

# INNOVATION RESEARCH CENTRE

**IN-HOUSE AND PARTNERSHIP NEW PRODUCT  
DEVELOPMENT IN AUSTRIA:  
AN EMPIRICAL ANALYSIS ON OUTCOME  
AND EXPLANATORY FACTORS**

by

Elko J. Kleinschmidt

Innovation Research Working Group  
WORKING PAPER NO. 71

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# **In-house and Partnership New Product Development in Austria: An Empirical Analysis on Outcome and Explanatory Factors**

## **Introduction**

Success in new product development is still often illusive. However, a turbulent environment and rapidly changing technologies have made the development of successful new products critical for growth, or even the survival of companies. New products are seen as the key to continued corporate success and profitability. One way of improving the success rate could be via partnering with customers, suppliers and other external organizations. This paper will investigate the role of partnering in new product success by assessing 116 new product development projects of which approximately half are in-house projects and the other half are partnership projects. The data was collected in the Germanic market, primarily in Austria.

## **Background**

Partnering with customers, suppliers, and other organizations for new product development is gaining increased interest as reflected in the literature. Buyers and sellers are frequently replacing arms-length arrangements by close working relationships [30], by close linkages during the development or commercialization of a new product [3, 10], and by entering into co-marketing alliances [13]. Producers can profit from being close to an external organization and from accessing the firm's thought-world by getting first-hand technical and marketing knowledge enabling the manufacturer to develop and strengthen his internal competencies, thus increasing the chances for successful product development and commercialization (e.g., [8, 14, 16, 18, 22, 23, 34, 36, 37, 43]). For instance, Clark [14] notes that a close relationship allows the producer to benefit from supplier know-how and to capture it more effectively in product design and in the conduct of the development process. Likewise, Athaide and colleagues [3] argue that product co-development efforts may suggest potential technology applications the producer was unaware of before. As a consequence, Bonaccorsi and Lipparini [10], for example, report that partnerships shorten development time and reduce development costs.

In general, most of the writing on cooperation in any form tends to have a positive tone [42]. However, Mohr and Spekman [39] note that partnering is often viewed as a panacea to achieve competitive advantage without regarding the fact that many partnerships do not succeed. In a similar vein, Bidault and Cummings [7] argue that the tension between the logic of new product development and partnering may offset possible economic and technological advantages. To

illustrate, Gulati [28] reports that in nonequity alliances the partners are particularly vulnerable to each other's opportunistic behavior. Additional difficulties may arise in new product development partnerships because of disagreements on the allocation of property rights [11]. Further, some authors found that partnering with customers is not automatically the route to more successful product development (e.g., [6,12]).

There seems to be some contradictory evidence about the impact of external involvement on the outcome of new product development. What finally counts, however, is a successful new product strengthening the position of the developer company by achieving competitive advantage [16]. Considerable empirical research has been carried out to identify the determinants of new product performance at the project level. In general, there are no easy answers as to what makes a new product a success, as there is not one singly key factor but several that seem to impact on new product outcomes. However, in the case where new products result from rational planning and execution, the research has identified several factors that may be used to fairly accurately predict whether or not a new product will be successful (for an overview, see Montoya-Weiss and Calantone [40]). For example, product advantage, synergy with existing marketing, technical resources, and skills, top management commitment and support, and how well the development activities have been carried out are quite consistently reported to be factors decisive for success and are used to discriminate between successful and unsuccessful product development projects [16,20,41,44].

## **The empirical study on new product projects in Austria**

The objective of this study is to assess what makes for successful new product development in Austria (Germanic market) and to investigate the impact of a company's partnership with an external (eg, customer) organization on product development outcomes in comparison to non-partnership projects. We put the focus of this study on the differences (if any) between in-house developments (non-partnership projects) and cooperative developments between a manufacturer and the main external partner regarding the development of a non-customized industrial new product<sup>1</sup>. Within this relationship the manufacturer as the principal developer may develop the project on its own or works more or less closely with the external partner on the conception, development, testing, and/or marketing of the new product.

A conceptual framework was developed integrating different blocks of variables (constructs) that might have an impact on new product project performance. These constructs were identified from the results of previous investigations (primarily non-partnership success/failure studies) and from the literature that proposes what elements are important to success [1, 9, 19, 32, 36]. However,

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1. We do not include contract development or the development of customized products as in these cases all the specifications necessary for the development are normally provided by the customer.

there are no easy answers to what makes a new product a success, as there is not one single key factor or construct of success but several that seem to impact on new product outcomes. According to Griffin/Page [1, 22], project outcomes can be measured along different independent dimensions: customer-based success, financial success of the company, or technological success, factors that will be discussed later with the results.

Austria is an OECD member. Its macro economic performance measures are very similar to Canada regarding consumption. However, external trade performance and profile and skill levels are more related towards finished end products requiring a higher level of technical training. Nevertheless, both have developed important industrial capacities. A sizable empirical literature using Canadian data has established major factors of what makes successful new product development (see for example [15, 16, 19, 20]).

The review of the literature did show that no empirical large sample studies have been carried out in Austria on what makes for successful new product development. Because of the many similarities on macro economic conditions in Canada and Austria one could expect a-priori that factors explaining new product success in Canada are similar to factors of importance in Austria.

The two research premises based on the above literature review are:

- (1) The factors impacting on success in Austria are very comparable to the factors identifies in previous empirical studies.
- (2) Partnership projects because of their relationships with external partners inherently show higher values on factors thought to influence outcome and have better product outcome and performance profiles.

## **Sample and method**

Firms with an active new product development program were the focus of this investigation. This study used a sample frame consisting of companies mainly in the "high tech" e.g., electronics and electrical industry in Austria. For more details see Table 1. The companies were identified by using industry lists consisting of firms known to be active in research and development, new product development, and new business development. Representatives of the firms were initially contacted by telephone to ensure that the companies were actually active in new product development or research, to identify the key respondents, and to solicit cooperation.

A preliminary informant, often the leading manager of research and development, marketing, new product development, or new business development was contacted to identify qualified and competent persons who were responsible for development projects. The recommended project informant was assessed by telephone in terms of role and responsibility, and knowledge and

involvement concerning the projects under investigation. Respondents were asked to select typical new product projects done in partnership with an external organization and in-house (success and failure), but ones completed within the last three to five years so as to ensure reasonable reliability of the data. The projects chosen were to a large extent industrial non-customized products of a business-to-business nature.

In total, data on 116 partnership and in-house projects was obtained. The distribution of the projects by sub-industries is shown in Table 1. The proportion of successful and failed projects is given below.

While the distribution of partnering and in-house projects is almost equally divided, the distribution of project performance among the two categories is not: in our sample the proportion of failed projects is considerably higher for partnership projects. This means that we cannot

	Partnership projects	Non-partnership projects	
Success	24	41	65
Failure	35	16	51
	59	57	116

compare the in-house and partnership projects directly because of the unequal proportion of successes to failures within the two categories. Accordingly, we split the sample into successful and failed projects for comparison between the two categories.

The average firm in the sample had 525 employees and an average sales of Can\$ 144 mil. The sales and employment figures for the four segments are given below. There were no significant differences among the project segments on sales or employment (t-tests and ONEWAYS).

	Partnership projects	Non-partnership projects
Successes	Empl.: 671 Sales: : mil \$ 212.7	E: 499 S: 123.8
Failures	E: 511 S: 146.1	E: 400 S: 93.3

A detailed and structured questionnaire was developed as an efficient and consistent way of gathering data on the development projects. The details were based on previous research in new product success and organizational interaction. Whenever possible, existing scales were used or adapted from the marketing and new product literature. Specialist's advice was sought from the beginning in order to assure the appropriateness of the questionnaire and to check for the clarity

**Table 1: Industry Profile of Projects in the Austrian Sample**

Industry	No. of Firms	Percent of Firms
Aerospace	1	0.9
Electronics	42	36.2
Medical Instruments	2	1.7
Machinery	17	14.7
(Tele) Communication	8	6.9
Electrical	31	26.7
Software	2	1.7
Industrial Info & Control	4	3.4
Measurement Control	7	6.0
Transformers	2	1.7
TOTAL	116	100.0%

of the wording. In addition, the questionnaire was translated into German and re-translated in order to make sure the comparability of the questions and meanings asked.

The questionnaire was pre-tested by conducting personal interviews with representatives of the sample companies. No major modifications were necessary, except for some wording which had to be slightly changed in one item cluster. The questionnaire consisted largely of Likert-type scaled questions (anchored from 0 = "strongly disagree" to 10 = "strongly agree"). Data were collected via personal interviews of key informants intimately involved in and in most cases responsible for these new product projects from beginning to commercialization.

For each project, a structured face-to-face interview was conducted with these managers who had first-hand knowledge of the development of the product project, i.e. respondents were "experts" on the particular projects selected. The interviews lasted between 45 minutes to two hours per project. Each interview included a general discussion of the product development project, in most cases a site tour, and a general consideration of the partner involved.

## **Discussion of findings**

In the following we discuss our findings with respect to two different topics under investigation. We start with a short description of our success measures and report about the outcomes of successful and unsuccessful projects, as well as of partnership and non-partnership projects. We will see that there are significant differences.

Product superiority is often seen as the key factor for successful product development [15, 19]. We were interested in how well the products were developed in terms of performance compared to competitive solutions. Because of the different proportions of successful and failed projects for the in-house and partnership projects ANOVAs for comparing multiple groups (means) were carried out. The main differences are between successes and failures. However, partnership has also some impact.

The assessment of new product process activities indicates that successful and failed projects in Austria show close to identical results generally comparable to previous studies. Partnership and non-partnership did not significantly differ in the efficiency of the carried out activities.

On management commitment and team organization successes and failures showed profile similar to expectations. Partnership had some influence on specific findings.

The four groups were compared on environmental and problem awareness parameters. Again, successes/failures showed profiles as in previous studies. Partnerships/non-partnerships have some revealing results.

### *Successful versus unsuccessful projects for in-house and partnership projects*

Success was measured on different dimensions - financial, efficiency, and window of opportunity (including technical success). We also show performance measures specific to partnership projects only. Our general performance findings are presented in Table 2.

Without questions the "success - failure" split dominates differences on performance results. Partnership/in-house has only a limited impact on performance outcome. As expected, successful projects outperformed failures on all performance measures except for "did the project stay within its budget costs" (no significant differences here). *Partnership projects did not outperform non-partnership projects on a general level.* The review of the literature seemed to imply that partnership projects should perform better because of the involvement of external partners. The Austrian sample gives contradictory support to this notion (details below).

The performance results show that (for details see Table 2):

- successful projects (in-house and partnership) outperformed by far failures on "minimal acceptable return" and "met sales objectives" and "minimal profit objectives" (mean values are in the 7-range for in-house successes and in the 6-range for partnership successes compared to mean values of 1 to 2 for failures on the 10-point scale).

It is interesting to note that the values for partnership projects are consistently lower (whether success or failure) but not significantly lower except for "met/exceeded acceptable ROI". Here the in-house success is significantly higher than the partnership group. Overall: on these "financial" measures partnership projects do not do better. Whatever evidence there is points more into the opposite direction.

- On efficiency measures (time and budget) the success - failure dimension is important and the partnership - in-house dimension moderates outcome somewhat. Significant differences are found between successful in-house projects (this group achieved results in the 6 range) and failed partnership projects (results in the 4 range) for "being time efficient" and "being on schedule". In-house failures and partnership successes fall in-between and are not significantly different from the other groups. There is no significant difference amongst the four groups on "project met budget" (mean of 4.05; exceeded budget somewhat). It is interesting to note that when combining all successes and all failures (in-house and partnership) the successes are significantly better (0.07 level) and closer to being on budget (the mid-point of the scale) and the failures are over budget (4.31 versus 3.72). Again, one must conclude, that having a partnership in project development has certainly not a positive impact on outcome.
- For "window of opportunity" results (the new product opened new markets, new product possibilities, and created a technological success) the success - failure split is the major contributor to result differences. Successes, whether in-house or partnership, show very

**Table 2: New Product Performance Results**

Performance Measure	(1) Internal Success (41)	(2) Internal Failure (16)	(3) Partner- ship Success (24)	(4) Partner- ship Failure (35)	Sample Mean (116)	Significance Level *	Groupings (Duncan 0.05)
Met/exceeded acceptable ROI	7.31	2.00	6.45	1.67	4.73	.000	1 vs 3 1,3 vs 2,4
Met/exceed minimum sales objectives	7.56	1.56	6.87	1.47	4.78	.000	1,3 vs 2,4
Met/exceed minimum profit objectives	7.07	1.75	6.79	1.38	4.59	.000	1,3 vs 2,4
Time efficient project	6.67	5.25	5.62	4.51	5.60	.002	1 vs 4
Project adhered to time schedule	6.12	5.31	4.95	4.65	5.32	.07	1 vs 4
Project met budget	4.35	3.62	4.25	3.77	4.05	ns	ns
Project gave access to new markets	7.82	2.00	7.50	3.79	5.75	.000	1,3 vs 4 1,3,4 vs 2
Project opened new product possibilities	6.36	2.65	6.91	3.65	5.13	.000	3,1 vs 4,2
Technological success or breakthrough	6.14	1.93	6.16	4.88	5.18	.000	3,1,4 vs 2 1 vs 4
<u>Specific partnership results:</u>							
Benefits of partnership met minimal expectations	n.a.	n.a.	7.20	3.00	4.71	.000	n.a.
Results motivate firm to do more projects with partner in future	n.a.	n.a.	8.29	4.31	5.93	.000	n.a.
Results strengthen reputation of firm as "problem solver"	n.a.	n.a.	7.95	3.85	5.52	.000	n.a.
Results enhance attractiveness of firm in the marketplace	n.a.	n.a.	7.75	3.80	5.40	.000	n.a.

All values shown are based on a "0" to "10" scale, whereby higher values mean better performance

\*A statistical significance level; lower values mean higher significance.

n.a.: not applicable; n.s.: not significant at the 0.05 level.

close results (in the 6 or 7 range of the scale) and are significantly higher than the results for the failures. However, the failures for the partnership projects are consistently judged less negatively compared to failures for in-house projects. One may conclude that partnership projects when failed still create reasonable technological successes and open better access to markets compared to in-house failures. It seems that in this area of “new windows” partnership attenuates failures positively.

- The four specific result measures for partnership projects only show that successful partnership projects met minimal partnership expectations quite well (a mean of 7.02 versus 3.00 for failures), motivated the firm quite strongly to do more partnership projects with the partner (8.29 versus 4.31 for failures), strengthened the firm’s reputation as an “innovative problem-solver” (7.95 versus 3.85 for the failure), and will enhance the firm’s attractiveness in the marketplace (7.75 versus 3.80 for the failure). One may say that these measures seem to have face validity to assess outcomes of partnership projects.

### *New product characteristics*

Having a product advantage has been found to be a major aspect of successful new product developments in many previous studies. If a new product is termed a success, we would expect it to offer benefits to the customers or outperform commercially available solutions. Also, if a manufacturer and an external partner, eg, a customer decide to cooperate, certain benefits of better solutions for the customer can be assumed. The findings are shown in Table 3.

As expected, successful projects have better project characteristics. In addition, partnership also influences these characteristics and often significantly so. On all measures, except for “newness of the product to the firm”, successes are significantly higher.

Successful projects are characterized by:

- superior in meeting customer needs (high 7 to lower 8 range);
- superior quality to competing products (7 range);
- unique benefits (high 7 to high 8 range);
- benefits are easier to explain (high 6 to 7 range);
- superior price/performance characteristics (high 6 to low 7 range); and
- innovative in the market place (7 range).

As already mentioned, “new to company” did not differ across the four performance groups (mean value of 6.90).

Successful partnership projects were evaluated higher on all product characteristics than successful in-house projects and in the case of “offered unique attributes/benefits” significantly so. For four of the seven product characteristics failed partnership projects were significantly better than failed

**Table 3: New Product Characteristics**

Characteristics of developed product	(1) In-house Internal Success (41)	(2) Internal Failure (16)	(3) Partner- ship Success (24)	(4) Partner- ship Failure (35)	Sample Mean (116)	Significance Level *	Groupings (Duncan 0.05)
Superior in meeting customer needs	7.80	3.50	8.10	5.02	6.45	.0000	3,1 vs 4 3,1,4 vs 2
Quality superior to competing products	7.14	3.68	7.45	5.11	6.12	.0000	3,1 vs 4 3,1,4 vs 2
Offered unique attributes	7.63	3.37	8.91	6.34	6.92	.0000	3 vs 1 vs 4 vs 2
Benefits easy to explain	6.97	5.00	7.58	4.41	6.06	.0000	3, 1 vs 2,4
Superior price/performance characteristic	6.90	2.50	7.16	3.77	5.40	.0000	3,1 vs 4,2
New to market/how innovative	7.21	3.93	7.87	6.14	6.57	.0000	3 vs 4 3,1,4 vs 2
New to company	6.29	6.50	7.41	7.45	6.90	n.s.**	

All values shown are based on a "0" to "10" scale, whereby higher values mean better product characteristic.

\* A statistical significance level; lower levels mean higher significance.

\*\*n.s.: not significant at the 0.05 level.

in-house developments. The means are all above "5", the mid-point of the scale. This could be read as meaning that the failed partnership projects are not seen as a total failure on project characteristics. It is also noteworthy to point out that partnership projects (failures and successes) on "new to the company" are significantly higher (0.07 level) than in-house projects (6.35 for in-house projects versus 7.44 for partnerships).

One may conclude that successes have indeed better project characteristics (as was expected) and that partnership projects are "newer" projects" creating products with "newer" product characteristics. This applies to failed and successful new partnership developments.

**Partnership projects are "newer, more step-out, better" projects. These "superior/newer" product characteristics for partnership projects are reflected in improved "windows of opportunities" as shown in the previous chapter, but seemingly at a cost (see lower financial and efficiency results).**

#### *The new product development process: process activities carried out in Austria*

A total of 15 process activities were assessed whether these activities were carried out and how well (see Table 4 for a listing of these activities).

As in other empirical studies (for example Cooper and Kleinschmidt [21] and Kleinschmidt and Cooper [33]) in Austria firms do not on average follow a complete process. Some highlights:

- Concept testing in the general market, test marketing and pre-commercialization business analysis were carried out in less than 50 percent of the projects studied.
- Another three activities were carried out in the low 60 percent of the projects. These were "concept identification with partner" (57.8 percent), "concept identification with general market" (61.7 percent), and "pilot production" (64.7 percent).
- The five least carried out activities are all marketing and business analysis activities.
- The technical activities, on average, except for pilot production (carried out in 64.7 percent of all projects) and production start-up (done in 75.8 percent of all cases) are carried out above 90 percent of the time.

There may be good reasons not to carry out certain activities in specific cases. Nevertheless, the process carried out in Austria seems quite truncated and different from prescribed models.

The frequency of activities is little different across the four groups except for:

- "concept testing with partners". As could be expected, partnership projects have

**Table 4: Frequency of New Product Activities**

Process Activity	(1)	(2)	(3)	(4)	Sample Mean (116)	Significance Level *	Groupings (Duncan 0.05)
	Internal Success (41)	Internal Failure (16)	Partnership Success (24)	Partnership Failure (35)			
Idea Screening	92.7*	93.8	95.8	85.7	91.4	n.s.	
Preliminary market assessment	85.4	68.8	91.7	80.0	82.8	n.s.	
Preliminary technology assessment	97.6	87.5	100.0	94.3	95.7	n.s.	
Concept identification with partner	48.8	31.3	83.3	62.9	57.8	.007	3 vs 2, 1
Concept identification with general market	68.3	56.3	50.0	62.9	61.2	n.s.	
Concept testing in market	46.3	18.8	50.0	31.4	38.8	n.s.	
Business/financial analysis prior to "Go to development"	78.0	37.5	87.5	82.9	75.9	.003	3,4,1 vs 2
Product development	97.6	87.5	100.0	100.0	97.4	n.s.	
In-house testing	97.6	81.3	100.0	94.3	94.8	n.s.	
Key partner tests or field trials	65.9	81.3	87.5	71.4	74.1	n.s.	
Customer tests with general market - test marketing	36.6	18.8	58.3	45.7	41.4	.1	3,4 vs 2
Pilot production: testing future full scale production method	65.9	37.5	83.3	62.9	64.7	.05	3 vs 2
Pre-commercialization business analysis prior to launch	39.0	25.0	54.2	45.7	42.2	n.s.	3,1 vs 4
Production start-up	82.9	62.5	91.7	60.0	75.0	.02	
Market launch	90.2	75.0	91.7	74.3	83.6	n.s.	

\* Frequency of activity in percent. Meaning: 92.7 percent of all projects in this group (in-house successes) carried out this activity.

significantly more project identification with their partners than in-house projects.

- “business/financial analysis before development” is in 87.5 percent of all successful partnership projects carried out compared to only 37.5 percent for failed in-house projects. The other groups have in-between frequencies. It seems that partnership projects overall do more “business/financial analysis” than in-house projects. May-be the external partner insists more on this analysis.
- “customer tests with the general market” is most often carried out by successful partnership projects (58.3 percent of all projects) compared to failed in-house projects with a low frequency of only 18.8 percent.
- “pilot production” was most frequently carried out by successful partnership projects (83.3 percent) and least often for failed in-house projects (37.5 percent).
- successful projects (in-house and partnership) had more often a formal production start-up than failed partnership projects (for further details see Table 4).

These are interesting details but they do not show significant general tendencies for partnership or in-house projects or success or failure.

How well these activities were carried out is depicted in Table 5. The average efficiency ratings are in the mid-5 to the upper 7 ranges of the 10-point scale. Not an outstanding performance! This implies that much more can be done here. Also remember that for many projects many activities were not done at all (may-be they should have been done). Other observations are (for details see Table 5):

- The five activities showing lowest efficiency are “pre-commercialization business analysis prior to launch”, “concept testing”, “concept identification with general market”, “pre-development analysis”, and “preliminary market assessment”. They are all non-technical “homework activities” (except for the first, a business analysis activity) indicating major problems in this important phase of the development process. The efficiency ratings are all in the low to middle 5 range of the 10-point scale indicating major improvements are needed. These results are very similar to findings of previous studies, (e.g., Cooper and Kleinschmidt [21]).
- Of the six most efficiently carried out activities five are technical activities, supporting other studies that found that the technical activities on average are significantly better carried out [20].

How proficiently these activities were carried out is also significantly related to success (for details see Table 5). For projects that had carried out the specific activity, in successful projects all activities were handled more efficient than in failures (the success groups had a higher mean

**Table 5: Proficiency of New Product Activities**

Process Activity	(1)	(2)	(3)	(4)	Sample Mean (116)	Significance Level *	Groupings (Duncan 0.05)
	Internal Success (41)	Internal Failure (16)	Partner-ship Success (24)	Partner-ship Failure (35)			
Idea Screening	7.10 <sup>1</sup>	4.93	7.26	6.06	6.53	.002	3,1 vs 4,2
Preliminary market assessment	6.22	4.36	6.27	4.89	5.63	.01	3,1 vs 4,2
Preliminary technology assessment	7.30	6.57	7.41	6.30	6.93	.08	1 vs 4
Concept identification with partner	6.10	6.80	7.60	6.47	6.72	.09	3 vs 1
Concept identification with general market	6.03	4.88	5.83	5.09	5.56	n.s.**	
Concept testing in market	5.57	5.33	5.91	4.72	5.44	n.s.	
Business/financial analysis prior to "Go to development"	5.93	5.33	6.47	4.58	5.52	.03	3,1 vs 4
Product development	7.80	6.57	7.83	6.45	7.23	.004	1 vs 2 3,1 vs 4
In-house testing	7.82	8.07	8.04	6.69	7.64	n.s.	
Key partner tests or field trials	7.07	6.38	7.28	7.28	7.08	n.s.	
Customer tests with general market - test marketing	5.93	5.33	6.00	5.43	5.75	n.s.	
Pilot production: testing future full scale production method	6.74	6.50	7.70	7.13	7.09	n.s.	
Pre-commercialization business analysis prior to launch	6.18	2.75	7.00	3.37	5.20	.000	3,1 vs 4,2
Production start-up	7.32	6.10	7.45	6.00	6.90	.01	3,1 vs 4
Market launch	7.29	4.00	6.72	4.69	6.06	.000	1,3 vs 4,2

Note: All values shown are based on a "0" to 10" scale, whereby higher values mean being more proficient at the activity.

\* A statistical significance level; lower levels mean higher significance.

\*\* n.s.: not significant at the 0.05 level.

1. The proficiency measure assess how well the activity was carried out, if the activity was done. The higher the value, the "better" the activity was done.

value). The average efficiency levels for successes are between 5.70 and 7.90 compared to 3.25 to 7.28 for failures. For 10 of the 15 activities the differences were significant.

Partnership has very little impact on process activities. There are no clear differences on how frequently activities were carried out between the two groups. Equally, how well the activities were carried out was not significantly different for in-house and partnership projects (at the 0.05 level). As can be seen in Table 5 the differences identified in process activities are along the line of the overall success/failure split and nothing particular is discernable along the in-house/partnership dimension.

In Austria the development process is a truncated process: many activities are omitted and/or badly carried out. Technical activities are usually done and done better. In comparison, most non-technical activities are often not carried out at all and if carried out, done not very satisfactory. For successes, on average, activities were carried out better and often significantly better. Homework activities are the most significant group of activities omitted and badly done.

### ***Commitment and team organization***

The way a project team is organized and the commitment toward the project by top management impact on product development performance. As expected, successful projects have significantly higher ratings on these dimensions and failures have lower ratings on most of the measures (see Table 6). Whatever differences, the major impact is due to the success/failure dimension and partnership has less of an impact (details are discussed below).

Top management commitment and mutual respect of senior management have been reported to have significant influence on a successful product development. Successful cases are characterized not only by signs of good-will toward the project team but by how well top management carries out its responsibilities and commitments with respect to the projects. Failed projects, however, show a reduced top management commitment, respect and support for the development project and the team. The difference is significant between successes (in-house and partnership) and partnership failures (see "top management support" and "senior management worked well together"). One should also note that overall the support for partnership projects is lower than for in-house projects. Why this should be is difficult to explain. May-be, the lack of management support (see relative low support for failed partnership projects) was indeed a major contributor to the final outcome.

"Specific investment", the investment in people, equipment/property relevant only for the project was not very high (see mean for all projects of 4.66, the value is below the scale mean of 5). Failed in-house projects are significantly lower at 3.31 than the mean for successful partnership projects of 5.79.

**Table 6: Management Commitment and Team Organization**

Measure	(1) Internal Success (41)	(2) Internal Failure (16)	(3) Partner- ship Success (24)	(4) Partner- ship Failure (35)	Sample Mean (116)	Significance Level *	Groupings (Duncan 0.05)
Top management supported the project	8.90	7.53	8.41	6.74	7.96	.001	1,3 vs 4
Senior management worked well together on this project	8.60	7.33	7.95	6.42	7.64	.0002	1,3 vs 4
Investment	4.78	3.3	5.79	4.37	4.66	.08	3 vs 2
The project had a strong project leader (champion)	8.65	6.37	8.16	6.34	7.53	.000	1,3 vs 2,4
Project was undertaken by a multi-disciplinary team	5.90	3.87	6.79	4.88	5.50	.02	3 vs 4 3,1 vs 4,2
Team had external members from other companies	1.75	1.00	6.48	4.45	4.38	.0000	3 vs 4 3,4 vs 1,2
Team carried project from beginning to end	8.53	7.12	8.66	6.51	7.75	.002	3,1 vs 2,4
Project was undertaken by a dedicated team	5.90	4.18	6.16	5.51	5.60	n.s.**	
Project duration (in months) from first "Go" to launch	17.4	16.0	20.2	21.4	19.1	n.s.	

Note: All Values shown are based on a "0" to "10" scale, whereby higher values mean better project characteristic.  
 \*A statistical significance level; lower values mean higher significance.  
 \*\*n.s.; not significant at the 0.05 level.

“Team organization” consisting of several different parameters, is able to consistently distinguish between failure and success. Successful projects (for further details see Table 6):

- had a strong project leader (a champion), i.e. a person who took an inordinate interest in seeing that the product is fully developed and marketed (mean value in the mid-8 range for successes versus lower-6 for failures);
- had a team consisting of people from different departments like Marketing, R&D, Production, Finance, etc. (High 5 to high 6-range for successes versus high 3 and high 4-range for failures); and
- had a team that carried the project from beginning to end, i.e. from idea to launch (upper 8 range versus upper 6 range to lower 7 range).

Having a dedicated team (they devoted a large percentage of their time to the project) was not well developed. The mean value for all projects was just above the mid-point of the scale (5.60) indicating that the team members were not concentrating strongly on the project. There were no significant differences amongst the four performance groups (however, the successes had slightly more dedicated teams).

As expected, partnership projects used external members from their partner significantly more than in-house projects (low 1-range for in-house projects to high 4 to low 6 range for partnership projects). An interesting aspects is that the value for successful partnership projects reached only a mid-6 scale level. One may have expected a higher value for partnership projects. But having an external member does make a difference. It is noteworthy to see that failed partnership projects (although they used external members significantly more than in-house projects) used external members significantly less than successful partnership projects. In other words, **if you have a partnership projects under way make sure to make a member of your partner a permanent member of your development team!**

The average projects duration (in months) was 19.1 months for all groups. The in -house projects took between 17.4 and 16.0 months compared to 20.2 and 21.4 for the two partnership groups. However, the differences across the four groups were not significant (when comparing all in-house projects versus all partnership projects the difference was significant at 0.05).

### ***Impact of environmental and situational conditions on Success***

Based on the previous review of research on new product development the following environmental and situational factors were considered: market place and technology conditions, project specific synergy conditions and the early problem situation (eg, risk and cooperation perceptions) of the project (see Table 7 to 9).

Revealing results were obtained. Of the *external environmental condition (market and technology) market conditions* (see table 7) had only little impact on success. Failed partnership projects were aimed at somewhat more unpredictable markets than successful in-house projects. Overall all market conditions were in the mid-range of the scales indicating that market conditions were neither particularly changing, unpredictable, complex, or overly competitive.

The *technology condition* (see Table 7) had more impact and strongly along the partnership/in-house dimension. The success/failure dimension was not significantly influenced by technology factors. For example, all partnership projects combined used somewhat more dynamic technology, failed partnership projects used more unpredictable technology, more complex technology was part of all partnership projects which was also more complex and more R&D was carried out in the area of partnership projects. These differences were all significant compared to in-house projects. In other words, **partnership projects are technologically more demanding and therefore aimed at somewhat more unpredictable markets!**

*Synergy* had a strong impact on success. There was much less relationship between partnership success grouping and synergy. Of the eight measures of synergy six had impact on success and two were related to the partnership dimension (see also Table 8).

Successful projects had significantly better synergy with existing resources and skills of the firm compared to failures for:

- "marketing research and marketing intelligence" (mid 5 and 6 range for successes versus 4-range for failures),
- "manufacturing synergy" (low 7/high 6 versus low 6/high 5)
- "selling skills" (mean of high 6/low 7 versus low 5/high 4),
- "distribution skills" (mid 6/low 7 versus mid 5/high 4),
- "advertising skills" (upper 6 versus low 5/upper 4), and
- "technical support resources of the firm" (upper 6/mid 7 versus mid 5 range).

"R&D synergy" and "product production synergy" showed differences along the partnership dimensions with in-house projects having significantly more synergy than partnership projects. This lack of synergy for R&D and product production for partnership projects goes logically hand in hand with the above uncertain technology and unpredictable markets.

It should be noted that the levels of synergy for failures are usually near or above the mid-point of the scales, indicating that even failed projects were perceived at having a reasonable level of synergy (for details see Table 8).

**Table 7: Impact of Environmental Factors**

Factors	(1)	(2)	(3)	(4)	Sample Mean (116)	Significance Level *	Groupings (Duncan 0.05)
	Internal Success (41)	Internal Failure (16)	Partner-ship Success (24)	Partner-ship Failure (35)			
Market: stable vs dynamic	5.75	6.06	6.08	6.05	5.95	n.s.	
Market: predictable vs unpredictable	4.21	5.50	5.16	5.94	5.11	.03*	4 vs 1
Market: simple vs complex	4.87	5.87	6.29	5.88	5.61	n.s.	
Competition: none vs very competitive	6.80	5.75	6.70	6.68	6.60	n.s.	
Technology: stable vs dynamic	5.48	5.06	6.33	6.34	5.86	n.s.**	
Technology: predictable vs unpredictable	4.00	3.75	4.54	6.11	4.71	.0001	4 vs 3,1,2
Technology: simple vs complex	5.75	4.50	7.29	6.28	6.06	.004	3 vs 1 3,4 vs 2
R&D by other firms: little vs. extensive	5.73	3.87	6.82	6.00	5.74	.01	3,4,1 vs 2

Note: All values shown are based on "0" to "10" scale, whereby higher values mean more agreement with the factor statement or characteristic.

\*A statistical significance level; lower values mean higher significance.

\*\*n.s.; not significant at the 0.05 level.

**Table 8: Impact of Synergistic Aspects**

<b>Factors</b>	<b>(1) Internal Success (41)</b>	<b>(2) Internal Failure (16)</b>	<b>(3) Partner- ship Success (24)</b>	<b>(4) Partner- ship Failure (35)</b>	<b>Sample Mean (116)</b>	<b>Significance Level *</b>	<b>Groupings (Duncan 0.05)</b>
Synergy with MR and MI	6.36	4.87	5.45	4.11	5.29	.002	1 vs 4
Synergy with existing R&D	7.82	7.06	6.29	5.77	6.78	.001	1 vs 3,4
Synergy with manufacturing skills and resources	7.43	6.25	6.98	5.74	6.66	.01	1 vs 4
Synergy with production skills	6.02	7.18	4.29	5.12	5.57	.03	2 vs 4 2,1 vs 3
Synergy with existing selling skills	6.92	5.18	7.25	4.82	6.12	.0008	3,1 vs 2,4
Synergy with existing distribution skills/resources	6.58	5.50	7.08	4.80	6.00	.005	3,1 vs 2,4
Synergy with existing advertising/promotion skills/resources	6.73	5.18	6.67	4.88	5.99	.002	3,1 vs 2,4
Synergy with existing technical support skills/resources	6.82	5.43	7.41	5.31	6.30	.001	3,1 vs 2,4

Note: All values shown are based on "0" to "10" scale, whereby higher values mean more agreement with the factor statement or characteristic.

\*A statistical significance level; lower values mean higher significance.

These results support our contention that in Austria partnerships play a role in new projects where the firm encounters (perceives) internal technical/technological shortcomings (see previous discussion of "New product characteristics").

The *problem situation of the project* (see Table 9) had some impact primarily along the partnership dimension.

- In-house projects (successes and failures combined) were perceived to be somewhat less risky than partnership projects (0.08 level) with means of low 5/high 4 range for in-house projects compared to means of low 6/high 5 range for partnership projects.
- The need for technical cooperation was relatively high for partnership projects (whether success or failed) with a mean of 7.32 versus a low of 3.33 for in-house projects.
- The need for market cooperation, although low overall for all projects (mean of 3.60) was significantly higher for partnership projects and in particular for failed partnership projects (mean of 4.71 versus means in the 2-range for in-house projects).
- The initiative for the project that came from the other companies is not very high for all projects combined (mean of 3.66). However, for failed partnership projects the initiative came significantly more from other companies (mean of 5.00) compared to low 2-range to 3 means for the other groups. One should also note here that successes (in-house and partnership) compared to all failures (again, in-house and partnership) were significantly different (success mean of 2.03 versus a failure mean of 4.40, 0.001 level).

Whether the customer problems to be solved or the product features to be determined were difficult to define at the beginning did not differ across the groups (means in the low 5-range). Customers and suppliers were not major providers of the new product idea (sample means of 4.15 for customers and a very low 1.06 for suppliers). There were no significant differences amongst the four groups.

The strong agreement that cooperation with an external partner on technical matters was needed for success supports the above assessment that partnerships are primarily for technical reasons. But beware of following an initiative from other firms, this can be detrimental to success in partnership projects.

#### ***Development related costs for using a partner and perceived benefits at the beginning***

The respondents were also asked about the possible risks (four scales, see Table 10) involved in using partners in project in a general sense. There were some differences between the four performance groups:

**Table 9: Impact of Situational Factors**

<b>Factors</b>	<b>(1) Internal Success (41)</b>	<b>(2) Internal Failure (16)</b>	<b>(3) Partner- ship Success (24)</b>	<b>(4) Partner- ship Failure (35)</b>	<b>Sample Mean (116)</b>	<b>Significance Level *</b>	<b>Groupings (Duncan 0.05)</b>
Riskiness of project compared to other new projects	5.36	4.75	6.37	5.91	5.65	ns**	
Needed technical cooperation	3.21	3.62	8.08	6.80	5.36	.000	3,4 vs 2,1
Needed marketing cooperation	2.97	2.25	3.98	4.71	3.60	.03	4 vs 1,2
Customer problems difficult to determine at beginning	4.90	5.00	5.37	5.20	5.10	ns	
Project features difficult to determine at beginning	5.07	4.93	5.12	5.68	5.25	ns	
Major initiative from other companies	2.02	3.00	2.04	5.00	3.66	.001	4 vs 3,1
Major initiative from customers	4.88	3.81	4.74	4.88	4.15	ns	
Major initiative from suppliers	1.07	.81	1.20	1.08	1.06	ns	

Note: All values shown are based on "0" to "10" scale, whereby higher values mean more agreement with the factor statement or characteristic.

\*A statistical significance level; lower values mean higher significance.

\*\*n.s.; not significant at the 0.05 level.

- respondents involved in partnership projects agreed significantly more with the statement that "critical knowledge has to be given away to other companies" than when carrying out in-house projects (6 to 7 range for partnership projects compared to 4 range for in-house projects).

- when combining all partnership projects respondents agreed more with the statement that "new product cooperation with external partners could harm your product development efforts through possible similar activities of the partner with competitors" (mean of 5.62 versus 4.45 for in-house projects, 0.04 level; not shown in Table 10).

- respondents with partnership projects agreed more with the statement that "too close a cooperation with a particular partner may result in unnecessary products for the general market" (mean of 4.41 for the failed partnership projects versus 2.56 for successful in-house projects). The rather low sample mean level of 3.26 indicates that this is not a major concern for this group of respondents.

- a too close cooperation with a particular partner is not seen as a major concern by the respondents (sample mean of 4.17, below the mid-point of the scale). There are no significant differences across the four groups.

One may say that respondents with partnership projects generally have a more negative opinion about the value and dangers of working with external partners than when doing in-house projects. These opinions must be obviously based on actual experiences with partners. This result may imply that, at least in Austria, partnerships are not perceived by those who have partnerships as an "easy way out" and have their inherent problems.

*Development related benefits to be achieved by the projects at the beginning of the project* were also assessed.

-From the beginning successful projects (in-house and partnerships) expected that the product performance for the firm's customer could be greatly improved (mean of 8.10 versus 7.41 for all failures, 0.03 level; not shown in Table 10).

- Successful partnership projects "expected that the new product would enable the firm to be first in the market" compared to failed in-house projects (means of 7.91 and 4.50). The other two performance groups behave correspondingly along the success/failure dimension but not significantly.

All groupings -successes versus failures and partnerships versus non-partnerships- expected similar development outcomes for the following aspects (no significant differences):

- the cycle time for the project would be somewhat reduced compared to other projects

**Table 10: Development Related Costs For Using a Partner**

Performance Measure	(1) Internal Success (41)	(2) Internal Failure (16)	(3) Partner- ship Success (24)	(4) Partner- ship Failure (35)	Sample Mean (116)	Significance Level *	Groupings (Duncan 0.05)
Critical knowledge has to be given a way?	4.90	4.00	7.20	6.02	5.59	.006	3 vs 1 3,4 vs 2
Partner could harm our development effort	4.12	5.31	5.66	5.58	5.04	ns	
Too close cooperation could threaten balance with others	3.85	4.12	4.37	4.44	4.17	ns	
Too close cooperation could create products not acceptable to general market	2.56	3.31	2.83	4.41	3.26	.04	4 vs 1
-----							
Expectation at beginning:							
- cycle time could be reduced	4.92	4.80	6.45	5.20	5.31	ns	
- new product would deliver superior value	8.12	7.87	8.29	7.94	8.06	ns	
- product performance for customer could be greatly improved	8.04	7.56	8.20	7.34	7.80	ns	
- we would be first into the market	6.48	4.50	7.91	6.17	6.41	.02	3 vs 2
-----							
Company has capability to influence technology development in field	6.34	3.12	6.54	3.82	5.18	.0000	3,1 vs 4,2
Our reputation attracts most capable firms in industry for cooperation	5.56	2.81	6.08	4.22	4.88	.0001	3,1 vs 4 1,3,4 vs 2

All values shown are based on a "0" to "10" scale, whereby higher values mean better performance

\*A statistical significance level; lower values mean higher significance.

n.a.: not applicable; n.s.: not significant at the 0.05 level.

(sample mean value of 5.31 where higher values meant strongly reduced cycle time),

- the new product would deliver superior value to the customer (mean of 8.06 on the 10-point scale), and
- the product performance for the customer would be improved (mean of 7.50 on the 10-point scale).

*Using a partnership, based on this data, is not seen by the developing companies as an approach that will significantly improve the expected benefits of a project at the beginning of the project except for having a somewhat improved chance of being first.*

Two other aspects were also probed (see bottom of Table 10):

- How far an organization has the capability to influence the technology development in the field of a project showed that successful projects (in-house and partnerships) had more influence than failed projects (mid 6 range versus 3 range for failures).
- To what a degree does the company's position/reputation attract the most competent partners indicated that for successful projects the attraction was somewhat positive (upper 5 to low 6 range) compared to failed projects (upper 2 to lower 4 range). The failed partnership projects scored higher (but not significantly) than the failed in-house projects.

Having the capability to influence the technology in the field and a solid reputation helps to succeed. Partnership projects, however, are not particularly distinguished compared to in-house projects on these aspects. One may use these factors for project idea selection, i.e., chose projects where your company has technological strength and a solid reputation.

## Conclusions

**1. Success factors and performance outcomes for new product developments in Austria are very comparable to previous research findings from other OECD countries. Thus, our research premise (1) is supported.**

Successful projects in Austria:

- do better in meeting acceptable return on investment, and sales and profit objectives; were done faster and adhered better to the time schedule and budget, and achieved a better window of opportunity (market, product, and technology).
- on product characteristic successful projects outperformed failures on all characteristics except for newness. These results are similar to previous findings.

- the new product process is fragmented and not complete, marketing and control activities are often not done at all, and the proficiency profile of activities is similar to other studies, ie. technical activities are done well, and marketing and control activities are done on average less well. These results concur with previous results. The five least carried out activities are all marketing activities and the weakest part of the process as reflected by the findings based on Austrian data is the "homework phase". Consistently, many of the early activities are not done at all and if they are done they are not done very well. In this area lots remains to be improved. As was found in previous studies, successful projects carried out process activities significantly more efficient.

- commitment by top management to a project made a difference to success in Austria (as expected). And so did better team work. Successful projects were marked by having a strong project leader with a multi-disciplinary team, that strongly carried the project from beginning to end (all this is in line with expectations based on findings of studies carried out in other countries).

- on environmental factors and synergy Austrian projects behaved as expected: environmental factors had only limited impact with market conditions being close to insignificant and technology conditions impacting on partnership outcomes primarily and successful projects having more synergy with the firm's resources. The problem situation for the projects did not have a major impact on outcome.

- the costs of using a partner was perceived as being higher by respondents having done a partnership project and respondents of successful projects claimed somewhat higher development related benefits for projects at the beginning of the project. Overall, these factors were not strongly related to outcome.

**(2) Partnership projects did differ on some aspects from non-partnership projects. However, the differences are not very pronounced and somewhat contradictory to expectations. The results give only weak support for the second research premise.**

Partnership projects in Austria:

- showed no strong differences on performance measures when compared to non-partnership projects. However, on financial measures partnership projects had values consistently lower than in-house projects (and for the measure "met/exceeded acceptable ROI" successful partnership projects were significantly lower) and partnership failures were significantly less timely. In reverse, **partnership failures** were consistently more highly evaluated on "windows-of-opportunity" than in-house failures. In other words, the outcome results for partnership projects do show some differences. However, they are partially positive and partially negative and one cannot say that the differences in general exceed outcomes for in-house projects as was implied by some of the literature.

- did show consistently higher values on new product characteristics and as a group (partnership versus in-house) had often significant differences. Partnership projects could be classified as being "newer/superior/more step-out" projects and this applied to successful and failed partnership projects.

- were little different on process activities compared to non-partnership projects. Of the 15 activities none were significantly different on how well these activities were done. Partnership has therefore no discernable impact on process activities.

- showed that top management support and team organization differences originate primarily from the success/failure dimension and partnership per se has less of an impact. However, one should note that partnership projects had significantly more investment specific to the project and, as expected, had more external team members from other companies. Partnership projects, on average, took longer to launch than in-house projects.

- did differ on some environmental measures from non-partnership projects: partnership projects faced somewhat more unpredictable markets and the technology faced was significantly more unpredictable and complex and more firms did R&D in the area. Synergy differences were primarily identifiable along the success/failure dimension. Only for research and production related synergy did partnership make a difference with in-house projects having significantly more synergy here. The problem situation of the project was somewhat different for partnership projects. They were perceived as more risky, the need for technical and marketing cooperation was seen as higher and for failed partnership projects the initiative came significantly more often from other companies.

- saw more risk in cooperating with external partners. They perceived risk in that the cooperation may give away critical knowledge, the partner could do eventually similar activities with competitors and particular for partnership failures that too close a cooperation may result into products not needed by the general market.

- showed that development related benefits at the beginning of the project are seen very similar compared to in-house projects except that partnership projects in general were perceived as promising more to be first into the market.

In summary: partnership projects achieve somewhat better "windows-of-opportunities" but may be at a cost: somewhat lower financial results and less timeliness. This result is due to having projects that are "newer, more step-out, better" on product characteristics, they follow the same (truncated) project development process, top management supports these projects similarly and the development team is comparable except that somewhat more specific investment for the project is done and as expected, members from the partner are important for success, they also take longer and face somewhat more uncertain markets and dynamic and unpredictable technologies; as one may expect such projects had lower research and production synergy and from the

beginning had higher needs for technical cooperation. Respondents for partnership projects were also more critical about possible problems that may arise from partnership projects. In short: partnership projects are for primarily technical reasons, they help somewhat in opening new opportunities but do not achieve overall better results.

From a managerial point-of-view, it was interesting to note that:

- a) the new product development process is not well executed in Austria: the process one finds is a truncated one - too many steps or activities are not done at all (however, there may be sometimes good reasons to leave out a step or two. On the other hand, there is enough evidence based on previous studies that a more complete process increases the success rate and many of the left out activities are crucial activities for success);
- b) successful projects do the process activities better ;and
- c) it is the homework activities that suffer significantly from a quality of execution.

Partnership projects in Austria differ somewhat but not greatly from non-partnership projects:

- a) they do not consistently achieve better results. However, they showed better product characteristics.
- b) they seem to be used primarily for technical reasons: the project is based on more dynamic and complex technology and the firm perceives it has a lack of synergy (resources or skills) in R&D, technology and production. The technological support through the external partner may permit to develop a somewhat "newer/superior/more step-out" product.
- c) firms that chose a partnership approach for a project know early that they need an external partner primarily for technical support and the idea for the projects originates more often from outside the organization.
- d) firms that are involved in partnership projects in Austria perceive more risk inherent in a cooperation with an external partner than those that do not use a partner. This could indicate that there are indeed practical problems with partnerships as is implied in the some of the literature. This may indicate that partnerships are not inherently an easy way to success.
- e) a partnership does not improve the execution of the activities of the new product development process compared to in-house projects. The process as depicted by the projects under investigation (in-house and partnerships) is a truncated one with many activities left out and/or done not very well. In particular the "homework" activities need considerable improvements.

- f) partnership projects did not receive any special support from top management or had better organizational structures indicating that partnership projects were not considered as anything special or more important than internal developments.

As an endnote one may conclude that partnerships as applied in Austria, are in no way an approach to improve directly new product performance. They seem to have their place for technologically more difficult projects but are in no way a panacea for increasing new product development overall.

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