

## FACILITATING DECISION-MAKING IN PRE-DEVELOPMENT

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### Abstract

Managers of product development projects face the challenge of organising the fuzzy phase of pre-development. In pre-development uncertainty about the outcomes rules. Pre-development projects easily fail, so many companies simply run parallel projects and count on strength in numbers. This approach consumes precious resources, and even worse, is a potential threat for the company that sees too many pre-developments fail.

Separating the potential winning projects from the potential losers is perhaps the most difficult task. In spite of the great importance of pre-development for the survival of a company, most of these decisions are taken on the basis of experience, or just the gut feeling of the managers in charge.

This paper does not aim to relieve managers from their difficult task. However it does introduce an instrument that helps managers to assess relevant issues and facilitates decision-making in pre-development.

*Keywords: pre-development, fuzzy front end, decision-making, success, failure, prediction*

### 1 Introduction

New product development is essential for producers of durable consumer goods. Challenged by strong international competition, accelerating technological development, shortening product life cycles and ever-changing consumer needs, these companies depend on productive and reliable product development. Unfortunately, failure is as much a part of product development as is success.

In this paper we propose a new approach to improve the reliability of activities in the front-end of product development. In section 2 we explain pre-development. In section 3 we discuss the factors that affect the success-rate of pre-development which were found in the literature. In section 4 we describe some results of a case study of pre-development in a Dutch multinational manufacturer of household appliances. Finally, in section 5, we present an instrument that enables fast and easy assessment of the quality of product development activities and allows managers of front-end developments to predict outcomes.

### 2 Pre-development

Pre-development spans the most explorative of all activities in product development. Pre-development has no fixed boundaries but is generally considered to start with a business definition of the innovation-to-be, and ends with a product development assignment based on proven technology. Pre-development comprises activities as diverse as idea generation, preliminary study, concept generation and definition, and feasibility planning.

Managers of pre-development often work on projects with high levels of uncertainty about the

outcomes. Many pre-development projects do not result in a viable product-proposition for reasons such as: the proposed business direction proves unrealistic; insufficient resources are available within the company to complete the project; technology needed is not yet available, et cetera. However, managers are expected to safeguard a steady and reliable output of high quality new product-propositions.

In order to avoid spending resources on unproductive projects, pre-development managers must be able to identify winning projects as early as possible. However, this task currently lacks a substantial basis. In pre-development

- There's no other basis for the prediction of outcomes than the experience, common sense and gut feeling of the pre-development engineers and their managers. This basis often proves to be insubstantial.
- Pre-development often lacks a structural system to learn from experiences in both successful and unsuccessful projects.
- Pre-developers, although well capable of pinpointing individual causes of failure, often have no comprehensive understanding of all causes and their relative influence and connection

Analysis revealed that failures in pre-development projects often have demonstrable origins. Furthermore, many researchers in the field agree that success can be educed by paying attention to a limited number of success-influencing factors.

### 3 Literature study

In this section the results of a literature study on success and failure in the early phases of product development are discussed. The study focused on the identification of success-influencing factors, i.e. prerequisites, circumstances, competences, conditions, et cetera that affect the success of pre-development. The study spanned what is generally referred to as 'the Fuzzy Front End' (FFE). The FFE comprises all of a company's activities prior to actual new product development. FFE differs from pre-development in that it also includes strategic planning activities and business definition. Because in recent years FFE has become a widely used label for all activities undertaken prior to actual product development, our literature study focused on FFE rather than pre-development.

In the literature we found some 55 factors that affect performance in the FFE, of which their respective authors have demonstrated the validity at least to some extent. Building on the work of Hüsiger and Kohn [1], who scanned some 165 sources for FFE influencing factors, we classified these factors in seven categories. The following list specifies these categories and gives for each category a few examples. For the full list see [2].

#### **Project management**

- Create and maintain a shared team purpose
- Deploy cross functional teams

#### **(Product) creation**

- Accurately identify the target customer
- Define products as clearly as possible (clear specifications)

#### **Strategy & synergy**

- Have a clear vision and clear objectives
- Stick to the strategies

#### **Senior management**

- Generate support and take responsibilities
- Take care of sufficient resources

### **Process**

- Implement a formal process
- Manage information efficiently in the Fuzzy Front End

### **Culture**

- Foster a collaborative culture
- Be a true learning organisation

### **People**

- Foster and stimulate product champions
- Make motivation of teams a cultural value

## 4 Case-study

The literature study provided useful insights in critical issues in pre-development. But as the studies reported in the literature pertained to different industrial sectors the subject needed further study in a product development environment. Therefore we analysed five cases of pre-development projects, executed by a multinational manufacturer of domestic appliances for the causes of their failure or success.

The company's difficulties in completing projects satisfactory-for-all stakeholders were found to originate in the following (summarised) issues:

### Business Planning and Feasibility Assessment

Many problems sprang from underestimating technical complexity and feasibility in the planning phase. In several instances, business plans appeared to be based on poorly validated information. In other instances, feasibility was at least questionable from the start on. These issues have been recognised by many scholars and are typical for the Fuzzy Front End.

- **Project Start-Up and Allocation of Resources**

Project start-up is described by many sources as an essential step to generate commitment, create a common purpose, and reach agreement on milestones and the quality of results. The case studies revealed a lack of attention for the start of projects, both substantially and practically.

- **Top-down Support**

The influence of senior management, both constructive and destructive, on outcomes of projects proved larger than was initially acknowledged. This is closely related to strategy and synergy issues, as senior management is responsible for fitting projects in the larger organisation.

- **Technical Know-how & Execution**

Front-end activities in particular are characterised by high demands for new knowledge. This knowledge must be applied in a sensible manner. The case studies indicated a lack of specialist knowledge and revealed limits to the quality of execution in several cases.

- **Project Control**

The most consistent finding of the case studies was the inability of pre-development teams to stick to the planning. This seemed to relate to business planning and project start-up. Literature does not specifically address this issue, but rather takes it as a prerequisite of project management.

- **Business Partners Performance Assessment**

The case studies showed weaknesses with regard to selection of and co-operation with business partners. Literature promotes co-operation with partners and other external sources, but does not provide guidelines on how to handle co-operation.

- **Prototyping**  
Prototypes were used extensively to communicate ideas on new products and to monitor progress. However, poor quality of the prototypes sometimes hindered communication about project progress.
- **Market Preparation & Demand Generation**  
Generation and especially verification of customer demands was sometimes poorly executed. Literature emphasises the importance of concurrent or integral development, including demand-generating activities.

A number of specific influencing factors were derived from the case studies. For example, in one of the projects the team struggled with a new formal product creation process that had recently been introduced. This had a negative effect on the outcome of the project. The following influencing factor was formulated: “The team lacked experience with the process in use”. In a similar way all observed influences have been represented by influencing factors. Former team members then verified and reformulated these factors. This resulted in a list of 97 confirmed factors all of which were found to have negative effect on the outcomes of the studied projects.

## 5 Re-conceptualisation and framework

These 97 factors were combined with the 55 general success factors from the literature (see section 3), resulting into a final list of 72 success factors tailored to pre-development in the sector of durable consumer goods. Table 1 shows some examples of these factors, as well as the problem categories under which they have been classified. For the full list see [2]

Table 1. Problem categories and success factors

<b>Category</b>	<b>Example of success factor</b>
Communication	Frequently inform senior management about (the progress of) the project
Consolidation	Finish work completely in preparation of consolidations
Culture	Have a strong orientation and commitment towards innovation
Development Partners	Monitor co-operation with Development partners closely
Execution	Conduct detailed studies
Functional Groups	Guard the interests of all functional groups throughout a pre-development process
Planning	Organize the project in such a way that it is independent from other projects
Preparation	Conduct a preliminary patent study
Process	Maintain a high quality pre-development process
Product Management	Prepare sales-organizations as early as possible
Project Leader	Install a strong project leader
Senior Management	Show consistent leadership
Strategy	Consciously commit efforts to the business definition and the strategies
Synergy	Have synergy between project strategy and (overall) business-strategy
Team	Establish and maintain connections with key outsiders
Testing	Have proper test criteria and methods available

The problem categories of Table 1 were used to build a framework for success in pre-development projects. The framework, shown in Figure 2, was partly derived from models of Hüsigg and Kohn [1] and Koen [3]. The framework resembles a flywheel revolving in a bearing, driven by a set of powered gears. The analogy between this mechanical construction and pre-development activities is clear: the flywheel represents the most critical activities carried out during pre-development. The central gear represents the team, which executes the assignment. The surrounding powered gears represent all parties supporting, steering and co-operating with the team. Together, these gears drive pre-development. Finally, the bearing-ring represents the prerequisites that enable a pre-development to evolve smoothly. Each of the sixteen elements in the model is the denominator for a cluster of success-educing factors.

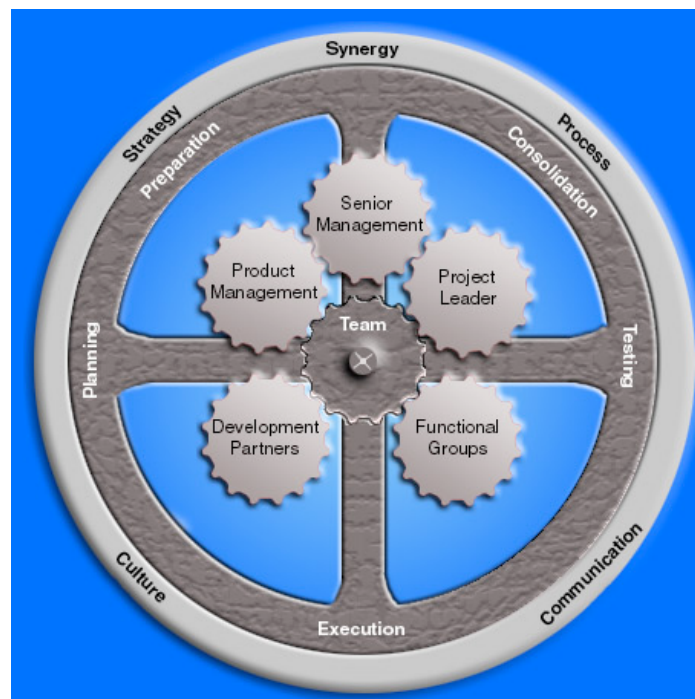


Figure 2. A framework for pre-development

## 6 Pre-DICTION

Based on the results from the literature study and case studies an instrument, named **Pre-DICTION**, has been designed. The purpose of this instrument is to assist managers of pre-development projects in making decisions on the continuation of projects by providing estimates of the chance for success. Our approach was to utilize the knowledge of all employees involved in the pre-development as much as possible. We assumed that it is possible to converge individual “partial” views and expectations on a project’s progress into a single indicator.

As the scope of this project did not allow for the development of a fully functioning prototype only a functional model of the instrument was build and tested. This functional model was set-up in such a way, as to meet the specific needs of the company that delivered case-study material (see section 4); it should therefore not be considered a generally applicable instrument.

## 6.1 An outline for the functional model

We chose to develop a digital application based on the final list of success factors and the framework (see section 5). Based on further analysis we concluded that the instrument should at least perform the following three functions:

1. A collector of pre-developers' opinions about the project
2. A processor that converges these opinions into readily assessable indicators
3. A display that presents these indicators in a comprehensible way

Re-writing the list of success factors into a questionnaire created the first function. For the second and third function Microsoft Excel was used for both its ability to perform calculations and its availability on most workstations. Excel facilitates separation of operations in different sheets. Excel typically builds up documents from separate sheets, which may correspond to different administrative books. Table 2 lists the sheets that are the building blocks of the functional model.

Table 2. Sheets of the instrument

Sheet	Features
1. Questionnaire	<ul style="list-style-type: none"> <li>• Presentation of the questions in random order</li> <li>• Scoring on a five-point scale</li> <li>• Instructions on its use</li> </ul>
This sheet is built upon the success factors. It collects the opinion of the individual respondent and transfers it to sheet 2.	
2. Main	<ul style="list-style-type: none"> <li>• Collection of the answers of sheet 1. Questionnaire</li> <li>• Calculation of average scores, and category weights</li> <li>• All information per factor arranged in columns</li> </ul>
'Main' is the body of the instrument. It contains all relevant information per success factor. In this sheet, basic pre-calculations are performed.	
3. Results	<ul style="list-style-type: none"> <li>• Calculation of success-chances and category scores</li> <li>• Colour-coded total scores (indicating high and low scores) and deviations from mean scores</li> </ul>
This sheet shows all numerical results of calculations performed on the data; particularly useful for archiving and for use in sheet 4.	
4. Charts	<ul style="list-style-type: none"> <li>• Graphical representations of 3. Results</li> <li>• Easy to print, ready-made presentation sheets</li> <li>• Convenient "first glance" assessment</li> </ul>
This sheet provides ready-for printing graphs and forms the output of the system.	
5. Archive	<ul style="list-style-type: none"> <li>• Storage of selected data from "Results"</li> <li>• Possibility to generate trend-lines based on multiple measurements</li> </ul>
The archive holds all analysis results and can be used for comparison between projects and, more importantly, for reflection on the tool itself.	

The flow of information through the instrument is shown in Figure 4.

## 6.2 Presenting the instrument

In this section, **Pre-DICTION** is briefly shown in screenshots of an imaginary project. Then, the (groups of) people involved in the use of the instrument are introduced (who). Next, the operation is explained in five steps (how). Finally, the timing of usage is discussed (when). The "who", "how" and "when" should be interpreted as a guideline for the use of the instrument in project assessment. The instrument is a digital application that facilitates

managers in making decisions about pre-development projects. It collects opinions of all people involved in a project on 72 success indicators on a five-point scale, and calculates an overall weighted average score, representing the project's chance for success on a percentage scale (0% meaning failure, 100% meaning success). Also performance indicators per problem category are displayed (see Figure 4).

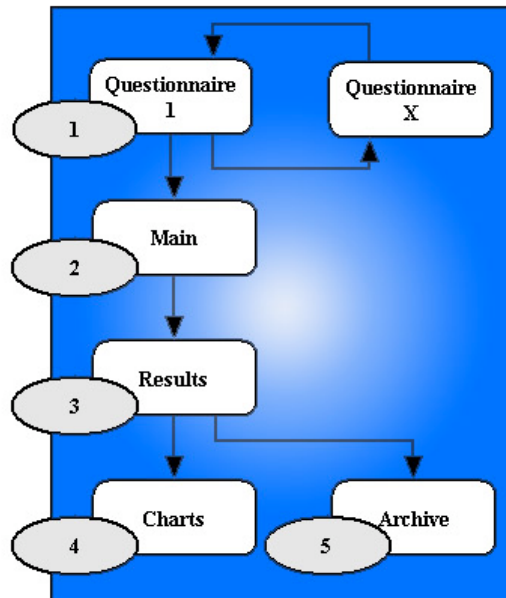


Figure 1. Flow of information through the functional model

# Pre-DICTON

HELP

### Imaginary Project

	Scale Minimum	1	2	3	4	5	Scale Maximum
Is the quality of our performance being positively influenced by the business-strategy	No, not at all	1	2	3	4	5	Yes, very much so
Are all strategies attuned to each other (project strategy, pre-development strategy, marketing strategy)	Hardly	1	2	3	4	5	Totally
Do we share a common purpose in our team	No, we don't	1	2	3	4	5	Yes, we do
How extensive are our connections with key outsiders (essential (re)sources outside the team)	None-existing	1	2	3	4	5	Widespread
Do we consciously devote time and attention to the reduction of risks in our project	No, not really	1	2	3	4	5	Yes, very consciously
Do we have a practical, realistic and straightforward attitude	We don't	1	2	3	4	5	We do
How well do we manage to keep our energy focussed on promising directions	Not very well	1	2	3	4	5	Very well
How well do we succeed in keeping the factory standard price low	Not very well	1	2	3	4	5	Very well
Do we have suitable tests and facilities for testing available	We don't	1	2	3	4	5	We do
Are we critical enough when deciding whether to start testing or not (yet)	No, we are not	1	2	3	4	5	Yes, we are
Do we make good use of prototypes	No	1	2	3	4	5	Yes

Please, estimate how much of the originally planned project time we've consumed so far  %

Please, estimate how much of the total amount of work has been done  %

Please, estimate how long you've been working in your current function (in months)?  months

Where do you work? (Select the location you are originally stationed)

- Location A
- Location B
- Location C
- Other

Which of the following words best describes your role in this project?

- Pre-Developer
- Project Leader
- Product Manager
- Functional Manager
- Senior Manager
- Support
- Other

Figure 2. Screenshot of the digital questionnaire.

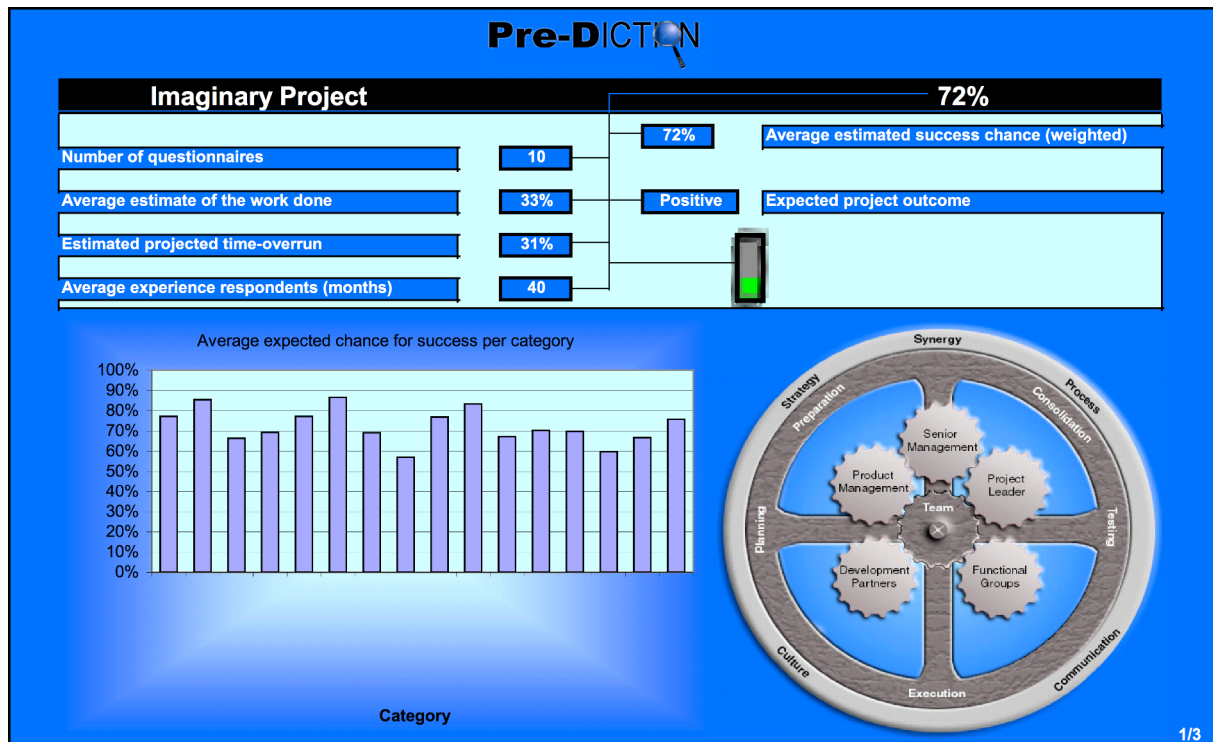


Figure 3. Screenshot of page one of the presentation sheets.

### Who should use Pre-DICTION?

**Owner:** ownership of **Pre-DICTION** lies with pre-development managers. They will conduct the use of the instrument. The owner will furthermore be the keeper of the archive. In daily practice, this means that an initiator can ask the owner to provide the **Pre-DICTION** Excel-file to a facilitator, and to instruct the facilitator on its use.

**Initiator:** Although in principle, everyone involved in pre-development can initiate the application of **Pre-DICTION** in a project, project leaders will generally be the initiators. When an initiator observes the need for use of the instrument, he/ she contacts a facilitator and the owner.

**Facilitator:** The facilitator has the tasks to gather data, perform analysis on this data, and facilitate assimilation of the test results. This person needs to be an experienced facilitator, as it is his/ her task to facilitate the meeting in which the results are discussed and a plan of action is drafted.

**Respondents:** These are all people involved in the project. The respondents provide the input for analysis through the questionnaires they receive from the facilitator. It is also their task to interpret the analysis results: They need to discuss the results, work out differences in opinions or perceptions, and decide on the course of action. The facilitator will be there to assist the respondents.

### How to use Pre-DICTION

The following manual instructs on the use of **Pre-DICTION**.

#### Step 1

- Email the questionnaire to all involved.
- Gather the completed questionnaires.



**Step 2**

- Retrieve the scores.
- Copy-paste the values into sheet Main.

**Step 3**

- Print the pages in sheet Charts.

**Step 4**

- Gather all respondents for an assessment meeting.

**Step 5**

- Discuss the results.
- Draft a plan for action.

**When to use Pre-DICTION**

The instrument is designed as a decision aid, which makes it particularly useful for decision-making in consolidation meetings. However, **Pre-DICTION** can be applied at any time during a pre-development project.

## 7. Conclusion

**Pre-DICTION** has been tested in a limited number of trials. The instrument works as a mirror for the participants in the project, as it reduces the complexity of a project to a set of 16 performance indicators. As the instrument has been built on a broad base of practical and theoretical experiences, users benefit from mistakes made in the past. In this sense, **Pre-DICTION** functions as an instrument for learning. However, **Pre-DICTION** is still in a preliminary state. Its way of working was demonstrated in a functional model, but its final shape and application remain to be developed. Repeated applications must prove its predicting value. Also, when regularly applied, the instrument should benefit from learning experiences and will evolve continuously.

Pre-developers now have a potential means to disentangle the Fuzzy Front End of new product development. The process of decision-making in pre-development projects is expected to be easier with the estimates of **Pre-DICTION** at hand.

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