Success and failure of 50 innovation projects in Dutch companies

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Introduction

Continued innovation of products, services, technology and the organization itself, has been one way to keep a business on its feet during the turbulent 1990s. The importance of innovation – the process during which leap-changes are effected – is generally recognized. More than ten years ago, Tushman and Nader (1986) already predicted that managing innovation would become the most important organizational task of the future. Standstill is simply no option for business and industry. Attention focuses primarily on how innovation projects can be carried out most successfully.

However, in practice the successful conclusion of a total innovation project is by no means matter-of-course, and many innovations even end in failure. Table I, which is based on the results of US research by Carr (1996), illustrates this point.

Table I indicates that 20-30 per cent of the projects ended in failure and 50 per cent showed no improvement. So this latter group also cannot be considered successful. In other words: 70-80 per cent of the projects failed, either completely or partly.

These US figures raise the question of how successful Dutch companies and their managers are in terms of innovation. How many innovation projects succeed, how many fail? The study in hand searches for an answer to this question. The logical next question then is, what are the differences between innovation projects that succeed and those that fail? In short, what are the factors that lead to success, and which factors lead to failure in the projects examined in this study?

Theory

Innovation projects require more systematic and profesional efforts, as shown by the large percentage of organizations that fail to complete innovation projects successfully (Carr, 1996; Vrakking and Cozijnsen, 1992). In recent decades much research has been done to discover in which way the “ideal” innovation project should be carried out, but often without formulating (success) criteria. The related question is: which activities and factors show a positive correlation with successful innovations?
The relevant literature lacks clear conclusions about which factors have a positive effect on successful innovation. Various causes are mentioned (Wolfe, 1994):

- Most of the studies concentrate on only a part of the innovation process. It is frequently not very clear to what part of the process the study is limited.
- The theoretical basis of the studies depends in part on the particular section of the innovation process a study focuses on. Many studies do not describe their theoretical context.
- The way in which studies evaluate and operationalize successful innovation varies widely, or is hardly touched upon. The different measures for successful innovation do not make it any easier to generalize the different studies.
- The studies lack clear indications of the types of innovations investigated. In all likelihood a simple technical innovation is based on different success factors rather than a complex organizational innovation.

A thorough analysis of the major studies shows that they can all be classified in one of five different perspectives. Each of these perspectives defines successful innovation differently. Based on their definition of successful innovation, each perspective has developed different evaluation criteria. This means that for each perspective a different measure of success has been developed to decide whether or not an innovation has been successful.

A brief outline is shown in Table II.

The main concern of the first studies into successful innovation (diffusion and adoption perspective, planned change perspective and so-called structure studies) was the relationship between individual and structural characteristics, and the speed with which the individual or the organization was able to accept an innovation. Adoption behaviour therefore was the measure of success, and it only concerned the initiation phase or the decision-making phase. Everything that came after those phases, i.e. whether the necessary adjustments in the organization and behavioural changes of the employees were implemented adequately, was outside their scope. Only during implementation is the innovation really given shape and form, which makes considerable demands on organizational conditions and the commitment of the people involved to adjust.

The implementation phase is the essence of every innovation process and most failures can be expected to occur during this phase.

Since the implementation phase is often the most crucial phase and is also seen as the completion of a project, it is interesting to map the success and failure factors of this phase. The success measure, which we will address in more detail later, will therefore be based largely on the end results of such an innovation project and these will vary per project. The end results of an innovation project will be determined formally during an evaluation phase.

The implementation phase, when the actual innovation must be given shape and form in an organization, consists of controlling both the innovation process and the change dynamics. The aim of this phase is to achieve the largest possible result with a minimum of costs and energy (Vrakking, 1995). Central to this crucial phase are the success and failure factors. In a change model, Vrakking and Cozijnen (1995, p. 15) compare the management process and the dynamic process. The management process refers to the planning aspect of organizational changes. In addition, they distinguish the dynamic process of complex changes. More specifically, the dynamic process deals with factors such as resistance to change.

<table>
<thead>
<tr>
<th>Type of change</th>
<th>Successful (%)</th>
<th>Neutral (%)</th>
<th>Failed (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total quality management (TQM)</td>
<td>29</td>
<td>50</td>
<td>21</td>
</tr>
<tr>
<td>Revitalization</td>
<td>16</td>
<td>50</td>
<td>34</td>
</tr>
<tr>
<td>Vision, values, attitudes</td>
<td>32</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Business process systems (BPS)</td>
<td>27</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Information technology</td>
<td>20</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

Source: Carr (1996)
interpersonal communication and power relations. In short, the dynamic process concerns the “people side of innovation”. This phase is dominated by control aspects like planning, budgeting and monitoring (Wijnen et al., 1997) and intervention methods (training courses, survey feedback, conferences etc.), to handle the dynamic that results from the innovation process (Cummings and Worley, 1993; Andersen and King, 1995; Zaltman et al., 1973).

The strategic perspective, represented by – among others – Kleinknecht, already concentrates much less on the end results of concrete projects. It focuses much more on the indirect results that are more economic in nature. The strategic perspective defines successful innovation as the degree in which innovations meet the demands of the market. From this point of view, enhancing the organization’s competitive position or increasing market share are the objectives of innovation. We refer to it as the strategic perspective because of its orientation on the market and external environment.

According to representatives of the strategic perspective it is essential to find answers to questions like:

- What strategic advantages can be realized through the innovation?
- Does the market consider the innovation an improvement compared to the existing goal?
- Can we realize the innovation more quickly than the competition can?
- How much should be invested in R&D?

The study of Brouwer and Kleinknecht (1994) is an example of Dutch research based on this perspective. They examined to what degree R&D expenditure and the availability of technological knowledge contribute to the innovation success of organizations. Their success measure consisted of a calculation of what part of the turnover was generated by implemented innovations in an organization. The strategic perspective can be placed at the very end of the phases model, in the incorporation phase.

### Other research into successful innovation

It is immediately clear that the implementation perspective, and therefore the implementation phase, receives relatively little attention. The implementation phase has already been referred to as “the poor cousin” of innovation literature (Vrakking and Cozijnsen, 1992). Does this mean that the implementation phase is not important? On
the contrary. Many innovation projects fail because the implementation phase is not handled correctly (Carr, 1996; Vrakking and Cozijnsen, 1992). The implementation phase is known as one of the most difficult phases (Andersen and King, 1994; Cozijnsen and Vrakking, 1992). Then why has there been so little empirical research?

One reason why the implementation phase has received so little attention is that it proves very difficult to establish a success measure for implementation. The level of analysis, unlike the other perspectives, is the innovation project itself. If, in the implementation phase, one wants to find factors that influence successful innovation, the success measure will have to relate to the results (output) of the innovation project. The most important result of a successful innovation project is the degree in which the defined goals have been achieved. It is necessary to quantify the results in terms of defined goals.

The implementation phase is the final active phase in an innovation process. Implementation factors such as management factors, resistance and intervention refer to events in the innovation process itself. In all likelihood, the way in which the innovation is implemented during the process has a direct effect on the final results of innovation projects. Whereas the other perspectives can design their success measures and criteria based on the results of (individuals in) the innovating organization, the success measure of the implementation activities will have to relate directly to the results of the innovation project. So a way must be found to quantify the results of the innovation project.

How can project results be quantified? It is impossible to check innovation results against an external success criterion. There simply is no success measure external to the innovating organization that is useful for organizational as well as technological and product innovations. The objectives of the different types of innovations are too diverse. To evaluate innovation projects, the objective of the innovation will therefore have to serve as the reference (de Leeuw, 1990). The degree in which the goals – as defined by the innovating organization itself – are achieved then becomes the success measure.

A success measure is only workable if it has been quantified, or at least standardized in some way (Steers, 1988). So the achieved results on the objectives included in the success measure must all be quantifiable. To measure is to know. Some innovation objectives are relatively easy to quantify, for example objectives like:

- increase of turnover;
- increase of profits; and
- increased productivity.

Other innovation objectives are much more difficult to quantify:

- atmosphere; and
- changes in power balances.

In general, one can say that objectives with regard to the human aspect are more difficult to quantify than the more “solid” organizational objectives. To be able to measure the results of an innovation project objectively both the organizational and the human results must be included in the success measure (Vrakking and Cozijnsen, 1992). Table III contains a selection of frequently named objectives of innovation projects. Non-quantifiable objectives have been removed from the selection (Steers, 1988; Vrakking and Cozijnsen, 1992; Wijnen et al., 1997).

The following is known about the organizations from our sample. A total of 78 per cent of the organizations focus on products, 20 per cent on services, and the focus is unknown for 2 per cent. Six organizations operate on a regional level, 30 on an international level. The organizations differ in size: the number of employees varies, from only two to more than 1,000. Six organizations employ more than 1,000 people; five employ between 500 and 1,000 people; 18 organizations employ between 100 and 500; 11 employ between 20 and 100; and nine companies employ fewer than 20 people. Several organizations did not want to share this information for reasons of anonymity. If the rest of the questionnaire was completed...

<table>
<thead>
<tr>
<th>Table III Quantifiable objectives/results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Organizational objectives/results</strong></td>
</tr>
<tr>
<td>Increased profits</td>
</tr>
<tr>
<td>Increased turnover</td>
</tr>
<tr>
<td>Increased efficiency</td>
</tr>
<tr>
<td>Improved effectiveness</td>
</tr>
<tr>
<td>Higher productivity</td>
</tr>
<tr>
<td>Increased productivity</td>
</tr>
<tr>
<td>Increased market share</td>
</tr>
<tr>
<td>Improved environment</td>
</tr>
<tr>
<td>Quality improvement</td>
</tr>
</tbody>
</table>
correctly, these organizations were included in the sample.

Taking into consideration the requirements described above, we constructed the following success measure for innovations: result score $R$. This result score reflects the score that can be calculated on the basis of pre-established objectives of an innovation project and the achieved result with regard to those objectives. Each innovation is assigned a number, which indicates the degree to which an innovation has had a successful result.

This result score of an innovation has the characteristics of a weighted average and is calculated as follows.

The relative “importance” of an objective for the innovation is obtained by assigning value 2 to an important objective for the innovation, and assigning value 1 to a somewhat important objective. The organizations could only indicate the objectives mentioned in Table II as the original objectives of the innovation project.

Subsequently, a value is given to the achieved result per objective. A very positive result is assigned value 2, a somewhat positive result value 1, no result receives value 0, a somewhat negative result value $-1$ and a very negative result receives value $-2$.

If the results and importance of the objectives are multiplied together, a result score ensues. As the objectives may differ in numbers and importance, the product is then standardized.

So, the result score, $R$, is calculated as follows:

$$R = \frac{\sum_{i=1}^{12} W_i \cdot U_i}{\sum_{i=1}^{12} W_i}$$

$R$ = result score of the innovation

$i$ = objective of the innovation

$W_i$ = importance of objective

$U_i$ = achieved result on objective

The result score ranges from $-2$ to 2; so a perfectly executed, very successful innovation can get a maximum score of 2, a disastrous innovation can have a minimum score of $-2$.

**Research design**

We will first describe the research population and sample. Subsequently, the procedure and the measuring instrument are addressed. This paragraph also presents the operationalizations of research questions and hypotheses, as well as the statistical methods used.

**Research questions and hypotheses**

**General research question**

How successful are Dutch innovation projects, and what are the success and failure factors of innovation projects?

In addition to this general question, we also want to find an answer to the following questions.

**Question 2**

Which implementation factors are related to the innovation result?

Related hypotheses: we presume that there is a negative correlation between the degree in which management of the innovation project is inadequate and the innovation result. The hypothesis is:

$H2a$: As the time management of an innovation project is poorer, the innovation project will be less successful.

**Question 3**

What is the relative strength of the effect of the implementation factors on the innovation result? To this end we tested the following hypotheses:

$H3a$: There is a correlation between the implementation factors of time management, cost management, information management, decision making, resistance to unprofessional leadership and innovation success.

We also wanted to know the differences between the three types of innovations and innovation success. Our question was whether the implementation factors influence product innovations, technological innovations and organizational innovations to the same degree. The following hypothesis was formulated:

$H3b$: There is a correlation between the implementation factors of time management, cost management, information management, decision making, resistance to unprofessional leadership and success of product innovations.

**Research population and sample**

The research population consists of profit organizations that recently concluded an
innovation process. In these organizations the innovation project has been completed and the results are known, or at least verifiable. The completed innovation project had to be characteristic for that particular business.

The organizations examined were from different sectors, i.e.:
- food industry;
- insurance industry;
- metal-electro sector; and
- other industrial sectors; this category includes some organizations that do not fit in any of the other three categories, but were included in the sample.

Organizations that did not want to divulge what industry they were active in for reasons of anonymity are also placed in the final category. Figure 1 shows the distribution of the organizations in the different industrial sectors.

Every respondent from an organization included in the sample was asked to think of a recently completed innovation project, and answer all the questions for this particular project. The frequency table (Table IV) shows how complex and how new the innovation projects were to the innovating organization.

**Procedure**
A survey was conducted to answer the research questions. Based on a questionnaire, information was gathered for 50 organizations. The study is quantitative, cross-sectional and was done on a random sample.

First of all, addresses and telephone numbers of the organizations in the sample were collected, using annual reports, telephone directories and professional journals. We also used the address file of the French Chamber of Commerce. The organizations were first contacted by telephone. Based on expectations about the characteristic innovation type of the contacted organization (product, technological or organizational), we asked to be put through to an employee. Initially this would be the human resources manager, a technological innovation manager, or a product development manager respectively. Once contact with the organization had been established, it was determined jointly who the right person would be to complete the questionnaire. To thank them, each respondent received a book of their choice or a book token.

Figure 2 shows the positions of the respondents who completed the questionnaire for their organization.

The questionnaire “Successful innovation” was subsequently sent to the respondents. If they wanted, the respondents could also answer over the telephone. A total of 58 people responded, which means a response of 30 per cent. Of the returned questionnaires, eight could not be used. So the final number of questionnaires processed was 50.

**Research instrument**
Data were collected by means of the “Successful innovation” questionnaire, which was designed specifically for the current
study, and therefore exploratory in nature. The questionnaire consists of 36, mainly closed, questions.

The questionnaire contains two parts. Questions regarding general business information and the experience of the interviewed organization with innovation projects, are included in part I.

In part II the respondent is asked to think of one recently completed innovation project and answer a number of (closed) questions about it.

To answer question 1 “to what degree are the examined innovation projects successful?” we used the success measure for innovations described above.

The range of the result score goes from –2 to 2. The following example illustrates the calculation of result score $R$.

Organization X has concluded an innovation and fills out the questionnaire. The organization lists as the original objectives of the innovation project, as shown in Table V.

After the innovation is completed organization X fills in the results of the innovation as shown in (Table VI):

Result score $R$ of this innovation project is calculated as follows:

Profit is an important objective and is given a value of 2. This is multiplied by value 1, which has been assigned because this objective had a somewhat positive result. Quality improvement is also very important (value 2) and is multiplied by value 2 (very positive result). Increasing employee motivation was a somewhat important objective and was therefore given a value of 1.

The result was somewhat negative and is given a value of -1.

These three products are added up and then divided by the number of objectives mentioned and their importance:

$$\frac{(2 \times 1) + (2 \times 2)}{2 + 2 + 1} = 1$$

The result score of this innovation is 1.

Based on four hypotheses, question 2 tests which implementation factors are connected with the innovation result. $H2a$, $H2b$, $H2c$ and $H2d$ presume a negative correlation between the degree in which management of time, costs, information and decision making are less effective, and the innovation result.

The four management factors (time management, cost management, information management and decision making) each consist of a number of items from the questionnaire. Based on the theory of Wijnen et al. (1997) these items are taken to represent the management factors.

To check whether the items show some correlation and can represent the same factor, we calculated the mutual correlations of the items. Based on these correlations we have no reason to think that the items do not measure the intended factors.

$H2e$ presumes a correlation between the degree of resistance and the innovation result. The questionnaire contains 12 items that measure resistance. When the results were processed one item was removed because it did not play a role in more than 95 per cent of

### Table V

<table>
<thead>
<tr>
<th>Objective</th>
<th>Very important</th>
<th>Somewhat important</th>
<th>Not important/not unimportant</th>
<th>Somewhat unimportant</th>
<th>Very unimportant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased profits</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Quality improvement</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Increasing employee motivation</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

### Table VI

<table>
<thead>
<tr>
<th>Objective</th>
<th>Very positive result</th>
<th>Somewhat positive result</th>
<th>No result</th>
<th>Somewhat negative result</th>
<th>Very negative result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased profits</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Quality improvement</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Increasing employee motivation</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
the examined innovation projects. It concerns the item of sabotage. It is interesting to gain understanding of the interrelations between the resistance items. That is why an exploratory (rotated factor) analysis was carried out. Based on the graph, in which intrinsic values and the factors are plotted, three resistance factors were selected. Together they explain 67.2 per cent of the variance. We call the three selected factors:
(1) factor 1: resistance to leadership;
(2) factor 2: resistance against (political) power struggle; and
(3) factor 3: resistance against too many or previous innovations.

Table VII shows which items constitute the three factors. The degree to which the items correlate with the factors is also indicated as factor loads.

H2e was then tested by calculating the correlation between the three resistance factors and the innovation result.

Due to the low frequency of intervention methods it was impossible to carry out a factor analysis for the intervention methods. To check for a connection between the innovation result and intervention methods, we calculated the correlation coefficients for all separate intervention methods.

Question 3 was tested with the aid of regression analysis, which enables the calculation of (relative) strengths and directions of correlations. The dependent variable is innovation success, the independent variables are: time management, cost management, information management, decision making and resistance to leadership.

**Table VII** Factors, items and factor loads

<table>
<thead>
<tr>
<th>Factors</th>
<th>Items</th>
<th>Factor loads</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lack of leadership</td>
<td>0.83</td>
</tr>
<tr>
<td></td>
<td>Insufficient professionalism of managers</td>
<td>0.76</td>
</tr>
<tr>
<td></td>
<td>Distorted power relations</td>
<td>0.56</td>
</tr>
<tr>
<td></td>
<td>Conflicts between individuals</td>
<td>0.48</td>
</tr>
<tr>
<td></td>
<td>Lack of understanding and support</td>
<td>0.42</td>
</tr>
<tr>
<td>2</td>
<td>Competition between departments and groups</td>
<td>0.64</td>
</tr>
<tr>
<td></td>
<td>Political power struggles and competition</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td>Informal coalition formation</td>
<td>0.34</td>
</tr>
<tr>
<td></td>
<td>Individual competition</td>
<td>0.27</td>
</tr>
<tr>
<td>3</td>
<td>Negative earlier experiences with innovations</td>
<td>0.67</td>
</tr>
<tr>
<td></td>
<td>Too many innovations simultaneously</td>
<td>0.50</td>
</tr>
</tbody>
</table>

**Figure 3** Degree of success of examined innovations (in percentages)

In this paragraph we present the results of the empirical research.

Question 1 was: “to what degree are the examined innovation projects successful?” To answer this question result score \( R \) was calculated for all the innovation projects we examined. Based on their score the innovation projects are divided into four groups, each representing a different degree of innovation success. The groups are presented in Figure 3.

Figure 3 shows that 23 per cent of the innovation projects are successful. In successful innovation projects 50 per cent or more of the defined objectives have been achieved. Of the innovation projects, 23 per cent were partially successful: they realized between 25 per cent and 50 per cent of their objectives. More than 39 per cent of the innovation projects have failed either completely or partly. Eleven of these projects only realized 25 per cent of the objectives at best. A little over 16 per cent of the projects failed completely: not only were the objectives not achieved, but the original situation deteriorated due to the innovation project.

To check for a relationship between innovation result and implementation factors time management, cost management, information management and decision making, we calculated the correlation coefficients and \( p \)-values (one-tailed). Table VIII contains our findings.

As Table VIII shows, the correlations between time management, information management, decision making and the innovation result are statistically significant.
No immediate connection was found between cost management and innovation result.

Of the differences in innovation success of organizational innovations, 61 per cent can be explained by the implementation factors time management, cost management, information management, decision making and resistance to leadership. Both the factor cost management and resistance to leadership explain the differences in innovation success of organizational innovations.

It is striking that inadequate cost management still shows a positive effect on the innovation result. Time management and resistance to leadership have a negative effect. The correlation of innovation success per significant implementation factor, checked for the effect of other implementation factors, is 0.58, 0.46, and 0.41 respectively.

To check for a negative correlation between degree of resistance and the innovation result, we first of all carried out a factor analysis, from which three factors emerged. Table IX shows the three factors and their correlation with the innovation result.

Only the factor resistance to leadership has a significant correlation with the innovation result. This would mean that leadership style definitely influences the effective implementation of innovations.

Finally, we examined whether there is a connection between the intervention methods used in an innovation project and the innovation result. To this end the correlation coefficient of every intervention method was calculated separately. Our findings are presented in Table X, which only includes those intervention methods that show a significant correlation with the innovation result.

Intervention methods that focus on interaction within and between groups and participation show a much stronger positive correlation than methods based on coercion.

### Conclusion and discussion

Part of the main question was: “to what extent are the examined innovation projects successful?”. This question was answered by calculating result score $R$ for the innovation projects. This result score is used here as a measure for the success of an innovation project. Based on pre-determined objectives and achieved result, the result score was calculated. Each innovation project was then assigned a number that indicated the degree of success of an innovation.

We concluded that a little more than half of the projects can be considered completely or at least partly successful. However, more than 39 per cent of the innovation projects failed, either completely or partly. This is a considerable percentage, especially considering that, in general, the respondents will be more inclined to fill out the questionnaire a little too positively (socially desirable) instead of negatively. It would be an interesting exercise to compare these percentages with the results from industrial sectors other than those examined here, or with the results from organizations in other countries. Unfortunately, this is not possible, because we have not found any comparable research that defined innovation success as a function of achieved results on established objectives.

The first thing we noticed was that there were no success or failure factors that have an unambiguous influence on the success of all types of innovation projects. The success and failure factors differ per innovation type. The correlation between the different innovation factors and innovation result is established, but when relative effects are measured this correlation largely disappears, or changes strongly.
As to the link between innovation success and implementation factors, only the factor of “resistance to leadership” shows a significant correlation with innovation success. Finally, 61 per cent of the differences in innovation success is explained by nearly all implementation factors, i.e. time management, cost management, information management, decision making and resistance to leadership.

Many questions remain unanswered. To make more definite statements about the relative importance of the success and failure factors, we must first examine which implementation factors are interrelated.

The method developed here to measure innovation success appears to be practicable. However, this success measure must also be further developed and improved.

References

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