of this study is to update and empirically summarize research on success factors of NPD, responding to needs created by the changing market environment and recent methodological advancements in meta-analytical research. To this end, 233 empirical studies with 2618 effect sizes were identified following the seminal meta-analysis of Henard and Szymanski (2001).

Generally, results (see Table 3) show a decline in the importance of success factors, indicated by weaker and decreasing effect sizes over time. Updated results show

Table 4. Relationship between Cultural Dimensions and New Product Success

		Partial Correlation (controlling for gross domestic product) with:				
Categories	*k*	Individualism	Long-term Orientation	Masculinity	Power Distance	Uncertainty Avoidance
Product	183	−.14^{+}	−.12	−.01	.04	.12^{+}
Strategy	297	−.18**	.07	.04	.07	.18**
Process	923	−.05	−.12***	.08*	−.10***	.09**
Marketplace	261	−.18**	−.14**	−.01	.07	.19**
Organizational	418	.04	−.11*	.07	−.10*	.07
Overall	2144	−.07***	−.16***	.03	−.10***	.17***

k = number of correlations.
Significant at $^{+}p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

important growth only in cross-functional communication and competitive response intensity. Based on effect sizes that are weaker for individualistic countries and stronger for risk-averse countries, culture apparently plays a significant moderating role in NPD.

The finding that the importance of success factors generally declines over time justifies the call for new and more comprehensive theoretical approaches to capture the underlying nature of NPD success factors. One might speculate that the potential to create competitive advantages through an understanding of NPD success factors is reduced as knowledge of these factors becomes more widespread among managers.

Some theoretical observations also emerge. The concept of marketing assets contrasted to technological assets emerges from the analysis. It becomes clearer what implications the resource-based view (Wernerfelt, 1984) implies for product innovation, development, and launch. Firms with strategic slack in technology cannot substitute these assets for marketing assets. There is no cross-functional transformation available. Merely coordinating, collaborating, or even integrating the two functions does not transfer differentiated assets between them.

The second insight is that the wide variety of moderations that affect each asset basis differentially, demonstrates in addition to nonsubstitution of assets, the employment of these assets and the transformation of these assets into productive skills and activities are entirely of separate essences; and both tacitly and practically nonsubstitutable regardless of degree of integration. This leads to a theoretical reconsideration of scale and scope efficiencies in innovation as uneven across the total asset size of the enterprise, but rather segmented by source (technology or marketing).

From a managerial perspective, attempting to improve success rates of NPDs requires consideration of national culture. Accordingly, findings of this analysis identify and emphasize the moderating effects of culture. Working in varied cultures (i.e., R&D teams) will result in differing antecedents of successful new product ventures.

Further Research Directions

One clear direction for future research is a more differentiated investigation of culture as a key factor moderating the importance of NPD success. For instance, expanded primary research could investigate a wider variety of cultures, including the more extreme ends of the cultural dimensions framework. Doing so would clearly indicate the boundary conditions of established NPD models.

The current meta-analysis reveals another area for future research. While the organizational characteristics factor is well researched and generally shows no effect on NPS, factors such as market orientation and dedicated human resources exhibit “large” effects (over .3; Cohen, 1977). These factors have received limited attention, as indicated by the relatively small number of effect sizes available—demonstrating the need for further assessment of these potentially important success factors.

As with all meta-analyses, by definition, this one can identify those factors that have already received considerable empirical attention. As results show generally diminishing importance of success factors over time, it is reasonable to assume that a set of new—or, rather, not yet identified—factors has emerged. One can suspect the evolution to multiagent and integrated, open systems have changed concepts like functional integration to more interorganizational integration. So, this meta-analysis presents the past stock of literature on the set of success concepts; yet as the field evolves so must the study of competitive success. Of course, that is why science calls it research and not just search.

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Appendix A. Manuscripts Included in the Meta-Analysis

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Appendix B. Predictors of New Product Performance

Predictor	Definition
Product characteristics	
Product advantage	Superiority and/or differentiation over competitive offerings
Product meets customer needs	Extent to which product is perceived as satisfying desires/needs of the customer
Product price	Perceived price-performance congruency (i.e., value)
Product technological sophistication	Perceived technological sophistication (i.e., high-tech, low-tech) of the product
Product innovativeness	Perceived newness/originality/radicalness of the product
Strategy characteristics	
Marketing synergy	Congruency between the existing marketing skills of the firm and the marketing skills needed to execute a new product initiative successfully

Appendix B. *Continued*

Predictor	Definition
Technological synergy	Congruency between existing technological skills of the firm and the technological skills needed to execute a new product initiative successfully
Order of entry	Timing of marketplace entry with a product/service
Dedicated human resources	Focused commitment of personnel resources to a new product initiative
Dedicated R&D resources	Focused commitment of R&D resources to a new product initiative
Company resources*	Commitment of (other) company resources (e.g., knowledge, patents) to new product development initiatives
Strategic orientation*	Strategic impetus, orientation, and focus of corporate strategy
Process characteristics	
Structured approach	Employment of formalized product development procedures
Predevelopment task proficiency	Proficiency with which a firm executes the prelaunch activities (e.g., idea generation/screening, market research, financial analysis)
Marketing task proficiency	Proficiency with which a firm conducts its marketing activities
Technological proficiency	Proficiency of a firm's use of technology in a new product initiative
Launch proficiency	Proficiency with which a firm launches the product/service
Reduced cycle time	Reduction in the concept-to-introduction time line (i.e., time to market)
Market orientation	Degree of firm orientation to its internal, competitor, and customer environments
Customer input	Incorporation of customer specifications into a new product initiative
Cross-functional integration	Degree of multiple-department participation in a new product initiative
Cross-functional communication	Level of communication among departments in a new product initiative
Senior management support	Degree of senior management support for a new product initiative
Marketplace characteristics	
Likelihood of competitive response	Degree/likelihood of competitive response to a new product introduction
Competitive response intensity	Degree, intensity, or level of competitive response to a new product introduction (also referred to in the literature as market turbulence)
Market potential	Anticipated growth in customers/customer demand in the marketplace
Environmental uncertainty*	Degree of uncertainty due to the general operating environment faced by the firm (e.g., regulatory environment, technology uncertainty)
*Organizational characteristics**	
Organizational climate*	The extent to which the day-to-day decisions are governed with organization/group's shared values and norms
Project/organization size*	Size of the project or organization
Organizational design*	Organizational design such as reward structure, job design
External relations*	Coordination and cooperation between firms and other organizations
Degree of centralization*	Extent of centralization or bureaucratization in the organization/project
Degree of formalization*	Extent to which explicit rules and procedures govern decision-making in the organization/project

Predictors and definitions are taken from Henard and Szymanski (2001) except for the predictors marked by an asterisk.