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## Accounting information for changing business needs

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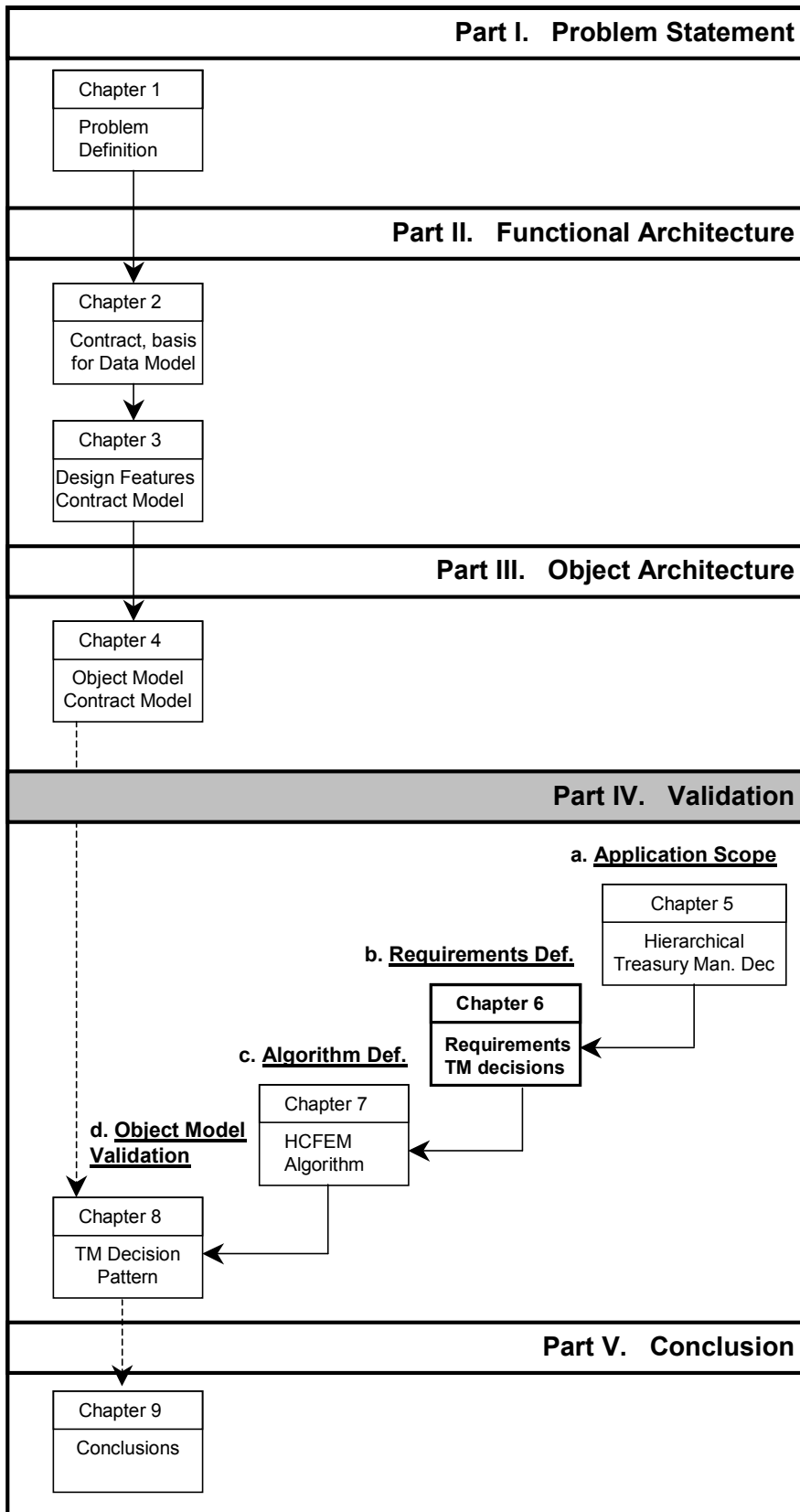
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## **Part IV: Validation**

### **b. Requirements Definition**



## 6. Accounting Information to support Treasury Management Decisions

### 6.1 Introduction

The validation of this research is discussed in four consecutive chapters, Chapters 5 to 8. This chapter outlines the *ex ante* and *ex post* accounting data required to service treasury management decisions focusing on optimising financial resource flows as outlined in the hierarchical framework of treasury management decisions in Chapter 5. This chapter concludes with a summary of accounting data requirements common to all treasury management decisions and provides an answer to research question two of research objective two as outlined in Section 1.4 of Chapter 1.

**Research Objective 2, Research Question 2:** Which are the relevant *ex ante* and *ex post* accounting data suitable to service treasury management decisions with financial information?

This chapter is structured as follows. First, Section 6.2 describes which information is used for decision-making. Next, the various elements of a decision are explained in Section 6.3. Section 6.4 then goes on to analyse every treasury management decision as discussed in Section 5.4 of Chapter 5 and to define the accounting information required for decision-making on the basis of relevant costs. Section 6.5 stipulates a generic statement of requirements for data availability to service treasury management decisions with relevant costs. A summary of this chapter is presented in Section 6.6.

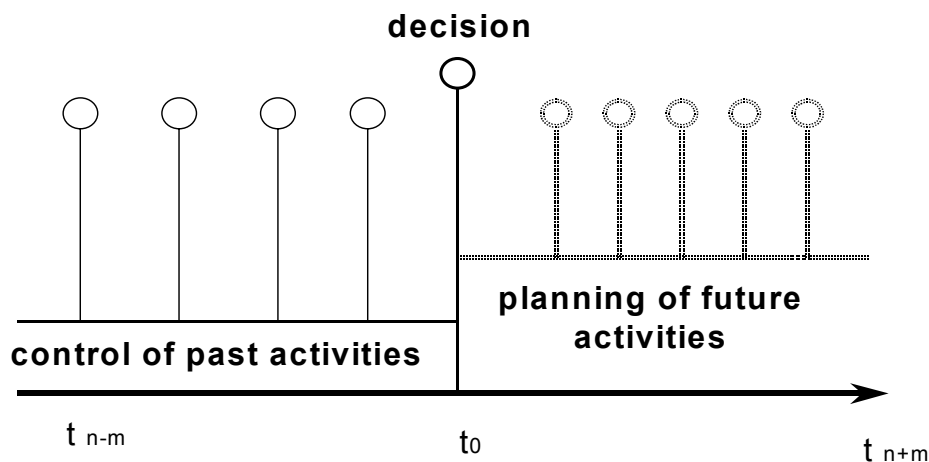
### 6.2 Which information to use for treasury management decision support?

The objective of the validation is to investigate whether the contract data model can hold sufficient data to support the application chosen in hierarchical treasury management decisions with relevant costs. The focus of this chapter is to describe requirements on the contract data model for data availability to service treasury management decisions focusing on optimising financial resource flows as described in Chapter 5. These requirements will be based on the relevant cost technique using a similar approach as, for example, Verdaasdonk (1998, pp. 30-42). The relevant costs technique was chosen because of the desire to focus on short to medium-term treasury management decisions. Decision-makers within organizations operate as countervailing powers, as every individual pursues his or her own objectives and strives to obtain the portion required of the scarce available resources (Lawrence and Lorsch, 1967). Hopwood (1980) explains this phenomenon as a situation of decision-making in the context of disagreement on the overall company objectives and on the actions to be taken to achieve these objectives. The relevant scope for decision-making extends to all aspects of the organization, though in profit-making organizations, the ultimate objective is that actions resulting from decisions also have a positive financial impact (Verdaasdonk, 1998). Agreement on the right type of information and its availability seems to be the crucial factor for successful and consistent decision support. Information used for decision-making can range from various types of non-financial information to purely financial information. Wouters et al. (1999, p. 439) explain that '*non-financial measures are a valuable supplement to financial measures as they are required to understand and improve the financial performance of an organization*'. In the same paper, they refer to examples of the use of *non-financial information* in Rocart (1979), Govindarajan and Gupta (1985), Eccles (1991) and

Kaplan and Norton (1996, 1993), among others. There is no agreement among researchers as to which *financial information* is suitable for decision-making. In management accounting, decisions have traditionally been based on full cost information. These data were suitable in static market situations where companies were supplying a limited number of standard products (Johnson and Kaplan, 1987). Direct costs of the material consumed and labour costs were allocated proportionally to the finished product, while overhead costs were allocated arbitrarily. This approach provided acceptable information for decision-making in the past, since labour and material costs made up the larger portion of the total production costs. However, over the last ten years, the market landscape has been changing drastically owing to a number of new evolving innovations. Authors like Theeuwes and Adriaansen (1994) and Johnson and Kaplan (1987) argue that the rapid change in the business environment from a seller's market to a buyer's market has resulted in higher overhead costs. This is a result of, for instance, the increased use of technology (see e.g. Hyer and Wemmerlov, 1984) and a number of other new manufacturing practices (see e.g. Slack, 1991 and Voss, 1992) that have rendered traditional management accounting practices no longer suitable for providing suitable decision-making information. Therefore, Young and Selto (1991) and Wouters (1994) claim that '*cost accounting is no longer relevant for decision-making*'. As information based on allocations of resource consumption is not suitable for providing decision-making under these new circumstances, Theeuwes and Adriaansen (1994) proposed an alternative technique, the resource-transition based approach. This approach, an application of the relevant cost approach, only considers the cash flow aspects of resources obtained to achieve a specific result. The relevant cost approach was applied in Verdaasdonk and Wouters (1999), Verdaasdonk (1998), Wouters (1997, 1991), Corbey and Jansen (1993).

### 6.3 Aspects of a treasury management decision

It is important to recognize the various aspects of a decision in order to indicate the focal point for decision-making and to understand which type of financial information is required. Each decision is made in its moment, but its execution consists of a series of planned future activities (see Figure 6-1). The future-oriented aspect of decision-making relates to choosing one preferred alternative out of a number of possible alternatives to solve the 'problem' that is the subject of the decision. The *ex post*, control aspect of a decision concerns the evaluation of past activities. Gordon and Narayanan (1984) explain that '*in predictive procedures of decision-making, ex ante information is used for "forecasting the occurrence of future events" and ex post information is used for "assessing the validity of the forecasts"*'. For the remainder of this chapter, the focus will be on both the *ex ante* and the *ex post* aspects of a decision. The accounting technique applied to support decisions is 'the relevant cost approach'. The relevant costs of a decision alternative consist of the incremental cost plus the opportunity costs. *Incremental costs* are those costs that differ from scenario to scenario. *Opportunity costs* are defined as 'the benefits forgone as a result of choosing one course of action rather than another'. Verdaasdonk (1998, p. 11) notes that relevant costs are always situation-dependent. This means that for every decision alternative, a cost must be judged on relevancy, based on the context in which the decision would be made. In this research, the use of opportunity costs for treasury management decision support is illustrated with the intention of defining the relevant data availability requirements when supporting this technique using data models. There was no intention to present a full overview of all possible opportunity cost situations for any treasury management decision. An answer to this question could, for instance, be provided through case study research but falls beyond the scope of the research objectives of this dissertation.



**Figure 6-1. Different aspects of a decision based on time**

There are often several scenarios for most treasury management decisions that can be proposed as possible solutions. As discussed in Section 6.2, decisions can be supported by financial and non-financial information. However, when choosing to service decisions with financial information, the outcome of different scenarios has to be comparable to determine the most interesting scenario from a financial perspective. Some features of financial resource flows complicate financial resource flow comparison.

1. *Differences in financial resource types.* There are different types of financial resources, e.g. cash in bank accounts, straight loans, mortgaged loans, bonds, short-term credit lines, etc. A *financial resource type conversion rate* is needed which expresses the speed and effort involved when converting a resource flow to a chosen common denominator, e.g. cash.
2. *Difference in currency.* Each financial resource flow is expressed in a currency. Even when two or more financial resource flows are of the same type (e.g. two straight loans), these financial resource flows might be expressed in different currencies (e.g. straight loan A in USD and straight loan B in JPY), rendering them difficult to compare. A *currency conversion rate* has to be maintained which expresses the conversion of financial resource flows defined in different currencies as a chosen common currency (e.g. the home currency).
3. *Differences in financial resource flow timing.* A financial resource flow is effectuated at a specific moment. The moment at which a financial resource flow is executed is an important characteristic. Suppose the annual interest on a loan can be paid via two methods. Using the first alternative, interest is paid back once at the end of the year while using the second, twelve monthly payments are made. This example illustrates that the difference in effectuation timing of financial resource flows makes them difficult to compare. The solution is to bring the different financial resource flows involved in one decision together at the same moment in time. This technique is known in literature as the *Net Present Value (NPV)* of the financial resource flow (Brealey and Myers, 1996, p. 73).

The CFE (Cash Flow Equivalent) serves as common denominator to overcome these three different characteristics of financial resource flows and is calculated as follows:  $CFE = NPV$  (financial resource flow \* financial resource conversion type rate \* currency conversion rate).

It should be stressed that financial resources can be used to compensate both financial commitments (e.g. paying loans or interest) and operational commitments (e.g. collecting customer invoices, paying supplier invoices), the reason why operational CFEs and financial CFEs can be differentiated.

## 6.4 Analysis of treasury management decisions

### 6.4.1 Introduction

Section 5.4 of Chapter 5 investigated how treasury management decisions on optimizing financial resource flows can be defined at different levels following a hierarchical approach. Three different frameworks for treasury management decision-making were outlined, namely decentralized, centralized and hybrid decision-making frameworks. The framework for hybrid decision-making as discussed in Section 5.5 of Chapter 5 allows the servicing of decentralized and centralized decision-making and was considered to be the most suitable framework to cover all possible contingencies in practice. The decisions defined in the hybrid model are therefore used to analyse the data requirements as described in the remainder of this section.

The following decisions are analysed here.

- Decision A: Setting the Master Financial Schedule
- Decision B: Optimizing Financial Resource Inflow Orders
- Decision C: Optimizing Financial Resource Outflow Orders
- Decision D: Optimizing Financial Resource Surplus Orders
- Decision E: Optimizing Financial Resource Conversion Orders
- Decision F: Optimizing Financial Resource Expansion Orders
- Decision G: Optimizing Financial Resource Safety Stock Level.

Each decision is analysed in four parts. The first part is an explanation of the scope of the decision. The second part concerns the description of the information needed to make the decision. The third part (accounting information) elaborates the financial impact of the trade-off between the various alternative solutions to the decision. In the fourth and last part, the requirements for supporting the decision with accounting data are made explicit. An overview of the seven treasury management decisions is presented in Table 6-1.

### 6.4.2 Decision A. Setting the Master Financing Schedule

#### What is decided?

The Master Financing Schedule (MFS) is a time-phased plan of the available amounts per type of financial resource<sup>33</sup> per location<sup>34</sup>. This decision concerns deciding the available level (amount), the planning of inflows and outflows, the investment of surpluses and the financing of deficits for every financial resource type per location, as well as setting the required level of safety stock. Deficits can be financed in two ways. First, an extra (new) amount of financial resources can be acquired at a particular location (henceforth called ‘expansion of financial resources’).

<sup>33</sup> Examples of financial resource types include bank deposits in a particular currency, mortgaged loans, credit lines, etc.

<sup>34</sup> The location is a participant’s address in the financial marketplace where the financial resources reside (e.g. a bank address, an insurance company address, etc.). The country information of the location is particularly important as this data is the determining factor in indicating whether a financial transaction is executed within one country or not.

**Table 6-1. Overview of treasury management decisions**

Treasury Management Decision	Relevant Control Variables	Accounting Information
A. Setting the MFS	<ul style="list-style-type: none"> <li>Acceptance of Demand for Financial Resources (operational and financing origin)</li> <li>Acquisition and employment of financial resources</li> </ul>	<ul style="list-style-type: none"> <li>CFE<sup>35</sup> inflow from operations</li> <li>CFE outflow for operations</li> <li>CFE inflow from financing (or conversion)</li> <li>CFE outflow for financing (or conversion)</li> </ul>
B. Optimizing Inflow Orders	<ul style="list-style-type: none"> <li>Payment Instruments</li> <li>Location</li> </ul>	<ul style="list-style-type: none"> <li>CFE inflow from operations</li> <li>CFE inflow from financing (capacity expansion)</li> <li>CFE inflow from financing (conversion)</li> <li>CFE outflow (financial effort involved in inflow)</li> </ul>
C. Optimizing Outflow Orders	<ul style="list-style-type: none"> <li>Acceptance of Demand for Financial Resources</li> <li>Timing (possibility for leading / lagging)</li> <li>Currencies used for outflow</li> <li>Payment Instruments</li> <li>Discount payment possibility</li> <li>Location</li> </ul>	<ul style="list-style-type: none"> <li>CFE outflow for operations</li> <li>CFE outflow for financing (capacity expansion)</li> <li>CFE outflow (financial effort involved in outflow)</li> </ul>
D. Optimizing Surplus Orders	<ul style="list-style-type: none"> <li>Location</li> <li>Timing surplus financial resource</li> <li>Investment instruments</li> </ul>	<ul style="list-style-type: none"> <li>CFE inflow (financial benefit from the investment)</li> <li>CFE outflow (financial effort of investment instruments)</li> </ul>
E. Optimizing Expansion Orders	<ul style="list-style-type: none"> <li>Location</li> <li>Timing financial resources needed</li> <li>Financing instruments</li> </ul>	<ul style="list-style-type: none"> <li>CFE inflow (new, expanded financial resources)</li> <li>CFE outflow (financial effort of financing instruments)</li> </ul>
F. Optimizing Conversion Orders	<ul style="list-style-type: none"> <li>Location</li> <li>Conversion instruments</li> <li>Timing</li> </ul>	<ul style="list-style-type: none"> <li>CFE inflow (converted resources)</li> <li>CFE outflow (resources from which converted)</li> </ul>
G. Optimizing Safety Stock Levels	<ul style="list-style-type: none"> <li>Location</li> <li>Timing</li> <li>Financial Effort</li> </ul>	<ul style="list-style-type: none"> <li>Missed CFE inflow due to missed Sales</li> <li>Opportunity CFE of capital</li> <li>CFE outflow (financial effort of Expansion Order)</li> <li>CFE outflow (financial effort of Conversion Order)</li> </ul>

<sup>35</sup> CFE (Cash Flow Equivalent) is used as the unified denominator of a financial resource flow.



Second, an amount of financial resources can be transformed where there is a surplus financial resource elsewhere (henceforth called ‘conversion of financial resources’). Inflow and outflow planning can be defined as ‘the process of determining a tentative plan of how many financial resources (per type and per location) are expected to enter or leave the organization during an interval called the ‘planning horizon’. Planning of financial resource inflows and outflows is achieved on the basis of operations resources planning (procurement and sales of products and services) and the planning of other financial commitments (e.g. inflows and outflows of existing loans, tax and dividend payments, salaries, etc.). The objective of the decision defining the MFS is comparable to the decision to set a Master Production Schedule (MPS) in operations management, and is defined by Giesberts (1993) as a process of volume co-ordination and mix co-ordination. The objective of volume co-ordination is to absorb medium-term fluctuations in financial resource demand. This objective is realized by setting the available capacity per financial resource type and location, and determining which inflows and outflows use this type of financial resource, specified per period. *Volume co-ordination* focuses on medium-term and short-term fluctuations in the demand. Accordingly, capacity is controlled by the ability to convert to another type of financial resource and the ability to expand the financial resource capacity by acquiring new financial resources like new loans, extra credit lines, etc. The objective of *mix co-ordination* is to obtain the required ‘financial service level’, i.e. the ability to service the planned demand for financial resources satisfactorily. This objective is realized by determining the mix of financial resources available at different moments.

### Information required for this decision

The following information is needed to support this decision:

- The MFS schedules and maintains amounts, including detail on currency, of financial resource flows per financial resource type per location, in time periods of a given length. At this level of detail, time-phased data on inflow and outflow amounts are required.
- Information on the possibility of converting one financial resource type (at a given location) into another financial resource<sup>36</sup> type or information to convert financial resources from one location to another location.
- Norms defined for the ‘Setting the MFS’ decision. Examples include the safety level of financial resources to be available per type and location, investment and payment instruments to be used, etc.

The actual MFS decision data should be linked to the projected data of the MFS definition in order to be able to control the execution of this decision afterwards.

### Accounting information required

The definition of the MFS determines the availability of each financial resource type per location for a specific timeframe. This availability is dependent on the balance of financial resource inflows and outflows as a consequence of transactions of an operational and financial nature. As financial resource types can vary greatly (e.g. cash in bank accounts in different currencies, various types of straight loans, credit line capacities, etc.), a uniform measurement mechanism is required to make balances of financial resources comparable. This measurement mechanism is called ‘Cash Flow Equivalent (CFE)’. The availability of financial resources can thus be measured by the time-phased balance between planned operational CFE inflows and outflows, together with the time-phased balance between

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<sup>36</sup> Conversion between some financial resource types is straightforward, e.g. the conversion between amounts in different currencies deposited in a bank. However, it is impossible to convert some types of financial resources without serious effort. For example, it is difficult if not impossible to convert some types of loans, e.g. mortgaged loans cannot easily be converted to available cash money that can be used for any purpose.

financial CFE inflows and outflows<sup>37</sup>. Operational CFE inflows are influenced by the trade-offs made in choosing which products to produce or when to offer services. Simultaneously, this trade-off involves the purchase and consumption of materials, and the production capacity to produce and consume. These transactions generate operational CFE outflows. Financial CFEs consist of inflows and outflows that are fulfilments of financial commitments. Examples of financial CFE inflows include new loans, raising capital, tax restitution, etc. Examples of CFE outflows include tax payments, interest and loan payments, etc. In this dissertation, the amounts of operational CFE are considered as available (and constant) data<sup>38</sup>.

The *ex ante* accounting information is the result of solving the 'objective function of the MFS'. The data supplied are the time-phased CFE inflows and outflows from operational and financial origin and the required minimum level of financial resources per type per location in a given period. The MFS indicates which additional financial resources are required per type and per location (obtained through expansion or conversion) or the surplus of financial resources per type and per location that can be invested, and which inflows or outflows are required to fulfil commitments. The constraints optimized are the 'financial effort' that has to be offered for outflows and financing or the 'financial benefit' obtained in surplus investment and inflows. It should be noted that 'financial information' is only one type of information on which a decision is based. When several Master Financing Schedules are feasible, the total CFE of each plan can be compared. The *ex post* accounting data concerns the execution of the MFS. They are the CFE of the various financial resource inflows, outflows, surpluses or deficits (i.e. expansions or conversions), defined in execution of the MFS. These data are required to enable the control of the execution of the 'Setting the MFS' decision later.

### Requirements

The accounting requirement for evaluating the 'Setting the Master Financing Schedule' decision is the measurement of the balance of CFE inflows and outflows. As explained earlier in this section, CFEs are the unified measure of financial resource inflow and outflow, meaning that CFEs differ between alternative courses of action. Since financial resources are used to fulfil operational and financial commitments, there is a distinction drawn between two types of CFE, namely operational CFEs and financial CFEs. This implies that in a MFS simulation, these CFEs have to be identified.

Operational CFE inflows are the unified measure of financial resource inflows caused by operational resource transitions (e.g. sales items) from the organization to its sales markets. Operational CFE outflows are the unified measure of financial resource outflows caused by operational resource transition (e.g. raw materials, human labour or capacity) from the procurement markets. This means that *ex ante* information is required about their relationships with the outside world (customers and suppliers) and on how an operational resource outflow results in operational resource inflow. A relationship with the outside world has to be described in terms of 'exchange of operational resources for financial resources'. Company rules should provide information on how external operational demand is satisfied by procurement or by production processes. Should demand be satisfied by procurement, operational supply contracts can be used. Otherwise, where demand is satisfied by production processes, no financial resource outflows are directly generated (and are therefore considered beyond the scope of this research). In this dissertation, the financial resource inflows and outflows resulting from operations and measured by operational CFEs are considered as given

<sup>37</sup> Note that it is possible to convert surpluses to cover deficits.

<sup>38</sup> In literature, in addition to 'operational cash flows' and 'financial cash flows', 'investment cash flows' (e.g. see Brealey and Myers, 1996) can also be distinguished. The latter type concerns the amount of cash that flows to offset an investment. Investment decisions are considered here to be long-term operations management decisions. As the focus of this research is on short and medium-term treasury management decisions, 'investment cash flows' fall beyond the scope.

and constant data. However, it is important that these financial resources are defined with detail on timing, currency, tax and discount implications.

Financial CFE inflows are the unified measure of financial resource inflows resulting from financial resource transition (e.g. new loans, new credit lines, raising capital, grants, etc.) from the financial markets<sup>39</sup>. Financial CFE outflows are the unified measure of financial resource outflows caused by financial resource transition (e.g. interest and loan payments, corporate tax payment, etc.) from the organization to the financial market. This implies that *ex ante* information is required about relationships with the outside world (participants in the financial market, both on demand and supply sides). It is important that *ex ante* information is required on how financial resource outflows result in financial resource inflows (possibly of other types). The definition of how acquired financial resources are used is necessary to be able to project and adjust the available amount of financial resources per type and per location in a time-phased manner. The relationship with the outside world has to be defined in terms of ‘demand for financial resources [of type X] used for the supply of financial resources [of type Y]’. *Ex ante* information on supply and demand contracts within the financial market could be used here. Company rules should provide information on how financial resource demand is satisfied by means of financial resources with operational origin (e.g. customer payments) or by means of financial resources with financial origin (e.g. the settlement of an existing loan through a new loan). This additional information concerns knowledge of the financial processes. This knowledge consists of descriptions of how specific financial output resources lead to demand for specific financial input resources. This knowledge can be incorporated by means of so-called recipes. In most business information systems, this type of recipe is currently not incorporated. The financial resource transition pattern can be designed using the information requirements defined above. The financial resource transition pattern can easily be converted to CFE patterns for planning and for executing the MFS. These would then result in *ex ante* and *ex post* accounting information. In Section 6.5, the requirements stated above are generalized into the (generic) requirements of ‘Financial Resource Transition’ and ‘CFE Transition’.

### 6.4.3 Decision B. Optimizing Financial Resource Inflow Orders

#### What is decided?

The optimization of financial resource inflow orders concerns ensuring that the amounts of financial resources committed optimally flow into the organization at the right moment. For this decision, the amount of the financial resource flowing into the organization is considered as constant (and available) data. The focus is on ensuring that the financial resource flows into the organization optimally (i.e. with minimal financial effort, like bank costs).

#### Information required for this decision

The following information is needed to support this decision:

- Data on each type of financial resource per location on inflows
- Norm data defined for the ‘Optimizing Financial Resource Inflow Orders’ decision. Examples include maximum accepted ‘financial effort’ (e.g. bank cost) per inflow transaction, payment instruments accepted for inflow transactions, etc.

Financial resource inflows can have an operational or financial origin. The operational financial resource inflows can be considered as customer debt collected by the accounts receivable department. They are the financial fulfilment of the trade-off decision ‘which products to produce or services to offer when’ i.e. the demand for finished products or

<sup>39</sup> Participants in financial markets include banks, venture capitalists, tax government, etc.

services (operational resources) that are to be paid for. This dissertation considers the outcome of the trade-off decision as given data and focuses on the settlement of the financial resource inflow. As explained earlier in this section, detailed operational financial resource inflow information on timing, currency, tax and discount implications has to be available. Focus is on the ‘financial effort’ involved in the financial resource inflow (with operational origin). These ‘financial efforts’ concern costs of foreign payments, costs of payment instruments used, costs of factoring companies, etc. Inflows of financial resources with financial origin include inflows of new loans, availability of new credit lines, etc. In supporting this decision, the amount of the financial resource inflow is considered as constant and available data. It is important that detailed information is available on timing and the currency in which the financial resource flows into the organization. Focus is on the ‘financial effort’ involved in the financial resource inflow (with financial origin). These ‘financial efforts’ concern administrative costs of new loans, costs of payment instruments used, etc.

### **Accounting information required**

The ‘Optimize Financial Resource Inflow Orders’ decision concerns the inflow part of the execution of the Master Financing Schedule (MFS). As explained earlier, the MFS is a detailed plan of the availability of financial resources per *type* and per *location*. The organization has to ensure that the correct amounts of financial resources flow into the organization at the right moments and the question remains whether financial resources flow into the organization optimally, from a financial perspective. The *optimization* of the inflow of financial resources concerns 1) the *type* of financial resource used, 2) the *location* where financial resources flow to and 3) the *payment instrument* used for the financial resource flow. Doing the right thing from a financial perspective involves minimizing the ‘financial effort’ in executing the transaction. The ‘financial effort’ includes the bank cost of the payment instrument used. The financial outcome can be measured by comparing the incremental costs involved in the various financial resource ‘inflow’ alternatives. The CFE is the unified unit for measuring and comparing the financial costs involved in different inflow alternatives. The preferred alternative is the financial resource inflow alternative with the minimum amount of financial CFE outflows involved. The preferred alternative is the inflow alternative with the minimum amount of financial effort. The financial value of the financial effort involved should be compared with some sort of financial target (e.g. norm CFE in financial resource inflows involved) or the opportunity costs. Opportunity costs can occur in situations where various alternative solutions can be chosen to organize the financial resource inflow. For example, when an expensive inflow instrument is used (e.g. a letter of credit) financial resources flow early and predictably into the organization, compared to when a cheap instrument is used and money flows in late (e.g. a draft payment). The opportunity costs is the missed part of the financial resource as a result of choosing one alternative to execute the financial resource inflow over another. Accounting information is only one type of information that can be used to support this decision. Other actions to optimize the inflow of financial resources are better related to a well-organized administration, e.g. early invoicing, follow-up of uncollected items after due date, actions that influence the way customers pay (the financial instrument used, paying in the preferred financial resource type at the preferred location), etc.

### **Requirements**

The evaluation of the financial impact of the ‘Optimizing Financial Resource Inflow Orders’ should be performed based on predefined norms regarding inflows of different types of financial resources per category of opposing party (e.g. customer, bank, government, etc.). These norms could be derived from predetermined plans, e.g. the MFS. Deciding which alternative solution to choose from requires the determination of the opportunity effect of each of the alternatives. The opportunity effect can be determined by incorporating information about alternate financial resource inflow possibilities. However, a complication can occur here. In most inflow transactions of operational origin the choice of 1) the payment instrument used to execute the inflow transaction 2) the financial resource and 3) the location

(e.g. bank address) where the payment is directed to rests with the opposing party (the customer). For example, a customer has an invoice due with the amount expressed in EUR and USD (different types of financial resource). The invoice can be settled by cheque or draft payment (different types of payment instrument). A USD account in the Netherlands or the USA (different locations) could be used. To some extent it is possible to ‘guide’ this opposing party towards the preferred choice by only supplying the US bank account. The invoice can also be settled in EUR. The same reasoning holds true for the inflow of transactions with financial origin. Where a new loan has to flow into the organization, the choice of payment instrument, location and type of financial resource rests primarily with the opposing party (e.g. a bank or venture capitalist). It is up to the organization to guide this inflow preferably. This implies that the opportunity effect cannot simply be determined by comparing alternatives. The MFS could be used to overcome this drawback because it is a time-phased plan of financial resources per type and per location. It is possible to incorporate assumptions on financial resource inflow as described in this plan. If the MFS is still realistic, it can be used to estimate the financial impact of the financial resource inflow because it contains information on how and when the financial resource is expected to flow into the organization. In Section 6.5, the opportunity effect is generalized in the ‘Context Congruency’ requirement.<sup>40</sup>

#### 6.4.4 Decision C. Optimizing Financial Resource Outflow Orders

##### What is decided?

The optimization of financial resource outflow orders concerns ensuring that the amount of financial resources committed optimally flow out of the organization at the right moment. Three situations can occur. First, the amount of financial resource to flow out of the organization is available, the situation covered in this decision. The focus is on optimizing the financial effort in executing the outflow. Second, the amount of financial resources to flow out of the organization is not available but can be converted from another type of financial resource in which a surplus is available. To solve this problem, Decision E (Optimizing Financial Resource Conversion Orders) has first to be executed, then the resource outflow is executed by the current decision (Decision C). Third, the amount of financial resource to flow out of the organization is not available and cannot be converted from another type of financial resource. In this situation, Decision F (Financial Resource Capacity Expansion Orders) is first executed and then the financial resource outflow is optimized by the current decision (Decision C). As explained earlier in this section, for this decision (Decision C), the *amount* of the financial resource to flow out of the organization is not decided by this decision, but is given data. The focus is on ensuring that the financial resource flows out of the organization optimally (i.e. with the minimum amount of financial costs involved).

##### Information required for this decision

The following information is needed to support this decision:

- Data for each type of financial resource and per location on outflows
- Norm data defined for the ‘Optimizing Financial Resource Outflow Orders’ decision. Examples include maximum accepted ‘financial effort’ per outflow transaction, payment instruments accepted, etc.

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<sup>40</sup> The ‘context congruency’ requirement outlines the need to define the scope in which possible alternatives of the decision will occur. The preferred decision alternative within this scope can be found by measuring the opportunity cost of one decision alternative against the opportunity cost of each other decision alternative. This is called the ‘opportunity effect’.

Outflows of financial resources can be of operational or financial origin. The operational financial resources outflows are a form of supplier debt that has to be settled by the accounts payable department. They are the financial consequence of the execution of the trade-off in 'which products to produce or services to offer when', more specifically, in the procurement of materials and labour. This dissertation considers the outcome of this decision as given data. As explained earlier in this section, detail on timing, currency, tax and discount implications of the operational financial resource outflow have to be available. The focus is on the 'financial effort' involved in the financial resource outflow (of operational origin). The financial efforts concern the costs of foreign payments, the costs of payment instruments used, etc. Outflows of financial resources with financial origin include redemptions of loans, corporate tax payments, interest payments, etc. In supporting this decision, the financial resource outflow amount is not decided in this decision but is available data. It is important that detail is available on timing and the currency in which the financial resource flows out of the organization. The focus is on the 'financial effort' involved in the financial resource outflow (with financial origin). These financial efforts deal with administrative costs of new loans, costs of payment instruments used, etc.

### **Accounting information required**

The 'Optimize Financial Resource Outflow Orders' decision concerns the outflow part of the execution of the MFS. It was explained earlier in this section that the MFS is a detailed plan of the availability of financial resources per resource *type* and per *location*. The organization has to arrange that the amounts of financial resources committed flow out of the organization at the agreed moments. The question focused on in this dissertation is whether the financial resources flow out of the organization optimally, from a financial perspective. Optimization of the outflow of financial resources concerns 1) the type of financial resource 2) the location to which the financial resource is flowing and 3) the financial instrument used to execute the financial resource flow and 4) timing. 'Leading' or 'lagging' of financial resources is possible when they are not immediately available. Choosing the optimal outflow alternative involves minimizing the financial effort in executing the transaction. The financial effort concerns the bank costs of the payment instrument used, interest payments when lagging the outflow, etc. The financial outcome can be measured by comparing the incremental costs involved in the various 'outflow' alternatives. The unified unit to measure and compare the financial effort involved in different outflow alternatives is the financial CFE. The preferred alternative is the financial resource outflow alternative with the minimum financial CFE involved. The financial effort CFE should be compared with some sort of financial target (e.g. norm cost involved in the financial resource outflow) or opportunity cost. Opportunity costs are involved where financial resources flow out of the organization predictably when an expensive financial resource outflow instrument is used (e.g. a letter of credit) compared with another alternative where a cheap financial instrument is used which is less predictable (e.g. cheque payment). The opportunity cost is the amount of financial resources lost (the lower amount of financial effort when executing the more optimal alternative). Accounting information is only one type of information that can be used to support this decision. Other information used in the decision-making process includes focussing on bank relation management and therefore using a preferred bank account that is not necessarily the most optimal alternative from a financial perspective but is nevertheless used to obtain better interest rate conditions in the future.

### **Requirements**

The evaluation of the financial impact of the 'Optimizing Financial Resource Outflow Orders' should be performed based on predefined norms regarding outflows of different types of financial resources per category of opposing party (e.g. supplier, bank, government, etc.). These norms could be derived from predefined plans, e.g. the Master Financing Schedule (MFS). The opportunity effect can be determined by incorporating information about the alternative financial resource outflow possibilities and the way in which the outflow

transaction is executed, i.e. the payment instrument used. In Section 6.5, the opportunity effect is generalized in the ‘Context Congruency’ requirement.

#### 6.4.5 Decision D. Optimizing Financial Resource Surplus Orders

##### What is decided?

The ‘Optimizing Financial Resource Surplus Orders’ decision concerns temporarily invested surpluses. Examples include weekend, overnight or seasonal investments of financial resources not allocated for the corresponding period (e.g. weekend, night, season). The result of surplus optimization is that the inventory of invested financial resources becomes allocated and is thus unavailable for other objectives. As compensation, a ‘financial benefit’ (e.g. an extra amount of a type of financial resources) is received.

##### Information required for this decision

The following information is required for this decision:

- Available amount for surplus investment for each financial resource type per location
- Time (how long will financial resources be available for surplus investment)
- Norm data defined for the ‘Optimizing Financial Resource Surplus Orders’ decision. Examples include minimum invested amount per surplus investment transaction, minimum required ‘financial bonus’ per investment transaction.

The important questions in surplus optimization are knowing 1) the amount of financial resource inventory available for investment at a given moment, 2) how long it can be invested in order to optimize the transaction and 3) how it can be invested in order to optimize the ‘financial benefit’.

The first two questions concern the determination of the financial resource inventory for each type and per location at any moment. As discussed earlier in this section, the financial resource inventory amount to be invested is determined by the balance of financial resource inflows and outflows that are the result of financial settlement of operations resource inflows and outflows and other financial commitments. In Section 5.4 of Chapter 5, it was shown that the *location* and *type* of financial resource are important characteristics. The same type of financial resource can be available at different locations (e.g. USD in a bank account in the Netherlands and USD in a bank account in the USA). Sometimes, only once amounts of the same type of financial resource are brought to one location does a surplus become visible. This technique is known as ‘*cash pooling*’ (within the context of this research, this technique is renamed as ‘financial resource pooling’). It is possible that it is more interesting to invest a larger surplus amount of a financial resource at one location rather than investing smaller surplus amounts of financial resources at different locations. Another technique is the ‘*netting*’ of balances (surplus and deficit amounts) of different types of financial resources maintained with the same financial opposing party. For this technique, it is important to know whether financial resources of one type can be converted into financial resources of another type and whether there are financial costs involved in this conversion (e.g. currency conversion costs). The available (unconsumed) amount per type of financial resource per location and per period is defined in the MFS and is comparable to the Available To Promise (ATP) concept known in operations management to define the availability of operational resources defined in the Master Production Schedule. The third question concerns the trade-off decision of how to invest the surplus of financial resources given the fact that there are several possibilities for investment. The surplus investment generates a ‘financial benefit’ (extra amount of financial resources).

**Accounting information required**

The 'Optimize Financial Resource Surplus Orders' decision concerns the execution of the outflow part of the MFS. Whether a surplus of financial resources occurs and whether it is advisable from financial perspective to invest the surplus is periodically evaluated. From a financial perspective, positive advice is given when there is a financial benefit involved in the surplus investment. The financial benefit can be calculated by comparing the incremental revenues with the incremental costs for different investment alternatives. The unified unit for measuring and comparing the financial benefit of different alternatives is the amount of financial CFE involved. This financial value should be compared with some sort of financial target. This target could be predefined targets (minimum margins or minimum interest rates) or opportunity costs. Opportunity costs can occur when surpluses in a given type of financial resource – once invested through the chosen investment solution – cannot be invested through an alternative solution due to scarcity of resources. The opportunity costs consist of the missed benefit or the missed surplus investment.

**Requirements**

The evaluation of the financial impact of the 'Optimization of Financial Resource Surplus Orders' decision should be performed based on predefined norms regarding interest rate, minimum available surplus amount per type of financial resource for investment, etc. These norms could be derived from predetermined plans, e.g. the MFS. The opportunity effect can be determined by incorporating information about alternative investment possibilities. However, a complication occurs here. In most situations, information on the *quantity* of financial resources in surplus and *period* the financial resources are available for surplus investment are not available because they are dependent on future demand. This implies that the opportunity effect cannot simply be determined by comparing alternative surplus investment possibilities. The MFS could be used to overcome this information gap. If the MFS remains realistic, it can be used to estimate the financial impact of investing a financial resource surplus and as a consequence, block the invested financial resource for the invested amount and period of investment. In Section 6.5, this opportunity effect is generalized as the 'Context Congruency' requirement.

**6.4.6 Decision E. Optimizing Financial Resource Conversion Orders****What is decided?**

The objective of the 'Optimizing Financial Resource Conversion Orders' decision is to temporarily handle deficits in financial resources by converting an amount of surplus financial resources. The result of this alternative is the fact that the converted financial resource becomes allocated and thus unavailable for other objectives. Other possibilities for attaining this goal are discussed in the next decision (Decision F: 'Optimizing Financial Resource Capacity Expansion Orders'). The current decision (Decision E) could be part of other decisions, such as 'Setting the MFS'. Examples of financial resource conversions are the conversion of an amount in USD into an amount in EUR.

**Information required for this decision**

The following information is required for this decision:

- Deficit amount for each financial resource type and per location
- Time (how long is the amount of financial resources required)
- Information on the possibility of converting surplus the financial resource into the deficit financial resource
- Norm data defined for the 'Optimizing Financial Resource Conversion Orders' decision. Examples include maximum acceptable 'financial effort' (e.g. bank costs) per conversion



transaction, conversion instruments accepted (e.g. option contracts, forward rate agreements), etc.

The important questions in deficit optimization are 1) what the amount of financial resource inventory available at a certain moment in time is, 2) for how long the extra amount of financial resources will be needed and 3) how the deficit can be financed in order to optimize the transaction.

The first two questions concern the determination of the financial resource inventory at any given moment. As discussed earlier in this section, the financial resource inventory amount to be financed is determined by the balance of financial resource inflows and outflows resulting from financial settlement of operations resource inflows and outflows and other financial commitments. In Section 5.4 of Chapter 5 it was noted that *location* and *type* are the essential characteristics of financial resources<sup>41</sup>. The same type of financial resource can be available at different locations. Sometimes, only when amounts of the same type of financial resource are combined at one location does a deficit becomes visible. This technique is known as ‘*cash pooling*’. Financing a larger financial resource deficit at a single location can be more interesting than financing smaller deficit at different locations. Another technique is the ‘*netting*’ of different financial resource balances (surpluses and deficits) maintained with the same financial opposing party. To apply this technique, it is important to know whether financial resources of one type can be converted into financial resources of another type and whether there is financial effort (e.g. bank costs) involved in this conversion. The financial resource deficit for each period is visible in the MFS and is comparable to a negative amount of Available To Promise (ATP), a concept used in operations management to indicate availability of operational resources in the Master Production Schedule. The third question concerns the trade-off decision of how to finance a financial resource deficit given the fact that several alternative conversion solutions are possible. The conversion possibilities generate an amount of financial resource inflows on the one hand (the converted financial resource) and an amount of financial resource outflows on the other hand (the financial resource for which the conversion takes place). The use of conversion instruments can generate an extra financial resource outflow on the other hand.

### Accounting information required

The ‘Optimization of Financial Resource Conversion Orders’ decision concerns the execution of the inflow part of the MFS. Whether a deficit in financial resources will occur and whether it is advisable from a financial perspective to finance the deficit through the conversion of a surplus is periodically evaluated. From a financial perspective, positive advice is dependent on the financial benefit involved in the deficit investment. The financial benefit can be calculated by comparing the incremental revenues with the incremental costs of different deficit financing alternatives. The unified unit to measure and compare the financial impact of different alternatives is the amount of financial CFE involved. The CFE should then be compared with some sort of financial target. This target could be predefined targets (maximum margins or maximum interest rates) or opportunity costs. Opportunity costs can occur when deficits cannot be financed otherwise, owing to scarcity of resources. The opportunity costs consist of the benefit missed (of another financing solution) or the deficit financing solution missed.

### Requirements

The evaluation of the financial impact of the ‘Optimizing Financial Resource Deficits’ decision should be performed based on predefined norms. These norms could be derived from predetermined plans, e.g. the MFS. The opportunity effect can be determined by incorporating information about alternative financing possibilities. However, a complication occurs here. The alternative deficit financing possibilities are usually not known simultaneously, because

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<sup>41</sup> The currency in which a financial resource is expressed is considered here an element of the financial resource type.

no information is available on, for instance, deficits or surpluses in other financial resources in the near future. This implies that the opportunity effect cannot be determined simply by comparing the alternatives. The MFS could be used to overcome this information gap as it holds information on surpluses and deficits in financial resources in the future. If the master schedule remains realistic, it can be used to estimate the financial impact of financing a financial resource deficit by converting an available amount from another type of financial resource or another location. As a consequence, fresh availability in a particular type of financial resource is identified as a consequence of deficit financing by conversion. The financial resource converted is recorded as 'consumed' over the converted amount. In Section 6.5, this opportunity effect is generalized into the requirement for 'Context Congruency'.

### **6.4.7 Decision F. Optimizing Financial Resource Capacity Expansion Orders**

#### **What is decided?**

The objective of the 'Optimizing Financial Resource Capacity Expansion Orders' decision is to enlarge the available amount (capacity) of a given type of financial resource in order to cope with short-term fluctuations in the demand for financial resources. Another way to attain this goal is discussed in the previous information request above (Decision E 'Optimizing Financial Resource Conversion Orders'), and is the conversion of an available amount of another type of financial resource into the financial resource in deficit. This decision (Decision F) could be part of other decisions such as 'Setting the MFS'. Examples of financial capacity expansions are new loans, increasing credit lines, etc.

#### **Information required**

The following information is required for this decision:

- Deficit amount for each financial resource type and per location
- Time (when and for how long is the amount of financial resources needed)
- Norm data defined for the 'Optimizing Financial Resource Expansion Orders' decision. An example is the maximum accepted 'financial effort' (e.g. bank costs) per expansion transaction.

#### **Accounting information required**

The accounting information relevant to supporting this decision can be measured by the total financial CFE leaving the organization as a result of the financial resource expansion alternative. The accounting information relevant to measuring the financial impact associated with the inflow of the acquired financial resource is discussed in Decision B (Optimizing Financial Resource Inflows Orders). The accounting information required to support the financial impact of the financial resource outflow in settling the redemption of the financial resource expansion is discussed in Decision C (Optimizing Financial Resource Outflows Orders).

#### **Requirements**

The information required here is the total outgoing financial CFE associated with the relevant measures. Corbey and Tullemans (1991) have investigated the relevant measures for operational resource capacity expansion. They refer to economic commitment as one of the most important variables. This can be applied to financial resource capacity expansion. Economic commitment is then defined as the total CFE associated with a particular kind of measure. This CFE is dependent on the (minimum) term of commitment of a specific alternative. For instance, a straight loan has a low 'financial effort' but has a minimum term of one month. This implies that the financial capacity expansion should be evaluated based on the total additional financial resource outflow involved (expressed in financial CFE outflow), rather than the financial resource consumption (this can only be applied in some

circumstances, e.g. a credit line that can be consumed based on demand). The financial CFE is the unified measure to be used for comparing different financial resource capacity expansion alternatives. The ‘Financial Resource Transition’ and ‘CFE Transition’ generic requirements refer to the requirements stated here (see Section 6.5).

#### 6.4.8 Decision G. Optimizing Financial Resource Safety Stock Level

##### What is decided?

The objective of the ‘Optimizing Financial Resource Safety Stock Level’ decision is to determine the amount of available financial resource inventory for each type and per location to accommodate the uncertainty in supply and demand of financial resources in the short term. This decision is only relevant when demand for financial resources is not deterministic. From an operational perspective, there are two extreme implications for an organization temporarily running out of available financial resources.

- Unpredicted increase in bad sales debts causing slowdowns in or loss of financial resource inflow
- Unpredicted increase in sales initiating procurement that has to be settled financially.

Keynes (1930) differentiated between three different causes of uncertainty that initiate the maintenance of financial resource safety stocks, a transactional cause, a precautionary cause and a speculative cause. The first two reasons are applicable to treasury management decisions focusing on optimization of financial resource flows: the transaction currency can fluctuate (transaction cause) and the transaction volume can fluctuate (precaution cause). The ‘speculation cause’ is considered less applicable here.

##### Information used

The following information is required for this decision:

- Historical planning information on inflows and outflows of financial resources per location
- Actual information on inflows and outflows of financial resources per location
- Norm data defined for decision ‘Optimizing Financial Resource Safety Stock Levels’. An example is the minimum acceptable financial service level.<sup>42</sup>

##### Accounting information required

The financial trade-off that has to be made is the trade-off between the ‘financial effort’ of the financial resource safety stock against the cost of not having safety stock. The cost of not having financial safety stock is dependent on the two extreme situations described above. In the first situation, where inflow of financial resources is completely lost because of bad sales debts, the financial impact of running out of available financial inventory equals the CFE missed or the financial supply missed. In the second situation, where there is an unpredicted increase in sales, the opportunity cost of capital could play a role, i.e. a part of the sales will be lost or postponed as procurement for the sales that cannot be financed. The costs of financial resource safety stock are determined by holding costs. These holding costs can consist of interest costs, opportunity capital costs, possible costs involved in financial currency or interest rate risk. There is also an opportunity cost of capital resulting from the CFE outflow of obtaining the financial resource safety stock. This cost is determined by the time difference between the moment of the financial resource safety stock acquisition and the moment the financial resource safety stock is replenished after being used.

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<sup>42</sup> The financial service level is defined in this context as the ability to respond to the demand for financial resources.

**Requirements**

There are no new requirements with regard to the accounting information required. The relationships with the outside world are significant. Information is required concerning the alternatives of not having the financial resource safety stock (loss of sales or planned financial capacity usage). The MFS could be used to supply the relevant information.

**6.5 Statement of information requirements to support treasury management decisions**

In the previous section, seven treasury management decisions were analysed. The requirements to support these decisions with *ex ante* and *ex post* accounting data were described for each decision individually. In this section, the requirements for each individual decision are generalized as three basic functional requirements. This statement of generic information needs can be used as a requirements definition to design an information system in which treasury management decisions are automatically serviced with relevant cost data, for instance.

**Requirement 1: Financial resource transition**

The financial resource flow between the organization and its markets is called 'financial resource transition flow', which can be detailed as an incoming and an outgoing resource flow. In the information system design, these two types of financial resource flows have to be distinguished. Outgoing flows are determined by external demand (supplier and interest payments, loan redemption, etc.), whereas incoming flows are influenced by external supply (customer collection, acquisition of new financial resources, etc.). The information system design must be able to translate the external demand pattern of financial resources into an external supply pattern of financial resources. *Ex post* and *ex ante* financial resource transition data have to be available. *Ex ante* resource transition refers to agreements made with the outside world about future financial resource flows. *Ex post* refers to realized financial resource flows.

**Requirement 2: Cash flow equivalent transition**

The information system design must be able to translate the financial resource transition (inflow and outflow) into a cash flow equivalent (CFE) inflow and outflow pattern. This information is called 'cash flow equivalent transition'. This CFE transition data is the unified, dimensionless measure for facilitating the comparison between the outcomes of different treasury management decision alternatives. This requirement has to be introduced to overcome three difficulties in comparing financial resource flows, namely 1) different types of financial resources, 2) financial resource flows expressed in different currencies and 3) financial resource flows defined at different moments in time. This requirement is valid for both *ex ante* and *ex post* transitions. *Ex ante* means the incorporation of financial aspects of possible future financial resource transitions here. *Ex post* means the incorporation of financial aspects of realized financial resource transitions.

**Requirement 3: Context congruency**

The objective is to support treasury management decisions at multiple levels where decisions at lower levels are executed within boundaries set at higher levels. The design of the financial information system should therefore adopt information on long-term plans. These long-term plans detail financial target information on the courses of action the organization wants to follow in specific circumstances. Decisions made in a shorter term horizon should be checked against those defined in a longer term horizon and execute the long-term financial targets. 'Context information' is thus concerned with detailing information regarding the financing

policy of an organization. Examples of the financing policy can include the detail of the world-wide network of financial opposing parties (e.g. banks), the different types of financial resources used (e.g. credit lines, loans, raising capital, etc.), margins like minimum amount invested or financed, maximum financial costs per transaction acceptable (as an amount or percentage), etc. Context information outlines the scope within which alternative solutions to a decision can be looked for. This context is required in order to list a finite number of solution alternatives per decision, for which preference of one alternative over another can be measured by opportunity costing.

## **6.6 Summary**

Management accounting concentrates on describing which information to use for decision-making. Information for decision-making can be differentiated into financial and non-financial information. There is a vibrant discussion between researchers as to which financial information is most suitable for decision-making. In this chapter, the relevant cost approach as described by Theeuwes and Adriaansen (1994) and Wouters (1993) was applied to treasury management decisions concentrating on optimizing financial resource flows. Section 5.4.3 of Chapter 5 presents a framework for hierarchical treasury management decision-making. This chapter analyses what accounting information is required to service each of the seven decisions that are part of this framework with relevant costs. Then a general statement on information requirements was described. This general statement of data availability requirements will be used in Chapter 8 to validate whether the contract data model can hold sufficient data to support this application. However, in order to have the complete set of data availability requirements, the described set of requirements has to be extended first by possible additional requirements resulting from a generic algorithm to calculate the relevant cost consequences (i.e. incremental costs and opportunity costs) of any of the treasury management alternative scenarios. The description of this generic calculation algorithm will be the subject of investigation in the next chapter.



