

University of Groningen

## Design of a Methodology to Support Software Release Decisions

Sassenburg, J.A.

**IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.**

*Document Version*

Publisher's PDF, also known as Version of record

*Publication date:*

2006

[Link to publication in University of Groningen/UMCG research database](#)

*Citation for published version (APA):*

Sassenburg, J. A. (2006). *Design of a Methodology to Support Software Release Decisions: Do the Numbers Really Matter?*. s.n.

**Copyright**

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

**Take-down policy**

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

*Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.*

**PART 2: EXPLANATION PHASE – DESIGN OF METHODOLOGY**



## 5 FRAMEWORK OF THE METHODOLOGY

*“Almost all men are intelligent. It is method that they lack.”*  
-- F.W. Nichol --

### 5.1 Introduction

The Exploration Phase of this study, presented in the previous two Chapters, notes that strategic software release decisions match the characteristics of the Harrison (1987) Process Model and it was confirmed that such decisions require a formal decision-making process or methodology. In this Chapter, these conclusions are used to define a framework for the methodology to be designed, called the **Release Decision Methodology**.

In Section 5.2 the Process Model is revisited, showing its interdisciplinary character and managerial decision-making functions. In Section 5.3 the framework of the methodology to be designed is introduced, using the different elements of the Process Model. Attention is paid to the architecture of the methodology, making a distinction between process areas and underlying practices. The different authorities, or stakeholders, involved in the decision-making process are identified. Finally, to narrow the study towards existing theory for each identified process area, four secondary research questions are formulated in Section 5.4. This Chapter ends with a summary and conclusions in Section 5.5.

### 5.2 Process Model

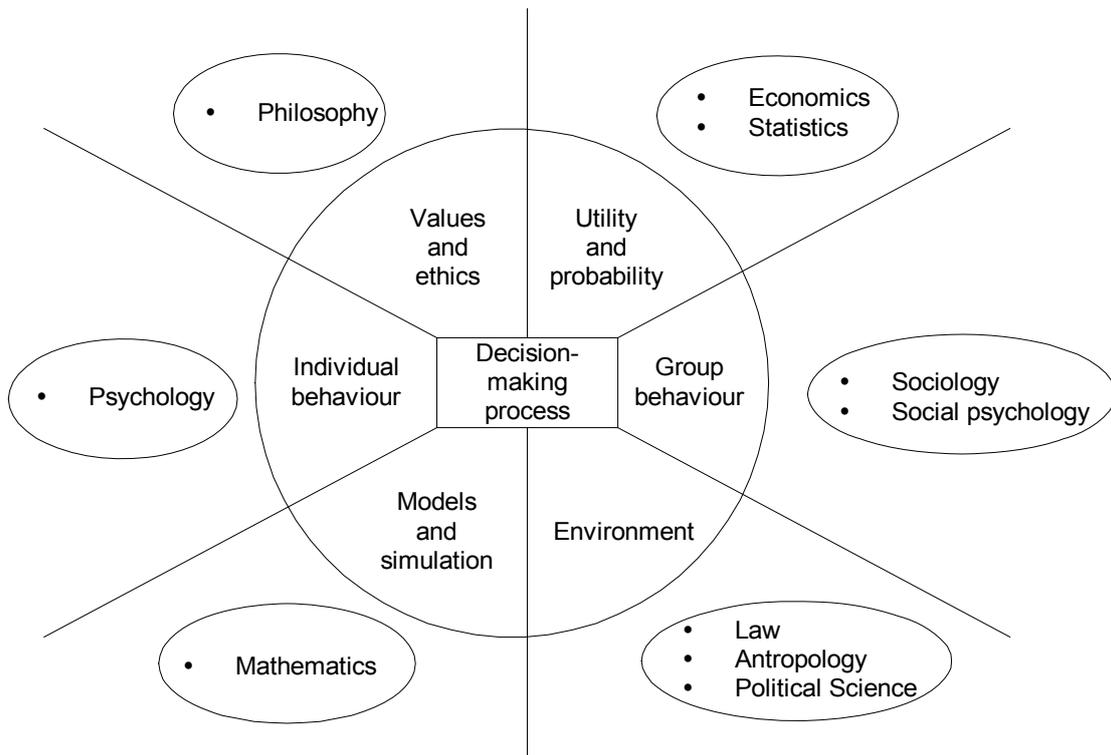
The primary research objective is to design a methodology to support strategic software release decisions. In the Exploration Phase of this study, it is concluded that these decisions are non-routine decisions and, generally, concern the release of newly developed products, or major revisions of existing software products. For strategic software release decisions it is concluded that the Harrison Process Model can be used as the primary reference decision-making model. The Process Model and other decision-making models are not mutually exclusive, as discussed in Section 3.4.3. The Process Model integrates parts of the other decision-making models in an inter-disciplinary framework as illustrated in Figure 5-1 (Harrison 1987, p.159):

- ❖ *Rational Model*. The model proposed employs some of the techniques of the Rational Model, with emphasis on the quantitative disciplines, to reduce uncertainty in comparing and evaluating alternatives. It assumes *maximizing behaviour*.
- ❖ *Organizational Model*. The model proposed includes parts of the Organizational Model by emphasizing the environmental constraints that confront managerial decision-makers, such as time constraints, cost constraints and imperfect information on completeness and reliability. It assumes *optimizing behaviour*.
- ❖ *Political Model*. The process model proposed will, from time to time, use some of the bargaining techniques of the Political Model to make a proposed choice more acceptable to disagreeable stakeholders with different preferences for the decision outcome. It assumes *satisficing behaviour*.

The decision-making process, as presented in Figure 3-16 in Section 3.4.1, is applicable to the Process Model, identifying six functions of managerial decision-making. It recognizes the need for:

1. setting objectives [Function 1],
2. a search for alternatives [Function 2],
3. a comparison/evaluation of alternatives [Function 3],
4. a choice being made [Function 4],

5. the choice being implemented [Function 5], and
6. the need for follow-up and control [Function 6].



**Figure 5-1: Interdisciplinary Framework for Decision-making**  
(Harrison 1987, p.160)

Using the Process Model as a reference offers the opportunity to determine the important factors increasing the likelihood of strategic decision success (Harrison 1987, pp.354-362), as in Figure 5-2.

Attitude toward the Decision	Attitude toward the Decision-making Process	
	Attainable objectives Open decision-making process	Unattainable objectives Closed decision-making process
Judgmental strategy Satisficing outcome	Successful strategic choice	Wrong process for unrealistic objectives
Computational strategy Maximizing outcome	Uncertainty ignored	Wrong means directed toward wrong ends

**Figure 5-2: Strategic Decision Matrix**  
(Harrison 1987, p.359)

These factors, dealing with managerial attitudes toward the decision-making process and managerial attitudes toward the decision, are:

1. *Decision-making process.* The primary factors here are the availability of well-defined, *attainable objectives* as opposed to unattainable objectives and a mindset toward an *open decision model*, giving weight to the environment [dynamic objectives, imperfect information, time and cost constraints, cognitive limitations], opposed to a closed decision model.

2. *Decision.* The primary factors here are a *judgmental decision strategy* [choosing an alternative based on judgment applied to information that is imperfect] instead of a computational strategy and the search for a *satisficing outcome* [strong preference for a desirable result; complemented by an acceptance of less-than-perfect knowledge about the outcome], meeting the defined objectives instead of a maximizing outcome.

### 5.3 Release Decision Methodology

#### 5.3.1 Design Considerations

Initially, two different design alternatives were considered but were rejected for the following reasons:

1. *Another model of choice.* The case studies did not indicate that models of choice are applied in the software release decision-making process (see Section 4.4.3). Instead, stakeholders involved, either consciously or unconsciously, go through some process steps that enable them to make a ‘good’ release decision in a complex environment. It is anticipated that the design of a supporting methodology for strategic software release decisions should not introduce another model of choice.
2. *Market entry model.* A focus on designing a market entry model was considered, enabling a software manufacturer to evaluate and compare different release alternatives from a quantitative point of view, with the Rational Model as the primary reference for strategic software release decisions. Although this is a valuable business-oriented approach, such a model could only in a limited way address the fact that uncertainty, time and cost constraints and cognitive limitations characterize these decisions. It was concluded that the Process Model offers a better alternative. As stated in Section 2.3, software engineering is still a relatively young discipline and there is a lack of general agreement on software measurement and a lack of maturity in measurement (Bourgue *et al.* 2004). This was confirmed during the case studies, but the definition of a market entry model is not discarded (to be discussed in Section 6.4).

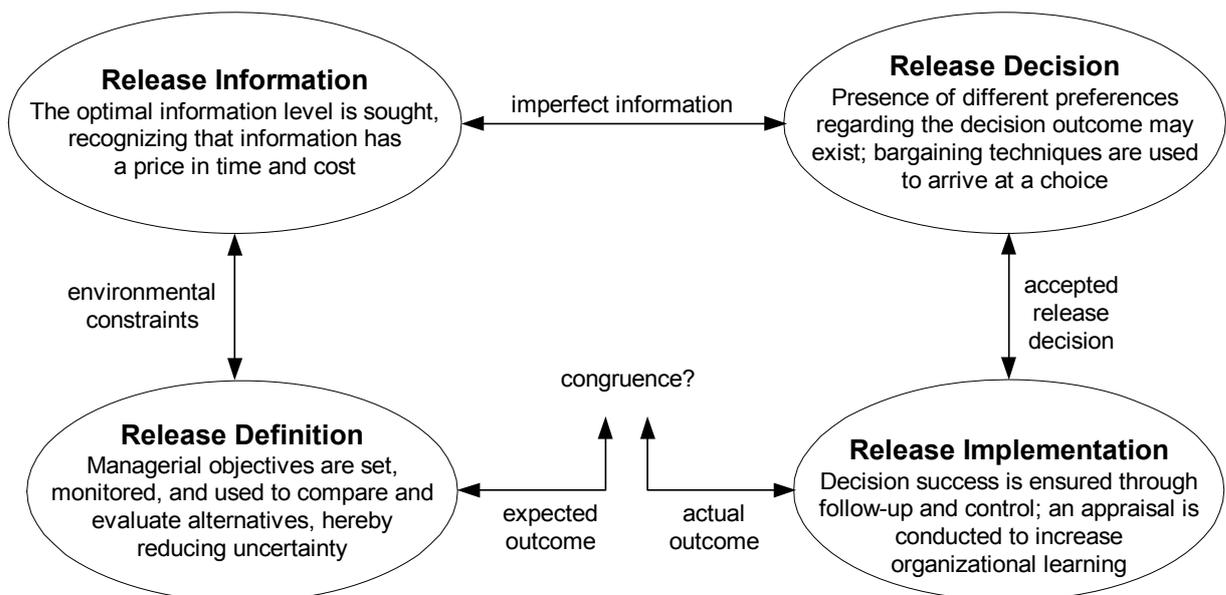


Figure 5-3: Release Decision Methodology

The Process Model incorporates the presence of uncertainty, time and cost constraints for information, and cognitive limitations. As discussed in Section 5.2, this model offers the

opportunity of determining the important factors leading to strategic decision success. The strategic decision matrix reveals four important conditions for the methodology to be defined:

- a. presence of attainable objectives [Condition 1],
- b. an open decision-making process [Condition 2],
- c. a judgmental strategy [Condition 3], and
- d. a satisficing outcome [Condition 4].

A framework is designed on the basis of these conditions, in combination with the six functions of the managerial decision-making process. This framework, called the **Release Decision Methodology** is presented in Figure 5-3.

In this framework, the parts of the other decision-making models [Rational, Organizational and Political] are mapped onto the functions of managerial decision-making. This framework is used to define the methodology as a set of coherent, easy-to-understand practices for these process steps. This approach has another advantage, in the likelihood of adoption of such a methodology. As discussed in Section 4.6, characteristics like limited complexity, and compatibility with existing practices and values, are identified as direct constraints on the methodology design. In this framework, four process areas in the software release decision-making process are distinguished, each addressing the process from different perspectives. These process areas match problem areas identified for software release decisions, as discussed in Section 4.5:

1. *Release Definition.* Decision-making is mainly viewed from a quantitative perspective, assuming that information is near to perfect: complete and reliable. It emphasizes the *maximizing behaviour* approach in the Rational Model, and the mathematic, economic and statistic disciplines play an important role in this process area. In software release decisions, decision-making from a quantitative perspective is concerned with the definition and control of a product development strategy: setting the managerial objectives with their priorities [Function 1], and ensuring they are attainable [Condition 1]. The availability of a product development strategy will enable the comparison/evaluation of different release alternatives [Function 3], thus answering the question: which alternative maximizes economic value?
2. *Release Information.* This process area is concerned with the search for alternatives [Function 2], for example, the identification and collection of information that is needed to compare and evaluate different release alternatives. This search is derived from the formulated product development strategy. Decision-making is also viewed from a quantitative perspective, but with the recognition that information is imperfect in the sense that not everything can be expressed in numbers, and that information has its price, in time and money. For this process the mathematic, economic and statistic disciplines still play an important role, but the maximizing behaviour approach is extended with an *optimizing behaviour* approach, as emphasized in the Organizational Model. What is the optimal volume of information? Insufficient information increases uncertainty and hampers the decision-making process, whereas too much information is a waste of scarce resources; there is an optimum above which the cost for searching for more information exceeds the benefits.
3. *Release Decision.* Decision-making is viewed from a psychological, sociological and socio-psychological perspective, addressing factors that influence individual and group behaviour. It recognizes the imperfections of information, and stakeholders, involved in the act of choice [Function 4], will possibly have different preferences with respect to the decision outcome; an open decision-making process [Condition 2]. The challenge is to use a judgmental strategy [Condition 3] to reach a decision outcome that meets the objectives formulated, and is agreeable to all stakeholders involved. The concept of optimizing behaviour is extended with a *satisficing behaviour* approach [Condition 4] as

emphasized in the Political Model: Which outcome satisfies the needs of all stakeholders involved?

4. *Release Implementation*. Decision-making is viewed from an implementation perspective once a decision has been made and is implemented [Function 5], assuming a successful decision requires follow-up and control [Function 6] of the implemented decision. For software release decisions, it is necessary to identify the factors that ensure congruence between the expected and the actual outcome. To increase organizational learning, the decision-making process and its outcome should be evaluated.

In Figure 5-4, relationships between the four process areas and the Process Model are given.

Process Area	Decision-making Function	Decision Success Factor
<i>Release Definition</i>	(2) Setting managerial objectives (3) Comparing and evaluating alternatives	(1) Attainable objectives
<i>Release Information</i>	(2) Search for alternatives	-
<i>Release Decision</i>	(4) The act of choice	(2) Open-decision-making process (3) Judgmental strategy (4) Satisficing outcome
<i>Release Implementation</i>	(5) Implementing decisions (6) Follow-up and control	-

**Figure 5-4: Relationships between Process Areas and Process Model**

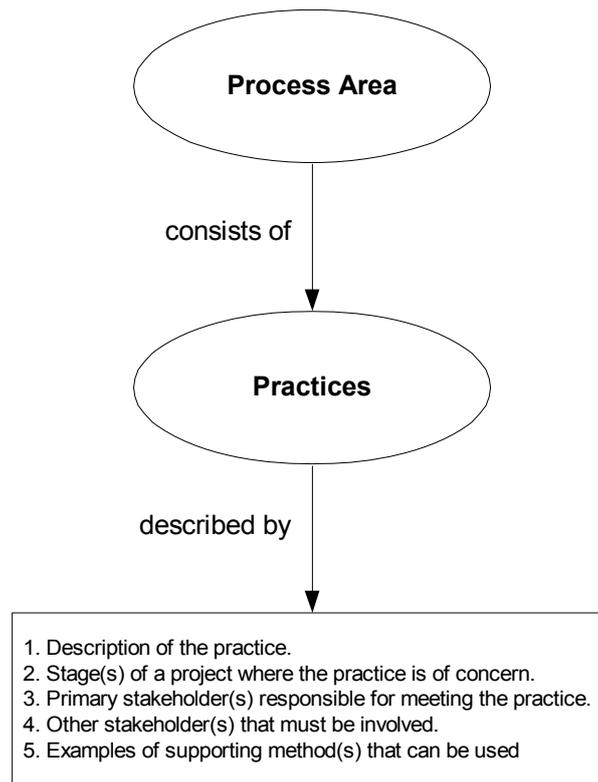
### 5.3.2 Practices

A process area is defined as a cluster of related practices which, when performed collectively, achieve a set of goals considered important for establishing process capability in that area. The next step in designing the methodology is the identification of relevant practices for each process area, which should describe ‘what’ is to be accomplished [general guidelines] but not ‘how’. Taking this approach, the descriptions of practices still offer the possibility for interpretation and customization to the external market environment, and to internal strategic and functional characteristics of a software manufacturer organization.

Information is given for each practice, with Figure 5-5 showing the resulting methodology structure:

1. A description of the practice.
2. The stage(s) of a project where the practice is of concern.
3. The primary stakeholder(s) responsible for successfully implementing the practice.
4. The other stakeholder(s) to be involved.
5. Examples of supporting method(s) that can be used.

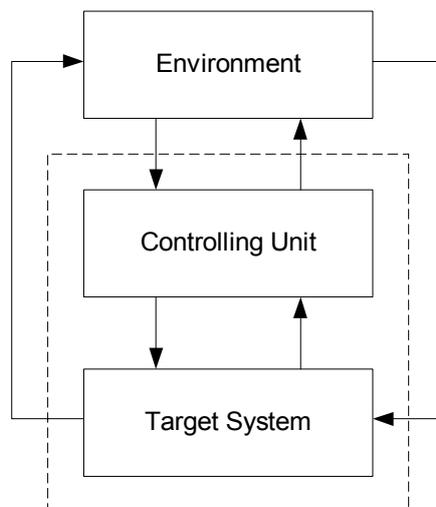
Before the process areas are further explored to derive the relevant practices, the different stakeholders involved in the decision-making process are identified in the next Section.



**Figure 5-5: Structure of the Release Decision Methodology**

### 5.3.3 Stakeholders

For the identification of the different stakeholders in a release decision-making project, in general terms, an approach used by Hollander (2002) is adopted, based on the definition of effective control of a target system described by, for example, Kickert and Gigch (1987) and Leeuw (1990). A controller or controlling organ or unit, a controlled or target system and an environment, as illustrated in Figure 5-6, represent a control situation. The interactions between the target system and the controlling unit consist of monitoring, and manipulation, of the target system by the controlling unit.



**Figure 5-6: Control System**  
(Kickert and Gigch 1987; Leeuw 1990)

Leeuw also defines five requirements for effective control, as illustrated in Figure 5-7.

Hollander (2002, pp.52-53) adapts the control system of Figure 5-6 to the controlling power of business development teams in the following way:

- ❖ The *environment* is based on Porter’s five forces model, being the company and its competitors, the customers or buyers of the product, the suppliers, the substitutes for the product and new potential entrants from other markets (Porter 1980).
- ❖ The *controlling unit* consists of the project management function, and should fulfil the five requirements for effective control to steer a project in the right direction. Business development management should specify goals [Requirement 1], should have an explicit or implicit model to predict the possible effects of the control measures [Requirement 2], should have information on the state of the project and the environmental influences [Requirement 3], should have sufficient control tools at its disposal [Requirement 4], and should have sufficient data-handling capacity [Requirement 5].
- ❖ The *target system* is the business development project.

Requirement		Description
1	Goal	The controlling unit should specify goals for the target system, which may, or may not, be constant in time or stated explicitly.
2	Model	The controlling unit should have a model to predict the possible effects of the control measures, or should at least have a good understanding of the target system.
3	Information	The controlling unit should have sufficient information about the state of the system and the environmental influences, and embrace the means for acquiring and updating this information.
4	Measures	The controlling unit should have enough measures of control at its disposal or the organ must encompass enough degrees of freedom to cope with possible environmental and system disturbances.
5	Capacity	The controlling unit should have sufficient data handling capacity, which enables the use of the information required for taking control measures.

**Figure 5-7: Effective Control**  
(Leeuw 1990, 1994)

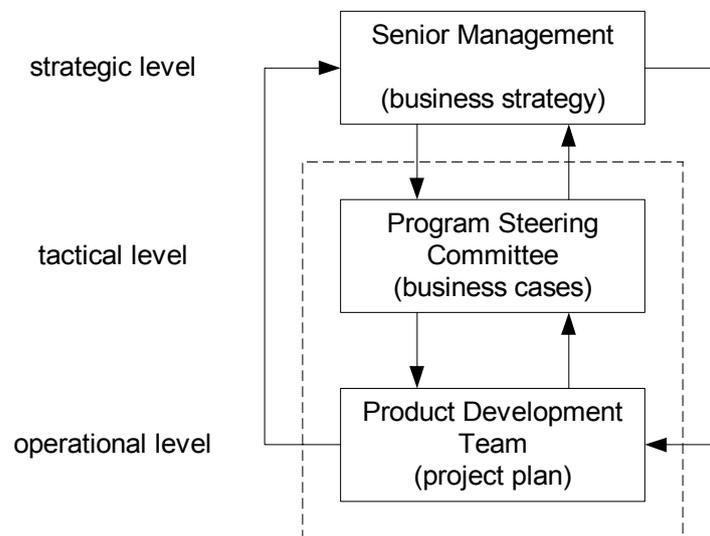
This general description of a control system can, in the same way, be adapted to software development projects, as a special case of a business development project. With this adapted Hollander control system as a reference, it is customized to software manufacturer organizations to identify the important stakeholders in the **Release Decision Methodology**. For this customization, the software manufacturer organizations in the case studies are used as a reference, with specific interpretations as follows:

- ❖ *Environment*. The environment of a software development project consists of the external market environment, and internal strategic, and functional, characteristics of the manufacturer organization. As discussed in Section 3.2.1, an organization must determine its primary strategic orientation or business strategy. This is one of the responsibilities of Senior Management at a strategic level. They have the responsibility to define business strategy, describing the long-term expectations for business and technology developments, and how the software manufacturer intends to gain a competitive advantage. Business developments are addressed in terms of changes in the marketplace and organization. Technology developments are addressed in terms of adoption of new technologies and new application of existing technologies. The business strategy can be used as the basis for defining programs, and high-level product development strategies for projects to be carried out towards attaining a long-term competitive advantage.

- ❖ *Controlling Unit.* Considered to be the tactical management level of the software manufacturer organization. The controlling unit includes Project Steering Committees, responsible for the successful implementation of project(s) identified. A Project Steering Committee consists of representatives of different organizational stakeholders:<sup>53</sup>
  - Marketing: responsible for the market interface with customers and end-users.
  - Development: responsible for the development of the product.
  - Maintenance & Exploitation: responsible for maintenance, and exploitation of released products.
  - Customer/end-user: This stakeholder is optional and only relevant when the customer representative is a stakeholder in defining the project objectives and accepting the released product [for example, when a custom system is written on contract], see Section 1.7.

In project management methodologies like PRINCE2 and PMBOK (Section 1.4.1), one of the first responsibilities assigned to this committee is to justify why a project is required in terms of expected revenues, with the result called the business case. PRINCE2, for example, prescribes the definition of a business case at the start of a project, describing expected benefits and cost, as well as periodic updates of the business case during project execution.

- ❖ *Target System.* Considered the operational management level of the software manufacturer organization. The target system is the Product Development Team, responsible for planning and executing the project, so that project objectives, stated in the business case, are attained. The team activities are derived from the business case and further detailed in a project plan. The Project Steering Committee should approve this project plan, although for projects with strategic value Senior Management should also be involved (see Section 4.4.3) where non-routine decisions require the involvement of senior management, as opposed to routine decisions. See also Figure 5-8.



**Figure 5-8: Control System for Software Development Projects**

As the research phenomenon in this study is strategic software release decisions, the important stakeholders are considered those at the strategic level, [Senior Management], and tactical level, [representatives of different organizational authorities: Marketing, Development, Maintenance & Exploitation, and Customer/end-user [the latter optional]].

<sup>53</sup> A Project Steering Committee is not necessarily limited to the constituencies only. The participation of subordinates or followers in strategic decision-making, whose responsibilities are affected by choices made at higher levels of management, can be important (Harrison 1987, p.265).

#### 5.4 *Secondary Research Questions*

In the following Chapters, the methodology is designed by identifying the practices for each process area. This involves a further study on existing theory, and to narrow the study, for each process area a secondary research question is formulated.

- ❖ *Release Definition.* This process area focuses on the comparison, and evaluation, of alternatives using the formulated product development strategy as a reference. Emphasis is on the quantitative disciplines, to reduce uncertainty levels. For the release decision itself, it is of special interest in deciding when to release, or to enter the market with, a software product. In the case studies, no examples were found of methods to model the economic market entry trade-off. The availability of a method to compare and evaluate different release alternatives would support this decision, and the first secondary research question is therefore formulated as:

*1<sup>st</sup> Secondary Research Question:*

***How to model the market entry trade-off for a software product?***

- ❖ *Release Information.* This process area focuses on the search for relevant information, derived from the formulated product development strategy. This search for information has its price in cost and time. Too much information is a waste of precious cost and time, whereas insufficient information leads to increased uncertainty. The case studies revealed the presence of high uncertainty. How much uncertainty is allowed when making a release decision? Is there an optimal level of information? The second secondary research question is therefore formulated as:

*2<sup>nd</sup> Secondary Research Question:*

***To what extent can an optimal level of information be determined as input to the software release decision-making process?***

- ❖ *Release Decision.* This process area focuses on the decision-making process itself, recognizing that stakeholders will possibly have different preferences for the decision outcome. In the case studies, minor attention was paid to the release decision-making process. Sociological and political effects are assumed to influence both individual and group behaviour. The third secondary research question is therefore formulated as:

*3<sup>rd</sup> Secondary Research Question:*

***What effects, stemming from individual and group behaviour, play a role in the software release decision-making process?***

- ❖ *Release Implementation.* When making a decision to release a software product uncertainty is likely to be present. It is therefore necessary to monitor the consequences of a decision when implemented, especially when the decision is of strategic value and there might be incongruence between the expected and the actual outcome. Only in this way, can decision success be accomplished. In the case studies, minor attention was paid to the implementation of the release decision. The fourth secondary research question is therefore formulated as:

*4<sup>th</sup> Secondary Research Question:*

***Which issues are important to increase the likelihood of a successful implementation of the software release decision?***

### 5.5 *Summary and Conclusions*

In this Chapter, a framework for the methodology is presented, based on the Harrison Process Model, matching the characteristics of strategic software release decisions. The Process Model integrates parts of the Rational Model [with an emphasis on maximizing behaviour], the Organizational Model [with an emphasis on optimizing behaviour], and the Political Model [with an emphasis on satisficing behaviour]. It identifies six different functions of managerial decision-making, as 1) setting objectives, 2) the search for alternatives, 3) the comparison/evaluation of alternatives, 4) making a choice, 5) implementing the choice, and 6) follow-up and control.

The Process Model is used to define the **Release Decision Methodology**, consisting of four different process areas.

- ❖ The '*Release Definition*' process area reflects the Rational Model, with emphasis on maximizing behaviour, and is concerned with the definition and control of the product development strategy.
- ❖ The '*Release Information*' process area reflects the Organizational Model, with emphasis on optimizing behaviour, and is concerned with searching for the optimal level of information as input to the decision-making process.
- ❖ The '*Release Decision*' process area reflects the Political Model, with emphasis on satisficing behaviour, and is concerned with the decision-making process itself.
- ❖ Finally, the '*Release Implementation*' process area addresses the need to ensure congruence between the expected and actual outcome.

The defined process areas are further sub-divided into underlying practices for which a template is defined. This template foresees the identification of the stakeholders responsible for, and involved in, the correct implementation of each practice. Therefore, the different stakeholders involved in the decision-making process are identified, using a general description of a control system and customizing it to software development projects. The stakeholders identified are Senior Management at strategic level, the Project Steering Committee at tactical level [Marketing, Development, and Maintenance & Exploitation], and the Product Development Team at operational level.

To narrow the study toward existing theory for each identified process area, four secondary research questions are formulated, one for each process area. In the next four Chapters, 6 through 9, the process areas are further discussed, in answering the secondary research questions, and dividing each process area into underlying practices.