9 RELEASE IMPLEMENTATION

"A decision brilliantly conceived can prove worthless without effective implementation."
-- Shull et al. (1970) --

9.1 Introduction

In the previous three Chapters, attention is paid to the definition of the release scope [product development strategy], the search for information [market and product-related] and the collective decision-making process. In discussing the collective decision-making process, it is assumed that the release decision acts on a simplified model of reality, due to bounded rationality at individual level and conflict resolving at group level. The decision outcome *satisfices* the stakeholders involved, but might not necessarily be the optimal outcome. It is therefore necessary to monitor the consequences of a decision when implemented, especially when the decision is of strategic value.

The importance of decision implementation, contributing to overall decision success, is the reason for extending the Process Model, used as the reference model for decision-making in this study, to compile a **Release Decision Methodology**, including implementation and learning aspects (Section 5.3.1).

In Section 9.2 the area of decision implementation is discussed, confirming it is crucial to decision success, and attention is paid to the appraisal of decisions. In the following Section 9.3 concepts discussed are applied to strategic software release decisions. An answer to the 4th and final Secondary Research Question: 'Which issues are important to increase the likelihood of a successful implementation of the software release decision? is given. Based on the clarification of implementation and learning aspects, practices for the *'Release Implementation'* process area are derived in Section 9.4. The Chapter ends with a summary and conclusions in Section 9.5.

9.2 Decision Implementation

9.2.1 Implementation Success

Trull (1966) develops a comprehensive model for determining the success of a given decision, and describes the success of a decision as the sum of the decision quality and decision implementation; an approach adopted in this study (Section 3.4.5):

decision success = quality of decision outcome + quality of decision implementation [88]

Trull (1966) distinguishes important factors for these two components as:

- *Decision-making Quality*. Compatibility with existing operating constraints [policies, procedures], timeliness [optimal time for making the decision], optimal amount of information [marginal value of additional information equal/close to zero], and influence of the decision-maker [perceived authority of the decision-maker].
- *Decision Implementation*. Avoidance of conflict of interest [common acceptance of the decision], positive risk-reward factor [acceptance of more uncertainty without demanding

[88] In Section 8.4.3, the decision-making quality is defined as the sum of the quality of the decision inputs and the quality of the decision-making process.

> rewards], and understanding of the decision by those who must carry it out (see also Korsgaard *et al.* 1995).

However, these factors mostly address the decision-making process and decision implementation to a lesser degree. Shull *et al.* (1979) describe other factors that determine whether a decision is successful, and which are more focused on decision implementation:

- ❖ The decision remains viable following implementation.
- ❖ The decision manifests an acceptable degree of congruence between the actual outcome and the expected outcome.
- ❖ The decision outcome elicits enthusiasm and skill from those who must implement it.

The first criterion is superfluous, and it is assumed that meeting the second criterion will automatically satisfy the first criterion, as the expected outcome will normally be viable. The third criterion is criticized here, as in a practical context a decision may be painful but necessary. It is more important that those responsible for carrying out the decision be involved in the act of choice, and understand the rationale behind the decision made, irrespective of whether the outcome elicits enthusiasm and skill. The second criterion is considered most important for decision implementation success, as a decision can only become effective if action commitment, resulting from the decision, is built into it from the start, as also found by Drucker (1967). Decision-makers should provide a fall-back plan, the means to monitor whether the expected results materialize and the means to implement corrective actions where the actual results are not congruent with the expected results.

Even when a fall-back plan has been defined, March and Olsen (1987) note there could still be many obstacles to the successful implementation of almost any decision, with examples:

- ❖ The reduced importance of a decision once it is made.
- ❖ The control of the outcome of a decision by stakeholders who were not involved in its making.
- ❖ The development of new situations and problems to command attention of decision-makers after the implementation choice has been made.

The second obstacle is addressed in the methodology in the previous Chapter (Section 8.5, practice P-C3); the stakeholders responsible for decision implementation must be involved in the decision-making process. The presence of the two remaining obstacles can be reduced: decision-makers not involved in the decision implementation should not be automatically discharged from their responsibilities once the decision has been made, but must remain involved through the implementation stage. In this way, the decision remains important to all stakeholders involved in the decision-making, and their responsibility is to monitor the actual decision outcome. Only when the outcome matches expectations, or the expectations are re-formulated to match the actual outcome, the responsibility for further maintenance is transferred and the authority responsible for product development is discharged.

Another issue in decision-making is the later appraisal of a decision, and in the following Section, decision appraisals are further discussed.

9.2.2 Organizational Learning

Learning is a conscious attempt on the part of organizations to retain and improve competitiveness, productivity and innovation in uncertain technological and market circumstances. The greater the uncertainties, the greater are the needs for learning. Organizations 'learn' to improve their adaptability and efficiency during times of change (Dodgson 1993). Grantham (1993) notes learning enables quicker, and more effective, responses, in a complex and dynamic environment. Learning can also support increased information sharing, communication, understanding and the quality of decisions made.

The work of Schön on learning systems (1973) is integrated with the work of Argyris around professional effectiveness (1957) and organizational learning (1964). They argue that people have mental maps on how to act in situations, involving the way they plan, implement and review their actions. They, furthermore, assert that it is these maps that guide people's actions rather than the theories they espouse, and there is often a division between theory and action. Argyris and Schön (1974) suggest that two *theories of action* are involved: theories that are implicit in what people do as practitioners and managers, and those which people call on when speaking of their actions to others. The former can be described as *theories-in-use*, which describes the [often implicit] 'theories' guiding people's actual behaviour, while reasons people give when explicitly asked to explain their behaviour, can be called *espoused theories*.

Argyris and Schön (1974) develop a model, as in Figure 9-1, to illustrate these theories of action, which considers three elements:

1. Governing Variables: dimensions people try to keep within acceptable limits. Any action is likely to impact on a number of such variables –any situation can thus trigger a trade-off among governing variables.
2. Action Strategies: the moves and plans used to keep their governing values within the acceptable range.
3. Consequences: the results of an action. These can be both intended - those a person believes will result - and unintended.

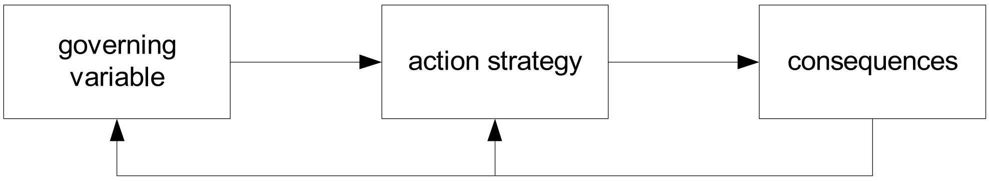

Figure 9-1: Model of Theories
(Argyris and Schön 1974)

Where the consequences of the strategy used are what the person wanted, then the theory-in-use is confirmed, as there is a match between intention and outcome. If there is a mismatch between intention and outcome, the consequences may well be unintended. They may also not match, or could work against, the person's governing values. Argyris and Schön suggest two responses to a mismatch, as seen in the concept of *single-loop learning* and *double-loop learning*.

Argyris (1978) defines *organizational learning* as a process of detecting, and correcting, errors, which are any feature of knowledge, or knowing, that inhibits learning. Where something goes wrong another strategy that will address and work within the governing variables is sought. In other words, given or chosen goals, values, plans and rules are operationalized rather than questioned, considered 'single-loop learning' by Argyris and Schön. The emphasis is on *'techniques and making techniques more efficient'* (Usher and Bryant 1989), which can be compared to a fan that learns when it is too hot or too cold and then switches itself on or off. The fan is able to perform this task because it can receive information [the temperature of the room] and take corrective action when necessary.

If the fan could question whether it should be set at a certain temperature threshold, it would be capable of not only detecting a discrepancy between actual temperature and threshold, but of questioning the underlying policies and goals. This is a second and more comprehensive enquiry, and might be called double-loop learning. Such learning may then lead to an alteration in the governing variables and, thus, a shift in the way in which strategies and consequences are framed, as in Figure 9-2.

Summarized, single-loop learning is present when goals, values, frameworks and, to a significant extent, strategies are taken for granted. Double-loop learning, in contrast, involves questioning the role of the framing and learning systems, which underlie actual goals and strategies. These two forms of learning will not occur if the organization is not aware that learning must occur. Argyris and Schön (1978) also define *deutero-learning*, which occurs when organizations learn how to carry out single-loop and double-loop learning.

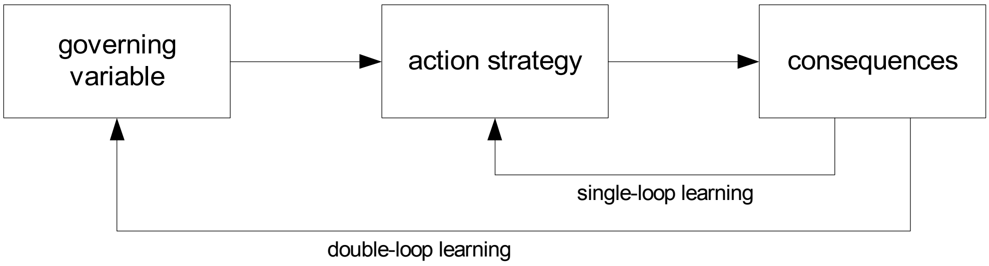

Figure 9-2: Revised Model of Theories
(Argyris and Schön 1974)

In the previous Section, several issues on decision implementation are discussed, which are issues related to single-loop learning; monitoring whether the expected results really materialize, and implementing corrective action if the actual results are not congruent with expected results. In this Section, the focus is on the appraisal of a decision. The organization's ability in decision-making can be improved by identifying strengths, weaknesses and possible areas for improvement. This identification can be accomplished by a 'decision appraisal' and is an example of double-loop learning; evaluating the decision-making process and decision implementation to distil lessons learned for future operations.

The appraisal of decisions is a topic that has received little attention in the literature. Keren and Bruine de Bruin (2003) identify the following reasons for a reluctance to examine the question of decision quality:

- The topic may be seen as too broad and ill-defined, rendering it difficult for treatment in a systematic and concise manner.
- Various classes of decisions can be defined, each requiring different judgment criteria.
- 'Decisions about decisions' introduces the concept of second-order decision-making, which would expose third, fourth and fifth-order decisions, and so on.[89]

Another complicating factor in decision appraisals is that when evaluations are made after the fact, information is often available that was not available when the decision was made, including information about the decision outcome. Researchers addressing the decision appraisal issue have taken different perspectives, either judgment of decisions by the process [by which they were derived] or by outcome [and the associated consequences] (Keren and Bruine de Bruin 2003). Most researchers adopt a process perspective, under the assumption that a high-quality decision process is more likely to produce the envisioned decision outcome. On the other hand, a high-quality decision-making process cannot guarantee an envisioned outcome, as all decisions in a practical context are made under uncertainty (Brown *et al.* 1974, p.4; Edwards 1984, p.7). Others claim that, *vice versa*, envisioned decision outcomes are likely to be the result of a high-quality decision process. The debate is ongoing, but is considered irrelevant for this study.

[89] This problem is similar to the problem of infinite regress, as discussed in Chapter 7.

Huber (1991) describes the following processes or constructs that contribute to organizational learning:

1. *Knowledge Acquisition*: Organizational learning occurs when an organizational knowledge base is created, with firm-specific competencies and routines. Acquiring, storing, interpreting and manipulating information, both from within and outside the organization, create knowledge bases.
2. *Information Distribution*: Refers to the process through which an organization shares information among units and members, thereby promoting learning, and producing new knowledge or understanding. Greater sharing, or distribution, of information leads to improved organizational learning.
3. *Information Interpretation*: For information to be shared, such information must be interpreted. Information interpretation is the process by which distributed information is given one, or more, commonly-understood meanings. Greater learning occurs when more and more varied interpretations are developed.
4. *Organizational Memory*: Refers to the repository where knowledge is stored for future use. Organizational memory can be made of both hard data, such as numbers, facts, figures and rules, as well as soft information such as tacit knowledge, expertise, experiences, anecdotes, critical incidents, stories, artefacts and details about strategic decisions (Morrison 1993).

In the next Section, the theory on decision implementation and decision appraisal is applied to strategic software release decisions.

9.3 Applicability to Strategic Software Release Decisions

9.3.1 Implementation Success

In Section 9.2.1, several issues contributing to decision quality are discussed. The factors identified by Trull (1966) on strategic decision quality and strategic decision implementation are dealt with in previous Chapters when discussing release objectives (Chapter 6), release information (Chapter 7) and the release decision (Chapter 8). The existing operational constraints [policies, procedures] are related to:

- ❖ the product development strategy in Chapter 6 [in theory derived from a business strategy],
- ❖ timeliness [optimal time for making the decision] is not specifically addressed but considered an obvious precondition when implementing this methodology,
- ❖ the optimal amount of information [marginal value of additional information equal/close to zero] is addressed in discussing the objective of reaching the zone of cost effectiveness in Chapter 7 [information perfection], and
- ❖ influence of the decision-maker [perceived authority of decision-maker] is discussed in Chapter 8 [stakeholder involvement].

Issues identified as contributing to decision implementation quality are also dealt with in previous Chapters: The avoidance of conflict of interest and common acceptance of a decision is addressed in discussing the product development strategy (Chapter 6) and aspiration levels (Chapter 8); the positive risk-reward factor [acceptance of more uncertainty without demanding rewards] is [implicitly] addressed when discussing the management of uncertainties; and understanding of the decision by those who must carry it out is addressed in discussing the product development strategy (Chapter 6) and stakeholder involvement (Chapter 8).

Relevant here is that a decision can only become effective if the action commitments resulting from the decision are built from the start, as noted by Drucker (1967). Decision-makers should provide a fall-back plan, the means to monitor whether the expected results really materialize, and the means to implement corrective actions where the actual results are not congruent with the expected results. It is concluded that to increase the likelihood of a successful implementation of a software release decision, corrective maintenance actions should be foreseen before the release decision is made, and a process to monitor implementation results should be installed. To reduce implementation obstacles identified by March and Olsen (1987), it is concluded that transfer of responsibility should only take place when congruence, between the actual and expected outcome, is reached. In a practical context, this responsibility is either transferred from the development team to another organizational authority, or the responsibility remains with the development team. These conclusions answer the 4th Secondary Research Question: 'Which issues are important to increase the likelihood of a successful implementation of the software release decision?'

9.3.2 Organizational Learning

In Section 9.2.2, the notion of organizational learning is discussed, with special attention to double-loop learning. Decision-makers should evaluate the decision-making process and decision implementation and distil lessons learned for future operations. The 'outcome *versus* process' debate is less relevant for this study. There is no apparent reason why the adoption of appraisal should limit itself to either the decision-making process or the decision outcome – both issues are important. For the decision outcome, the relevant issue is to determine whether the actual outcome is congruent with the expected outcome, and how any possible incongruence can be explained. This omits the question of whether the decision outcome itself can be considered good or bad; a question that is normally difficult to answer. The appraisal perspective can, furthermore, be even broader, by appraising the entire project from its start until its completion. The release decision can be regarded as the central issue when adopting this broader perspective, as the decision to transfer the developed product from its development phase to operational use, is a decision that is, in principle, irreversible. An appraisal with all involved stakeholders in an open, constructive atmosphere is a good opportunity to identify strengths, weaknesses and possible areas for improvement. Morrison (1993) notes the appraisal might include both hard data, such as numbers, facts, figures and rules, as well as soft information such as tacit knowledge, expertise, experiences, anecdotes, critical incidents, stories, artefacts and details about the software release decisions. After the appraisal, additional effort will be needed to distribute the information, interpret the information, and create organizational 'memory' that is easily accessible. When successful, future product development efforts might benefit from the availability of this organizational memory, and this might positively influence the quality of practices in process areas identified in the **Release Decision Methodology**.

A final remark concerns the importance of establishing a repository for defect archives. When the software product is released, defects injected during development but not detected prior to releasing might surface. These will either be detected by the software manufacturer [faults] or during operational use by the end-user [failures]. It is important to archive these defects in a central repository and classify them [for example: severity level, origin, impact, removal effort]. This approach has several advantages. It facilitates the management of corrective actions by offering transparency and is a useful source of information for analysis, and for use in future projects. During the decision appraisal the analysis of archived defects may be an issue that needs to be addressed. Results from the analysis of the origin of defects might lead to changes in the development process, while a better quantitative understanding of corrective maintenance effort needed, for example, related to the number of defects found, might offer a valuable source for estimating the maintenance effort required for future projects.

9.4 Practices Identified

In Chapter 5, the *'Release Implementation'* process area is introduced, reflecting the importance of decision implementation to overall decision success. This process area is concerned with implementation of the decision, and the later appraisal of the decision. This identifies four underlying practices:

1. ***P-D1: Maintenance Budget***. As discussed in Section 9.3.1, a budget should be reserved *a priori* to implement corrective action when problems arise. As the different stakeholders stay involved during the implementation of the release decision, the budget should also include the estimated effort for their involvement during this phase. If corrective action commitments are not built into the decision, it is nothing more than a good intention.

   The correct implementation of this practice is the responsibility of Maintenance & Exploitation. This unit should estimate the maintenance budget needed, based on the formulated product requirements. The estimate is reviewed by Development, with Senior Management responsible for approval of the estimated budget.

2. ***P-D2: Product Rollout***. The product, an input to this process area, is released to its customers and/or end-users following a defined rollout procedure, which should be monitored as to whether the released product requires corrections. Problems reported are collected, and analysed, to see the corrective actions required to harmonise the actual and expected decision outcome. If analysed faults and failures, reported as the *product status*, and an output of this process area, exceed a certain threshold [number and/or severity], then the released product may be withdrawn and the release decision reversed (see Section 8.5, practice P-C4).

   The correct implementation of this practice is the responsibility of both Development and Maintenance & Exploitation. Both constituencies should ensure correct working of the product before the product responsibility is transferred from Development to Maintenance & Exploitation.

3. ***P-D3: Project Discharge***. Similar to the rationale for involving Maintenance & Exploitation during the pre-release project phase (see P-A1 and P-C3), Development should stay involved during decision implementation until all stakeholders are satisfied with the stability of the released product, and the completeness and quality of the artefacts delivered. Then, as discussed in Section 9.3.1, the responsibility for the maintenance of the officially *released product*, an output from this process area, can be transferred to the responsible organizational authority.

   The correct implementation of this practice is the responsibility of Senior Management. As soon as the Project Steering Committee agrees on the correct working of the product released, an application for project discharge can be submitted to Senior Management.

4. ***P-D4: Project Appraisal***. As discussed in Section 9.3.2, a project appraisal is considered important as the concluding step of product development; starting at the project proposal phase and ending after the project discharge milestone. Without a proper appraisal of the project and making the results available for future use, organizations are likely to re-live the past by making the same mistakes. The *appraisal results*, as an output from this process area, are made available to the organization for further interpretation, to identify possible improvement for future projects and augment the organizational memory.

   The correct implementation of this practice is the responsibility of Senior Management. As soon as Senior Management has authorized the application for project discharge, the Project Steering Committee can prepare the project appraisal by summarizing the *project history*, as an input to this process area.

In Figure 9-3, the *'Release Implementation'* process area, combined with the *'Release Definition'*, *'Release Information'*, and *'Release Decision'* process areas is illustrated, as the final data-flow diagram of the methodology.

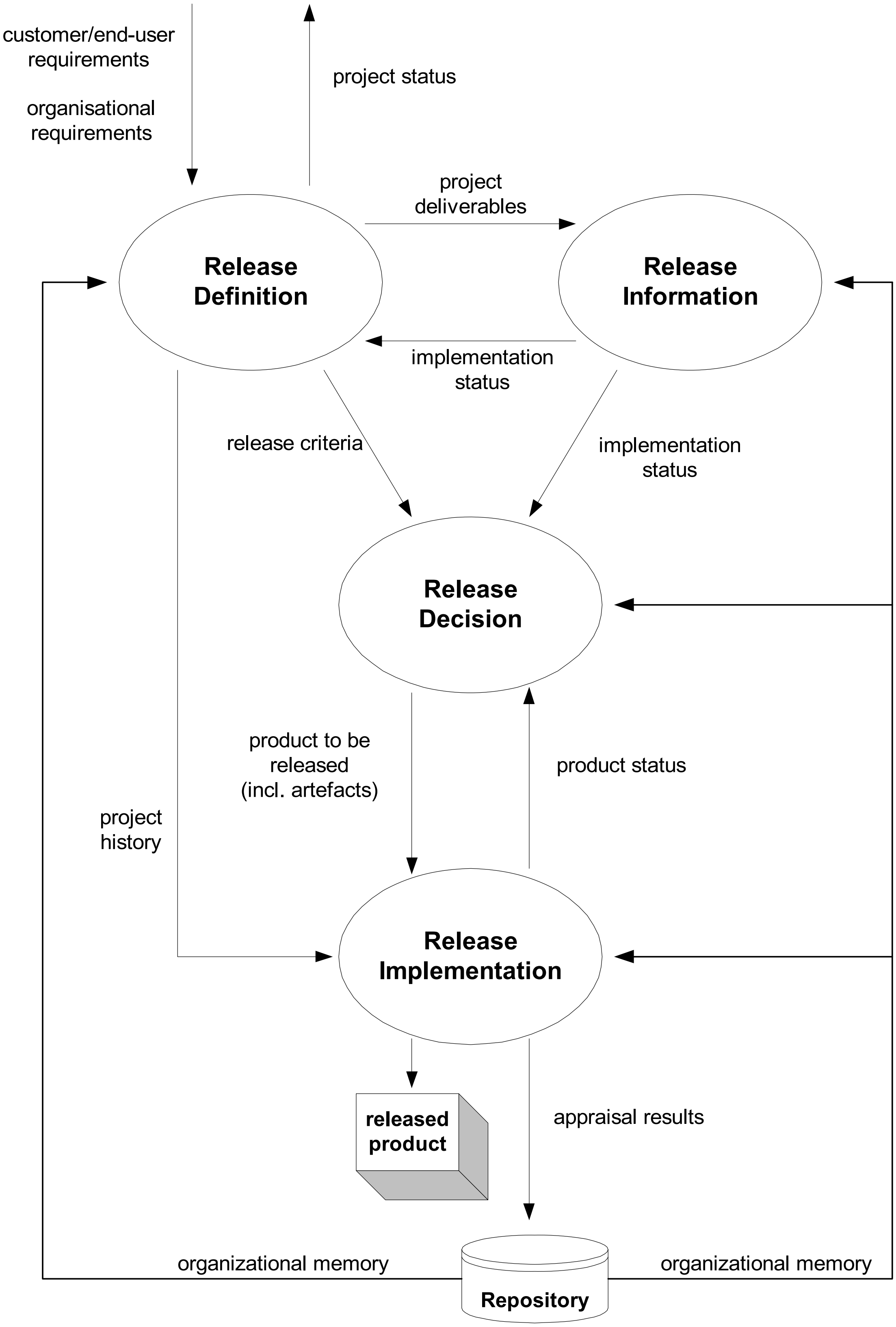

Figure 9-3: Final Data-flow Diagram including *'Release Implementation'* Process Area

In Appendix F, a summary of this process area is given including examples of supporting method(s) that can be used for the implementation of each practice.

9.5 Summary and Conclusions

In this Chapter, the fourth and last process area in the framework presented in Chapter 5, namely *'Release Implementation'*, is discussed. Answers to the 4th Secondary Research Question, namely ***'Which issues are important to increase the likelihood of a successful implementation of the software release decision?'*** are given.

For the implementation aspects of software release decisions the following conclusions are drawn. Decision implementation is an important factor contributing to overall decision success. Important issues identified for decision implementation are the acknowledgement that a budget for corrective actions should be reserved up-front, and the implementation of the decision should be carefully monitored, to ensure the actual decision outcome is acceptably close to the expected outcome, before the Project Steering Committee is discharged and product responsibility transferred.

An official discharge of development responsibilities and transfer of product responsibility, must precede the decision appraisal; a prerequisite for any software manufacturer wanting to improve its capabilities. The appraisal should not be limited to either the decision-making process or decision outcome, but must include both issues and the entire project history. By identifying strengths, weaknesses and possible areas for improvement, the organization's 'memory' [repository] can be augmented for use in future projects.

For the *'Release Implementation'* process area, concerned with the implementation of a decision once made, four practices are derived.

- The 'P-D1: Maintenance Budget' practice acknowledges commitments for possible corrective actions by reserving a budget for corrective actions.
- The monitoring of the degree to which the actual decision outcome corresponds with the expected outcome, and corrective actions, where necessary, is accomplished by the 'P-D2: Product Rollout' practice.
- The 'P-D3: Project Discharge' practice transfers the product responsibility once all development obligations have been met.
- Finally, the 'P-D4: Project Appraisal' practice concerns the project appraisal; to augment the software manufacturer organization's records as a means of increasing organizational capability.

The derivation of the practices for the last process area *'Release Implementation'* completes the methodology as presented in the data-flow diagram in Section 9.4 (Figure 9-3). In the next Chapter, review remarks on this methodology are given, and its descriptive and judgmental character are discussed.