

Improving distribution-performance for Ready-mix Concrete at Van Nieuwpoort Transport

Applying the Balanced Scorecard to performance measurement
system-design

Name: Richard J.A. Wurpel
Studentnr: 9975319
University: Delft University of Technology
Faculty: Technology, Policy and Management
Program: Systems Engineering, Policy Analysis and Management
Course: SPM5910 – Graduation Project

Graduation committee

Chair: prof. Dr. G.P. van Wee
1st Supervisor: ir. M.W. Ludema
2nd Supervisor: Dr. J.L.M. Vrancken

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Summary

Van Nieuwpoort Transport (VNT), one of the largest transporters of ReadyMix-concrete (RMC) in the Netherlands, wants to optimise its logistics. This objective is instigated by its three exclusive clients, who desire more competitive delivery-costs. These clients are three cooperating RMC-manufacturers that control nine RMC-factories in total. However VNT has a traditional organisation that solely applies financial metrics and lacks the necessary determinants for logistics optimisation.

In order to implement the logistics optimisation strategy VNT wants to apply the Balanced Scorecard (BSC). The BSC is a hierarchical performance measurement framework for strategy implementation aimed at balancing short- and long-term goals. Key to this method is the four-perspectives framework where performance is measured from four perspectives: (i) Financial, (ii) Customers, (iii) Internal Business Process, and (iv) Learning and Growth. This approach has been successfully adopted by many large organisations and recently even small and midsize enterprises have shown interest.

However applying the BSC to optimize VNT's logistics presents several challenges. First of all VNT has no prior experience with the BSC. Moreover four complicating factors were identified: (i) lacking performance drivers, (ii) traditional culture, (iii) ambiguous leadership commitment, (iv) scarce strategic resources. While the first two of these factors are commonly solved by the BSC, the latter conflict with the two main requirements for BSC-implementation. Therefore a conventional BSC-approach does not suit VNT, which presents a knowledge issue.

The objective of this thesis is to propose a BSC for the strategic execution of VNT's logistics optimisation. Besides the identified complicating factors two limiting factors were identified: poor data-management and project-duration (6 months). In order to meet the objective the main research question is:

What is a suitable Balanced Scorecard for Van Nieuwpoort Transport to optimise its logistics performance and how can it be implemented?

This question was divided into six sub-questions which (i) select and adapt frameworks for VNT to address the complicating factors, (ii) describe VNT's current state that requires logistics optimisation, (iii) formulate and translate the strategy into an operationalised strategy map to make a BSC, (iv) design an implementation-plan for the strategy map, (v) develop a prototype for a performance measurement system (PMS) that is part of the implementation plan, and (vi) discuss the practical and scientific usefulness of the results.

The research approach used to answer these questions applies *grounded theory* as its strategy. The main methods used are desk research, interviews of VNT and BTM personnel, data-analysis of the transport management system, observation of logistics' business processes, and a spiral model to develop the PMS.

Three frameworks were selected and adapted for VNT: a BSC-framework, a logistics framework, and a PMS-framework, which were based on desk research and interviews.

The first provided the process-steps and instruments to deliver the results. The other two frameworks provided instruments that reduced staff-resources. Ambiguous leadership commitment was addressed by means of strategic learning, which was achieved by inserting an extra *Plan-Do-Check-Act-cycle* (PCDA-cycle) at the initiation of the approach. Consequently controversial strategic elements are internalised into the learning strategy. Complementary, some requirements for staff-resources were postponed as well.

VNT's current state that requires logistics optimisation was described by means of strategic analysis based on interviews, observation and data-analysis. Analysis of the external context consisted of market analysis (Porter's diagram) and supply chain analysis (supply chain mapping). The analysis of the internal context consisted of business process mapping, information structure, performance analysis. Both were used to make a stakeholders-analysis and a SWOT. The three main results were: (i) Multiple customer-types were identified but customer-segmentation is considered controversial by the executive, (ii) VNT has no determinants for logistics optimisation installed on the strategic and tactical level, and (iii) three alignment opportunities were identified in the distribution process: centralisation of maintenance planning, centralisation of resource planning, integration of sales and transportation processes.

A BSC was proposed to VNT by formulating and translating a strategy for logistics optimisation, which was based on the strategic analysis and key stakeholder-interviews. The strategy was formulated by identifying controversial strategic assumptions from the SWOT. The strategy was translated to the organisation by means of a strategy map populated with formulated strategic objectives based on the analysis of the internal organisation. Once operationalised, this map served as the BSC-proposal. The strategy-formulation resulted in a two-part base/surge strategy for VNT that internalised strategic learning. These parts are: (i) *reduce delivery-costs while maintaining the customer-service level* (functional excellence), (ii) *improve organisational knowledge of customer value and logistics boundaries* (strategic learning). The strategy translation resulted in an operationalised strategy-map for VNT where strategic objectives were formulated for all four BSC-perspectives and categorised by strategic theme. Most identified trade-offs concern the challenged strategic assumptions. While VNT-management accepted the proposed BSC fully, BTM – the other key stakeholder – only accepted the functional excellence strategy. The proposed measures may be imprecise, but are assumed valuable for gaining organisational knowledge.

An implementation plan was proposed to VNT by prioritising the operationalised strategy map. Strategic objectives were prioritised based on identified bottlenecks concerning *stakeholders* and *knowledge –and information gaps*. The implementation plan was a roadmap that consisted of *continuous improvement* -and *business process reengineering* initiatives to reach the strategic objectives. The results included a specification and ranking for testing of strategic assumptions based on commitment of key-stakeholders. The roadmap focussed on the learning growth perspective and included some tactical milestones. The roadmap was partially accepted by key-

stakeholders, which meant that the strategic assumptions could be challenged but controversial parts of the roadmap were not.

A PMS was prototyped based on a requirement analysis and developed by applying the spiral model. The requirement analysis consisted of identifying functional and performance requirements. The functional requirements were identified from a delineated part of the roadmap and supplemented by storyboards. Performance requirements were identified based on interviews and the storyboards. The prototype was validated by a user-test. The main result was a successfully developed PMS-prototype that only partially supports the strategy-map and was accepted by VNT.

The main conclusion is that a suitable BSC is proposed to optimise VNT's logistics while taking the following remarks into account concerning the validity. Extensive triangulation limited internal –and structural validity of the implementation plan and PMS-prototype. While some common BSC-practices were applied, external validity was not tested.

Recommendations were made for both VNT and for future research. The three main recommendations for VNT were: (i) improve internal and structural validity of the PMS-prototype by extending the user-test with the other key-user, as well as by expanding the PMS-prototype with the metric “yield-gap”, which requires the ERP as data-source. (ii) Improve the external validity of the strategy-map by making one for at least the sales-department as the other stakeholder of the distribution-process. (iii) Execute the proposed roadmap for the implementation of the strategy-map, which requires the allocation of staff-resources, setting and adjustment of targets, and the estimation -and allocation of budgets.

The three main recommendations for future research are: (i) determine the costs (e.g. staff-resources) and benefits (e.g. successfully challenged strategic assumptions) of the initial PDCA-cycle for strategy execution focussed on knowledge-sharing. (ii) Improve external validity by correlating the level of alignment with other functional silo's affected by the strategy. (iii) Improve external validity by applying the selection of frameworks to cases with a similar context.

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Abbreviations

BCW	Betoncentrale Westland
BPR	Business Process Reengineering
BSC	Balanced Scorecard
BTM	Van Nieuwpoort Betonmortel
CI	Continuous Improvement
PM	Performance measure
PMS	Performance measurement System
RMC	Ready-Mix Concrete
SME	Small and Midsize enterprises
TM	transit-mixer
TMS	Transport Management System
VNG	Van Nieuwpoort Group
VNT	Van Nieuwpoort Transport

1 Introduction

Van Nieuwpoort Transport (VNT), one of the largest transporters of ReadyMix-concrete (RMC) in the Netherlands, wants to optimise its logistics. This objective is instigated by its three exclusive clients, who desire more competitive delivery-costs. These clients are three cooperating RMC-manufacturers that control nine RMC-factories in total. VNT controls a large pool of resources (e.g. transit-mixers, drivers) to deliver RMC-products to customers on behalf of these manufactures. This includes logistic partners to accommodate peak-demand. Currently VNT has yet to formulate clear strategic objectives and has little performance-metrics, which makes logistics optimisation problematic. In order to overcome this problem VNT wants to apply the Balanced Scorecard.

The Balanced Scorecard (BSC) is a method for strategy execution and has successfully been adopted by many large organisations.

However, VNT's organisational maturity level presents a challenging context to successfully implement the BSC. Beside two conventional challenges (ie lacking performance drivers and a traditional organisational culture) VNT's context presents two unconventional ones: ambiguous leadership commitment and scarce staff-resources. These last two are especially challenging because they are prerequisites for successful implementation of the BSC.

This report describes a preliminary study into the optimisation of VNT's logistics by applying the BSC to its challenging context.

The outline of this chapter is as follows: in section 1.1 the problem statement is formulated by delineating the scientific -and practical context. The scope is demarcated in section 1.2. The research questions and objective are formulated in section 1.3. Section 1.4 presents the research strategy for this project. This chapter concludes with the outline of the report in section 1.5.

1.1 Problem formulation

The problem is formulated by identifying knowledge-gaps within the problem-situation. Consequently the scientific background and the company background are described.

1.1.1 Company background

Van Nieuwpoort Transport bv (**VNT**) is a subsidiary of a family-owned Western-European supplier of building materials (**VNG**). **VNG** has over 1500 employees across its subsidiaries which are mostly concentrated in the Netherlands. **VNG** has three main divisions: Prefab-products (Betonson), RMC-products (**BTM**) and Building Materials (**BM**), where **BM** supplies materials to these other two divisions. **VNT** was recently established to improve delivery performance for RMC-products and is controlled by **BTM**. In compliance with EU law VNT has to be defined as a Large Organisation (EU 2003/361).

VNT's core-business is delivery of products to customers on behalf of three cooperating RMC-manufacturers: **BTM**, the **Goudse Betoncentrale (GBC)** and **Betoncentrale**

Westland (BCW). This cooperation is one of the five largest suppliers of RMC-products in the Netherlands. The cooperation has nine production locations, which are geographically grouped into two regions and two satellites. The cooperation shares resources to reduce overhead. Nevertheless **GBC** and **BCW** are separate entities within the cooperation and conflicts of interest ought to be avoided (e.g. “Chinese wall” on finances and certain subjects).

VNT can be characterised as a department (for outbound logistics) of a business unit. To clarify, its strategic decisions are made by the cooperation and staff-functions are outsourced to either the cooperation or the parent-company. **VNT**’s organisation is rather flat, controls about 80 people (mostly operational personnel), and has a large fleet of transit-mixers (including some mixer-pumps). Operational personnel is divided into drivers and planners.

VNT-management thinks the following factors may be relevant for optimising its logistics performance:

- The cooperation’s approach to the new strategy is bottom-up.
- Conservative sector of industry.
- Peak-demand is addressed by balancing the resource-availability regionally and by outsourcing. However balancing-performance is not measured.
- The cost-awareness of operational personnel is questioned. However VNT has no data to validate the strategic assumption that costs can be saved by improving operational control.
- Operational personnel might receive conflicting instructions from several departments.
- Cultural differences between production locations might hinder communications.
- Acceptance of the Transport Management System (TMS) by operational personnel is poor.
- Customer-cooperation might provide opportunities to improve delivery-performance.

VNT-management wants to solve the resulting knowledge-issues by means of the Balanced Scorecard (BSC). Part of the BSC-implementation is the design and development of a Performance Measurement System (PMS). Ideally VNT desires a PMS that provides periodical performance reports to optimise its logistics.

1.1.2 Scientific background

From the company background it is derived that VNT’s new strategy is an optimization-problem of logistics processes which is to be evaluated and improved by application of the BSC. This section describes the following scientific aspects: logistics optimisation, performance measurement systems, the balanced scorecard, and alternative solutions.

Logistics optimisation is sub-optimisation

Logistics is defined the acts and processes of “... *getting the right product to the right customer, at the right time, at the right place, in the right condition, in the right quantity, at the right costs (the Seven R’s of Logistics)*” (Russel, 2007, p.59). Optimisation is defined as “*an act, process, or methodology of making something (as a design, system,*

or decision) as fully perfect, functional, or effective as possible" ("optimization", Merriam-Webster.com, 2014). Consequently logistics optimisation is about tweaking and reconfiguring these acts and processes to maximise/minimise output-attributes while meeting certain constraints.

The scope of logistics optimization ranges from a single link to a supply-network (ie a network of supply chains). Typically a single link is associated with one organization, whereas supply chains and supply-networks involve business processes across several organizations. Figure 1-1 depicts eight business processes across the supply chain. It should be noted that logistics is only involved in some of them. Therefore logistics optimization by itself is sub-optimization of business processes.

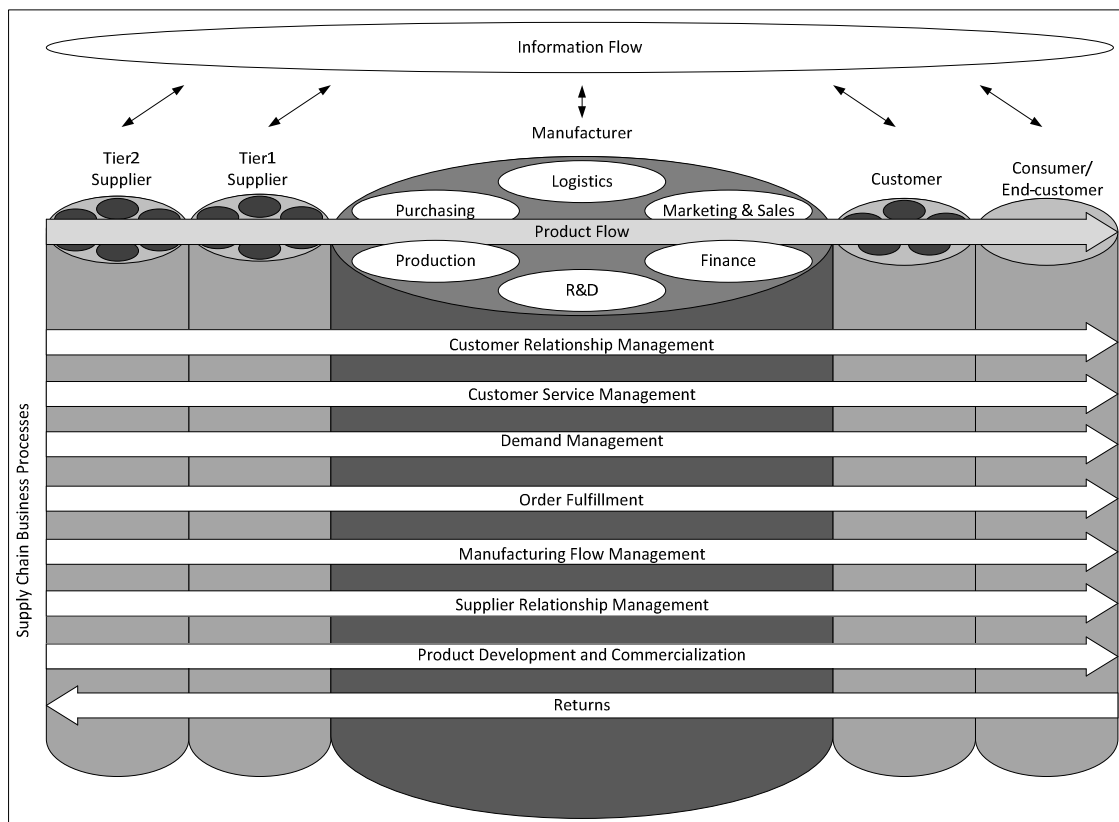


Figure 1-1: Supply chain business processes across the supply chain (Lambert & Pohlen, 2001, p.5, fig.3)

Moreover, the costs and benefits of optimization-efforts are not proportionally distributed across the organisation (ie company, supply chain/network). Consequently implementation difficulties for overall optimization and sub-optimisation are to be expected (Hoek, et al, 1987).

Sub-optimisation can be overcome by organisational focus and alignment. The field of logistics organisation provides strategies within its two main paradigms, ie *lean* and *agile*, as well as across these (hybrid). The appropriateness of any such strategy depends on its location within the supply chain.

While these strategies differ to some extent, their common characteristic involves data-intensity, which is focused on information-quality and responsiveness. The intensity-level of agile strategies is relatively high compared to lean strategies (Naylor, et al., 1999).

Getting the right information at the right place, at the right time and at the right quality can be challenging within an organisation, and especially between organisations. As mentioned above the costs and benefits of optimisation are not proportionally shared across the links and thus the availability, quality and responsiveness of information are a challenge. Means to overcome these data-intensity challenges include power (hierarchical, market), cooperation and institutions (compliance, certification).

Even when these problems are overcome and the appropriate information is readily available, organisations may struggle with the evaluation of information, practicality, implementation and costs. Many companies with ISO-9001 certification complain about information-overload. One cost-effective solution to minimize information-overload involves implementation of a performance measurement system.

Performance measurement systems

A performance measurement system (PMS) can be defined as *“a set of metrics used to quantify both the efficiency and the effectiveness of actions”* (Neely, et al, 1995, p81).

Research into PMS-design can be divided into two groups: Performance measurement frameworks and system design and development (Neely, et al, 1995). Research has focussed on the former, yet little research is available for the latter.

The distinction between the two is explained with a 3-layer-framework that defines the relationship between the context, system and metric data has been developed for PMS-design (Neely, et al 1995) (Figure 1-2). The relationship between the environment and the PMS defines the usefulness and operational performance of the system. Usefulness is determined by utility and usability. Attributes of operational performance include: maintainability, reliability, operating costs. These are also relevant to the systems interfaces to other data-systems.

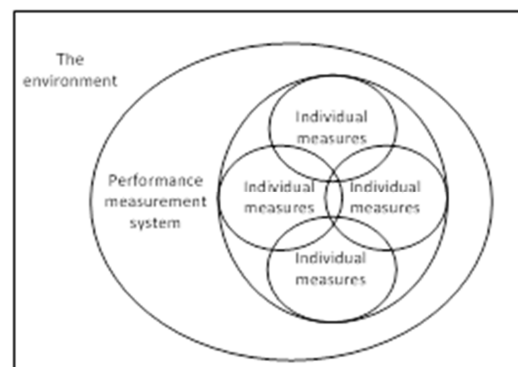


Figure 1-2: 3-layer-framework for PMS-design. source: Neely, et al., 1995, figure 1.

The Balanced Scorecard is a performance measurement framework which will be described hereunder as well as some alternative approaches.

Balanced Scorecard: a successful performance measurement framework

The Balanced Scorecard (BSC) can be defined as a hierarchical performance measurement framework for strategy implementation aimed at balancing short- and long-term goals (Neely, et al, 2000; Kaplan, Norton, 1992). This is achieved by supplementing results with quantified performance drivers.

Key to this method is the four-perspectives framework (Figure 1-3) where performance is measured from four perspectives: (i) Financial, (ii) Customers, (iii) Internal Business Process, and (iv) Learning and Growth. Within this framework the strategy is translated to the organisation by setting goals, setting targets, allocating resources and measuring performance. Essentially an organisation is forced to make trade-offs within this framework. Moreover it could be translated all the way down to the operational level as a development and reward system on a personal level.

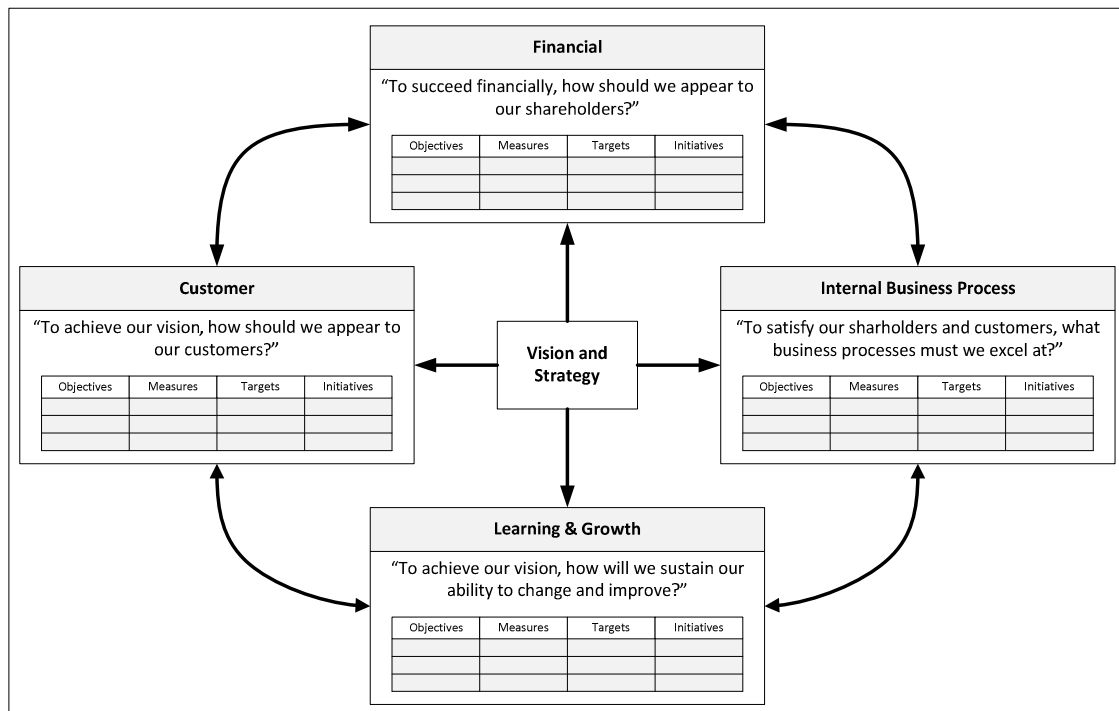


Figure 1-3: Four-perspectives-framework of Balanced Scorecard, adapted (source: Kaplan, Norton, 1996,p.4)

In the field of Management Research the BSC is classified as a hybrid approach by combining its two major paradigms: (i) goal oriented model, and (ii) human relations model (Dinesh, 1998). This means that the objectives are formulated top-down, the framework is implemented bottom-up, and the operational framework is used interactively top-down (Kaplan, Norton, 1996; Kaplan, 2010).

The BSC, has been widely adopted by large organisations (LO), mostly to create strategic focus and alignment (Kaplan, Norton, 2001). Beside the introduction of performance determinants, a major strength is that the links between the different dimensions of business performance are made explicit (Neely, et al., 2000). Since its inception the BSC has been improved to better fit organisational needs. These improvements include the internalisation of the Deming-cycle (Kaplan, Norton, 1996) to facilitate strategic learning and the application of strategy maps to facilitate organisational change (Kaplan, Norton, 2001). Moreover the BSC may function as a tool for supply chain management (Ganusekaran, 2003) and for strategy-execution at SME (Fernandes, 2006). Application

in the contexts of SCM and SME are interesting because these challenge the two major requirements for BSC-implementation: leadership commitment, and staff-resources.

However the BSC has difficulty to include external relations into a four-perspective framework, e.g. competitors and business partners (Neely, et al, 1995). Moreover BSC-approaches may be prone to delay during strategy-translation. Sometimes delay was caused by speculations about real correlation in respect to strategic objective linking (Papalexandris, et al. 2004).

Two main requirements of the BSC are *leadership commitment* and *staff-resources*. Leadership commitment is required for effective strategy execution, otherwise "... the Balanced Scorecard will be just another ad hoc reporting system" (Kaplan, 2010, p.31). Staff-resources are required to formulate and translate the strategy to the organisation.

Alternative approaches to performance measurement

Performance Prism is defined as a universal (ie hierarchical and horizontal) performance measurement framework that involves all types of stakeholders (Neely, et al, 2001). Like the Balanced Scorecard links between perspectives are made explicit but has the added benefit of addressing the entire context. Consequently the PMS can be populated with more relevant measures.

Quality management (e.g. Total Quality Management, iso 9000/9001) is another solution to performance measurement. However, there is a strong consensus that measurement should be derived from strategy (Bourne, et al., 2000). In practice companies have difficulty managing information overload with iso9000/9001 (Fernandes, 2000).

1.1.3 Problem statement

VNT wants to apply the BSC to execute its strategy of logistic optimization. However, it has no prior experience with this technique. Moreover the practical context presents four complicating factors: (i) lacking performance drivers, (ii) traditional culture, (iii) ambiguous leadership commitment, (iv) scarce strategic resources. While the first two of these factors are commonly solved by the BSC, the latter conflict with the two main requirements for BSC-implementation. Therefore a conventional BSC-approach does not suit VNT, which presents a knowledge issue.

Derived from the practical context four characteristics have been identified that are scientifically interesting. Firstly, a BSC-approach with ambiguous leadership commitment and scarce staff-resources has yet to be developed. Secondly, VNT's flat organization with scarce staff-resources resembles SME. Thirdly, VNT's lack of performance drivers could relate to its conservative sector. Lastly, its parent-company VNG has vertically integrated a large part of the RMC-supply chain, which provides opportunities for testing BSC in a SCM-environment.

However these topics are too broad for this thesis and thus the scope is delineated in the next paragraph.

1.2 Scope

The outset of the scope is the strategic execution of logistics optimization at VNT by applying the BSC. Therefore the choice for the BSC is made a priori and thus alternative approaches are beyond the scope.

In less challenging contexts successful application of the BSC can be expected in 6 to 26 months (Kaplan, Norton, 1996; Papalexandris, 2004; Fernandes, 2006). However given the challenging context and the limited project-time (six months), the scope has to be reduced in breadth and depth. Therefore the scope is limited to a proposal for a BSC and additional scoping will be applied during the project.

This demarcation to a BSC-proposal limits the practical and the scientific validity of the project. Especially since a conventional BSC-approach cannot be used. Therefore the practical and scientific relevance is challenged.

1.3 Research questions and design objective

In this section the research questions and design objective are stated, which are derived from the problem formulation and scope.

1.3.1 Research questions

The main research question is:

What is a suitable Balanced Scorecard for Van Nieuwpoort Transport to optimise its logistics performance?

In order to answer the main research question sub-questions have been formulated. Since suitable is a qualitative vague term, it is operationalised as *less stringent requirements for leadership commitment and staff-resources*. Hence the sub-questions are:

1. *What BSC-approach can be used to propose a BSC for logistics optimisation in a context where leadership commitment and staff-resources are scarce?*
2. *What current situation at VNT requires logistics optimisation?*
3. *What is the proposed BSC?*
4. *What is the proposed implementation plan?*
5. *What PMS-prototype is used to evaluate the proposed BSC?*
6. *What is the practical and scientific utility of the proposed BSC?*

1.3.2 Design objective

VNT's desire to periodically measure logistics performance coincides with any BSC that incorporates a Deming-cycle. While a fully operational PMS exceeds the scope of this project, a prototype is applied to evaluate the design of the BSC. This presents opportunities for VNT to gain knowledge for a fully operational version.

The design objective is:

Design, develop, test and validate a prototype PMS to evaluate the suitability of the proposed BSC that facilitates logistics optimisation for VNT.

The next section describes the project approach.

1.4 Research approach

The chosen research strategy for this project is grounding theory (Verschuren, Doorewaard, 1999). In this case the BSC is tested in a context that has ambiguous leadership commitment and scarce staff-resources. The BSC-approach requires adaption to this context because both are required for conventional approach.

Project overview

The relation between the research approach, research questions, and the chapters is presented in Figure 1-4

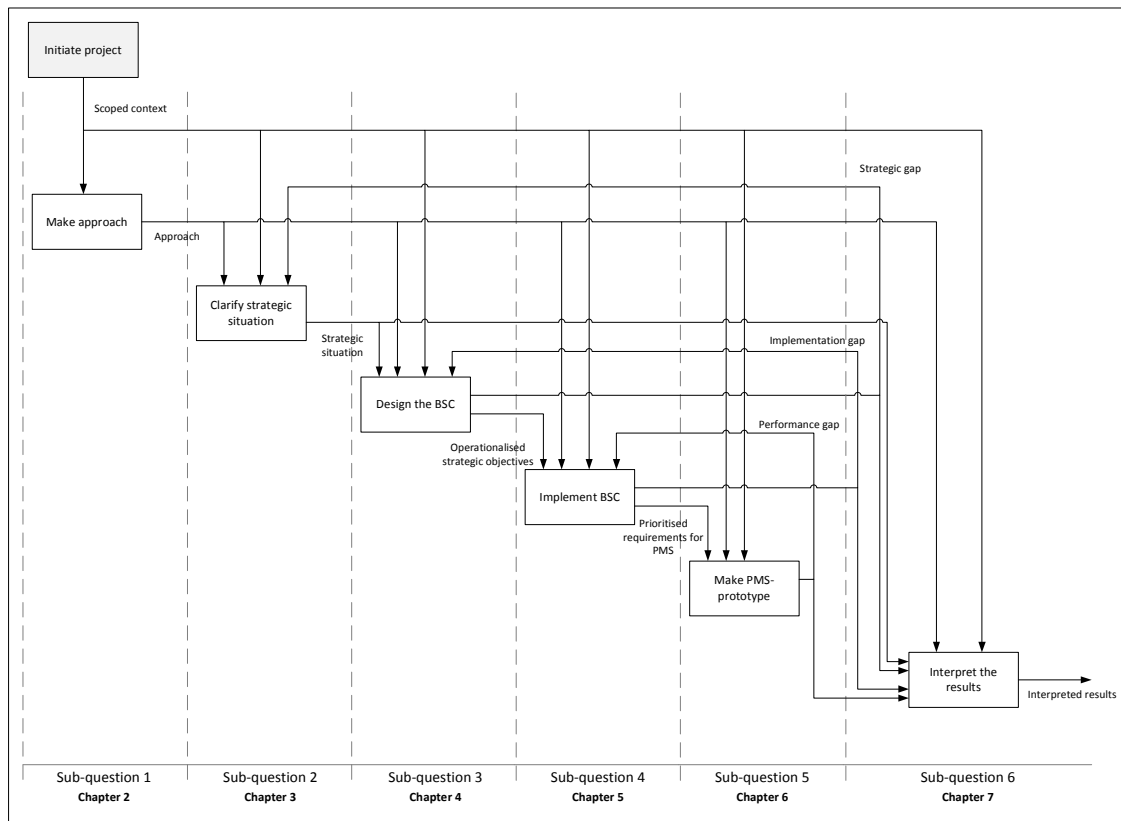


Figure 1-4: Project overview

1.5 Report outline

In this chapter the thesis was introduced. The outline for the remainder of the report is depicted in Figure 1-5 and consists of the following:

- A proposed approach for formulating, designing and testing the BSC within the scope. This approach results from a framework drawn from desk research and is presented in chapter 2.

- An analysis of VNT's current state. The internal and external environment are analysed for strengths, weaknesses, opportunities and threats based on desk research, data-analysis and interviews. This includes business process mapping, market analysis and stakeholders analysis. This analysis is described in chapter 3.
- The design of a Balanced Scorecard for VNT. The strategy is formulated based on the previous analysis and the theoretic frame and translated to the operations by means of a strategy map. This synthesis is described in chapter 4.
- The Implementation-plan of the designed Balanced Scorecard. Priorities are assigned to the objectives from the strategy map based on a bottleneck analysis. This plan includes the specification of performance measures that support implementation. This synthesis is described in chapter 5.
- The design, development and evaluation of the prototype PMS. A functional analysis is performed to a demarcation of the implementation plan. Requirements for operational performance of the prototype are identified from interviews and storyboards. The requirements are tested by means of user-tests with mock-ups and prototyping. Interviews and observation are used to evaluate the design qualitatively. The synthesis and results are presented in chapter 6.
- The results of the designed BSC are interpreted from a practical and scientific perspective to discuss the utility of the proposed approach. The discussion is presented in chapter 7.
- Conclusions and recommendations drawn from the research. These are stated in chapter 8.
- A reflection of the research project is presented in chapter 9.
- An overview of the references is given in chapter 10 (not depicted).

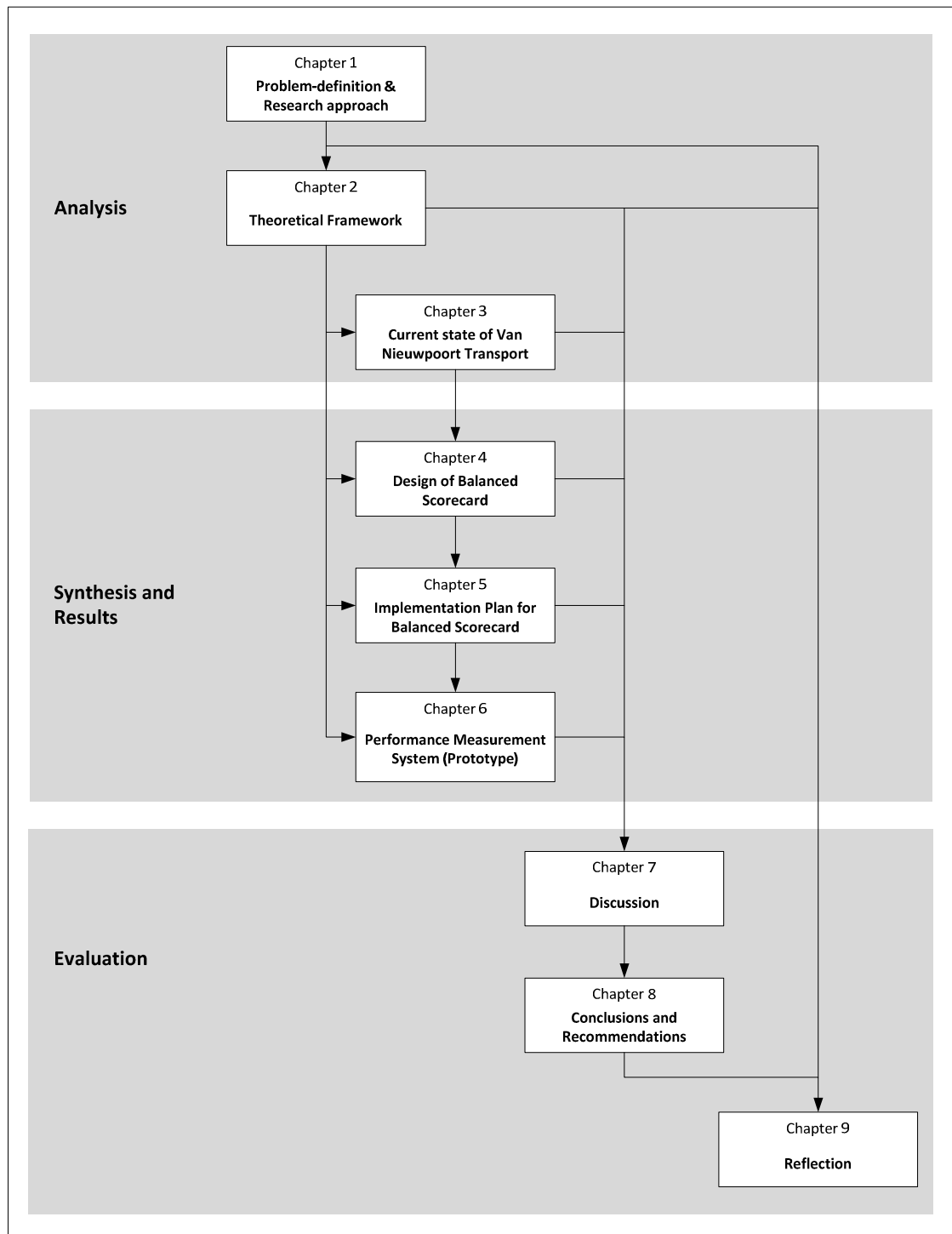


Figure 1-5: Outline of the report

2 Selection and adaption of frameworks for VNT

In the previous chapter it has become clear that the aim of the project is to propose a Balance Scorecard to Van Nieuwpoort Transport that enables logistics optimisation. Currently no BSC-approach exists that fits the context of VNT. Therefore the objective of this chapter is to present a suitable approach that also answers the first sub-question, which is:

What BSC-approach can be used to propose a BSC for logistics optimisation in a context where leadership commitment and staff-resources are scarce?

While this context has four important aspects: ambiguous leadership commitment, scarce staff-resources, lacking performance drivers, and a traditional organisational culture. Only the first two are the distinguishing criteria because conventional BSC-approaches have addressed the latter two. Nevertheless, the latter two do increase complexity.

The major challenge is evaluation of the proposal. The proposed BSC is evaluated by the proof of concept of a PMS-prototype that supports the implementation plan of this proposal.

In order to design the approach a combination of interviews and desk-research is applied. Desk-research is applied to find solutions to reduce the requirements of leadership commitment and staff-resources. The interviews are used to make design-decisions.

The outline of this chapter is as follows: identified design-decisions by adopting a general BSC-approach, design-decisions for VNT.

2.1 Defining the BSC-frame for VNT

The BSC-frame for VNT is defined by identifying available approaches by desk-research. From these approaches a BSC-approach for VNT is adapted that suits its context.

2.1.1 Addressing the distinguished situational requirements

In this section describes how the distinguished situational requirements can be addressed by adapting the general BSC-approach.

Figure 2-1 shows the relations between human capital, information capital and organisational capital. Scarce staff-resources (ie human capital) increase the difficulty of shaping the culture, leading the change agenda, aligning the workforce and stimulating teamwork (Kaplan & Norton, 2004a; 2004b). Poor information management (ie information capital) impede alignment and information sharing. Both these factors complement each other to increase organisational capital and thereby strategy execution.

The general BSC-approach is depicted in Figure 2-2. This is a closed loop system, which means that the process-steps are reiterated with each consecutive cycle. It resembles a

PDCA-cycle. Since the scope is a proposed BSC, the general BSC-approach is delineated to process-steps 1 and 2.

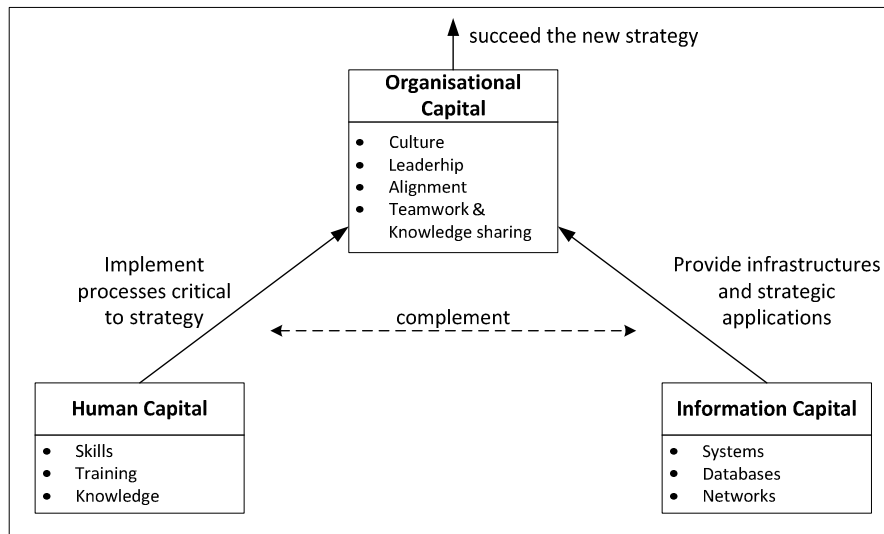


Figure 2-1: Learning and Growth perspective as foundation for strategy execution (Kaplan & Norton, 2004b)

Addressing ambiguous leadership commitment

Ambiguous leadership commitment is addressed by postponing strategic objectives that lack leadership commitment. The strategic bottlenecks are internalised into strategic learning. Therefore one (or more) additional iteration(s) of the implementation cycle is required. This also postpones some requirements for staff-resources. This modified BSC is named BSC-prospect.

The difference between a *conventional BSC* and *BSC-prospect* is depicted by a spiral-model of their implementation process in Figure 2-3. Since *BSC-prospect* has limited leadership commitment its starting-point is lower than *BSC-conv*. The first cycle of *BSC-prospect* finishes with a commitment challenge (ie. challenge strategic assumptions). If successful, the succeeding iteration of *BSC-prospect* has leadership commitment. Should the challenge be unsuccessful, the BSC is stopped, hence this iteration is dotted. In this diagram the end of the iterated *BSC-prospect* cycle coincides with that of *BSC-conv* because progress of *BSC-prospect* is unknown. If *BSC-conv* and *BSC-prospect* have the same scope then *BSC-prospect* has greater progress after its iteration because the organisation has gained more experience in strategy execution.

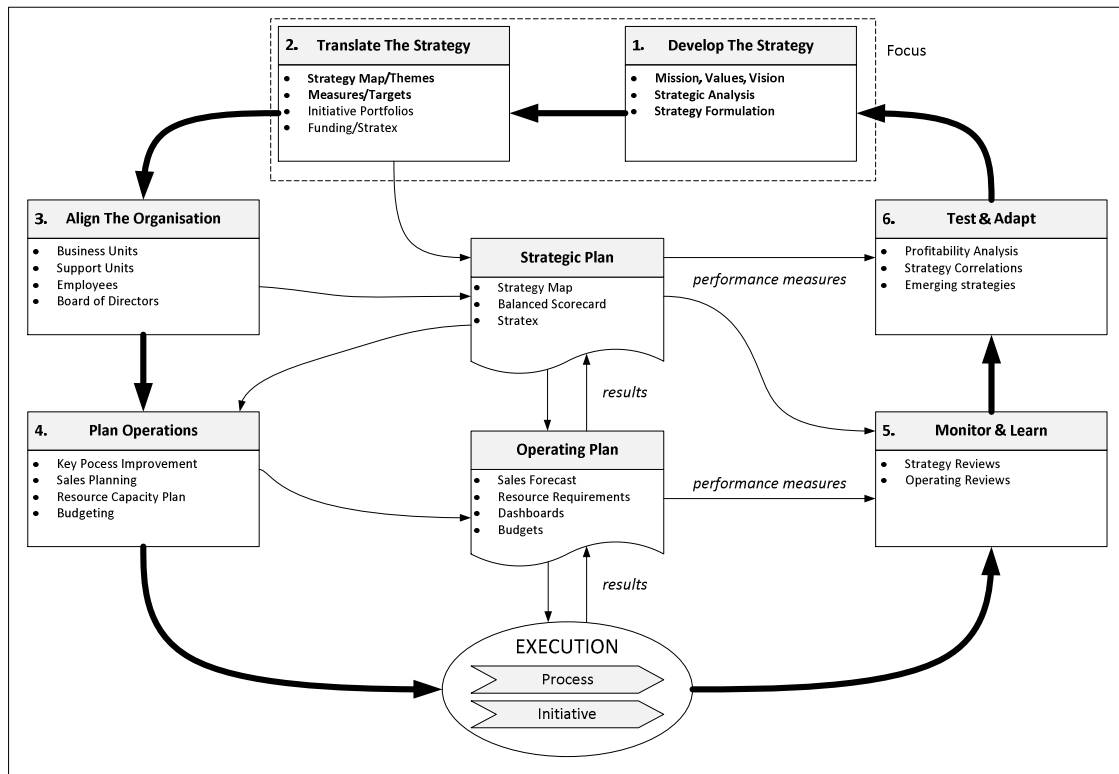


Figure 2-2: Delineated closed loop BSC-approach for VNT

Addressing scarce staff-resources

Scarce staff-resources are addressed by delineating the scope of the validation process and by applying a *triangulation of sources*. The first is realised by validating the proposed BSC with a proof of concept. This proof of concept consists of a proposed implementation plan and a PMS-prototype. The latter includes interviews, desk research, data analysis, observation. Moreover the BSC can be applied without explicit testing of causal relations (Kaplan, Norton, 2004), which reduces staff-resources. However this does threaten postponement during translation of the BSC (see 1.1.2).

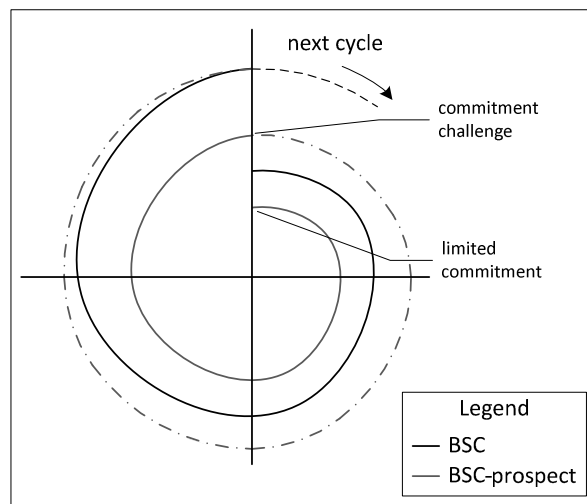


Figure 2-3: Spiral diagram of implementation BSC and BSC-prospect

2.1.2 Available BSC-approaches

Three BSC-approaches were identified: (i) the conventional BSC-approach (Kaplan, 2010), (ii) an adapted version tailored to the Greek business environment that emphasizes

human resource involvement (Papalexandris, 2004), (iii) an adapted version tailored to SME (Fernandes, 2006). An overview of these approaches compared to the PDCA-cycle (Deming, 1986) is presented in Table 2-1.

From Table 2-1 it is derived that essentially all three BSC-approaches have similar process-steps at the top-level. Although the instruments vary, Fernandes' approach seems to be inspired by Papalexandris based on the deliverables. However compared to Kaplan (2010) both specify more process-steps. All three approaches implement a PMS during the "Do"-step of the PDCA-cycle, and have a "Check"-phase. The adapt-step is not defined as a specific step for Papalexandris and Fernandes. Nonetheless adjusting target settings is included by Papalexandris.

Table 2-1: Identified BSC-approaches compared to PDCA-cycle

PDCA	Kaplan (2010)	Papalexandris (2004)	Fernandes (2006)
Plan	Develop the Strategy	Project preparation	Project initiation
		Clarification of vision and identification of strategy	Strategy Clarification
	Translate the strategy	Identification & prioritisation of strategic objectives	Strategy analysis
	Align the organisation	Selection of measures	KPI analysis
		Target setting and scheduling	Measurement analysis
Plan operations	Development of strategic initiatives	Strategy initiation	
Do	Execution of process initiatives	Formulation of implementation plan ¹	Implementation plan
Check	Monitor and Learn	(periodic review) ¹	Formal review
Act/Adapt	Test and Adapt	(adjust target setting)	

1) Periodic review was part of the implementation plan

Table 2-2 presents an overview of the contextual aspects where these approaches were applied. If these aspects are assumed complete then the instruments used by Kaplan (1996) and Papalexandris (2004) should be interchangeable for certain desirables, while interchangeability with Fernandes (2006) is more conditional.

2.1.3 Adapted BSC-approach for VNT

The general approach to design a BSC consists of the steps "Develop the Strategy" and "Translate the Strategy" as shown in Figure 2-2. These steps will be adapted to make the requirements for leadership-commitment and staff-resources less stringent.

Strategic analysis (or organic approach)

Two methods for strategic clarification were identified: strategic analysis and an organic approach (Fernandes, 2006). The first includes an analysis of the internal and external

context and a SWOT which can be used to challenge the strategic assumptions. The organic approach allows for a less rigid approach.

Table 2-2: contextual aspects of identified BSC-approaches

	Kaplan (1996)	Papalexandris (2004)	Fernandes (2006)
Organisation	LO	LO	SME
Leadership commitment	Yes	Yes	Yes
Staff-resources	Yes	Yes	No
Maturity		Iso9000	Iso9000

LO: Large Organisation; SME: Small and Midsize Enterprises

In this case the organic approach is not suitable because of combined factors of ambiguous leadership commitment, scarce staff-resources and little organisational knowledge of determinants challenges the effectiveness and efficiency of this step. Strategic analysis does not have these challenges and can be conducted with little ambiguity. Therefore Strategic analysis is chosen as method.

The scope of strategic analysis is determined by the type of BSC. For instance the BSC-III should analyse the four foundations (ie, leadership commitment, alignment, culture, teamwork) of the BSC (Kaplan, Norton, 2001). Both BSC-II and BSC-III are considered. While issues can be identified for all four foundation aspects, BSC-II is preferred for two reasons: a) leadership commitment is of primary concern, b) analysing all foundations requires considerably more staff-resources.

A SWOT requires an analysis of the external –and internal context. The logistics framework (2.2) is applied to the scope (1.2) to delineate the operating environment. To this end the external environment is delineated to a market analysis and a supply chain analysis. The internal context is delineated by demarcating the internal supply chain to the relevant business operations, information structure and stakeholders. The stakeholders are important for implementation. In order to reduce staff-resources during this phase the logistics frame is applied.

Vision

The vision demarcates the strategy and helps to prioritise strategic objectives.

Formulation of the strategy

This phase is determined by the type of BSC. For instance the BSC-II internalises strategic learning, which challenges the strategic assumptions. Since BSC-II was chosen a strategic learning element should be part of the formulated strategy.

In order to formulate the two-part strategy the logistics framework is applied.

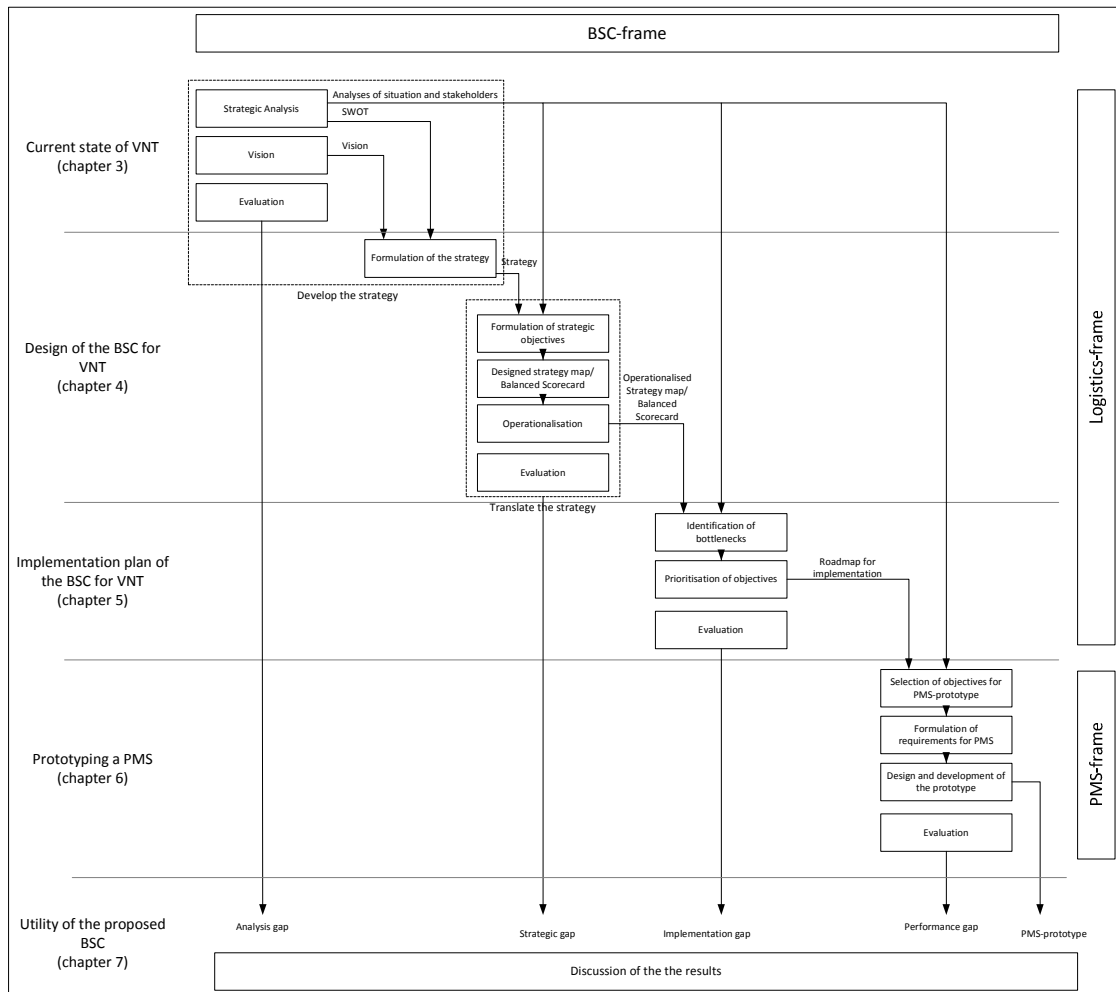


Figure 2-4: Adapted BSC-approach for VNT

Table 2-3: Differences between BSC-II and BSC-III for certain aspects

Aspect	BSC-II	BSC-III
Leadership-commitment	Challenge strategic assumptions	Control organizational culture
Staff-resources	Focus on alignment	Focus on organizational change

Sources: Kaplan & Norton, 1996; Kaplan & Norton, 2001

Formulation of the strategic objectives

The strategic objectives are formulated to execute the formulated strategy. These objectives are formulated by applying the logistics framework to the analysis of the current situation.

Design of the strategy map (or Balance scorecard)

Two types of visualisation of the Balanced Scorecard are identified: scorecard-type and map-type (Morisawa, 2001). Its selection depends on the type of problems that an organisation faces. The map-type is more appropriate for problems concerning focussing of strategies and the clarification of links (Morisawa, 2001). The scorecard-

type is suitable to emphasize performance measurement and brief reporting of results (Morisawa, 2001).

In this case the strategy map is preferred, because of the organisational knowledge concerning strategy implementation. It should be noted that for the design of the PMS-prototype a scorecard-type is suitable.

Operationalization of the strategy map/Balanced Scorecard

The strategy map is operationalised by applying the logistics frame to the analysis of the current situation.

Identification of bottlenecks

Given the company background bottlenecks could originate from: culture, teamwork, alignment and leadership. To minimize staff-resources two types of bottlenecks are analysed: organisational by means of stakeholders analysis, and information/knowledge by means of interviews.

Prioritisation

Design decision demarcated to prioritisation of strategy map based on bottleneck analysis of stakeholders. Deliverable is a roadmap for implementation.

Three identified factors for prioritisation are: bottlenecks (organisational, knowledge/information), expected gains, and solution-type. Two solution-types are considered: business process reengineering (BPR) and continuous improvement (CI).

Assumptions:

- (i) BRP and CI are executed consecutively (less staff-resources).
- (ii) CI provides wins more quickly than BRP (less organisational complexity).
- (iii) Therefore the logical frame for the roadmap is CI, BPR, CI.

2.2 Defining the logistics knowledge frame for VNT

Logistics is involved with many of the business operations across the supply chain, but cannot control all of them, for instance the product development process or the customers (Cooper, et al, 1997). Therefore logistics by itself leads to sub-optimisation. In order to overcome sub-optimisation organisations should align all aspects of business operations across the supply chain (Cooper, et al, 1997). Figure 1-1 depicts these eight business processes across the supply chain and across six functional silos within an echelon.

This sub-section aims to address this sub-optimisation by focussing on customer needs from a supply chain perspective rather than logistics itself. Therefore alignment of business processes and supply chain strategies are addressed.

2.2.1 Alignment of business processes

Two types of alignment are identified: functional and process. Functional alignment is accomplished by service agreements (Kaplan & Norton, 2001b). Process alignment is accomplished by focussing on the output of the (integrated) process.

A service agreement is a contract on price (or cost) and the selection of services to be provided including their functionality, quality level, response time and costs (Kaplan & Norton, 2001b).

The major downside to functional managed organisations is the focus on internal efficiencies (Towill et al., 2002). Functional specialisation naturally distributes knowledge of all value adding activities so that no one has complete control (Fawcett, 1995). This leads to sub-optimisation across the supply chain (Towill et al., 2002).

Process alignment requires the tear down of inter- and intra-organisational barriers to allow information to flow more freely. However this either has to be enforced or requires trust. Identified means for inter- and intra-organisational alignment are presented in Table 2-4. Cross-functional teams can be used to effectively tear down barriers. Figure 2-5 shows the three steps from a functional baseline toward supply chain integration by process integration.

Table 2-4: means to process alignment

	Enforced	Teamwork
Inter-organisational	<ul style="list-style-type: none"> • Forward/Backward integration • Market-power 	<ul style="list-style-type: none"> • Co-operation • Virtual organisation
Intra-organisational	<ul style="list-style-type: none"> • Top-down 	<ul style="list-style-type: none"> • Bottom-up

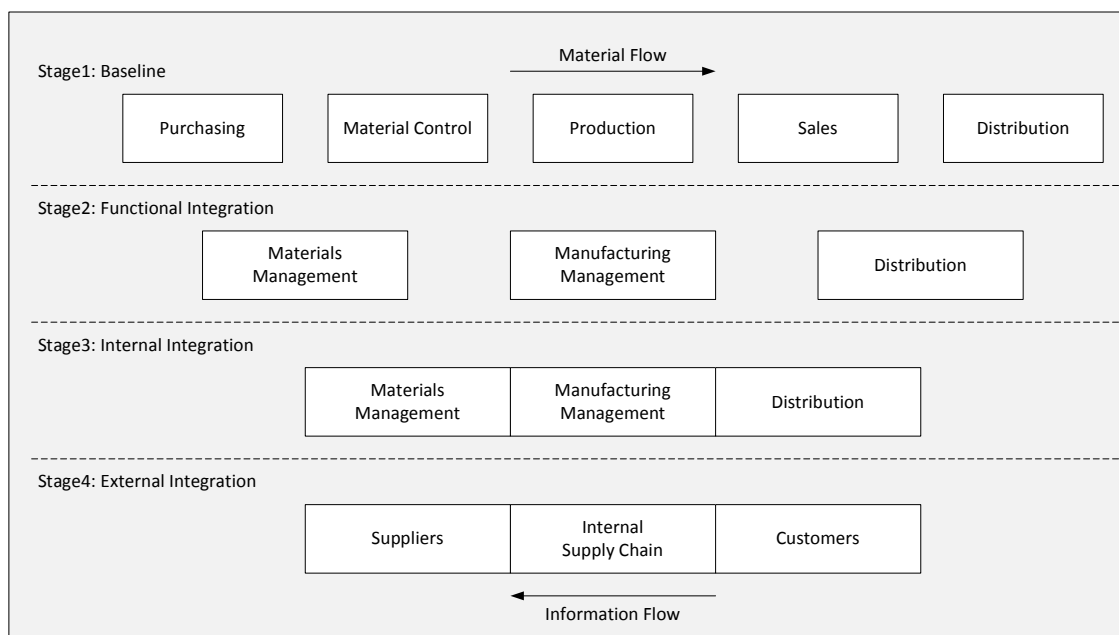


Figure 2-5: Achieving an integrated supply chain, adapted from Stevens (1989, p.7, fig. 5)

2.2.2 Supply chain strategies

The need for a logistics strategy is explained by means of a fictive example. Optimisation of cost-effectiveness typically involves multiple variables (performance drivers). For clarity it is discussed using a fictive 2-dimensional coordinate system with two variables.

In comparison, three variables would have a five facet asymptotic plane. Figure 2-6 shows the relationship between two variables: *cost* and *quality*. the solution-space is demarcated by three asymptotes. Both variables have their constraints (minimal quality and maximum cost). Furthermore, by optimising cost-effectiveness solutions are only viable when cost-effectiveness is improved. This third asymptote is drawn on the assumption that *cost* and *quality* are marginally proportional.

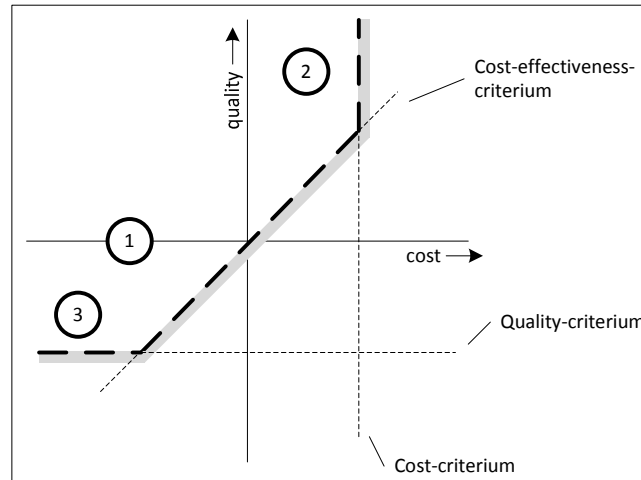


Figure 2-6: Optimisation of cost-effectiveness in a 2-dimensional system

Supply chain strategies are devised to accommodate a market-need; in particular for the end-user. Its success is the suitability to the market-winner (Mason-Jones et al, 2000). For the market-winners *costs* and *service level* the respective strategies are the seemingly mutual exclusive paradigms lean and agile respectively (Mason-Jones et al, 2000). However the market-qualifiers may require a hybrid strategy instead (Towill ea, 2002). This sub-section describes five types of logistics strategies: lean, agile and hybrids. The three viable hybrid strategies were identified based on the space-time commonalities (Towill ea, 2002). Figure 2-7 depicts these five strategies in a space-time matrix and are described below:

Leanness (same space, same time) focusses on efficiency. Leanness is about “... *developing a value stream to eliminate all waste, including time, and to ensure a level schedule*” (Naylor et al, 1999, p.108).

Agility (same space, same time) focusses on being nimble (ie high level of flexibility and responsiveness). Agility is about “... *using market knowledge and a virtual cooperation to exploit profitable opportunities in a*

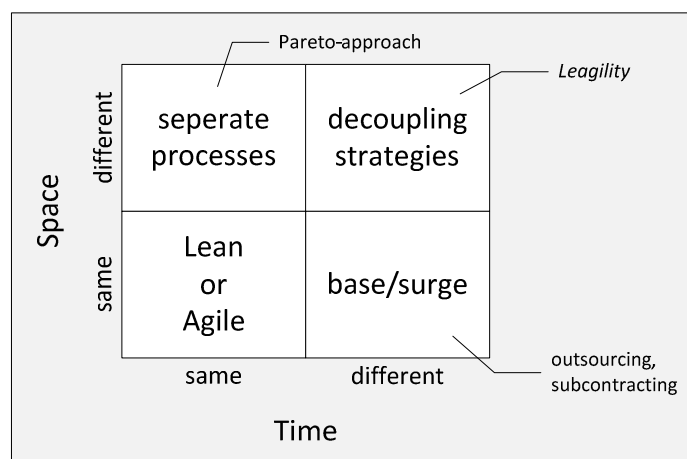


Figure 2-7: logistics strategies in the Time/Space Matrix, adapted from Towill ea, 2002, p.303, fig. 2.

volatile market place" (Naylor et al, 1999, p.108). Thus agility is more about supply chain reconfiguration than solely manufacturing flexibility or responsiveness.

Separate processes (different space, same time) recognizes that some products/services tend to be more predictive than others and thus provide the opportunity to operate processes with either a focus on lean or agile in parallel (Towill et al, 2002). Its aim is to create a Pareto-optimum.

Decoupling strategies (different space, different time) focuses on postponement by maximising leanness up to *the customer order decoupling point* (CODP) and focussing on agility afterwards (Towill et al, 2002).

Base/surge (same space, different time) assumes that a proportion of total expected demand can be predicted with a high degree of certainty (ie the base) for relative risk-free capacity-planning and that capacity for the remainder (ie surges) should be made available much closer to the actual time of delivery (Towill et al, 2002).

2.2.3 Instruments

The following instruments were selected for analysis of the current situation. These were selected in order to minimize strategic resources.

Five market-forces diagram

This qualitative method assesses the company's market position by analysing five forces: customer power, supplier power, industry rivalry, threat of substitutes and threat of new entrants.

This method is used to identify external stakeholders and customer needs.

Supply chain mapping

Supply chain mapping captures the business processes from upstream raw materials to downstream the end-users.

This method is used to identify external stakeholders and the customer order decoupling point.

SADT-diagram

This instrument describes systems as a hierarchy of its functions.

This method is used to map VNT's internal logistics organisation.

Data-analysis of quality of information

Assessment of the quality of information is relevant to the optimisation of the logistics strategy.

Continuous Improvement (CI)

This method is used as an implementation method for implementing strategic initiatives.

Business process reengineering (BPR)

This method is used as an implementation method for implementing strategic initiatives.

2.3 Defining the PMS-framework for VNT

In order to design the PMS the context of the PMS has to be defined. From the theoretic frames three major factors in the context are derived that determine its operational usefulness: (i) BSC implementation plan, (ii) users and owners, and (iii) data-sources. Moreover the aspect of maintenance during the operational phase of the system's life cycle is affected in terms of maintenance and redesign. The relations between these contextual factors are depicted in Figure 2-8

BSC is implemented by assigning owners to metrics and meeting targets (2.4.1). Since a strategy is translated to the business operations from four perspectives multiple owners of targets are to be expected. Consequently multiple users of the PMS should be expected. From the Logistics framework it is derived that performance targets should require modification as a result of progress through CI and BPR. Moreover the focus on business processes of the supply chain (figure 2-2) may shift as a result of strategic learning, which may require other metrics and data-sources. Furthermore, data-sources may migrate or have revisions, which might threaten operational performance of the PMS (ie. compatibility, accessibility).

The requirement for staff-resources relates to the number of users & owners as well as data-sources. These can be reduced by demarcating the BSC-implementation plan. Which implies the necessity of future maintenance (ie modified targets) and redesign (ie change of metrics) and thus changing requirements for users and data-sources.

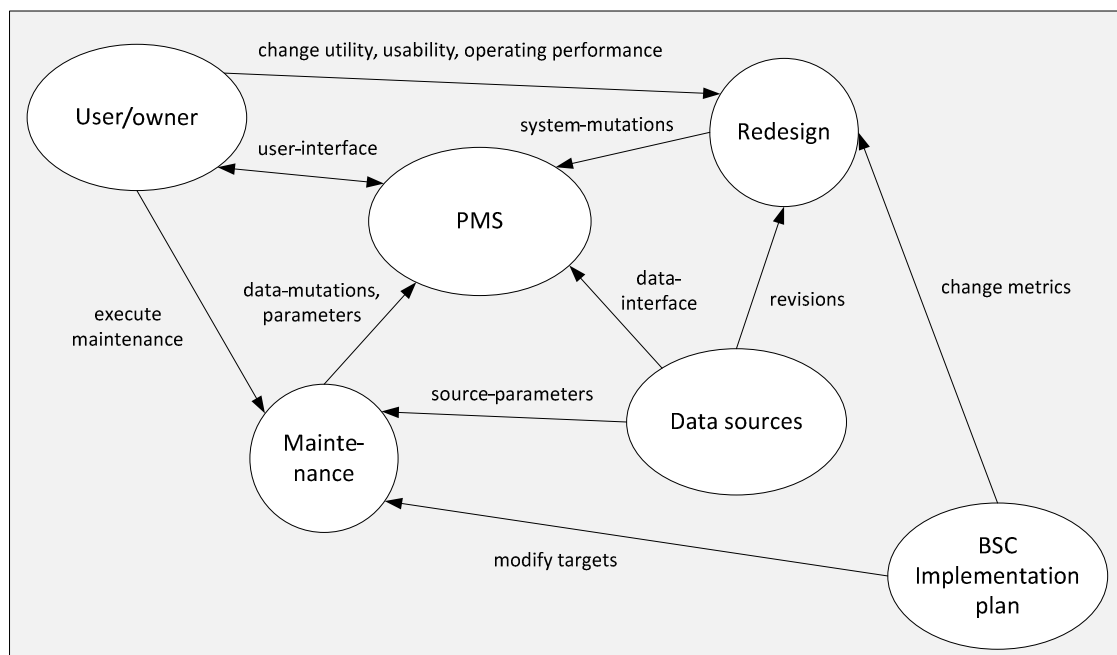


Figure 2-8 Identified relations in PMS-context for proposed BSC

However, PMS-redesign is identified as a scientific issue (Neely, et al, 1995). Since this project uses the PMS-prototype as a means to evaluate the proposed BSC, this issue is less relevant. Therefore this issue is reduced by requiring that PMS has a modular

systems architecture. Consequently modular design is applied as a method for the PMS-prototype. The PMS is developed by applying the spiral model, which is a widely used method for software development.

2.4 Evaluate the results

By applying the four previously described steps of the approach, the scope has been consecutively narrowed. Since the BSC is a holistic approach, assessment to what extent each step contributes to the whole is both practical and scientifically needed to evaluate the suitability of the proposed approach.

Since the BSC-design is limited to a proposal, the design is evaluated by means of prototyping. In order to minimize the risk of providing an ad hoc solution each consecutive step is evaluated qualitatively to the previous step, and the test-results of the prototype are evaluated to the proposed BSC. This qualitative evaluation consists of assessment by VNT-management and user-assessment for the prototype.

2.5 Sub-conclusions 2

The following conclusions are made in this chapter:

- The chosen type of BSC addresses the requirement for leadership commitment.
- The frameworks for Logistics and PMS-design reduce the requirements for leadership commitment and staff-resources.
- The formulated approach for VNT addresses the contextual limitations to leadership commitment and staff-resources. However, the demarcation of scope has limited the means to evaluate this approach.

3 Current state of Van Nieuwpoort Transport (VNT)

In this chapter the strategic analysis of VNT is presented. The objective is to specify the current situation at VNT. The results from this analysis will be used to translate the strategy in chapter 4.

In order to specify the current situation a strategic analysis is performed. This analysis consists of the analysis of the external –and internal context and a SWOT-analysis, as specified in paragraph 2.4.

The chapter-outline is as follows: analysis of the external context, internal context, and stakeholders, SWOT-analysis, evaluation and sub-conclusions.

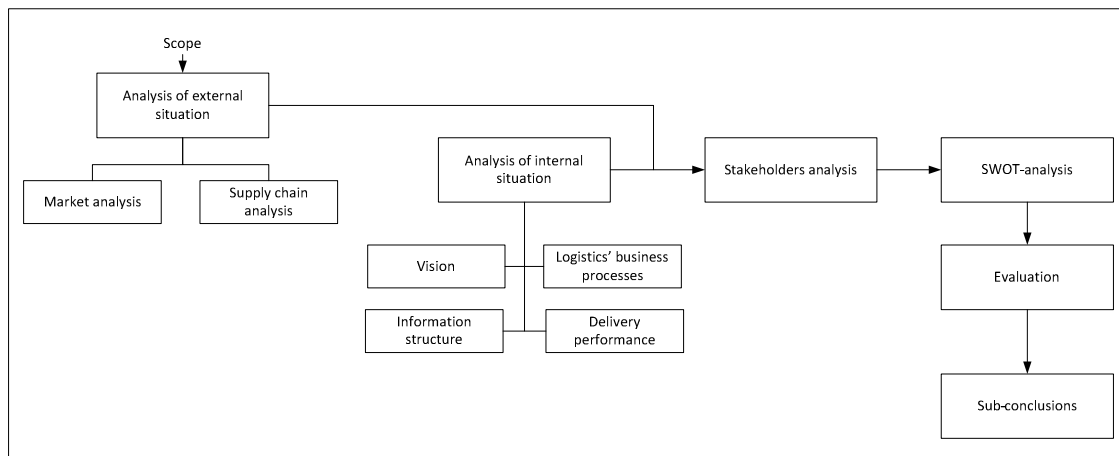


Figure 3-1: outline chapter 3

3.1 Analysis of the external context

The analysis of the external context consists of a market-analysis and a supply chain analysis.

3.1.1 Market for RMC-products

The market was analysed by applying the five forces diagram (Porter, 1979). This qualitative method assesses the company's market position by analysing five forces: customer power, supplier power, industry rivalry, threat of substitutes and threat of new entrants.

Figure 3-2 presents an overview of the joint market-position of the RMC-manufacturers BTM, GBC and BCW.

- **Supplier power** is identified based on the availability of suppliers and recent trends in supplier behaviour. In the Netherlands the suppliers of materials for RMC-products are limited. Cement is monopolized by the ENCI (Heidelberg). There are a few suppliers of Sand and Grit. Some additives are sourced internationally. Water is sourced locally.
- **Customer power** is identified based on the market-drivers. Customers vary from large construction companies with multiple high volume projects to incidental small turnover

clients and everything in between. On this scale customers value price and availability differently, whereas structural customers value availability higher than incidental customers. Consequently the market-winner depends on the type of customer.

The customer's attitude is rather traditional. Customers seem reluctant to adapt to new technologies (e.g. innovative materials that reduce seasonal influences). Consequently it may be difficult to improve the customer's "way of working" to the benefit of the supplier.

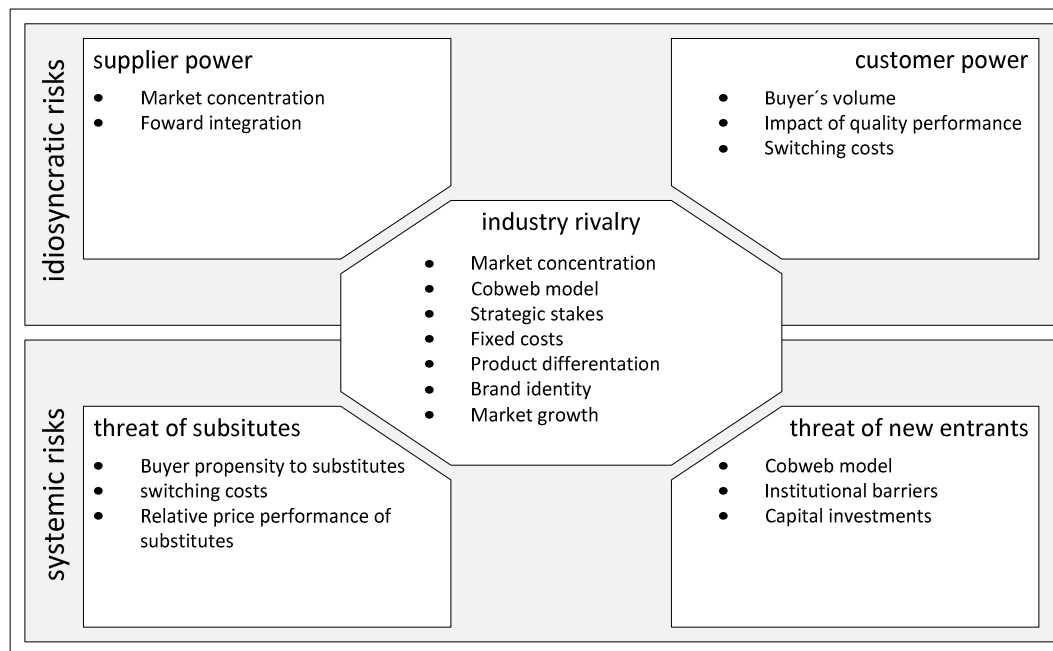


Figure 3-2: Five forces diagram for BTM, GBC, BCW

- **Threat of substitutes.** Site-batching, prefab, alternatives to licensed products. Substitute products are developed for some product-segments within the industry. Typical examples for top-floors include Nextfloor! and Gyvlon for the traditional sand-cement-floor. These substitutes are typically protected by patents and require licencing (when available). Also substitute-products exist for processing under low temperatures.
- **Industry rivalry** is derived from a characterisation by the company and thus a perception. Competition is high due to overcapacity in the market. Overcapacity is hard to avoid due to the cyclical and seasonal nature of the construction industry. The major market-players are Mebin (Heidelberg), Dyckerhoff Basal (Buzzi Unicern Group), Cementbouw (CRH) and Van Nieuwpoort (Van Nieuwpoort Groep).
- **Threat of new entrants** is derived from the four other powers including regulatory constraints.

The main market-differentiators are price and availability. Product-quality is a market-qualifier because the bulk of the market (i.e. large customers) requires certified products. The manufacturers of certified products have organized themselves in the

VOBN. This branch-organisation regulates quality of certified products. All major market-players produce certified products.

These main market-differentiators relate directly to VNT's objective to reduce transportation costs while maintaining timely delivery.

The combination of customer-power and the traditional attitude within the industry will make it difficult to reduce peak-demand.

The major market-players seem to be created by forward-integration of suppliers of materials (e.g. cement, aggregates). Consequently the strategic interest of these parent companies seems important for future market-development.

Table 3-1: Customer-types

	Customer type A	Customer type B
Market-winner	Price	Availability
Market-qualifiers	Availability, Quality	Price, Quality

3.1.2 Supply chain analysis

The supply chain of BTM, GBC and BCW for RMC-products is mapped in Figure 3-3. This map is constructed by applying the SCOR-mapping-method (Supply Chain Council, 2001;2008). The organisational map of VNG has been used as a source. Second-tier suppliers and the end-customer are omitted in this schematic.

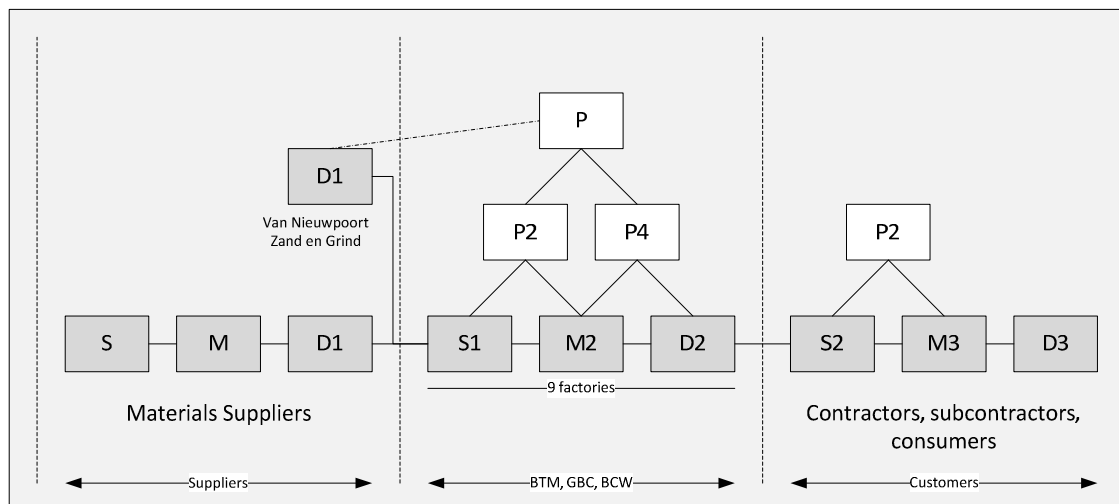


Figure 3-3: Supply chain diagram for BTM, GBC and BCW with first-tier suppliers -and customers.

Suppliers deliver the materials (by barge or truck)¹ to the factories, where these are stored into buffers (D1 in Figure 3-3). Suppliers are categorized based on material-group: cement, aggregates, additives and water. There are signs of vertical integration because

¹ Except for water (sourced locally)

some main aggregates (sand and grind) and some additives are sourced within the parent-company (VNG) (S1 in Figure 3-3).

The **manufacturers** - BTM, GBC and BCW - mix the materials into RMC-products per specification (M2 in Figure 3-3) and deliver the product to the customer (unless picked-up) on time and on spec (D2 in Figure 3-3). VNT provides the delivery-service.

Customers source their orders at the manufacturers based on market-conditions and their way of working (S2 in Figure 3-3).

Demarcation of the supply chain

The **Customer-order decoupling point** (CODP) is at the manufacturers at M2. Upstream the processes are oriented towards stock and downstream towards customer demand. The upstream component is planned by P2 (plan source) and the downstream component is planned by P4 (plan deliver). P2 and P4 are controlled by P1. Consequently VNT's processes are about D2, P4 and P1.

These demarcated processes (D2, P4 and P1) are part of the internal supply chain of BTM, GBC and BCW. This internal supply chain has been mapped with SADT-diagrams in Appendix B. The processes were identified based on observations and interviews. The processes were identified on the three organisational levels (strategic, tactical and operational), which are described in the corresponding paragraphs in the appendix.

3.2 Analysis of the internal context

The analysis of the internal context consists of a triangulation by applying the logistics framework in conjunction with interviews. Observation and data-analysis are used for fact-finding.

First the vision is stated (2.4.1) and afterwards the internal supply chain is delineated to triangulate the distribution process.

3.2.1 Vision

BTM's vision is to become a contender on costs –and service leadership, while being a good employer, a good neighbour and having an eye for sustainability.

3.2.2 Delineation of internal supply chain

The internal supply chain is delineated based on the customer order decoupling point (CODP). The buffers at the COPD allow for a decoupling-strategy (2.2.2). The internal supply chain at the factories has a clear separation of business processes: material procurement is isolated from distribution.

3.2.3 Distribution processes for RMC-products

The distribution processes consist of sales, manufacturing and transport. These are described by a process map specifying the three hierarchical processes.

Strategic processes

On the strategic level strategies are made for the functional departments based on the corporate strategies and changes in the business environment. These strategies are supported by allocation of resources. Typical allocations include acquisition and disposal of factories and transit-mixers and personnel-budgets. Strategic progress is measured primarily by financial reports and projected turnover. In case of performance gaps strategies and resource allocations are adapted accordingly. The strategic processes are mapped in Appendix B.

Tactical processes

The tactical processes are presented in Appendix B. The decomposition of the tactical process is twofold. Firstly, derived from interviews the tactical process has a hierarchy between the more operational tactical processes and the formulation and implementation of the tactics that control them (figure B-3). Secondly, the formulation and implementation of tactics reside in their functional silo's (figure B-4).

Of the more operational tactical processes only "make deliveryplan" (figure B-5) fits the scope.

On the tactical level the strategies for the functional departments are translated to tactics. These tactics are supported by allocation of resources. Typical allocations include hiring and dismissal of personnel, personnel-training, selection of service-providers, ICT-support, maintenance-budgets. Tactical progress is measured primarily by financial reports and projected turnover. In case of performance gaps tactics and resource allocations are adapted accordingly.

Operational processes

On the operational level the functional departments perform their tasks. The main operational processes are: *make sales agreement, plan resources, manufacture and deliver products, collect revenues from customers, and perform maintenance and repair*. These are mapped in Appendix B. The time-scope of these processes varies greatly.

VNT is has (partial) responsibilities for the processes *plan resources, manufacture and deliver products, and perform maintenance and repair*.

3.2.4 Information structure of distribution processes

The quality and readiness of information is analysed on the three organisational levels concerning VNT. The scope is limited to the relevant processes demarcated in the process-maps in paragraph 2.3. Consequently data for e.g. compliance purposes (e.g. CBS) is beyond the scope.

The relevant streams of information are identified by conducting interviews on the three hierarchical levels. The identified streams are delineated and the quality and readiness of the resulting streams are measured.

VNT uses three information systems: Axapta as ERP, a TMS for planning and scheduling processes and Fleetcontrol for realtime-tracking of transit-mixers. The interfaces of these systems are discussed in Appendix C.

Operational information streams

On the operational level the processes are grouped by the time-perspective: prior to the delivery-date, an on the delivery-date (see 2.3). This makes sense because the first relates to planning activities and the second to scheduling activities.

Prior to the delivery-date

The delineated process (2.3) prior to the delivery-date is “Process customer-orders” (A3.3.2). The outputs of this process depend on the following information:

Table 3-2: Information-streams prior to the delivery-date

Aspect	ICT	Responsibility	parties
Quality of order-specification	Axapta, TMS	Factory-planner	Customer
Responsiveness of order-specification	Axapta, TMS	Factory-planner	Customer
Quality of financial status customer	Axapta	Front-office	Factory-planner, Customer
Responsiveness of financial status customer	Axapta	Front-office	Factory-planner, Customer

On the delivery-date

The three delineated processes (2.3) on the delivery-date are: “Make and load product” (A3.2.2), “Perform scheduling operations” (A3.3.3) and “Deliver products” (A3.3.4). These

Table 3-3

Aspect	ICT	Responsibility	parties
Quality of order-specification	TMS	Factory-planner	Customer
Responsiveness of order-specification	TMS	Factory-planner	Customer
Quality of resource status customer	TMS, Fleetcontrol	Front-office	Customer
Responsiveness of resource status	TMS, Fleetcontrol	Front-office	Customer

Tactical information streams

On the tactical level financial results are aggregated to comply with company policies.

Strategic information streams

Sales-forecasts are used for resource acquisition, maintenance planning and personnel budgets.

The order-taking process

Readiness depends on accuracy and completeness provided by the customer, and on the willingness of the factory-operator to enter the order into the ERP.

Transport Management System (TMS)

The TMS has no performance measures for the quality and readiness of information it provides.

Management reports provided by the TMS are not used by VNT. Moreover, analysis shows that these have quality issues.

Analysis of the basic data recorded by the TMS shows that multiple errors contribute to poor data-quality. These include: input-errors by drivers, IT-errors in transit-mixers, input-errors by factory-operators, parameter-errors by central planner, communication-error between fleetcontrol and TMS.

Enterprise Resource Planning (ERP)

The ERP has no performance measures for altered orders.

3.2.5 Delivery performance

VNT's delivery performance can be defined in Quality of Service and the associated costs.

Costs

The costs of VNT's processes are reported in monthly management-report by BTM's financial department. The financial indicators used in these report do not translate to VNT's business processes.

Table 3-4: Asset management

Aspect	Process	Indicator	Quantified	Owner	Performance
Resource utilisation	Strategic	NA	No	VNT	NA
	Tactical	NA	No	VNT	NA
	Operational	NA	No	VNT	NA
Resource productivity	Strategic	Delivery costs	Yes	BTM	Poor
	T: delivery plan	Planned delivery-costs	Yes	VNT	NA
	Operational	NA	No	VNT	NA

T: tactical

Quality of Service

From a logistics perspective the quality of service (QOS) provided by VNT can be captured by the KPI order fulfilment. Table 3-5 provides a break-down of this KPI into its aspects including the relating installed performance measures to the processes where available.

Table 3-5: Order fulfilment

Aspect	Process	Indicator	Quantified	Owner	Performance
Order acceptance	O: order taking	Customer feedback	No	Sales	high
Order specification	O: order taking	NA	No	VNT	NA
Product quality	O: manufact.	Deviation from spec	Yes	BTM	good
Product quantity	O: manufact.	NA	No	BTM	NA
Punctuality	T: delivery plan	Resource demand	Yes	VNT	NA
	T: delivery plan	Resource availability	Yes	VNT	NA
	T: delivery plan	Planned delay	Yes	VNT	NA
	O: schedule	Scheduled delay	Yes	VNT	NA
	O: delivery	Customer feedback	No	Sales	good

S: strategic, T: tactical, O: operational

3.3 SWOT-analysis

In the supply chain overview it has become clear that VNT's delivery-process is on the customer-end of the CDP. Consequently agility is the logical logistic paradigm for VNT. Agility requires a higher focus on information quality and readiness than the lean paradigm.

However analysis of the distribution processes reveals that both the quality –and readiness of information are not measured. Despite there are some safeguards in the planning process by active inquiries by the central planner.

Some determinants are used on the tactical and operational level to optimize resources. The TMS provides an overview of the planned and achieved punctuality of deliveries and the utilization of loading points and transit-mixers. However these are not recorded.

Sales projections shared by the sales-department have little use for VNT, because VNT cannot translate these estimations to its weekly planning activities.

Feedback requested by the sales-department is informal and is focussed on customer-complaints and on customer-orders. No formal feedback-loop exists between P4.1 and P4.3.

Looking at its strategic and tactical processes from a resource-perspective VNT deploys a base and surge strategy. The base is formed by the Transit-mixers and drivers of VNT, while external resources are hired to safeguard service-level during surges.

Based on the analyses of the business and its environment the following strengths, weaknesses, opportunities and threats are identified for VNT. Figure 3-4 provides an overview.

Strengths	Weaknesses
-----------	------------

<ul style="list-style-type: none"> • High customer-valuation of distribution • Focus on order-acceptance (availability) • Centralized planning of external resources • In-house knowledge • Information systems 	<ul style="list-style-type: none"> • High distribution costs • Measurement of performance drivers • Decentral planning of internal resources • Knowledge management • Poor implementation of TMS • Functional silo's • Heterogeneous company culture • Crude cost-cutting • No customer segmentation
Opportunities	Threats
<ul style="list-style-type: none"> • Introduction of lean elements • Measure performance drivers • Centralization of planning activities • Organizational learning • Acceptance of TMS • Process orientation • Homogenization of company culture • Optimization of distribution costs • Customer segmentation 	<ul style="list-style-type: none"> • Competitiveness • Customer loyalty • Stakeholder commitment • Conservative sector culture

Figure 3-4: SWOT-overview

Strengths

- **High customer-valuation of distribution performance.** Customers value VNT's current distribution performance as high. This provides opportunities to optimize distribution costs.
- **Focus on order-acceptance (availability).**
- **Centralized planning of external resources.**
- **In-house knowledge.** Some operators on the factory-level develop better/best practices to improve their processes.
- **Information systems.** There are many information systems to support operational processes. These provide opportunities for organizational learning (data-mining). Examples are: ERP (Axapta), TMS, Fleetcontrol.

Weaknesses

- **High distribution costs.** According to BTM-management the distribution-costs are too high.
- **Measurement of performance drivers.** VNT has no KPI's installed for measuring the primary logistical performance-aspect.

- **Decentral planning of internal resources.** The local planning of internal resources leads to sub-optimal resource-utilization.
- **Knowledge management.** The absence of knowledge management concerning better/best practices among factories leads to sub-optimal productivity.
- **Poor implementation of TMS.** Data-quality of the TMS is not controlled and system-acceptance varies among operators.
- **Functional orientation.**
- **Heterogeneous company culture.**
- **Crude cost-cutting.** Productivity is increased by reducing resources without measuring the impact on distribution-performance.
- **No customer segmentation.** Customer segmentation is logical means when customers can be grouped based on market-winner.

Opportunities

- **Introduction of lean elements.** Lean elements improve financial results. The focus should be on increasing customer value. For instance by demand management, customer relations management, etc.
- **Measure Agility.** The primary delivery performance attribute should be measured to enable optimization of delivery-performance.
- **Centralization of planning activities.** Centralization increases optimization of internal resources, reduces the need for operators and enables more organizational learning.
- **Organizational learning.** Capturing and sharing better/best practices among factories improves overall performance. Furthermore customer valuation may improve customer relations management.
- **Acceptance of TMS.** The TMS supports the operational processes. Moreover tactics can be implemented by adjusting parameters.
- **Process orientation.** Process orientation reduces sub-optimization within functional silo's. Thereby improving distribution-performance.
- **Homogenization of company culture.** A homogeneous company culture reduces sub-optimization on the factory-level. Thereby improves delivery-performance.
- **Optimization of distribution costs.** Distribution costs can be optimized by aggregating financial and non-financial performance data.
- **Customer segmentation.** This provides opportunities to improve order-fulfilment (when applicable).

Threats

- **Competitiveness.** A lack of cost-reductions leads to reduced competitiveness.

- **Customer retention.**
- **Stakeholder commitment.**
- **Conservative sector culture.** A conservative sector culture hinders stakeholder commitment.

3.4 Evaluation of the strategy analysis

The strategic analysis is evaluated in terms of practical utility and internal consistency. The results will be used to determine to what extent the goal of this chapter was reached.

3.4.1 Internal validity

Internal validity is tested by checking the consistency and by testing the shareholder commitment.

Consistency

The outset of this chapter was to conduct a strategic analysis under the assumption that leadership commitment is ambiguous and staff-resources are scarce. The consistency is test by testing both aspects after conducting the strategic analysis. Given the limited number of cases, the results are presented qualitatively.

Table 3-6: Internal consistency of strategic analysis

Aspect	Result
Leadership commitment	Ambiguous for not accepting all the opportunities of the SWOT
Staff-resources	Difficulty to assess some performance aspects due to data-availability.

Stakeholder commitment

The stakeholders analysis revealed that the number of key stakeholders is high. VNT-management ranked VNT-management and BTM-executive as the two most relevant stakeholders for evaluation. The results of the qualitative evaluation by means of interviews is presented in Table 3-7.

Table 3-7: Acceptability of strategic analysis by two key stakeholders

Subject	VNT-manager	BTM-executive
Market-analysis	Accepted	Accepted
Supply-Chain-Analysis	Accepted	Accepted
Business-process map	Accepted	Accepted
Information Streams	Accepted	Accepted
Distribution Performance	Accepted	Accepted
SWOT	Accepted	Partially accepted

3.4.2 Structural validity

Collecting quantified data to validate the indications proved to be cumbersome given the quality of data-sources. Moreover, some data could not be collected from the data-sources due to lack of recording (ie order-modifications during the planning phase).

Based on the discussion of some of results from the strategic analysis some quick-wins were implemented by BTM-executive and VNT-management. These quick-wins are presented in Table 3-8.

Table 3-8: quick wins

Level	measure	Expected effect
Strategic	acquisition of mixers to optimize mixer-pool (VNT vs logistics partners).	break-even or cost-reduction while improving availability during peak-demand.
Tactical	policy to reduce overtime of transit-mixers of logistics partners.	Lower delivery costs
Tactical	increase training of planners and schedulers to TMS	Improved quality and readiness of information
Tactical	Acquire TMS-update and increase TMS-vendor support.	improve quality and readiness of information

3.5 Sub-conclusions 3

This chapter is aimed at answering the sub-question “What is the current state of VNT?” by making a strategic analysis under the assumptions of ambiguous leadership commitment and scarce staff-resources. Based on the results it is concluded that:

- The SWOT-analysis presents the current state of VNT based on the acceptability by the two key stakeholders. However BTM-executive does not accept some opportunities and therefore leadership commitment is ambiguous.
- Scarcity of staff-resources hindered the availability of quantitative information. Notably in respect to the order-taking-process.

4 Design of Balanced Scorecard for VNT

This chapter describes the design of the proposed Balanced Scorecard (BSC) for Van Nieuwpoort Transport (VNT). This BSC is designed by applying the methodology described in paragraph 2.4.2. The strategic analysis in chapter 3 is used as input for the design. An implementation plan for this BSC is presented in chapter 5.

It has been established that BMT's strategic scope for logistics optimisation is too narrow (3.4). Therefore strategic learning has to be included into VNT's strategy. This is crucial to create the necessary leadership commitment to align the organisation that may optimise logistics performance.

The chapter-outline (Figure 4-1) is as follows: the strategy is formulated in 4.1 by internalising a strategic learning strategy. In paragraph 4.2 this strategy is translated to the operations by formulating strategic objectives and translating these into a strategy map after which these are operationalised and trade-offs identified. The designed BSC is evaluated in 4.3. This chapter concludes with sub-conclusions in 4.4

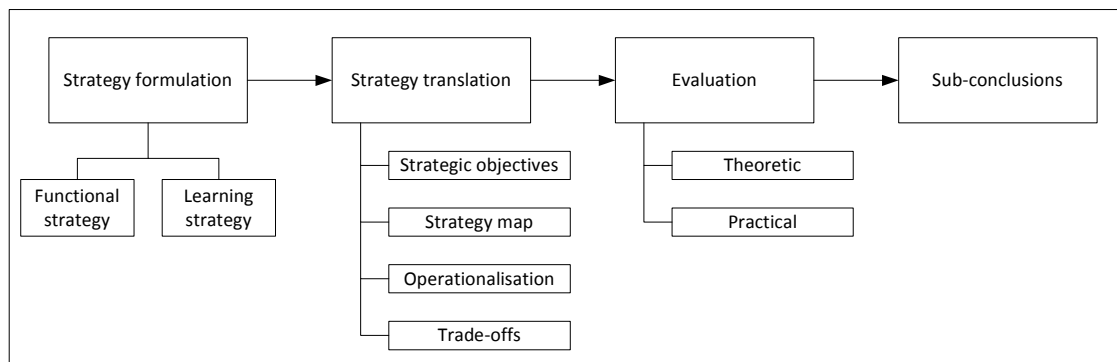


Figure 4-1: outline chapter 4

4.1 Formulation of VNT's strategy

In order to formulate the strategy for VNT's logistics optimisation first criteria are stated. Secondly the controversial aspect of the strategic domain described. Afterwards the strategy is formulated

4.1.1 Formulated criteria for logistics strategy

The formulated criteria for the logistics strategy are presented in Table 4-1.

The logistics strategy is chosen based on the supply chain analysis (Chapter 3). The COPD is the manufacturing process. Therefore the distribution-process is demand-driven. Given the fluctuations in demand a base-surge-strategy is most appropriate.

Table 4-1: criteria for logistics strategy

critereon	description
Challenge to strategic assumptions	BSC: to address leadership commitment
Base-surge strategy	Logistics strategy suitable to the context
Unambiguous	Kaplan & Norton (1996)

4.1.2 Controversial aspects for VNT

Means for executing the logistics optimisation strategy that have no support from the executive are labelled controversial. These means are identified by interviewing the executive about the results from the SWOT. The results are presented in Table 4-2.

Table 4-2: Controversial aspects

Means	Description
Customer segmentation	No customer should be favoured to others.
Centralisation of planning activities	Earlier centralisation attempts met with great resistance.
Integration of distribution process	Delivery costs can be reduced without integration.

4.1.3 Formulated strategy for logistics optimisation

The criteria in 4.1.1 and 4.1.2 allow some freedom for the formulation of the strategy of functional excellence. For instance both of the following strategies fit the criteria: *Reduce delivery-costs while maintaining the customer-service level*, and *Reduce delivery-costs while improving the customer-service level*. However the second strategy is assumed less feasible because it would require simultaneous improvement of two factors that are considered to a trade-off. Therefore the first is chosen.

Functional excellence

Reduce delivery-costs while maintaining the customer-service level

Strategic learning

Improve organisational knowledge of customer value and logistics boundaries

4.2 Translation of the strategy to VNT's operations

The strategies formulated in the previous sub-section are translated to the organisation by three steps: (i) formulate the strategic objectives, (ii) make a strategy map, and (iii) operationalise the strategy map.

4.2.1 Formulated strategic objectives

The strategic objectives are formulated from the basis that the overall goal of logistics optimisation is to increase long-term shareholder value. It is presumed that this breaks down into a revenue-growth strategy and a productivity strategy. Both parts are relevant to the formulated strategies for logistics optimisation. The formulated objectives derived from the business processes are presented in Table 4-3.

4.2.2 Proposed strategy map

The strategy map is made by causally linking the objectives in 4.1.1 and by assigning them to the logistics strategies (4.1.3). Since data-management is poor the quality of the causal links may be low. However these are assumed valuable for gaining organisational knowledge (Kaplan & Norton, 2004b).

Table 4-3: Identified strategic objectives

Objective	Description
Sustained shareholder value	Long-term value to shareholders
Expand revenue opportunities	Opportunities to capitalise new markets and products
Enhance customer value	Improve the benefits to customers
Increase asset-utilization	Efficiency of assets to generate cash flow
Improve cost-structure	The cost-effectiveness of VNT
Price	The market-winner for some customers.
Service Level	The market-winner for some customers.
Understand customer segments	Identify customer-segments and understand the effects of segmentation to the customer value proposition.
Order-fulfilment	The effectiveness of fulfilling the customer-order to the specification.
Improve resource performance	Increase the effectiveness and efficiency of VNT's resources.
Distribution cost contender	The cost-effectiveness of VNT to its competition.
Improve knowledge sharing	Share customer-knowledge with sales
Centralization of planning activities	Centralisation of order taking –and maintenance planning.
Integration of distribution process	Integration of sales and delivery-processes.
Base/Surge competences	The skills of the workforce to optimise logistics
Acceptance of TMS	The acceptance of the TMS by the workforce

The strategy map in Figure 4-2 shows that “Strategic learning” is focused on revenue growth, while “Functional excellence” focusses more on increasing productivity. Consequently from the perspective of VNT, logistics optimisation by means of revenue growth requires a challenge of strategic assumptions.

Trade-offs

Trade-offs are identified from the strategy-map in Figure 4-2, which are presented in Table 4-4. The functional excellence strategy, *Reduce delivery-costs while maintaining the customer-service level*, focusses on the trade-off of the internal process. Therefore this strategy is about the objectives: *order-fulfilment*, *improve resource performance* and *distribution cost contender*, which requires making trade-offs concerning customer-demand, capacity-allocation, maintenance and outsourcing.

The optimisation of these trade-offs is achieved from the Learning & Growth perspective (Figure 4-2). However, the priority of the learning & growth objectives is identified as a trade-off due to the scarcity of staff-resources. Prioritisation of KPI's is described in (5.2).

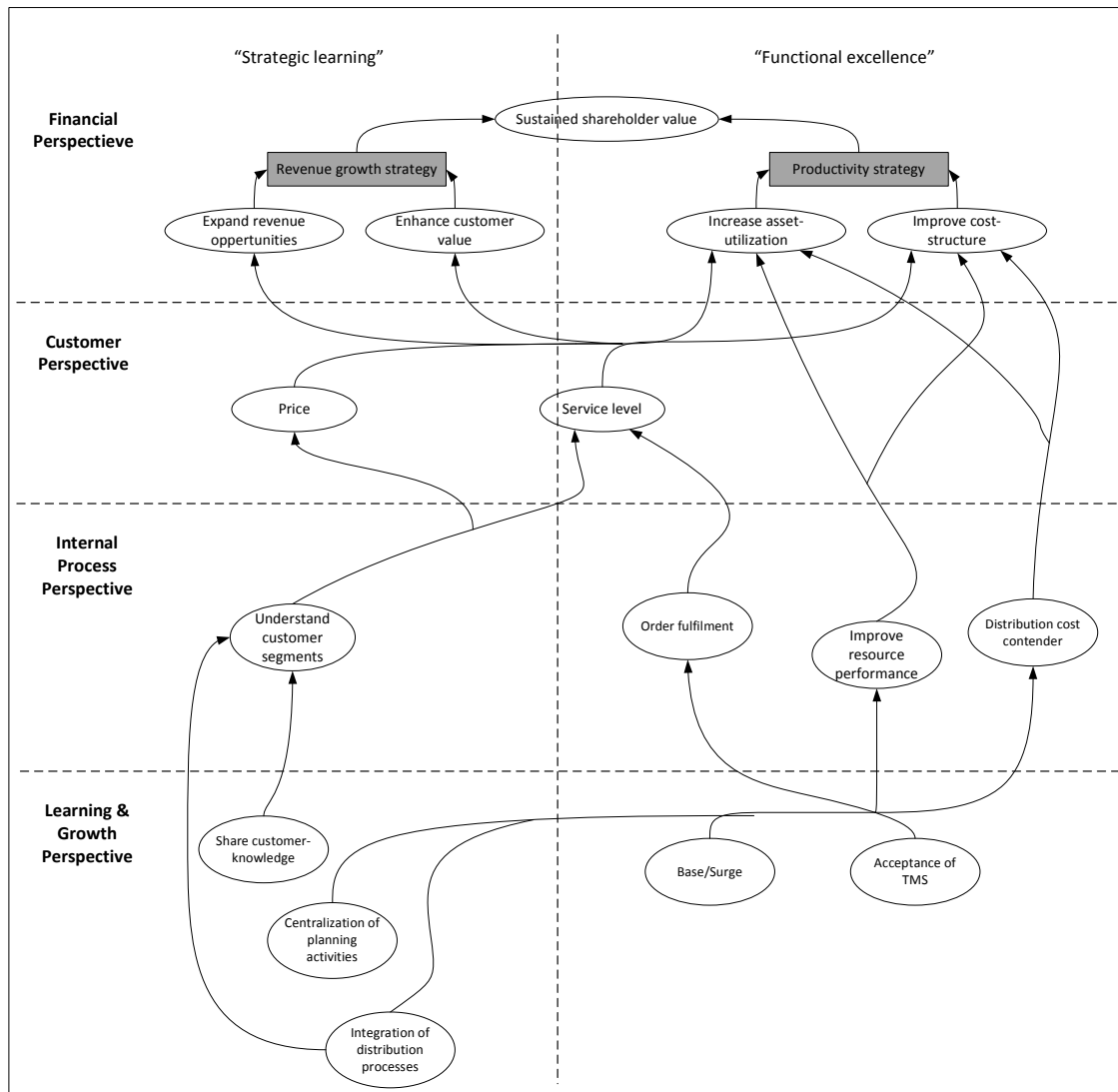


Figure 4-2: Strategy map for VNT

4.2.3 Operationalization of the strategy map

The strategy-map is operationalised by relating the strategic objectives to the analysis of the current situation (Chapter 3). The operationalization of the strategy map is adapted from the "Mobil NAM&R Strategy Map" (Morisawa, 2004, p.5, fig. 4), where the internal process –and learning and growth perspectives are fitted to VNT's current situation. The operationalised strategic objectives are presented in Table 4-5.

In Table 4-5 the objectives in the customer perspective are reduced to the customer value proposition and thereby operationalised by *customer rating per customer segment* and *market-share of customer segment*.

Table 4-4: Identified trade-offs

Perspective	Trade-off	objectives
Financial	productivity vs revenue growth	<ul style="list-style-type: none"> • Expand revenue opportunities • Enhance customer value • Increase asset-utilization • Improve cost-structure
Customer	Optimisation of customer segments	<ul style="list-style-type: none"> • Price • Service Level
Internal Process	Logistics optimisation	<ul style="list-style-type: none"> • Order-fulfilment • Improve resource performance • Distribution cost contender
Learning & Growth	priority	<ul style="list-style-type: none"> • Improve knowledge sharing • Centralization of planning activities • Integration of distribution process • Integration of distribution process • Base/Surge competences • Acceptance of TMS

4.3 Evaluation of the proposed BSC

The proposed BSC is evaluated by means of qualitative testing. This testing involves the internal, structural and external validity. However the major evaluation tests of the proposed BSC are the implementation plan (chapter 5) and the prototype-PMS (chapter 6).

4.3.1 Internal validity

Internal validity is tested by checking the consistency and by testing the shareholder commitment.

Consistency

The formulated strategy is consistent with the requirements and the strategy map is consistent with the SWOT.

Stakeholder-commitment

Both parts of the optimisation strategy are test for support by the two stakeholders. The results are presented in Table 4-6. Both strategies were successfully translated to all four perspectives of the BSC and operationalised. However the strategy-map was not fully accepted, which is presented in Table 4-7.

4.3.2 Structural validity

The stakeholder-commitment tests in 4.3.1 consist of the two stakeholders most relevant to the formulated strategy and strategy-map. Since KPI-owners have yet to be assigned other stakeholders are irrelevant.

Table 4-5: Operationalised strategic objectives

Objective	Operationalized	Description
Sustained shareholder value	<ul style="list-style-type: none"> Return on Capital Employed Net margin vs industry 	<ul style="list-style-type: none"> Long term profitability ratio Benchmark to industry
Expand revenue opportunities	<ul style="list-style-type: none"> Not specified* 	<ul style="list-style-type: none"> Not available*
Enhance customer value	<ul style="list-style-type: none"> Turnover vs industry Premium ratio 	<ul style="list-style-type: none"> Benchmark to industry Premium market capitalisation ratio to total market capitalisation
Increase asset-utilization	<ul style="list-style-type: none"> Cash flow 	<ul style="list-style-type: none"> Cash-flow generated by assets
Improve cost-structure	<ul style="list-style-type: none"> Cash-expense vs industry 	<ul style="list-style-type: none"> Benchmark to industry
Price	<ul style="list-style-type: none"> Share of segment 	<ul style="list-style-type: none"> Market-share per customer-segment.
Service Level	<ul style="list-style-type: none"> Customer-rating 	<ul style="list-style-type: none"> Customer-rating per segment.
Understand customer segments	<ul style="list-style-type: none"> Share of target-segment 	<ul style="list-style-type: none"> Identified customer segments
Order-fulfilment	<ul style="list-style-type: none"> On time, on spec 	<ul style="list-style-type: none"> Fulfilling the order-specification
Improve resource performance	<ul style="list-style-type: none"> Yield Gap Unplanned maintenance 	<ul style="list-style-type: none"> Yield versus outsourcing Maintenance beyond resource planning
Distribution cost contender	<ul style="list-style-type: none"> Distribution costs vs competition 	<ul style="list-style-type: none"> Benchmark to industry
Improve knowledge sharing	<ul style="list-style-type: none"> Gained knowledge of segments 	<ul style="list-style-type: none"> Customer knowledge gained and shared with sales
Centralization of planning activities	<ul style="list-style-type: none"> Strategic challenge 	<ul style="list-style-type: none"> Cost-effectiveness of maintenance planning. Cost-effectiveness of order-taking process.
Integration of distribution process	<ul style="list-style-type: none"> Strategic challenge 	<ul style="list-style-type: none"> Boundaries to logistics optimisation by functional excellence.
Base/Surge competences	<ul style="list-style-type: none"> Skills coverage 	<ul style="list-style-type: none"> Skills acquired for optimising base/surge
Acceptance of TMS	<ul style="list-style-type: none"> milestones 	<ul style="list-style-type: none"> the percentage of the workforce that accepted the TMS

*) outside of scope

4.3.3 External validity

The translation of the strategy to the organisation focussed on the operational business process. Aspects of compliance and corporate policies were beyond the scope, e.g. corporate policy (VNG) concerning ISO 9001:2000 and new regulations concerning driving-time.

Moreover by excluding “regulatory & social en Innovation (Internal process perspective)” opportunities for strategic learning are missed. For example inclusion of carbon-footprint to transit-mixer-acquisition might improve branding, which could improve the customer-value proposition.

Table 4-6: Acceptance of formulated strategy

Strategy	BTM-executive	VNT-manager
<i>Reduce delivery-costs while maintaining the customer-service level</i>	yes	yes
<i>Improve organisational knowledge of customer value and logistics boundaries</i>	no	yes

Table 4-7: acceptance of the strategy map

Strategy-map theme	BTM-executive	VNT-manager
<i>Functional excellence</i>	yes	yes
<i>Strategic learning</i>	no	yes

4.4 Sub-conclusions

The conclusions drawn from this chapter are:

- The formulated strategy for logistics optimisation has successfully internalised the controversial strategy aspects. However even phrased within the learning strategy the executive didn't accept the controversial part of the strategy.
- *With the designed Balanced Scorecard VNT can optimize its delivery performance (costs and quality of service).*
- *The BSC has only partly been tested and accepted by BTM and VNT.*

5 Implementation plan for the strategy-map

This chapter describes how the designed strategy-map (see chapter 4) can be implemented at VNT, BTM, GBC and BCW. The goal of this chapter is to present a roadmap for implementation with specified milestones per process-step. The roadmap will be used for the formulation of requirements for the Performance Measure System (PMS) in chapter 6.

Typically the implementation of a strategy map would require the instalment of metrics, setting targets, make a plan to attain the targets that includes the allocation of budgets, breakdown of strategic measures to operational level and monitoring the strategic progress (Papalexandris, et. al., 2004; Fernandes, et. al. 2006). Since staff-resources are scarce these processes cannot be fully executed. In order to minimize staff-resources the implementation-plan is restricted to a high-level roadmap that is implemented bottom-up.

In order to create the roadmap and to define the milestones the operationalised strategy map (4.2) is prioritised and owners for measurement need to be assigned.

The outline of this chapter, as depicted in Figure 5-1, is as follows: bottlenecks are identified in 5.1. Section 5.2 presents the roadmap including milestones by prioritizing the strategic goals. The roadmap is evaluated in section 5.3 and this chapter concludes with sub-conclusions in section 5.4.

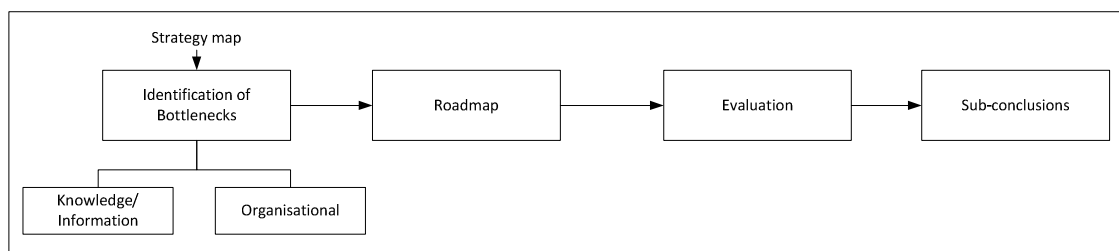


Figure 5-1: Outline chapter 5

Scope limited to internal business process and learning & growth perspective.

5.1 Bottlenecks

Two types of bottlenecks are relevant to the bottom-up implementation of the scoped strategy map: knowledge/information gaps and stakeholders.

5.1.1 Knowledge gaps

The knowledge gaps consists of KPI-owners, setting targets and measurement frequencies, and strategic initiatives for reaching objectives.

Proposed owners of KPI's

The owners are proposed based on the organisational structure. Table 5-1 present an overview of the proposed owners per target on the management level.

Table 5-1: Proposed owners of KPI's

Perspective	Objective	KPI	Owner
Financial	Sustained shareholder value	<ul style="list-style-type: none"> Return on Capital Employed Net margin vs industry 	<ul style="list-style-type: none"> BTM BTM
	Expand revenue opportunities	<ul style="list-style-type: none"> Not specified* 	<ul style="list-style-type: none"> BTM
	Enhance customer value	<ul style="list-style-type: none"> Turnover vs industry Premium ratio 	<ul style="list-style-type: none"> BTM BTM
	Increase asset-utilization	<ul style="list-style-type: none"> Cash flow 	<ul style="list-style-type: none"> BTM
	Improve cost-structure	<ul style="list-style-type: none"> Cash-expense vs industry 	<ul style="list-style-type: none"> BTM
Customer	Price	<ul style="list-style-type: none"> Share of segment 	<ul style="list-style-type: none"> Sales
	Service Level	<ul style="list-style-type: none"> Customer-rating 	<ul style="list-style-type: none"> Sales
Internal Process	Understand customer segments	<ul style="list-style-type: none"> Share of target-segment 	<ul style="list-style-type: none"> Sales
	Order-fulfilment	<ul style="list-style-type: none"> On time, on spec 	<ul style="list-style-type: none"> VNT
	Improve resource performance	<ul style="list-style-type: none"> Yield Gap Unplanned maintenance 	<ul style="list-style-type: none"> VNT VNT
	Distribution cost contender	<ul style="list-style-type: none"> Distribution costs vs competition 	<ul style="list-style-type: none"> VNT
Learning & Growth	Improve knowledge sharing	<ul style="list-style-type: none"> Gained knowledge of segments 	<ul style="list-style-type: none"> VNT
	Centralization of planning activities	<ul style="list-style-type: none"> Strategic challenge 	<ul style="list-style-type: none"> BTM
	Integration of distribution process	<ul style="list-style-type: none"> Strategic challenge 	<ul style="list-style-type: none"> BTM
	Base/Surge competences	<ul style="list-style-type: none"> Skills coverage 	<ul style="list-style-type: none"> VNT
	Acceptance of TMS	<ul style="list-style-type: none"> milestones 	<ul style="list-style-type: none"> VNT

*) outside of scope

Setting targets and measurement frequencies

In order to reduce staff-resources the scope of setting targets and measurement frequencies is limited to the internal process perspective and the learning & growth perspective. The reasoning is that the KPI's from the financial and customer perspective present either no knowledge gap (ie experience with installed financial KPI's), or are part of the strategic learning strategy that is challenged from the scoped perspectives.

VNT has little experience with setting targets for performance drivers. Moreover the quality and readiness of data concerning delivery-performance is lacking. Therefore it is not only difficult to set targets for KPI's, but the target-range as well.

In order to improve experience with target setting, a high measurement frequency is proposed for all KPI's concerning Internal Processes and Learning & Growth.

Proposed strategic initiatives for reaching milestones

Two types of initiatives are considered for reaching the (yet to be determined) targets: Continuous Improvement (CI) and Business Process Improvement (BPR). Table 5-2 presents an overview of the proposed strategic initiatives for the scoped objectives. The objectives "*centralisation of planning activities*" and "*the integration of distribution process*" both would require BPR to be completed. These BPR-initiatives are to be triggered by the corresponding strategic challenge (ie KPI). CI is proposed for the other objectives.

Table 5-2: Proposed strategic initiatives per objective

Perspective	Objective	KPI	Initiative
Internal Process	Understand customer segments	• Share of target-segment	• CI
	Order-fulfilment	• On time, on spec	• CI
	Improve resource performance	• Yield Gap • Unplanned maintenance	• CI • CI
	Distribution cost contender	• Distribution costs vs competition	• CI
Learning & Growth	Improve knowledge sharing	• Gained knowledge of segments	• CI
	Centralization of planning activities	• Strategic challenge	• BPR
	Integration of distribution process	• Strategic challenge	• BPR
	Base/Surge competences	• Skills coverage	• CI
	Acceptance of TMS	• milestones	• CI

5.1.2 Stakeholders' bottlenecks

Stakeholder-bottlenecks are identified from two aspects: leadership commitment and commitment of kpi-owners. The issue of leadership-commitment is relevant because the strategy-map was not fully accepted by BTM (4.3). Derived from Table 5-1 three kpi-owners are identified: BTM, VNT, and sales. Table 5-3 presents an overview of the stakeholders' bottlenecks and the complementary threats to implementation. Derived from Table 5-3 BTM is identified as the most relevant stakeholders' bottleneck.

Table 5-3: identified stakeholders' bottlenecks

Stakeholder	bottleneck	Threat
BTM	<ul style="list-style-type: none"> • Commitment to strategy-map • Commitment to KPI-ownership 	<ul style="list-style-type: none"> • Unsuccessful implementation • Unsuccessful execution of "strategic learning"
VNT	<ul style="list-style-type: none"> • No issue 	<ul style="list-style-type: none"> • No threat
Sales	<ul style="list-style-type: none"> • Commitment to KPI-ownership 	<ul style="list-style-type: none"> • Sub-optimisation of logistics performance

5.2 Roadmap to implement strategy map

Identify and prioritise the phases to implement the strategy map. Specify the phases to identify the milestones.

5.2.1 Identification and prioritisation of phases

A roadmap, as depicted in Figure 5-2, is constructed by prioritising the five identified phases. The prioritisation is based on the two formulated strategies and the prioritisation of strategic learning objectives (Table 5-4). The phases are:

- Phase 1: Execute strategy "functional excellence" which consists of a base-surge strategy to *Reduce delivery-costs while maintaining the customer-service level*.
- Phase 2: Execute strategy "strategic learning" which consists of challenging the strategic assumptions to seize opportunities for customer-segmentation, centralisation of planning activities, and process orientation.
- Phase 3: Centralize maintenance planning
- Phase 4: Centralize order-taking process
- Phase 5: Implement process-orientation for distribution process by integrating the sales and delivery processes.

Figure 5-2 shows that phase 2 can be run in parallel to phase 1 (to some degree).

Table 5-4: prioritised "strategic learning"

Objective	Means	Means rank	BTM-executive	result
<i>Understanding customer segments</i>	CI	1	omitted	1
<i>Centralisation of maintenance planning</i>	BPR	2	1	2
<i>Centralisation of order-taking process</i>	BPR	2	2	3
<i>Integration of the distribution process</i>	BPR	2	3	4

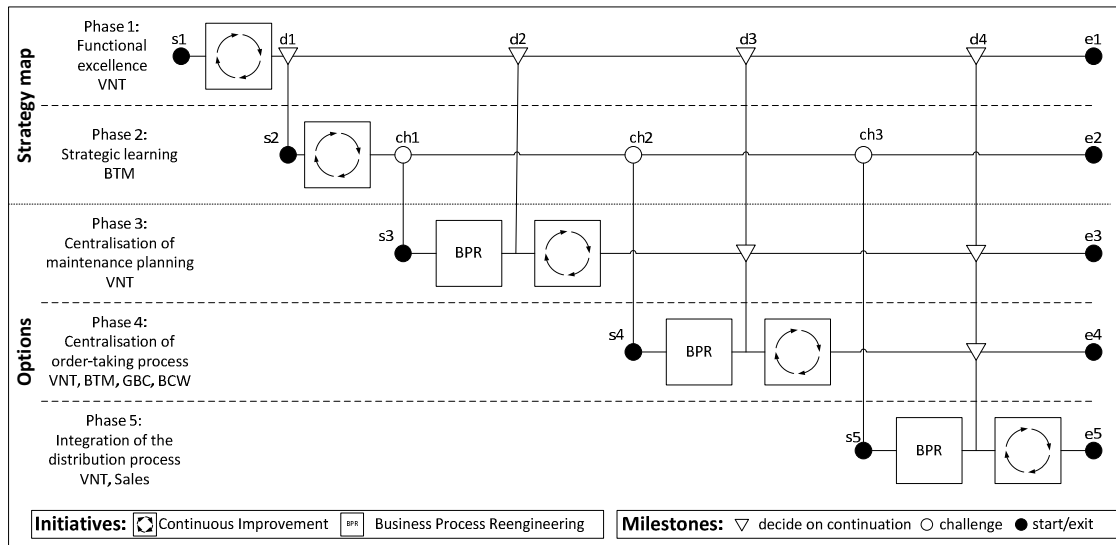


Figure 5-2: Roadmap to implement the strategy-map including options

Table 5-5 milestones for roadmap

milestones	description	outcomes
Ch1	Challenge decentralised maintenance planning	<ul style="list-style-type: none"> Adjust targets & continue strategic learning End implementation E2 start S3 to centralise maintenance planning
Ch2	Challenge decentralised order-taking process	<ul style="list-style-type: none"> Adjust targets & continue strategic learning End implementation E2 start S4 to centralise order-taking process
Ch3	Challenge functional orientation of distribution process	<ul style="list-style-type: none"> Adjust targets & continue strategic learning End implementation E2 start S5 to integrate the distribution process
D1	Decide on starting strategic learning strategy	<ul style="list-style-type: none"> Start phase 2 and continue phase 1 End implementation E1
D2 –D4	Decide on continuation of implementation	<ul style="list-style-type: none"> Adjust targets of strategy-map & initiate continuous improvement* End implementation E1/E2/E3/E4/E5
E1 – E5	End implementation	<ul style="list-style-type: none"> Start new BSC-cycle abandon BSC
S1, S2	Start phase 1/2	<ul style="list-style-type: none"> Start CI Phase 1/2
S3 – S5	Start phase 3/4/5	<ul style="list-style-type: none"> Start BPR Phase 3/4/5

*) unlikely outcome for D4, because post-integration a broader strategy-map is required

5.2.2 Specification of phases

In this section the first and second phase are specified based. Phases three to five are beyond the scope. Nevertheless, learning more about the requirements of those phases may be useful in phase two when targets for challenges need to be modified.

Phase 1: Functional excellence

Ideally this phase would start with installing all the KPI's. However measurement errors in TMS (3.2.4) could taint the KPI's, because the TMS is a likely data-source to monitor the KPI's (chapter 6). This may result in an inefficient learning experience for VNT to familiarize itself with the new KPI's and for target setting (5.1.1). Therefore priority is given to "Acceptance of TMS", at least until data-quality has improved. After this the KPI's are installed and adjusted within a CI-structure.

Phase 1 consists of four processes: *improve data-quality TMS, install KPI's, develop and initiate tactics, and monitor and learn*. The relations between these processes are depicted in Figure 5-3 and include two feedback loops. The first loop, "adjust targets", is used to adjust the focus of the strategy map as performance improves. This includes VNT's knowledge-gap concerning target-setting. The second loop, "adapt tactics/start new cycle", is used for both the adjustment of tactics beyond the scope of a single tactic and to start new tactics.

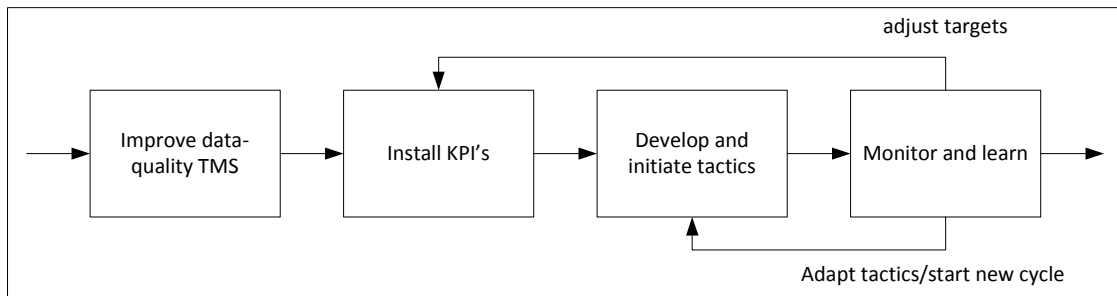


Figure 5-3: Specification of phase 1

The data-quality of TMS is improved by error-reduction that is initiated by CI. Figure 5-4 shows a spiral model that consists of three CI-cycles: (i) gain knowledge about errors in TMS, (ii) reduce input-errors, and (iii) reduce programming errors. The aim is to improve the statistical power of KPI's.

The installation of KPI's requires the setting of targets and a PMS to monitor the KPI's. VNT's knowledge-gap concerning target-setting is addressed by monitoring and learning. The design and development of a PMS-prototype is described in chapter 6.

Tactics can be developed based on the goal-means-diagrams (chapter 4). These tactics are initiated by means of

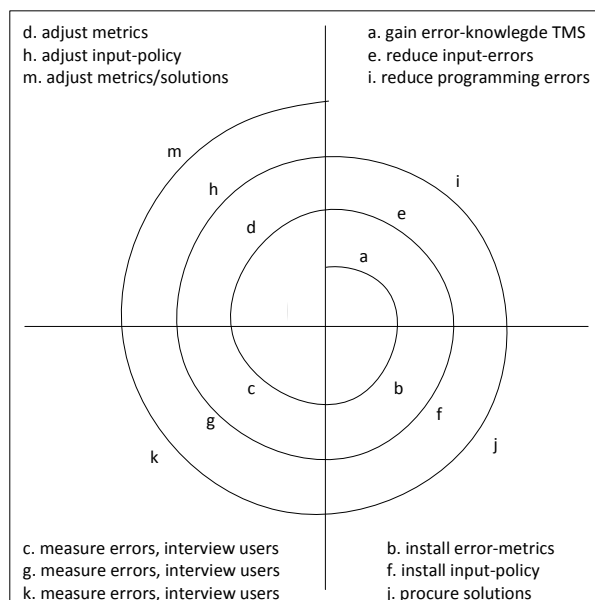


Figure 5-4: Continuous improvement of error-reduction in TMS

continuous improvement. An example would be improving acceptance of TMS by sharing knowledge (best practices) among the workforce.

Phase 2: Strategic learning

Phase 2 consists of executing three challenges that can be (but not necessarily be) executed in parallel. Therefore the same sequence of processes is used to initiate the challenges. This sequence consists of the following four processes: install KPI, improve knowledge, monitor & learn, challenge strategic assumption. The specification of phase two is depicted in Figure 5-5. The challenge process is separated from the “monitor and learn”-process for two reasons. Firstly, the challenge is owned by BTM (5.1.1) while the monitor and learn process is owned by VNT². Secondly, a separate process creates a conscience decision to initiate that process.

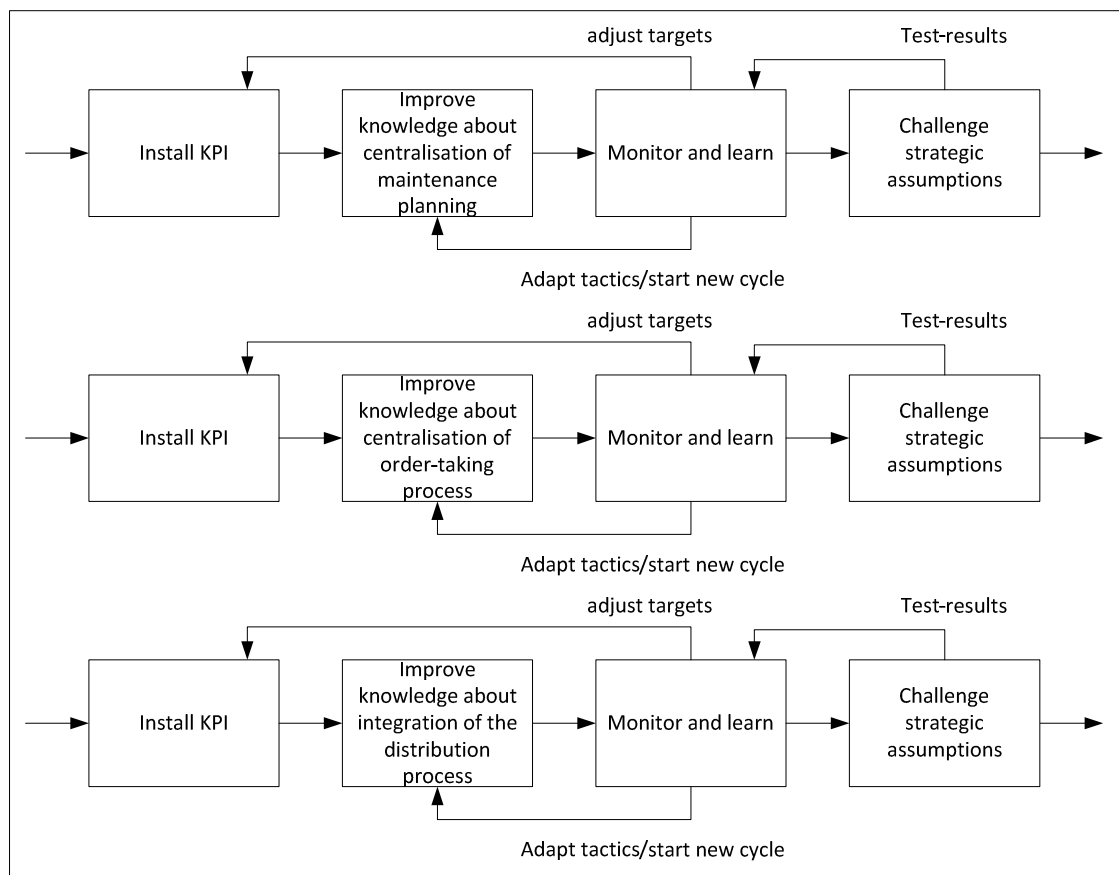


Figure 5-5: Specification of phase 2

Install KPI, Improve knowledge, Monitor and learn are similar to the respective processes in phase 1.

Challenge strategic assumption: In case of an unsuccessful challenge that leads to a continuance of strategic learning (Table 5-5), the test-results are feedback to the

² Bottom-up implementation

monitor and learn process. These results could both adjust the targets and the tactics for acquiring knowledge about the specific challenge.

This specification has two shortcomings. Firstly, the allocation of staff-resources in respect to the parallel processes is not analysed. Secondly, modification of KPI is not part of the process. Consequently some knowledge gaps remain.

5.3 Evaluation of the implementation plan

The proposed BSC is evaluated by means of qualitative testing. This testing involves the internal, structural and external validity.

5.3.1 Internal validation

The internal validation consists of determining to which extent the strategy map can be implemented by the proposed implementation plan. This is determined by two evaluations: (i) KPI's included in the roadmap, and (ii) resolved bottlenecks by the roadmap.

Consistency

The implementation plan focusses on the internal business process -and learning & growth perspectives of the strategy map. As a result instruments for the financial and customer perspective were not described.

The proposed roadmap solves the identified knowledge gaps.

Stakeholders-commitment to the roadmap

The acceptability of the roadmap is tested by discussing it with the two key stakeholders. The results are presented in Table 5-6.

Table 5-6: Acceptability of the roadmap by two key-stakeholders

Subject	VNT-manager	BTM-executive
Phase1: functional excellence	Accepted	Accepted
Phase2: strategic learning	Accepted	Accepted
Phase 3: centralisation of maintenance	Accepted	Conditional
Phase 4: centralisation of ordertaking process	Accepted	Not supported
Phase 5: integration of distribution process	Accepted	Not supported

From Table 5-6 it is clear that phases 1 and 2 have leadership commitment. User-acceptance of the TMS is vital for phase 1. BTM-executive has not committed to phases 3, 4, 5. Therefore phases 3,4,5 have a high level of uncertainty.

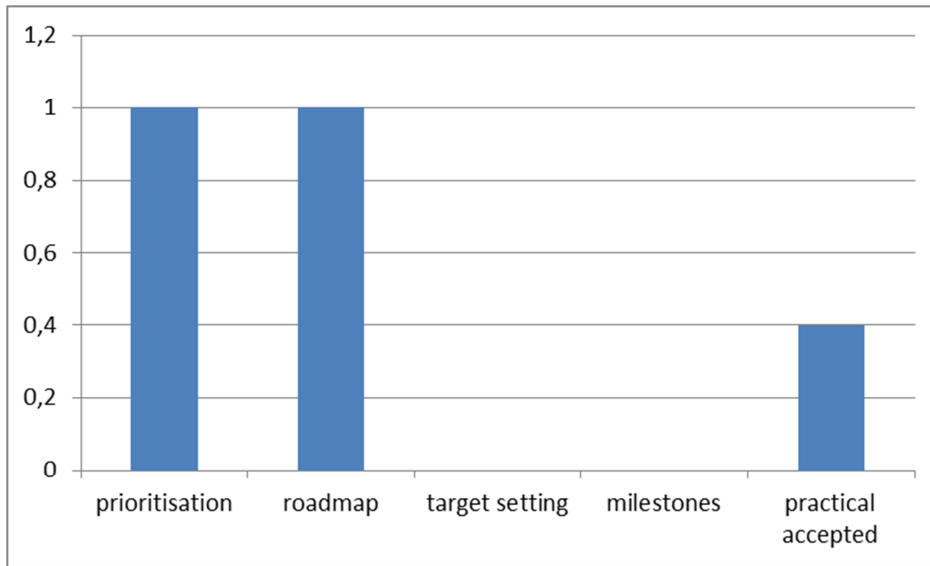


Figure 5-6: performance of the implementation plan

5.3.2 Structural validation

No test performed to simulate the challenging of strategic assumptions.

Stakeholder-commitment of sales is not tested.

5.3.3 External validation

The external validity could be checked by a qualitative test to whether the prototype is transferable. The main stakeholder of interest is sales because of the optional phase 5.

5.4 Sub-conclusions 5

This chapter is aimed at answering the sub-question “What is the proposed implementation plan for the BSC?” by proposing a roadmap based on a bottleneck-analysis under the assumptions of ambiguous leadership commitment and scarce staff-resources. Based on the results it is concluded that:

- The strategic objectives in the internal business process were successfully translated to operational level.
- The strategic learning objectives were prioritised.
- A roadmap was constructed to implement the strategy map that focusses on the internal process perspective and the learning perspective. With the exception of phase two, this map included milestones for all phases. However formulation and prioritisation of tactics in phase 1 were not made.

6 Prototyping a Performance measurement system

In this chapter the design, development and testing of a performance measurement system (PMS) is described. The objective is to build a prototype that can be used to evaluate the proposed implementation plan (Chapter 5) of the proposed Balanced Scorecard (Chapter 4). The prototype is designed, developed and tested by applying the approach described in 2.2.4.

The outline of this chapter, depicted in Figure 6-1, is as follows: the scope is demarcated in section 6.1. The design requirements are formulated in section 6.2. In section 6.3 the design of the PMS-prototype is presented. In section 6.4 the prototype PMS is evaluated. This chapter concludes with sub-conclusions in section 6.5.

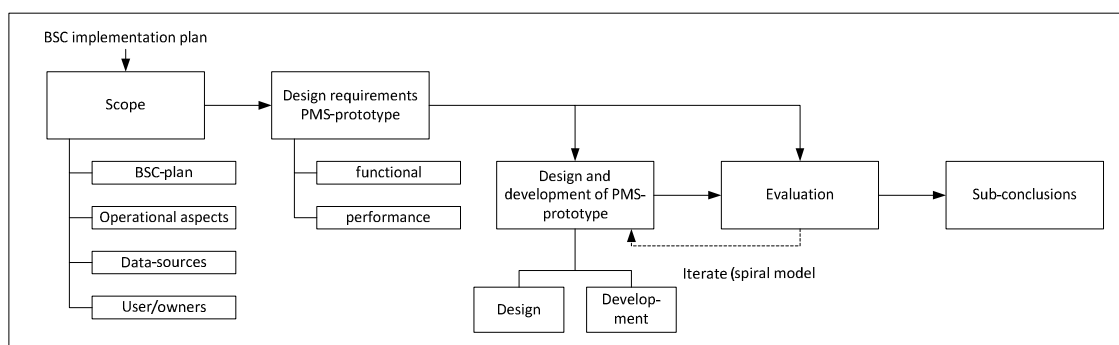


Figure 6-1: outline chapter 6

6.1 Scope for PMS-prototype

In order to reduce the staff-resources for designing and developing the prototype the number of data-sources and resources monitored is minimized.

6.1.1 Demarcation of implementation plan

The implementation plan is demarcated based on the type of metrics used for the processes of each phase. Since tactics were not specified (5.2.2) this process-object is not selected for both phases. An overview of the selection of process-objects is presented in Table 6-1.

Table 6-1: Selected process-objects of implementation plan

Phase	Process-object	selected
1	data-quality TMS	Yes
	KPI	Yes
	Tactics	No
2	KPI	Yes
	Tactics	No

6.1.2 Demarcation of data-sources

In order to select the data-source its suitability to providing information for the stated KPI's of the implementation plan is determined, which is presented in Table 6-2. Table 6-2 shows that the TMS is the most suited data-source. Moreover it is the only data-

source that can provide TMS-milestones, critical to the implementation plan (5.2.1). Therefore the TMS is chosen as the single data-source to minimize staff-resources.

However delineation to this data-source has certain limitations. First of all the TMS does not provide financial data about customer-orders and resources, nor does it provide sales-prognoses. Secondly personnel-data is recorded in a separate database. This limits the completeness of certain KPI's.

6.1.3 Demarcation of resources monitored

The delineation of resources to be monitored is based on an analysis of objects. The TMS is used to plan and schedule four types of resources: Loading Points, Transit-Mixers, Mixer-pumps, and Drivers. Table 6-3 presents an overview of the relevance of these resources to the KPI's (Table 6-2). Transit-mixer is considered more relevant than driver based on the attributes of a manned transit mixer, which is depicted in in Figure 6-2. Since manned transit-mixers (VNT) are cheaper than external TM (3.5.2) and cost-effectiveness of drivers is closely related to manned transit-mixers (VNT) drivers are considered less relevant. Therefore the scope is delineated to transit-mixers.

Table 6-2: Suitability of data-source to KPI

Phase	KPI	ERP	TMS	Fleetcontrol	Sales-db	Personnel-db
1	Share of target-segment	0	0	-	+	-
	On time, on spec	0	+	-	-	-
	Yield Gap	+	+	0	+	+
	Unplanned maintenance	-	+	-	-	-
	Distribution costs vs competition	+	0	-	-	-
	Gained knowledge of segments	0	0	-	0	-
	Skills coverage	0	0	0	0	0
	TMS-milestones	-	+	-	-	-
2	Challenge 1	0	+	0	0	0
	Challenge 2	0	+	0	0	0
	Challenge 3	0	0	0	0	0

Table 6-3 Relevance of resources

Resource	Description	Relevance
Loading point	Relevant in case of a bottleneck at loading point	0
Transit-mixer	Relevant to most deliveries	++
Mixer-pump	Relevant to some deliveries	0
Driver	Relevant to most deliveries	+

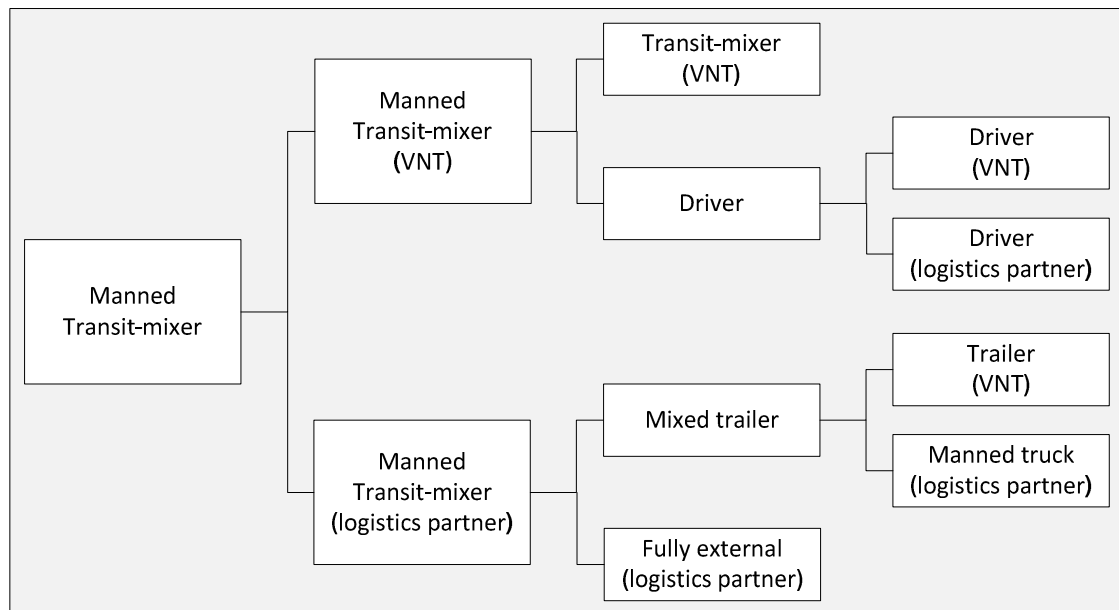


Figure 6-2 Attributes of a manned transit-mixer

6.1.4 Demarcation of users and owner

In order to reduce staff-resources the PMS prototype is demarcated to the strategic and tactical level. Moreover the TMS has operational performance drivers, which should be effective once the TMS has better acceptance. Consequently the identified users are limited to: Logistics coordinator (primary user) and BTM-executive (secondary user).

Since the number of users is low, usability shouldn't have priority for the prototype.

VNT has ownership of the data in the TMS. Therefore VNT is chosen as owner of this PMS.

6.2 Design requirements PMS-prototype

The usefulness of the system has two detriments: utility and usability.

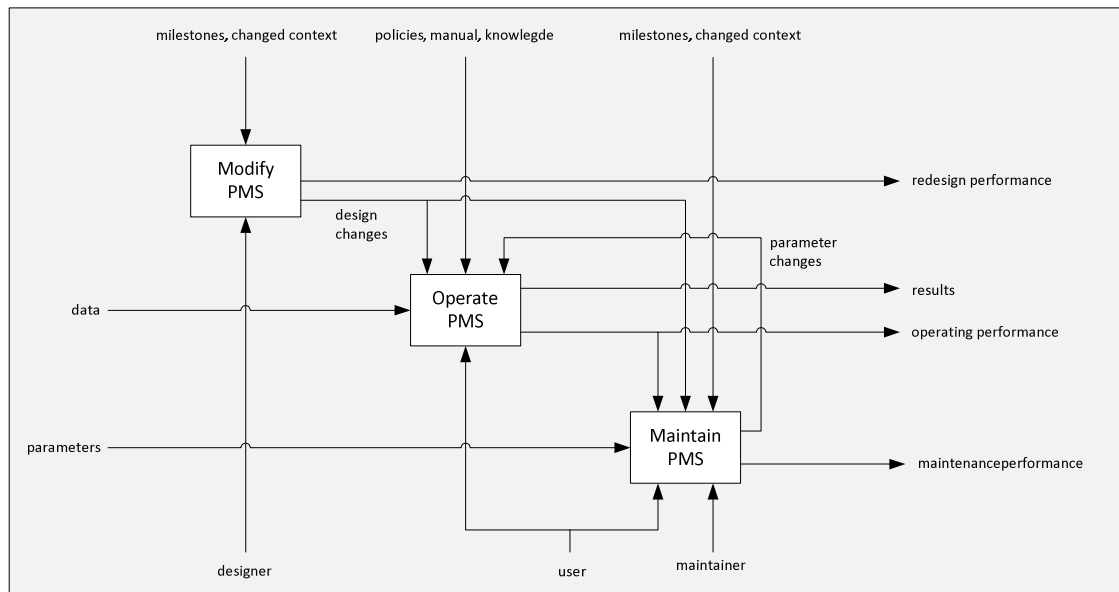


Figure 6-3: activities operational phase PMS (SADT)

Modify PMS: alter the PMS to include other metrics. Include other data sources. By applying a modular system's architecture testing of this aspect is set beyond the scope (2.4.4).

Operate PMS: use the PMS to monitor CI progress of phases 1 and 2.

Maintain PMS: improve the quality of information in the PMS, change weights and scales of metrics.

6.2.1 Functional requirements

The functional requirements are formulated based on the system's usefulness, which has two detriments: utility and usability. This subsection states the formulated requirements of these detriments.

Metrics for error-reduction TMS

The three specified CI-cycles are: gain knowledge, reduce easily solvable user-errors, and reduce programming errors. Basically, the first cycle is a categorisation of errors while the second and third cycle solve (reduce) some of these errors. Therefore metrics from the first cycle can be reused.

The main objects of information in the TMS are: customer-orders, deliveries, and resources. Many attributes of these objects relate to planning and scheduling errors. Table 6-4 presents an overview of some of these attributes. The solvability of errors is determined based on the effectiveness and efficiency of a measure to resolve an error. For instance, improving the status of a customer order would require improved acceptance of TMS and improved customer relations.

Attributes for error-reduction are prioritised based on solvability. Metrics are devised by identifying unexpected outcomes for attributes. Since “incorrect resource status” caused by incorrect login/out is already monitored manually, this metric is omitted.

Table 6-4: prioritisation of error monitoring

Error	Attribute	Error-type	Solvability	Scope	Selected
Incorrect status customer-order	• Delivery time	Human	Low	Y	N
	• Process-speed	Human	Low	Y	N
	• Unloading speed	Human	Low	Y	N
	• Means of unloading	Human	Low	Y	N
	• Breaks	Human	Low	Y	N
	• Delivery-type	Human	Low	Y	N
	• Quantity	Human	Low	Y	N
	• Priority	Human	Low	Y	N
Incorrect status resource	• Logged in/out	Human	High	N	N
	• Status unavailable	Human	Medium	Y	Y
	• Real-time status	Programming	High	N	N
	• Status recording	Programming	High	Y	Y
Incorrect system parameter	• Depot	Human	High	N	N
	• Delivery-costs	Human	Low	N	N

Metrics for KPI's

The delineation of scope limits the metrics of the KPI's. This limitation is dealt with by modifying the KPI's. Table 5-6 presents an overview of the modified KPI's. The modified KPI's apply some estimates based on previous analysis (3.2.5) to transform the aggregated delivery data from the TMS.

However monitoring the challenges 1 to 3 within this limited scope has proven difficult (Table 6-5). This is logical because these relate to objects that cannot be measured by the TMS (ie. overhead-resources and unaccepted suggestions to alternative delivery-times). Although improvements to the cost-structure of direct transportation costs can be captured. Here, lack of progress increases a successful challenge. Nevertheless these three challenges share the same indicator, which conflicts with the guidelines.

Table 6-5: Modified KPI's based on limited scope

Phase	KPI	Modified KPI
1	Share of target-segment	• Share per unloading means
	On time, on spec	• Quantity, punctuality per priority group
	Yield Gap	• structural hiring beyond VNT-capacity • demand vs capacity
	Unplanned maintenance	• Hired TM to compensate maintenance
	Distribution costs vs competition	• Overwork • Selection of third-party based on distance
	Gained knowledge of segments	• Ratio turnover per workday per workweek • Average distance to customer per product-group • Average cycletime per product-group

		<ul style="list-style-type: none"> • Turnover per product-group
	Skills coverage	<ul style="list-style-type: none"> • Ratio of reached targets
	TMS-milestones	<ul style="list-style-type: none"> • Time-errors per transit-mixer
2	Challenge 1	<ul style="list-style-type: none"> • Breakdown of transportation costs
	Challenge 2	<ul style="list-style-type: none"> • Breakdown of transportation costs
	Challenge 3	<ul style="list-style-type: none"> • Breakdown of transportation costs

The usability requirements are stated in Table 6-6.

Table 6-6 Usability requirements

Requirement	Description
Tiered-Dashboard (3 levels)	The ability to acquire a higher level of detail into the measured value improves the understanding by the user
Pop-up explanations KPI's	Easy learnable
Normalized performance	Easy learnable

6.2.2 Performance requirements

The scope of performance requirements has been greatly confined (6.1). Consequently the aspects of performance operations are confined to: maintainability, robustness, IT-resources, extendibility.

Table 6-7: Performance requirements

Requirement	Description
Maintainability	
Little maintenance (<8 hours/month)	Semi-automatic updating of inputdata
Maintainable with little experience	Semi-automatic updating of inputdata, explanatory parameters
Robustness	
configurable source-location	Different sources can be selected
Documented source-data	To reduce redesign of the data-interface in case of modification to source-systems
MS Access 2003	Readily available and inhouse knowledge
IT-resources	
Auto-storage of reports	Minimal time to present reports to the user
Local execution of program	Network is not hogged by calculations
Dsum calculations in excel	Running-sums in MS Access are very slow in comparison (ca 20 times slower)
Extendibility	
Redesignable	

6.3 Design and development of the prototype

In this section the design and development of the prototype PMS is described.

6.3.1 System design

Storyboards are applied to define the procedures for operational and maintenance activities (see Appendix G).

In order to meet the performance requirement of redesignability, a modular design approach is applied to the system architecture (6.1.2). This is applied in function and in data-storage. The systems architecture is depicted in Figure 6-4.

The *User interface* consists of two designed interfaces based on activity: (i) *monitor performance*, and (ii) *perform maintenance*. The first is designed as a three-tier-dashboard. The second is functionally designed. Access 2003 provides the design-interface.

The *System maintenance* module modifies the parameters of the weights and scales of the PMS and executes data and executes alterations to the system parameters.

The *Performance metrics* module provides the algorithms used for the metrics.

Data storage stores the following types of information: imported data, transformed data, weighted data, system parameters, user parameters, maintenance parameters, fault-correction parameters, performance-statistics.

The *Data transformation* module identifies faulty data, repairs repairable data and executes the metrics to calculate performance.

The *Data interface* collects the source data from the most basic tables of the TMS. The TMS-developer has stated that these tables are most robust in term of software-revisions. However the utilised source is documented should compatibility-issues arise.

6.3.2 Development of the prototype

The spiral-model has been applied to develop the prototype. The primary focus was on data-transformation in order to develop the metrics. The design of the user-interface was partially in parallel to the building process of the metrics because it provided insight into the readiness of aggregated data. Once the metrics were in place the operational user-interface was developed. Afterwards the data-interface, and maintenance interface were developed consecutively.

The development had an unexpected delay as a result of slow dsum-calculations in Access. The operational performance was deemed insufficient. This was solved by performing the required calculation in excel. This required intensive testing to minimise runtime-errors with the interface to excel.

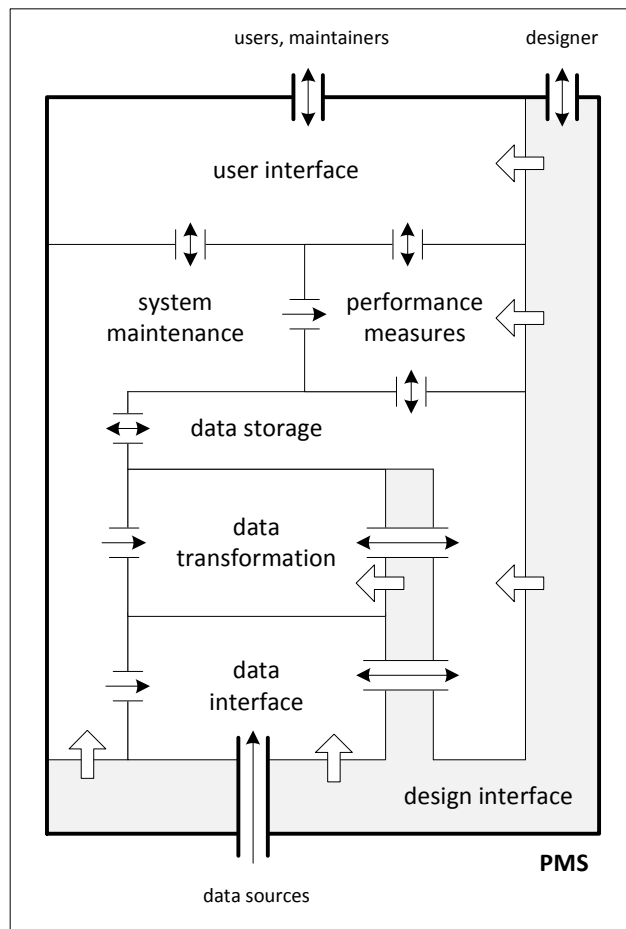


Figure 6-4: System architecture of prototype

6.4 Evaluation of the PMS-prototype

The PMS-prototype is evaluated by testing the internal validity (both to the requirements and to the strategy map), and by user testing (mock-ups and prototype).

6.4.1 Internal validity

The internal validity is checked by means of qualitative testing. Tests are performed to determine whether the prototype-PMS meets the design requirements, is consistent with the strategy-map and meets the user requirements. Therefore the following tests are performed: consistency with design requirements, mock-ups of the user-interface, user-test of prototype and consistency to strategy map.

Consistency to design requirements

Both the functional requirements and the performance requirements meet the design requirements. Even though the requirement of extendibility was not tested. However, the prototype does not explicitly monitor challenges 1, 2, 3. The results are presented in Figure 6-5

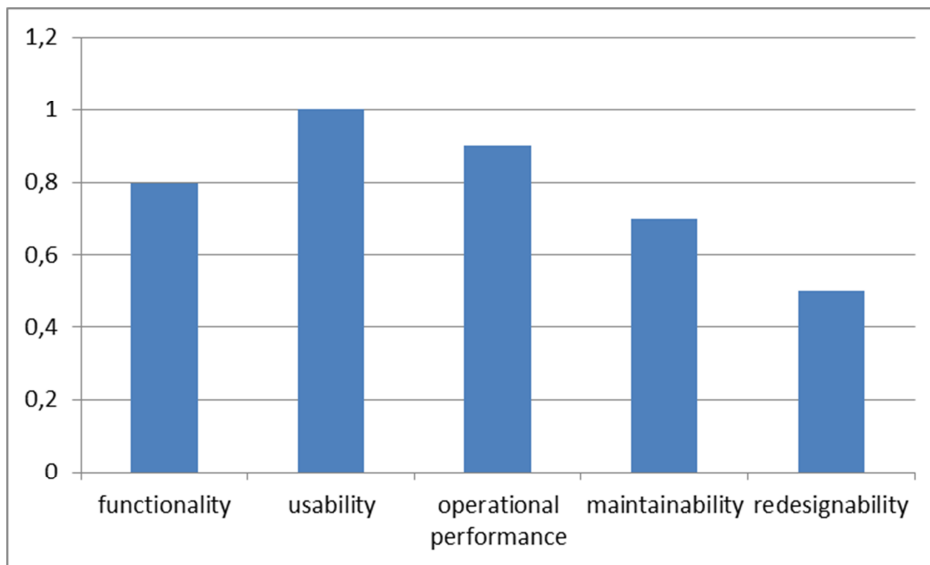


Figure 6-5: Normalised performance of the prototype vs requirements

User testing with mock-ups of the user-interface

While initial mock-ups with normalised metrics looked useful, during final development of the user-interface the user requested to include large graphs to the overview. The result was one day of additional programming to produce the additional graphs.

The cause for the discrepancy between the mock-up and final user-interface was not analysed.

User test of prototype

The user perceived the prototype as useful. The user found the metrics on productivity, data-faults in TMS, maintenance planning, overwork and utilisation useful. Metrics on punctuality were less useful than anticipated.

The user perceived the semi-automatic maintenance procedure practical and workable.

The user will use the PMS-prototype to: (i) identify faulty data in TMS, (ii) monitor delivery performance, (iii) gain knowledge into understanding customer characteristics.

To what extend can the remainder of the implementation plan be facilitated by this prototype?

Consistency to Strategy map

This qualitative test evaluates the extent to which the PMS-prototype covers the strategy map. The results are shown in Table 6-8.

Table 6-8: Strategy map coverage by PMS-prototype

Objective	Operationalized	Prototype-PMS
Sustained shareholder value	<ul style="list-style-type: none"> Return on Capital Employed Net margin vs industry 	<ul style="list-style-type: none"> No No
Expand revenue opportunities	<ul style="list-style-type: none"> Not specified* 	<ul style="list-style-type: none"> No
Enhance customer value	<ul style="list-style-type: none"> Turnover vs industry Premium ratio 	<ul style="list-style-type: none"> No No

Increase asset-utilization	• Cash flow	• No
Improve cost-structure	• Cash-expense vs industry	• No
Price	• Share of segment	• No
Service Level	• Customer-rating	• No
Understand customer segments	• Share of target-segment	• No
Order-fulfilment	• On time, on spec	• Partially
Improve resource performance	• Yield Gap • Unplanned maintenance	• Partially • Partially
Distribution cost contender	• Distribution costs vs competition	• Partially
Improve knowledge sharing	• Gained knowledge of segments	• Groundwork
Centralization of planning activities	• Strategic challenge	• No
Integration of distribution process	• Strategic challenge	• No
Base/Surge competences	• Skills coverage	• No
Acceptance of TMS	• milestones	• Partially

6.4.2 Structural validity

Two users of the PMS were identified, but the user test was performed with one user. Since both users operate at different hierarchical levels the user test is not representative for both levels.

6.4.3 External validity

The external validity is checked by a qualitative test to whether the prototype is transferable. The transferability is tested by determining whether a fully functional PMS can be constructed based on the prototype. This requires a test beyond the demarcated scope (6.1).

A fully functioning PMS can be constructed by including the ERP and personnel-db as data-sources. However, additional data-sources are needed to monitor Acceptance of TMS (surveys) and Base/Surge competences.

6.5 Sub-conclusions 6

In this chapter it is concluded that:

- A PMS could be developed based on the BSC implementation plan by including several additional requirements.
- The prototype-PMS includes metrics that support “functional excellence” and “strategic learning”. However the prototype does not explicitly measure the KPI’s from the strategy-map, but
- A PMS-prototype utilizing the TMS has been accepted by VNT.

7 Utility of the proposed BSC

This chapter discusses the practical and scientific utility of the proposed BSC. Thereby the final sub-questions is answered in this chapter. This question is: *What is the practical and scientific utility of the proposed BSC?*

In order to answer this question the results are discussed.

The outline of this chapter is: the practical utility is discussed in 7.1, and the scientific utility is discussed in 7.2.

7.1 Practical utility

Research approach

Triangulation was useful to focus the analysis. However, the combination of scarce staff-resources and the poor availability of quantitative data made the strategic analysis cumbersome.

Strategic analysis

Customer complaints had little focus and are not specified. This leaves room for interpretation for the quantification of order-fulfilment.

Design of the Balanced Scorecard

The design-decision to atone the strategy “increase customer-segmentation” to “understand customer segments” is a process-outcome that does not necessarily create customer value.

VNT, as the initiator and proponent of the BSC-approach, may have political motives for the project succeeding. Consequently it may favour process-speed over content, and therefore may be less critical towards the designed BSC.

The BSC has been designed with Morisawa’s strategy map, which may not reflect the overall strategy (e.g incomplete).

Implementation plan for the BSC

The investment of VNT in a TMS-training-program (Table 3-8) could be interpreted as a commitment into improving the quality and readiness of information, which may be achieved by continuous improvement.

Design and development of the PMS-prototype

The scope was demarcated to one data-source. The TMS does not contain the yields of deliveries, which are needed for the metric “yield gap”. The ERP contains these yields. Coverage of the strategy map could be increased by adding the ERP as a data-source.

Including order fulfilment for special project can be added to the PMS based on the current data-source.

Applying the BSC-approach to other contexts

The aim of the approach was to propose a BSC that fits the context of VNT. It might be applied to similar contexts. However it should be noted that the approach applies a logistics framework to minimize strategic resources. Therefore contexts requiring other

goals will have to develop a theoretic framework that fits those contextual goals as well in order to address scarce staff-resources. Consequently the application of the approach sorted by fit: VNTs parent-company, construction industry, traditional logistical company.

7.2 Scientific utility

The application of BSC-prospect at VNT has shown that:

- The current situation was analysed with a reduced need of staff-resources. The results proofed useful to both primary stakeholders. The BTM-executive learned about current performance. The VNT-manager gained insight into the limits of executive support. However, triangulation limited the breadth and depth of the internal analysis. For instance insight into the difference in perception between schedulers and salesmen about service-level is missing.
- A strategy for logistics optimisation that internalises strategic learning was formulated by applying the logistics framework. Since the strategy was accepted by VNT-management the strategy fits the bottom-up approach of the organisation. The strategic challenges were tested by means of interviews. This is not the most reliable test to exact lack of commitment to strategic learning goals. These challenges impact the priority of strategic objectives. For instance, priority to centralised maintenance planning greatly improves organisational knowledge concerning the limits of functional excellence.
- The formulated strategy was successfully translated by means of a strategy map. The strategy map proved useful to communicating hierarchically, especially since early mock-ups of the prototype-PMS that had a scorecard-type lay-out were more difficult to understand contribution to logistics optimisation.
- The implementation plan was prioritised based on bottlenecks of stakeholders and information/knowledge. However, facilitating stakeholders were not included. Inclusion of facilitating stakeholders could have increased the quality of the roadmap in terms of milestones. Prioritisation could be affected in terms of learning goals.
- Staff-resources can be postponed during the initial phases of the BSC-approach by applying knowledge frameworks.

8 Conclusions and Recommendations

This chapter presents the conclusions and recommendations of the thesis. The focus of this thesis is how the Balanced Scorecard can be tailored to the context of Van Nieuwpoort Transport (VNT) in order to achieve logistics optimisation. Therefore the main research question to be answered is:

What is a suitable Balanced Scorecard for Van Nieuwpoort Transport to optimise its logistics performance?

The outline of this chapter is as follows: conclusions are presented in paragraph 8.1. Recommendations are stated in paragraph 8.2.

8.1 Conclusions

The conclusions are drawn based on the sub-questions used to answer the main research question

8.1.1 BSC-approach for VNT

Since VNT's context doesn't meet the basic requirements for the conventional BSC-approach the following sub-question needed to be answered:

What BSC-approach can be used to propose a BSC for logistics optimisation in a context where leadership commitment and staff-resources are scarce?

In order to minimise requirements for leadership commitment and staff-resources a multidisciplinary framework was applied. This framework consists of a BSC-framework, a logistics framework and a PMS-framework.

The major design decisions for the BSC-framework included the type of BSC and the method for clarifying the current situation.

The logistics framework provided means to reduce staff-resources in terms of analysis of the situation that requires logistics optimisation, formulating the strategy and for translation to the organisation (formulating and operationalising strategic objectives).

The PMS framework provided knowledge to formulate requirements for the PMS-design.

Therefore it is concluded that the first two steps of the conventional BSC-approach have successfully been adapted to lower the initial requirements for leadership commitment and staff-resources for the specific context of VNT.

8.1.2 Situation requiring logistics optimisation

In order to improve upon the current situation a status quo is required by answering the following question:

What current situation at VNT requires logistics optimisation?

A strategic analysis, consisting of analyses of the external –and internal contexts and a SWOT was conducted. Triangulation by means of interviews, observation and data-analysis was applied to minimize resources. The results confirm a low level

organisational maturity. Data-management is poor and the opportunity of customer-segmentation is not acknowledged.

8.1.3 Proposed BSC for VNT

In order to propose a BSC that improves upon the current situation, the following question is answered:

What is the proposed BSC for VNT?

This question is answered by formulating and translating the strategy for VNT.

The strategy was formulated based on the SWOT. Since the aspired design is a BSC-II strategic learning should be internalised. Therefore the formulated strategy logistics optimisation has two components: (i) functional excellence, and (ii) strategic learning.

The strategy map was an adequate means to translate the strategy to the organisation. Especially the relation between objectives was useful.

However there are issues with the validity of the proposed BSC. Although the strategic gap is small, which proves a high level of internal validity, both the external and structural validity have issues. The identified construct-issue concerns that a political motive for accepting the BSC could not be excluded. The external-issue concerns the demarcation of the organisational scope resulting in a less than holistic strategy-map which consequently does not include all practical trade-offs.

8.1.4 Implementation plan of the BSC for VNT

In order to implement the proposed BSC the following question is answered:

What is the implementation plan of the proposed BSC for VNT?

The implementation consisted of a roadmap for the proposed BSC that is prioritised based on a bottleneck-analysis of stakeholders and information and knowledge gaps.

The acceptability test of the roadmap among the two key stakeholders shows that there is no leadership-commitment for phases three to five. This confirms the necessity of internalising strategic learning into the optimisation-strategy. For without the prospect of leadership commitment by means of strategic learning there would be an implementation-gap. Nonetheless the acceptability-test is too limited to determine whether other stakeholders can be utilised as proponents to speed up the roadmap.

Therefore it is concluded that marginalisation of staff-resources limits the validation of the implementation plan.

8.1.5 Design and development of the PMS-prototype

In order to evaluate the BSC the following question is answered:

What PMS-prototype is used to evaluate the proposed BSC?

The PMS-prototype is designed by applying the PMS-framework. Functional requirements were demarcated to phases one and two of the implementation plan for

the BSC. The scope was delineated to the resource transit-mixers by means of multi-criteria analysis (SMART). The TMS was used as the only data-source to minimize development resources. The prototype was developed by applying the waterfall-model.

While the prototype was successfully developed and accepted by VNT, there are three issues with the validity. Internal validity is an issue because of the measurement-gap with the implementation plan. Construct-validity is a problem because the user-test was limited to VNT and thus excluded leadership as a key user. Moreover the user-test was conducted prior to the operational phase. Consequently the practical usefulness was not tested.

Therefore it is concluded that although successfully accepted, the PMS-prototype cannot be used to completely evaluate the proposed BSC as a result of the measurement-gap with the implementation-plan.

8.1.6 Utility of the proposed BSC

In order to interpret the results the following question is answered:

What is the practical and scientific utility of the proposed BSC?

Extensive triangulation limits internal –and structural validity of the implementation plan and the PMS-prototype. While some common BSC-practices were applied, external validity was not tested.

8.2 Recommendations

Based on this preliminary study into the application of the BSC to a context with scarce leadership commitment and staff-resources recommendations are made for both the company under study and for future research.

8.2.1 Recommendations for VNT

- Improve the validation of the PMS-prototype by executing a user-test with the missing key-user (ie BTM-executive), include the ERP as a data-source and by evaluation the prototype after gaining some experience with the metrics (eg three months).
- Execute the implementation plan to optimise logistics and replace the PMS-prototype with a fully operational system that closes the measurement-gap. This implies executing the steps of the BSC that are beyond the scope of this project.
- Re-evaluate the BSC and expand its strategic reach to the entire organisation of BTM, GBC and BCW. This requires involving the other functional silos of BTM.
- Internalise supply chain optimisation by expanding the strategic analysis with the business processes. This requires involving the other functional silos of BTM.

8.2.2 Recommendations for future research

- Determine the costs (e.g. staff-resources) and benefits (e.g. successfully challenged strategic assumptions) of the initial PDCA-cycle for strategy execution focussed on knowledge-sharing.

- Improve external validity by correlating the level of alignment with other functional silo's affected by the strategy.
- Improve external validity by applying the selection of frameworks to cases with a similar context.

9 Reflection

This chapter presents a reflection on the scope, methodology and results of the project.

9.1 Scope

The section discusses whether an alternative approach to the BSC would have been a better fit to the context. The context was defined as: ambiguous leadership commitment, scarce staff-resources, no performance-drivers, traditional sector.

Arguments in favour of the BSC: all hierarchical levels are confronted by the BSC-approach. This creates organisational learning and the prospect of efficient strategy execution in the future (ie a more responsive organisation).

Arguments against the BSC: the combination of scarce staff-resources and no performance drivers makes collection and aggregation of information/knowledge across the organisation a hurdle which may even threaten the project (Papalexandris, ea, 2004). Moreover the organisation has a bottom-up approach towards strategy implementation. Therefore a performance measurement framework that includes horizontal relations should be preferred (e.g. Performance Prism). Beside improving coordination with sales, the Performance Prism could also improve communication with customers. However, the Performance Prism, like the BSC, has no blueprint for implementation (Tangen, 2004). Consequently both the selection of measures and the design of the PMS has not been fully integrated.

9.2 Methodology

Internal Validity

If the roadmap is abandoned before the strategic assumptions could be challenged then this BSC-approach is not suitable for VNT.

External Validity

The proposed BSC was validated by means of proof of concept (prototype-PMS) that does not entail the entire BSC. Obviously the first external validity test should be the implementation of the proposed BSC to test whether the BSC-prospect approach applies to VNT in practice.

Since the BSC-proposal is aimed at logistics optimization, it doesn't include all aspects of the business processes. Therefore it should be tested to what extent the framework has to be extended in order to include all business processes. Although, once leadership commitment has been established extension of the framework might be replaced by staff-resources (if applicable). By including all business processes the BSC has extended beyond the scope of VNT and includes BTM and possibly GBC, BCW. It should be noted that adoption by BTM implies leadership commitment, but not necessarily staff-resources. Therefore the application of knowledge-frameworks could prove useful.

Beside BTM the BSC could be adopted by its parent-company VNG. However it is unlikely that BSC-approach is a suitable approach at that level because its context will have leadership commitment and staff-resources.

In the RMC-industry it is expected that many companies have a similar context to VNT. Adoption of BSC-prospect by these companies is more likely. In order to properly apply the frameworks requirements for implementers have to be made explicit. However, these have yet to be made explicit.

Structural Validity

The horizontal relation with the sales department was underdeveloped.

Factory managers were not included to test the practical acceptability of the implementation plan.

Management-meetings and planner-meetings were not observed. Therefore the assessment of organizational learning is not complete.

9.3 Results

Gathering of data has proven to be very time-consuming for three reasons:

- the high number of data-faults in TMS
- the discrepancies between data-sources. Axapta versus TMS and TMS versus Fleetcontrol.
- The volume of recorded data

The volume of data could have been reduced by selecting fewer factories or a shorter time-period. The downside would be that data-faults would have been more difficult to identify.

Formulating milestones for the roadmap was difficult without including the relevant stakeholders.

Internal and structural validity of the PMS-prototype could have been improved during development. In this case the user-test was conducted after all modules were developed. However, the modules were (mostly) developed consecutively. By partially developing the user-interface after the completion of each module, results could have been more complete. The downside of such an approach is that the organisation could risk sub-optimisation. Therefore performing user-tests after the completion of each module is ill-advised. Nevertheless, the development of the fault-assessment module should have had priority.

9.4 Concluding remarks on reflection

Although the Performance Prism may have been a more suitable approach from the get-go, changing the approach during implementation would be a step back given the organisational knowledge gained.

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Appendix A Scientific paper

Populating a strategy map to optimise distribution of ready-mix concrete

A Balanced scorecard to fuel organisational maturity

Richard J.A. Wurpel

Faculty of Technology, Policy, Management, Delft University of Technology

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Abstract

Recently enterprises with little organisational maturity have shown interest in the Balanced Scorecard (BSC). In general these organisations do not meet two critical success factors for BSC-implementation: leadership commitment and staff-resources. Additionally poor data-management might be a complicating factor. This paper proposes the strategy-map for strategy execution where leadership commitment hinders optimisation of distribution performance. The framework is discussed based on the case-study of a transporter of Ready-Mix Concrete in the Netherlands.

Keywords: Balanced Scorecard ,PDCA-cycle, leadership commitment, strategy map.

1. Introduction

Effective and efficient formulation and execution of strategy is becoming more vital in the business environment. Performance measurement systems (PMS) have been successful in optimisation of business strategies. The Balanced Scorecard (BSC) is the best known framework to implement a PMS. In the last twenty years the BSC has been widely adopted by large organisations (LO). Recently, small and midsize enterprises (SME) have shown interest in the BSC (Fernandes, et al, 2006).

However since these smaller organisations typically lack organisational maturity, implementing the BSC may prove challenging. For successful BSC-implementation organisational maturity is defined by

leadership commitment, staff-resources and information management (Kaplan & Norton, 1996; Papalexandis, et al, 2004; Fernandes, et al, 2006). Leadership commitment is defined as leadership “... *itself will act on the basis of the new standard that is established as the result of the reforms and will assume responsibility for the results*” (Morisawa, 2002, p.15). Staff-resources are defined as the resources with time and expertise to implement the BSC (Fernandes, 2006). Nevertheless an approach was developed to implement the BSC with scarce staff-resources (Fernandes, et al, 2006). Currently, there are no reports describing BSC implementation in organisations with poor organisational maturity for all three aspects.

This paper describes the application of the BSC at a LO with poor organisational

maturity. This LO is characterised by: ambiguous leadership commitment, scarce staff-resources, and poor information management. The focus is strategy translation, which is challenging under these conditions and populating the BSC has been criticized (bron). First theory on the BSC is discussed, secondly the approach for populating the strategy map at a transporter of Ready-mix concrete is described and lastly the results are discussed.

2. Balanced Scorecard theory

The Balanced Scorecard (BSC) can be defined as a hierarchical performance measurement framework for strategy implementation aimed at balancing short- and long-term goals (Neely, et al, 2000; Kaplan, Norton, 1992). This is achieved by supplementing results with quantified performance drivers.

Key to this method is the four-perspectives framework (Figure 1) where performance is measured from four perspectives: (i) Financial, (ii) Customers, (iii) Internal Business Process, and (iv) Learning and Growth.

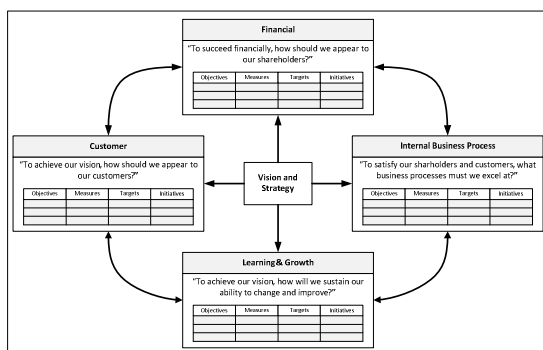


Figure 10: Four-perspectives-framework of Balanced Scorecard, adapted (source: Kaplan, Norton, 1996,p.4)

However the BSC has difficulty to include external relations into this four-

perspective framework, e.g. competitors and business partners (Neely, et al, 1995). Moreover BSC-approaches may be prone to delay during strategy-translation caused by speculations about real correlation in respect to strategic objective linking (Papalexandris, et al. 2004).

Two main requirements of the BSC are *leadership commitment* and *staff-resources*. Leadership commitment is required for effective strategy execution, otherwise “... the *Balanced Scorecard will be just another ad hoc reporting system*” (Kaplan, 2010, p.31). Staff-resources are required to formulate and translate the strategy to the organisation.

The limits of the context at hand for strategy execution by the BSC can be visualised in the learning and growth perspective. Figure 2 shows the relations between human capital, information capital and organisational capital. Scarce staff-resources (ie human capital) increase the difficulty of shaping the culture, leading the change agenda, aligning the workforce and stimulating teamwork (Kaplan & Norton, 2004a; 2004b). Poor information management (ie information capital) impede alignment and information sharing.

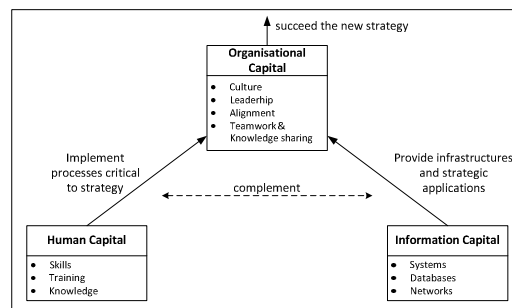


Figure 2: Learning and Growth perspective as foundation for strategy execution (Kaplan & Norton, 2004b)

Both these factors complement each other to increase organisational capital and thereby strategy execution.

3. The company

Van Nieuwpoort Transport (VNT), one of the largest transporters of ReadyMix-concrete (RMC) in the Netherlands, wants to optimise its logistics. However VNT has a traditional organisation that solely applies financial metrics and lacks the necessary determinants for logistics optimisation.

4. The approach

Addressing ambiguous Leadership commitment

Ambiguous leadership commitment was addressed by means of strategic learning, which was achieved by inserting an extra PDCA-cycle at the initiation of the approach (figure 3). Consequently controversial strategic elements are internalised into the learning strategy. Complementary, some requirements for managements resources were postponed as well.

Addressing scarce staff-resources

Scarce staff-resources are addressed by delineating the scope of the validation process and by applying a *triangulation of sources*. The first is realised by validating the proposed BSC with a proof of concept. This proof of concept consists of a proposed implementation plan and a PMS-prototype. The latter includes interviews, desk research, data analysis, and observation. Moreover the BSC can be applied without explicit testing of causal relations (Kaplan, Norton, 2004b), which reduces staff-resources. However this might threaten postponement during translation of the

BSC (Papalexandris, et al. 2004).

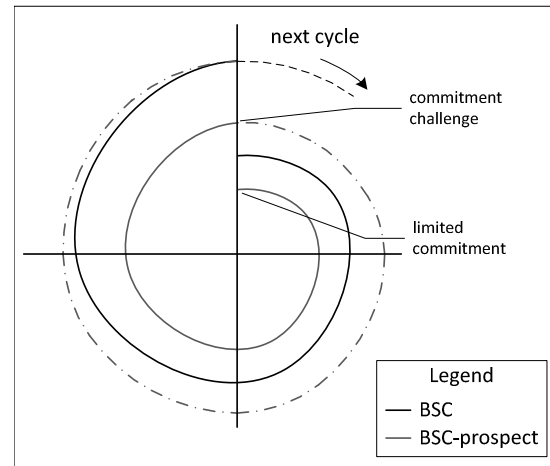


Figure 3: Spiral diagram of implementation BSC and BSC-prospect

Formulating the strategy

The formulated strategy for logistics optimisation consists of “functional excellence” and “strategic learning”. The functional excellence strategy is a base/surge-strategy. Strategic learning challenges the identified assumptions that were derived from the strategic analysis.

Translating the strategy

The strategy was translated to the organisation by means of a strategy map populated with formulated strategic objectives based on the analysis of the internal organisation.

The strategy translation resulted in a strategy-map for VNT where strategic objectives were formulated for all four BSC-perspectives and categorised by strategic theme (figure 3). Most of the identified trade-offs involve the challenged strategic assumptions.

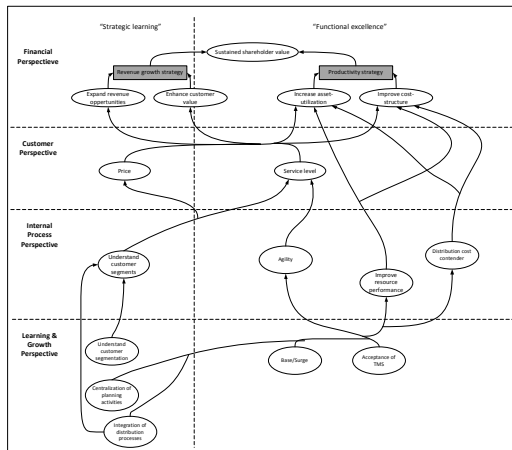


Figure 3: Delineated Strategy map

Operationalising the strategy map

The strategy map is operationalised by linking the most relevant outcomes of the internal business processes to the strategic objectives. Criteria for selecting metrics were based on Kaplan & Norton, D.P., 1996; Neely, et al., 1995; Gunasekaran & Kobu, 2006. For example “improve resources performance” is operationalised by “yield-gap” and “unplanned maintenance”.

Once operationalised, this map served as the proposed BSC.

Validating the strategy map

The strategy-map was validated by testing its approval by the two main stakeholders and by performing a proof of concept with a prototype performance measurement system (PMS).

The strategy-map was partially approved by the main stakeholders.

The prototype-PMS was successfully accepted by the organisation.

5. Discussion

Validation of the strategy map by proof of concept is limited. Ideally, staff-

resources would have been made available to conduct a formal review (Papalexandris, 2004; Fernandes, 2006).

The focus of the translation of the strategy was hierarchical in nature. A *posteriori* the sales manager had shown great interest in the determinants. Including the sales-manager into the strategy translation process might have improved leadership commitment and thus the strategy map. This is a trade-off between scope and the allocation of staff-resources.

The performance prism might be a better suited alternative in this context. It is better suited for a bottom-up approach that focusses on stakeholder-relations (Neely, 2003).

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Appendix B Process-maps of BTM,GBC,BCW

In order to identify the relevant processes that determine VNT's delivery-performance the internal supply chain processes of BTM, GBC and BCW are mapped on the three organisational levels.

The processes are identified by observation and interviewing personnel on all three hierarchical levels. The processes are mapped by using SADT-diagrams. **Referentie SADT.**

The outline of Appendix B is as follows: section B.1 specifies the scope. The strategic, tactical -and operational processes are described in the following sections (respectively B.2, B.3, B.4). Conclusions are drawn in section B.5.

B.1 Scope

By only mapping the internal supply chain processes activities concerning product-development are excluded.

The internal supply chain processes are summarized into the activity: "Produce RMC-products". The SADT-diagram of this process is depicted in figure B-1.

Explain figure B-1

The activity "Produce RMC-products" is decomposed by applying the hierarchical structure. The decomposition is shown in figure B-2).

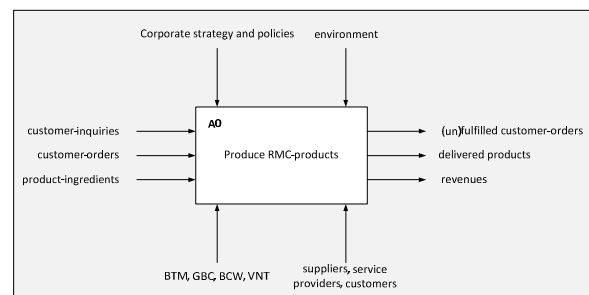


figure B-1 Internal supply chain process of BTM, GBC and BCW "Produce RMC-products"

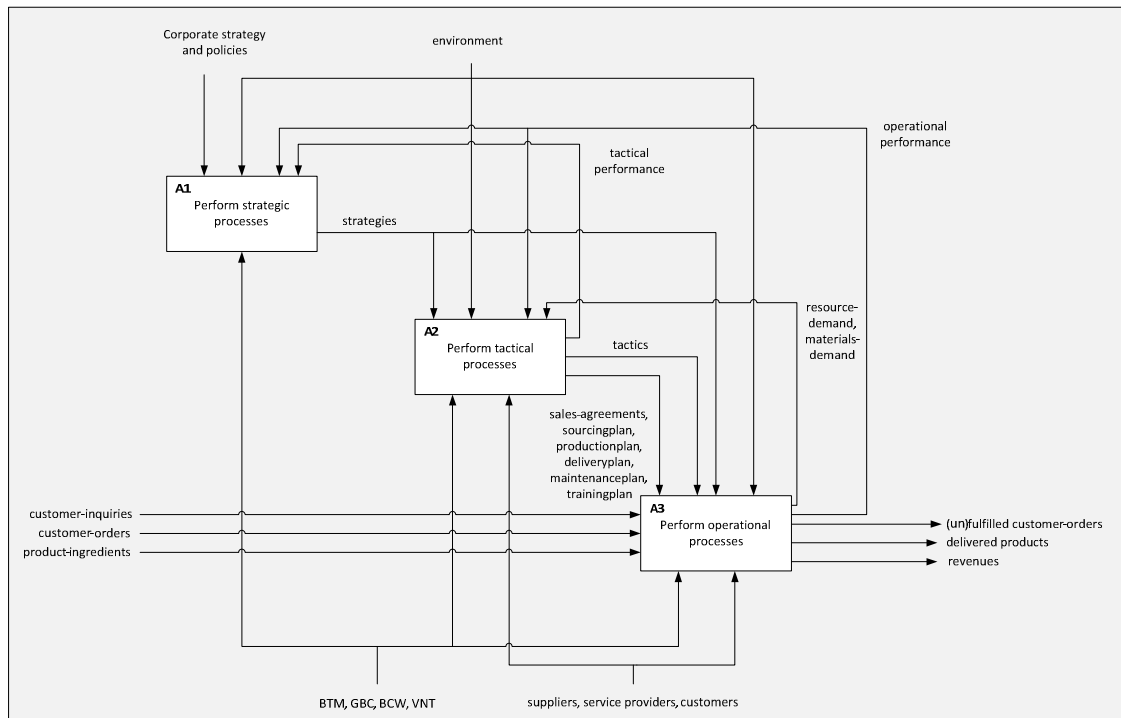


figure B-2: Decomposition of A0

B.2 Strategic processes

What delineates the strategic processes?

B.3 Tactical processes

The decomposition of the tactical process is twofold. Firstly, derived from interviews the tactical process has a hierarchy between the more operational tactical processes and the formulation and implementation that control them (figure B-3). Secondly the formulation and implementation of tactics reside in their functional silo's (figure B-4). Of the more operational tactical processes only "make deliveryplan" (figure B-5) fits the scope.

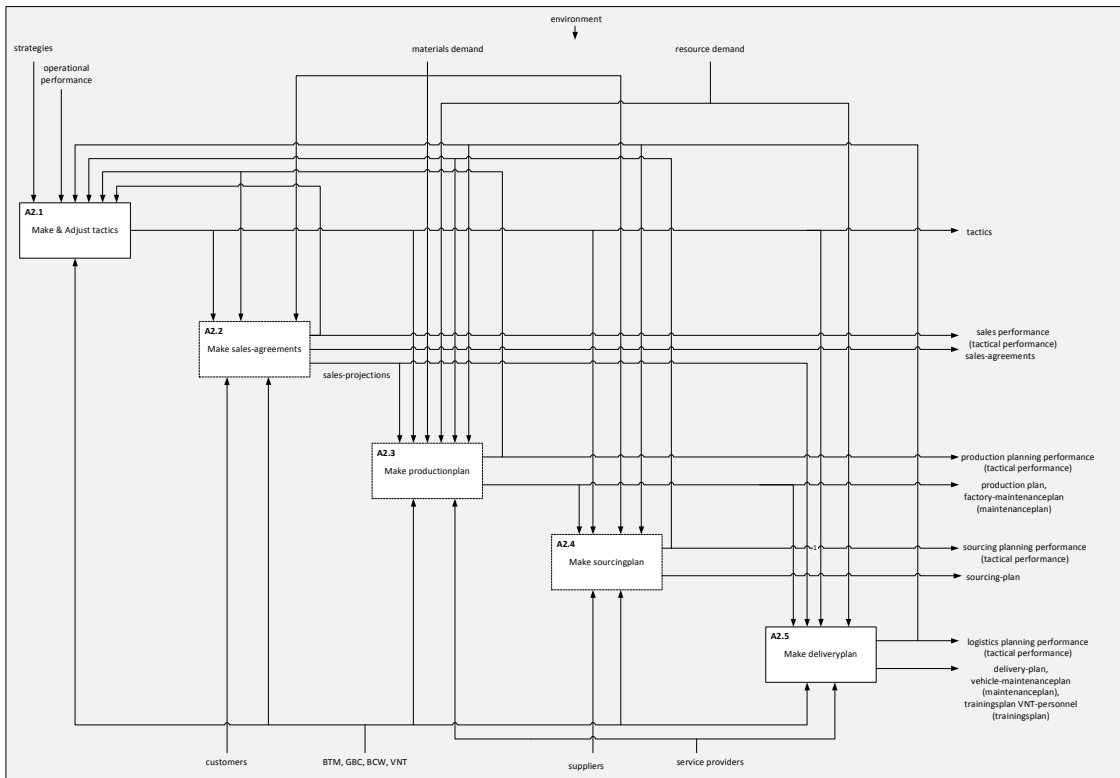


figure B-3: Decomposition of A2 "Perform tactical processes"

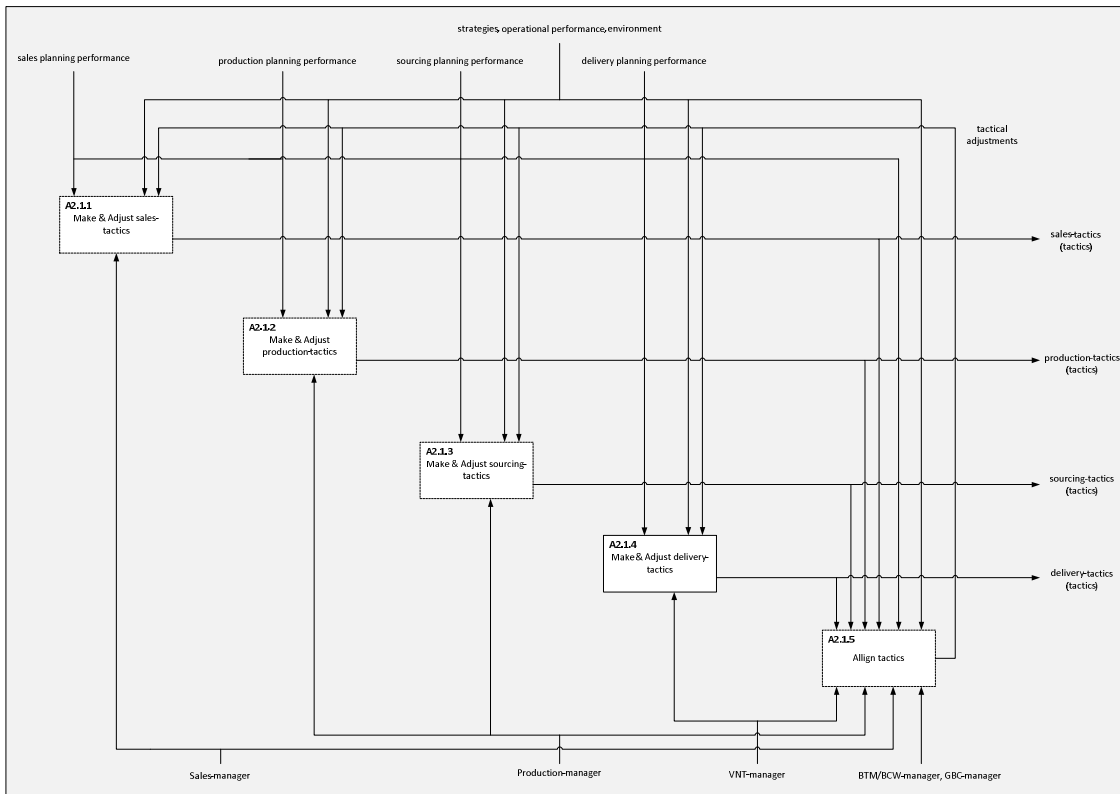


figure B-4: Decomposition of A2.1 "Make and adjust tactics"

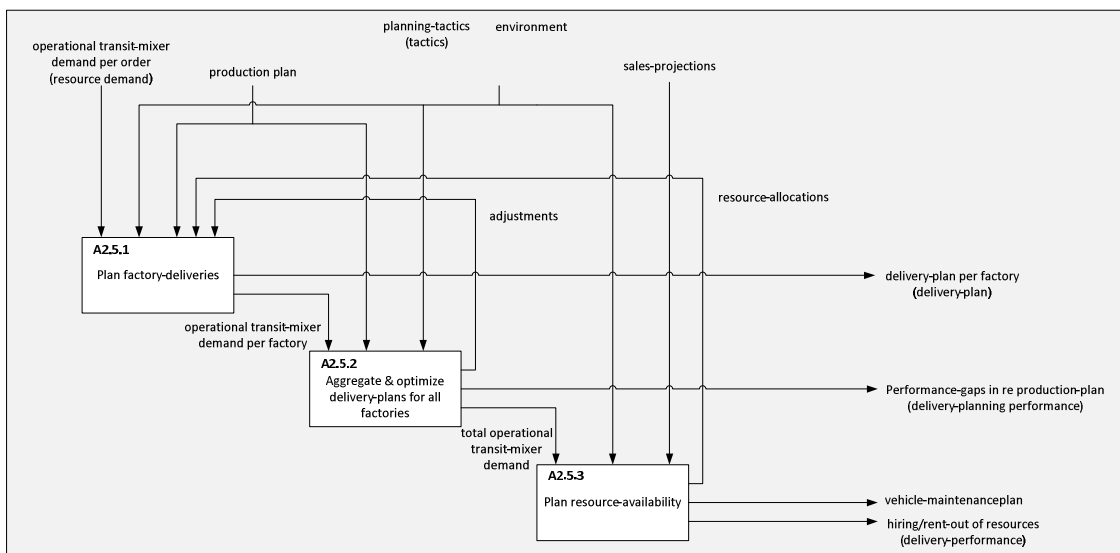


figure B-5: Decomposition of A2.5 "Make deliveryplan" (niet af!)

B.4 Operational processes

The operational process is decomposed by applying the three internal supply chain processes from SCOR: source, manufacture and deliver. A fourth activity is added which contains the supporting activities for performing the supply chain activities: “Perform maintenance & training activities”. The decomposition of “Perform operational processes is shown in figure B-6.

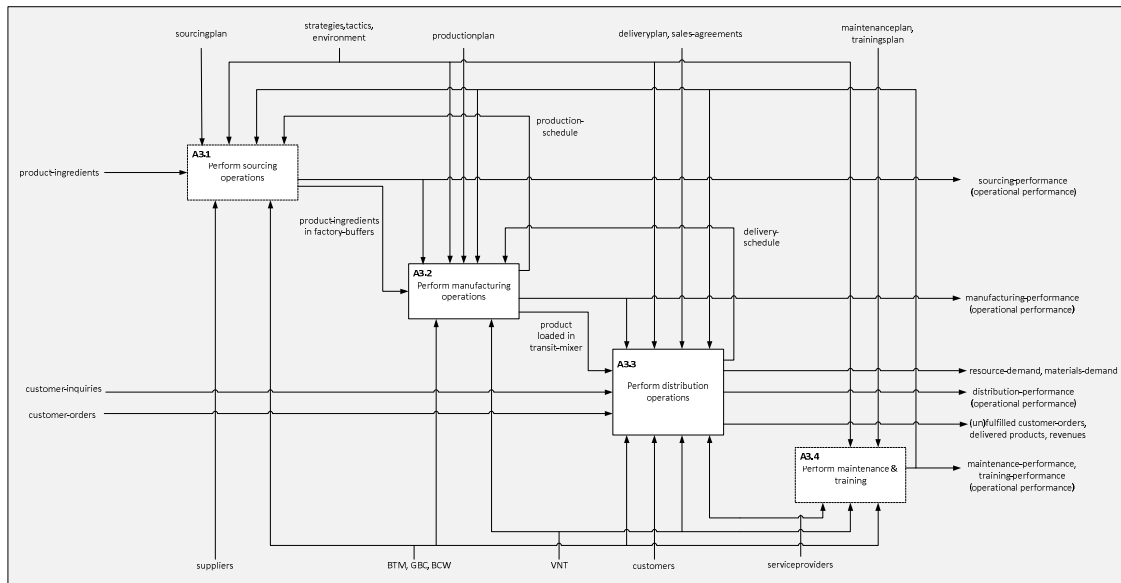


figure B-6: Decomposition of A3 “Perform operational processes”

Beschrijving figure B-6.

Perform sourcing operations

Description

Reasoning demarcation

Perform manufacturing operations

Description

Specification (figure B-7)

Reasoning demarcation

Perform distribution operations

Description

Specification (figure B-8, figure B-9, figure B-10, figure B-11)

Reasoning demarcation

Perform maintenance & training

Description

Reasoning demarcation

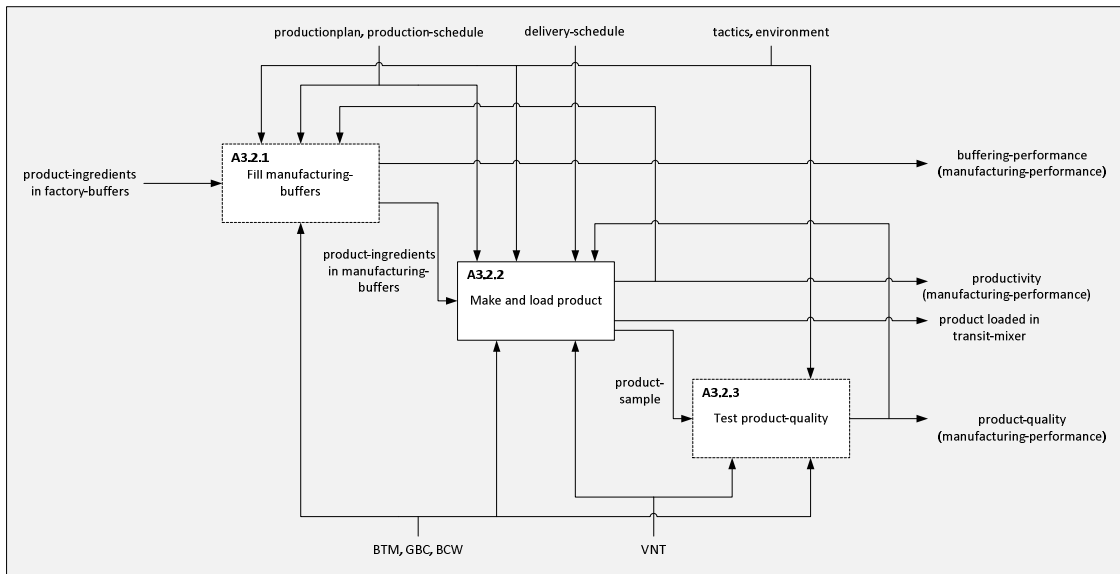


figure B-7: Decomposition of A3.2 “Perform manufacturing processes”

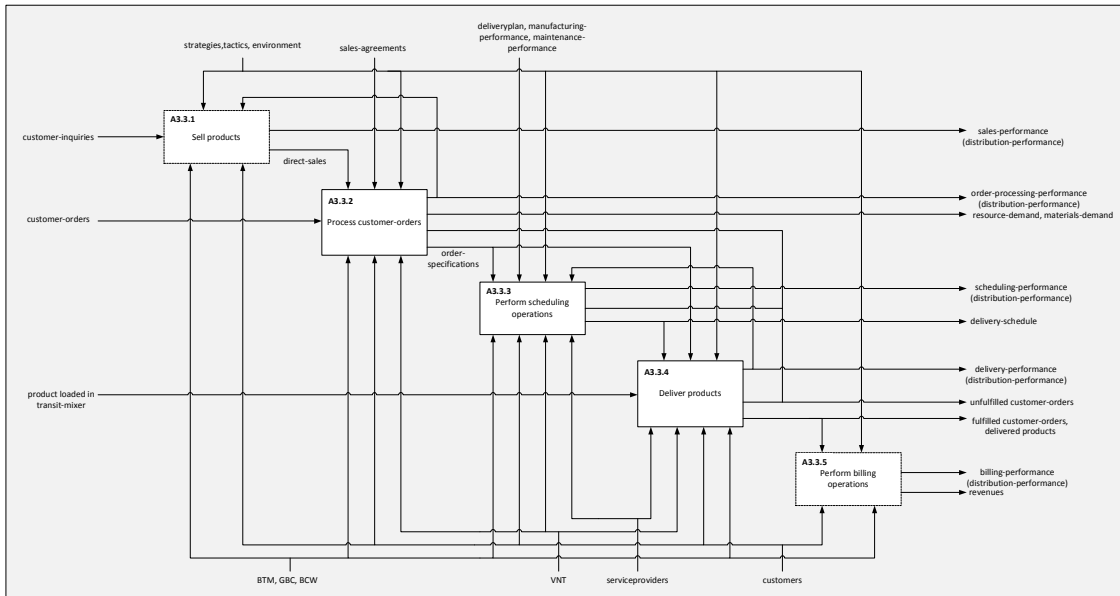


figure B-8: Decomposition of A3.3 “Perform distribution operations”

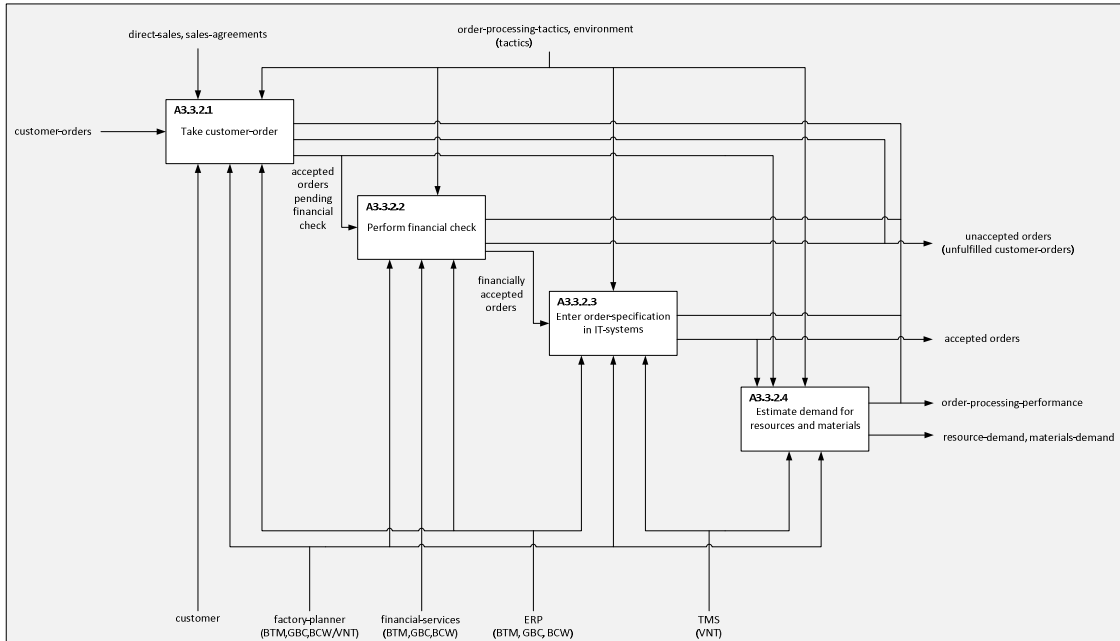


figure B-9: Decomposition of A3.3.2 "Process customer-orders"

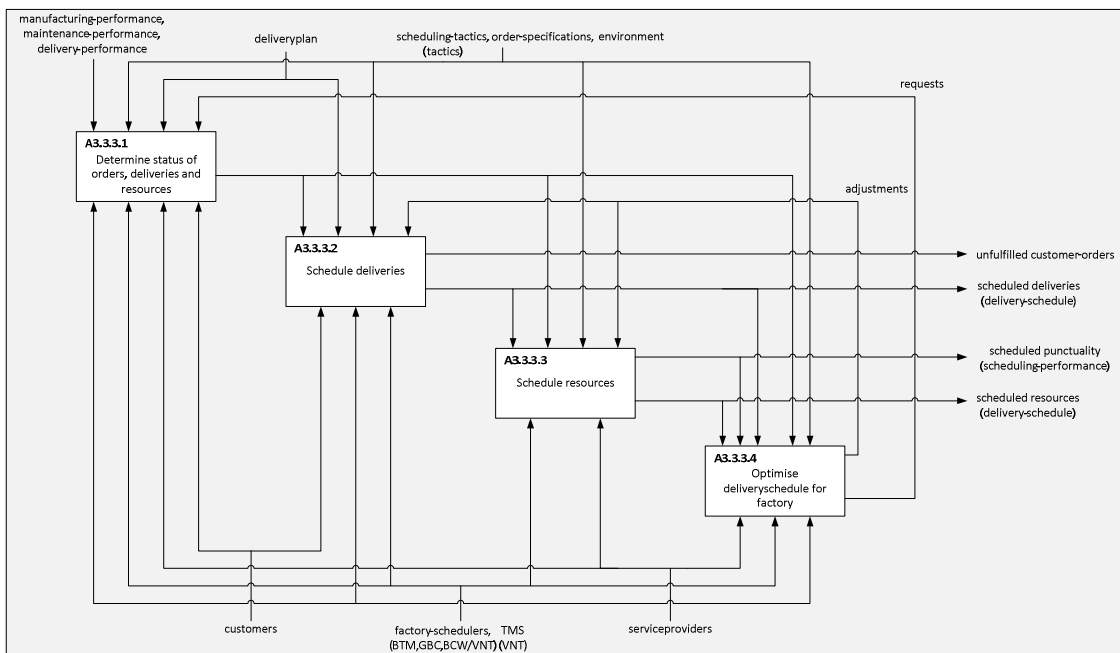


figure B-10: Decomposition of A3.3.3 "Perform scheduling operations"

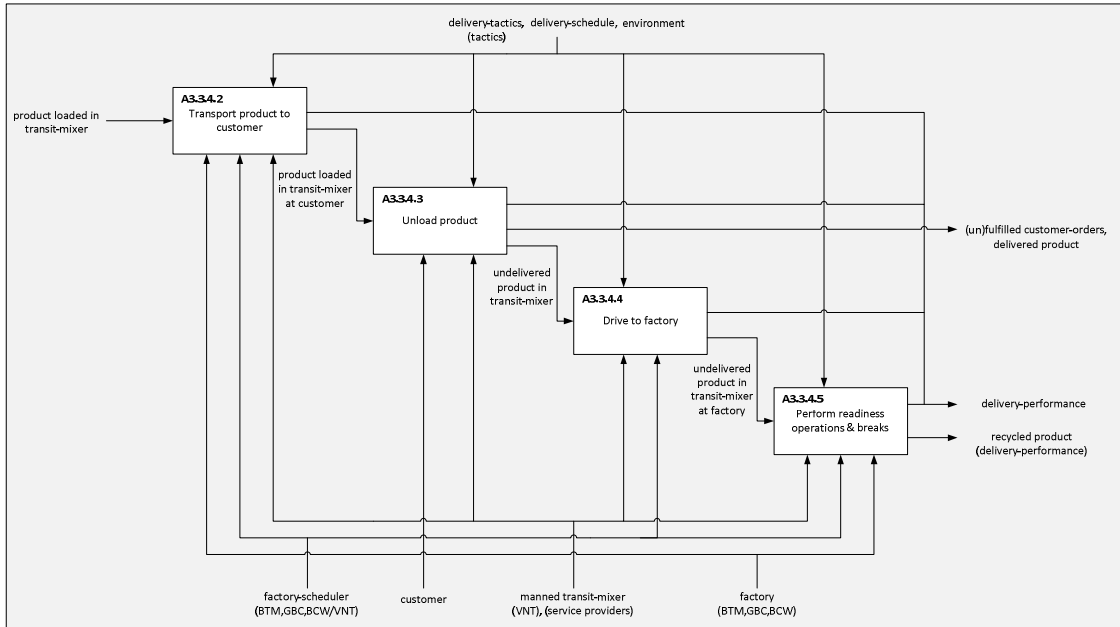


figure B-11: Decomposition of A3.3.4 “Deliver Products”

B.5 Conclusions Appendix B

Appendix C Stakeholders analysis

Management (BTM,GBC, BCW)

Great incentive to maximize turnover while minimizing customer complaints

Sales department

Great incentive to maximize turnover.

Planners and schedulers

Great incentive to maintain friendly relations with drivers

Great incentive to minimize customer complaints.

VNT-Drivers

Great incentive to work overtime. Ideal work-day: early start and home around 17:00.

Enjoy collective breaks.

Customers

The goal of BTM's customers is to complete their building-projects on time and with minimal costs. Such projects require different types of expertise and resources (e.g. carpenters, steelfixers, cranes, concrete-pumps, etc.) and are commonly coordinated with a project-plan. Despite the project-plans delays of all sorts do occur. While the working-context varies among projects, ordering concrete is usually one of the last planning-activities of the customers. The reason is simple: other resources are commonly scarcer than RMC and the characteristics of these other resources determine process-speed and unloading-speed. Moreover, some of types of projects are prone to delays caused by weather-conditions (e.g. rain and harsh temperatures in winter). Consequently the customer desires flexibility in the plan as contingency for such delays. Flexibility is increased by postponing ordering of RMC-products. However there is a trade-off, because postponing could result in insufficient transport-capacity as transit-mixers may have become a bottleneck. Therefore large customers usually try to order as soon as possible even if it means that they don't have all the order-details available at that moment.

Third party Transit-mixers

Financial incentive to select their customers based on business during low demand.

Maintainers of resources

Assumption: lean schedule, thus queue.

Providers of ICT-services

Want to provide solutions (services) to the industry.

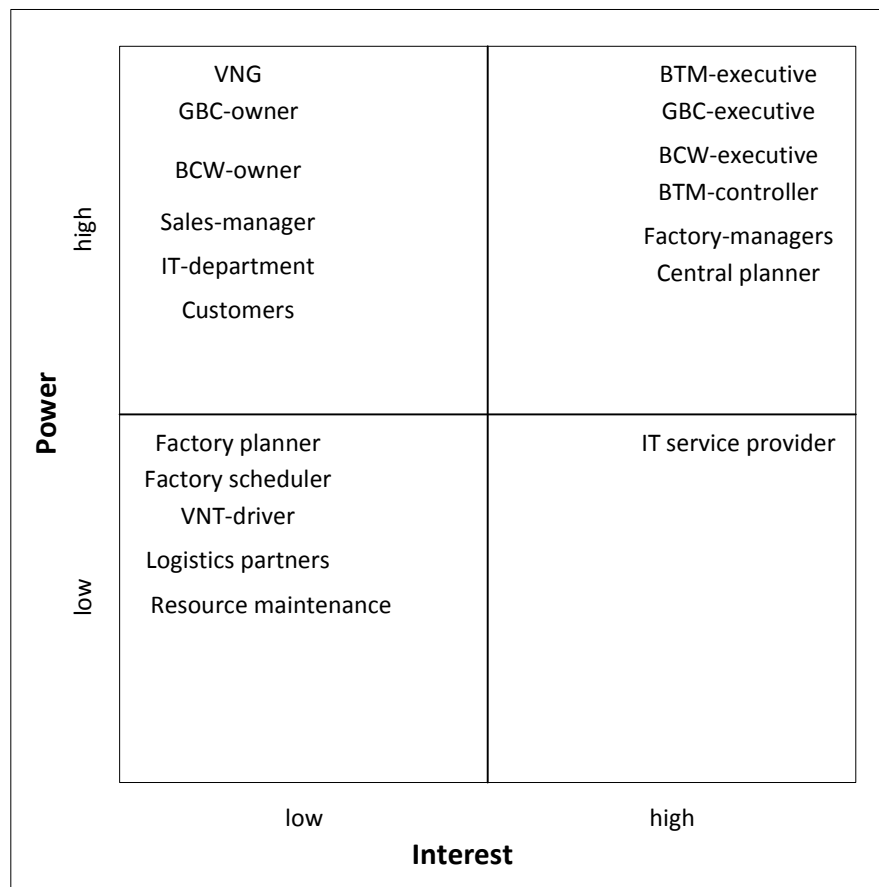


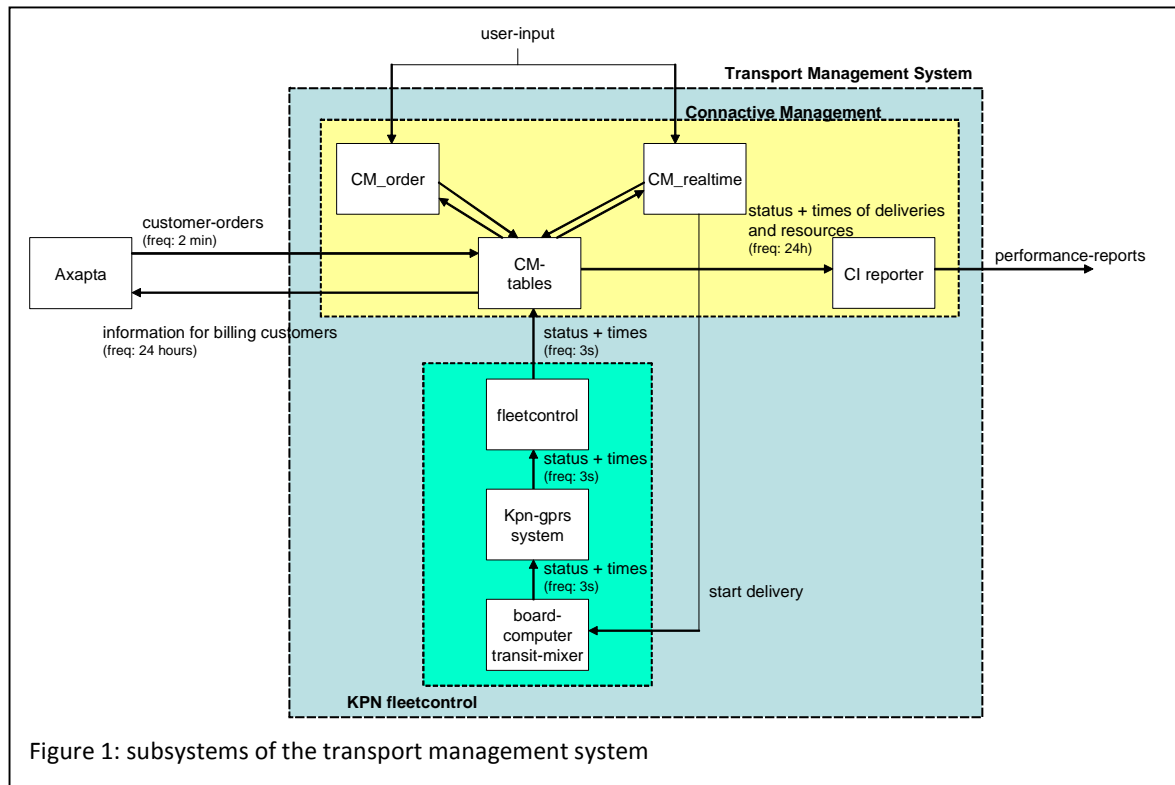
Figure 10-1: Stakeholder matrix

Appendix D Transport Management System³

The Transport Management System (TMS) of Van Nieuwpoort Transport (VNT) consists of multiple sub-systems (see figure 1):

Conactive Management: planning and scheduling of customer-orders and resources, and evaluation of deliveries (CI reporter).

KPN fleetcontrol: status, location and time recording of VNT-transit-mixers.



Customer-orders entered in Axapta are sent to the CM-tables of TMS Conactive Management⁴ with a frequency of 2 minutes. Modified customer-orders in Axapta overwrite the existing customer-order in the CM-tables is also send with the frequency of 2 minutes.

Users (transport-leaders, Mixmasters, and central planners) enter information about orders and resources in CM via the user-interfaces CM_order and CM_realtime. Assignments for transit-mixers are entered into CM-realtime and then send to the board-computer of the VNT-transit-mixer. The status of the VNT-transit-mixer is sent every 3 seconds to the CM-tables via the KPN-fleetcontrol-system.

³ Based on interviews with B. Kuijpers (production manager) and L. Kemp (Automatisering)

⁴ by XML

Information for billing customers is send to Axapta from the CM-tables every night at 04:30. The status + times of deliveries and resources is send to CI reporter every night at 04:30. CI reporter reports the performance of deliveries and resources to a certain extent.

D.1 Conactive Management (CM)

Conactive Management is developed by TMS Ortec and specifically designed for the RMC-industry. CM consists of 4 components: CM-tables, CM_order, CM_realtime and CI reporter.

CM-tables are tables containing the raw data about customer-orders and resources. CM_order and CM-realtime are user-interfaces with different functions and CI reporter is used for evaluation of the deliveries.

D.1.1 CM_order (planning)

This user-interface gives insight into the capacity planning by showing the punctuality of planned deliveries given the planned available capacity of resources. CM_order optimizes the planning by using linear optimization on costs. Lateness in estimated deliveries is translated into costs. An input-parameter is used for making this translation.

Among others, users can make resources (un)available, insert pauses at the customer and can prioritize customer-orders.

D.1.2 CM_Realtime (scheduling)

This user-interface gives insight into the real-time status of resources and deliveries on the day of delivery (see figure 2). The user also assigns deliveries to transit-mixers with this interface. Furthermore CM_Realtime gives advice for scheduling which resource should make which delivery. The accuracy of this advice depends on the accuracy of the inputdata.

Users can adjust pour-rates, quantities, product-specification, driving times, add rinsing-times, allocate transit-mixers to a customer-order, log-in/log-out resources, etc.

D.1.3 CI reporter (performance evaluation)

CI reporter is a MS Access database in which all the data recorded by TMS Conactive Process, Management and Lab are stored. CI reporter has some reporting functions that give insight to some extend about the performance of the manufacturing process and delivery process of RMC-products. However these functions do not give sufficient insight into making trade-offs in the distribution process. Raw data about the distribution process is stored in the following tables of CI reporter:

- RITMI000: data-records of the statuses (start loading, departure, arrival at client, start unloading, stop unloading, arrival at production-facility) of transit-mixers specified on delivery-number, driver, distance, production-facility. This table also specifies the estimated statuses by TMS Conactive.
- LEVER000: data-records of the deliveries specified on transit-mixer, quantity, quantity billed, quantity returned and order-number.
- TRUCK000: data-records of all transit-mixers specified on number-plate, capacity, pump, location. (From the location it can be derived whether a transit-mixer is hired.)
- NBPER000: data-records of when transit-mixers are unavailable specified by reason of unavailability.
- ORDPS000: data-records of pauses at the client. Specified by duration and after what quantity the pause is planned.

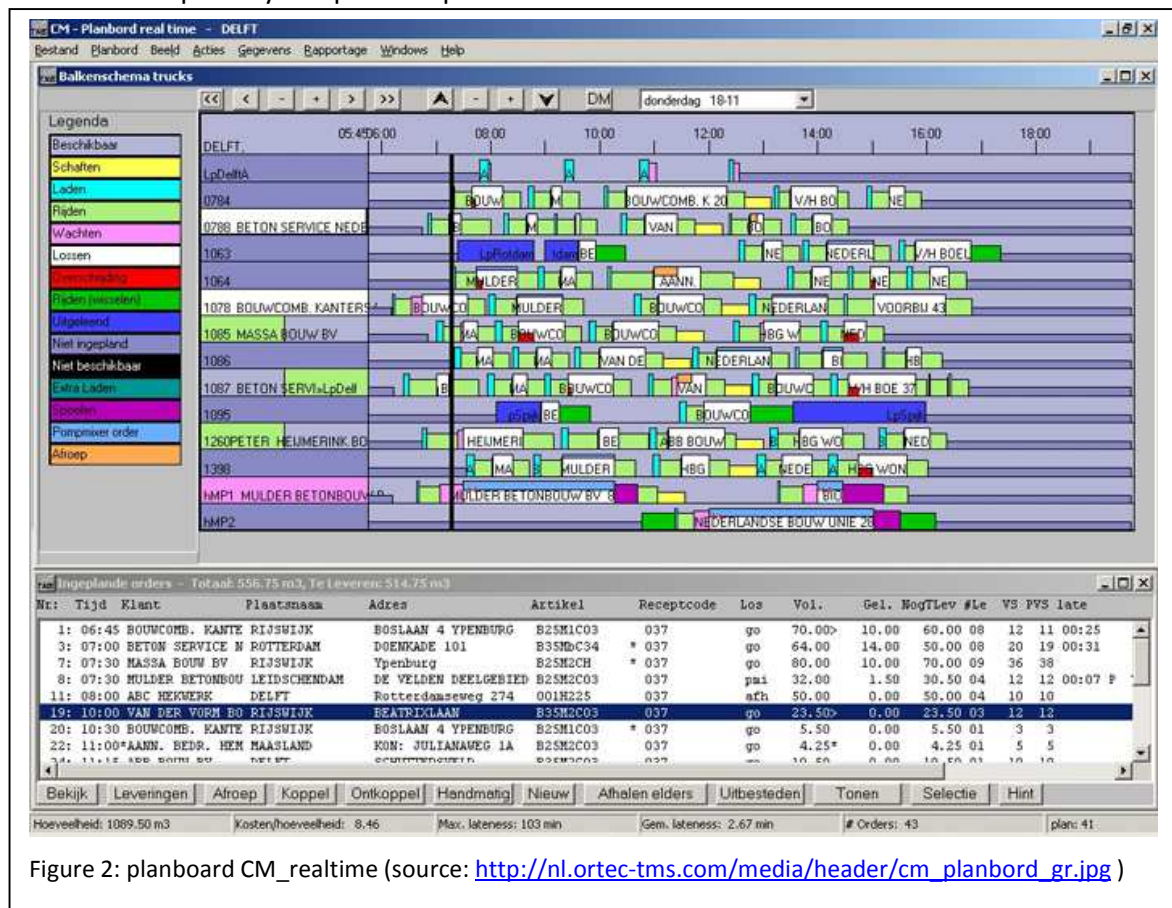


Figure 2: planbord CM_realttime (source: http://nl.ortec-tms.com/media/header/cm_planbord_gr.jpg)

D.2 Fleetcontrol

Fleetcontrol is developed by KPN and monitors the status and location of transit-mixers. The statuses and location of resources are communicated from the board-computer of the VNT-transit-mixer via GPRS to Fleetcontrol. The location data is determined by GPS. The status is derived from the login-status of the transit-mixer, GPS-location and the direction of the rotation of the drum (of the transit-mixer). The driver can override the board-computer manually to proceed to the next status. The transit-mixer can have the following statuses: start service, stop-service, garage, departure facility, arrival at work, start unloading, departure work, arrival facility, unknown.

Appendix E Fault-analysis TMS

E.1 Introduction

The operators of the Transport Management System (TMS) state that they have been confronted with many data-faults in this system.

Two types of errors are distinguished:

- Systemic error: errors with an explicit cause driving results.
- Random error: errors caused by the inherent unpredictability in instrumental measurement.

Data-quality of the TMS can be reduced by removing systemic errors.

E.2 Scope

The following observed faults are analysed for systemic causes:

- Status-errors of transit-mixers in TMS during delivery-cycles
- Parameters of transit-mixers in TMS

E.2.1 Status-errors of transit-mixers in TMS during delivery-cycles

Operators observe that the realtime-status of transit-mixers in the TMS doesn't resemble reality. Three causes are considered:

- Hardware-errors in some of the transit-mixers
- Errors in the interface between TMS and Fleetcontrol
- Parameter-errors for identifying transit-mixers that have returned to factories.

The third cause is outside of the scope because this cause can only be tested within Fleetcontrol.

E.2.2 Parameters of transit-mixers in TMS

E.3 Methodology

Systemic errors are identified by means of hypothesis-testing.

E.3.1 Identification of systemic errors of delivery-cycles

H1: Time-errors are systemic if some transit-mixers are more error-prone than others.

H2: Time-errors are systemic on the systems-interface if these do not exist in Fleet-Control.

E.3.2 Identification of systemic errors with parameters TMS

H3: Parameter-errors are systemic if multiple instances of transit-mixers exist.

H4: Parameter-errors are systemic if transit-mixers' characteristics are faulty.

E.4 Results

E.4.1 Status-errors transit-mixers

H1: The hypothesis is accepted because some transit-mixers (VNT) had significantly more time-errors.

H2: The hypothesis is accepted because there is no correlation between the samples.

E.4.2 Verification of resources

H3: The hypothesis is accepted because some transit-mixers existed multiple times (double) in the TMS.

H4: The hypothesis is accepted because many depots of hired transit-mixers were faulty.

E.5 Conclusions

- The performed tests do not identify all systemic errors.
- The occurrence of time-related systemic errors limit the usefulness of calculating the random error.
- Solutions for the tested systemic errors have a large scope. Error-prone transit-mixers require more operational control. Interface-problems between TMS and Fleet-control require programming. Parameter-management in TMS requires tactical control.

Appendix F Interviews BTM

F.1 Sales

F.2 VNT

F.2.1 Management

F.2.2 Central Planner

F.3 Controller

F.4 Factory Rotterdam

Betoncentrale Rotterdam

11-2-2008

Gesprek met Marco Tagelaar, Aad en Robert

De centrale heeft twee mengers. In rustige periodes wordt er maar één gebruikt. In geval van drukte wordt de 2^{de} menger gebruikt. Ook in geval van storingen wordt de 2^{de} menger ingezet. Een menger is in 5 minuten opgestart.

Mengproces: Het mengproces verschilt van Gouda. Bij de Rotterdamse centrale worden cement en zand in een mixer gemengd. Vervolgens wordt dit mengsel in de auto geladen en tegelijkertijd wordt grind geladen. In de auto vindt de uiteindelijke menging plaats (tussen het mengsel en het grind).

Lossen: Het wordt geprefereerd dat een auto wacht bij de klant ipv bij de centrale. Er wordt gestreefd om elke auto op tijd bij de klant te laten aankomen.

Als de stortsnelheid bij de klant verschilt van wat is opgegeven, dan probeert de mengmeester op basis van ervaring zo goed mogelijk de planning van de dag aan te passen. De mengmeester houdt ook rekening met het verplaatsen van pompen op locatie.

Gebruik TMS-pakket

De voorlopige planning wordt op basis van CM-capaciteitsplanning en ervaring gedaan. Hierbij wordt ook gebruik gemaakt van "dummy-auto's" (om de invloed van externe auto's inzichtelijk te maken). Kleine vertragingen (xx tot xx minuten) worden geaccepteerd.

CM-realtime wordt hoofdzakelijk gebruikt voor het overzicht waar de auto nu is. Adviezen van CM-realtime worden vrijwel altijd genegeerd (weggeklikt). CM-realtime is te onvoorspelbaar. Het komt te vaak voor dat meldingen van auto's niet goed aankomen in het systeem. Hierdoor heerst het gevoel dat het systeem te onbetrouwbaar is om mee te werken.

In de planning wordt geen rekening gehouden met het zetten van externe auto's op ritten waar ook eigen auto's met kastje rijden. Hierdoor kan de gesimuleerde levering door externe auto's niet tussentijds worden geupdate.

Inzet externe wagens en extern personeel

Er wordt gestreefd om externe auto's en personeel zo efficiënt mogelijk in te zetten en dus zo snel mogelijk naar huis te sturen.

Samenwerking met andere centrales

Als een auto ritten voor een andere centrale moet uitvoeren dan wordt er naar gestreefd dat het transport naar de andere centrale zo min mogelijk lege vracht is door bij voorkeur de auto ook een rit op de weg ernaar toe te laten uitvoeren.

F.5 GBC

Goudse Betoncentrale

8-2-2008

Gesprek met Jan Struik

Klantorders: Grote klanten willen graag 's ochtends vroeg beton voor muren (uitharden voordat een muur dragend is, kost tijd). Direct na de schaft willen grote klanten beton voor vloeren opdat het geen nachtwerk wordt (maken vloer op locatie kost zo'n x uur). Het is de kunst om de kleinere klanten tussen de piekmomenten in te plannen. Meestal hebben de kleinere klanten hier wel begrip voor.

Mengproces: grind, zand, cement en water worden in een trommel gemend. Het grind, zand en cement komt vanuit silo's in weegkamers, vanwaar deze in de trommel terecht komen. Zand en grind worden per transportband vanuit open opslagplekken naar de silo's getransporteerd. De transportband bepaalt de snelheid van het productieproces. Voor xx minuten kan een hoge laadsnelheid gehaald worden.

Kwaliteitscontrole: om de kwaliteit van het product te garanderen worden steekproeven genomen. Deze proeven getest op duurzaamheid en vochtigheid. Hierbij wordt versneld gedroogd. Tijdens het produceren wordt ook de vochtigheid gecontroleerd omdat met zand en grind ook water meekomt (door regen). Hierdoor zal dus minder water moeten worden toegevoegd.

Lossen: Voor het bepalen van het aantal ritten en het aantal auto's dat op een klantorder worden gezet zijn zowel het totale volume als de stortingsnelheid van belang. Daarnaast wordt rekening gehouden met files. Het wordt geprefereerd dat een auto

wacht bij de klant ipv bij de centrale. Als er bijvoorbeeld 5 auto's op een klantorder staan en er wordt hierbij een constante stortsnelheid gehaald, dan wordt geprefereerd dat een auto niet tussendoor op een andere klantorder wordt gezet en dat dus een andere auto (die later binnenkomt) wordt ingezet, omdat dit tot wachttijden bij de stort leidt (zowel voor de klant als bij de volgende auto('s)).

Er wordt altijd gestreefd dat de eerste auto op tijd bij de klant is. Bij het plannen van auto's wordt een kleine vertraging voor lief genomen. Deze vertraging mag max. xx minuten zijn.

Het komt vaak voor dat de stortsnelheid op bij de locatie hoger is, dan dat de klant heeft opgegeven. In dit geval zullen sommige klanten vragen of de volgende auto sneller kan komen. Hier hoeft de centrale geen rekening mee te houden. Het komt minder vaak voor dat de stortsnelheid langzamer is dan dat is opgegeven. Als deze langzamer is dan zal de centrale proberen om de auto's efficiënter in te zetten.

Gyvlon en betonmortel kunnen niet door dezelfde auto getransporteerd worden omdat grind (uit betonmortel enerzijds slecht is voor Gyvlon en betonmortel anderzijds niet verhard door Gyvlon. Een auto die eerst betonmortel transporteert en vervolgens Gyvlon zal dus tussentijds gespoeld moeten worden. Het spoelen van een auto kost zo'n xx minuten.

Gebruik TMS-pakket

Voor de planning wordt CM-capaciteit gebruikt. Als uit de planning blijkt dat er maar enkele korte vertragingen (<xx minuten) zijn dan worden deze voor lief genomen. In de overige gevallen wordt er verzocht om extra auto's.

Op basis van CM-capaciteit worden de ritten voor de dag zelf gepland. CM-realtime wordt hoofdzakelijk gebruikt voor het overzicht waar de auto nu is. Adviezen van CM-realtime worden meestal genegeerd. CM-realtime is te onvoorspelbaar. Als CM-realtime een melding mist (zoals bijvoorbeeld storten), dan raakt CM-realtime in de war. Pas als de auto weer bij de centrale is, dan pakt CM-realtime de status van de auto weer goed op. Bovendien zijn er een aantal parameters die niet goed lijken te zijn ingesteld. Het is niet duidelijk hoe vaak CM-realtime fouten maakt. CM-realtime maakt meer planningsfouten als het aantal acties toeneemt.

Externe auto's worden in CM-realtime gesimuleerd. Om deze auto's zo goed mogelijk te kunnen volgen worden deze auto's bij voorkeur voor of na een eigen auto gepland op dezelfde klantorder, zodat de software deze auto zo nauwkeurig mogelijk kan volgen.

Inzet externe wagens en extern personeel

Er wordt gestreefd om externe auto's en personeel zo efficiënt mogelijk in te zetten en dus zo snel mogelijk naar huis te sturen.

Bezettingsgraad auto's

Het zou natuurlijk mooi zijn om auto's 100% in te zetten. Dit is echter niet mogelijk. Ten eerste is de terugrit van een auto altijd lege vracht (een betonauto kan alleen beton vervoeren). Ten tweede zitten er piekmomenten in een dag. Daarnaast zijn er seizoensinvloeden en treden er op een dag vertragingen op (vooral bij de klant). Er wordt geschat dat de bezettingsgraad zo'n xx% tot xx% is.

Personeel kan uitvallen door ziekte en verzuim. Hoe kleiner het wagenpark, hoe groter de invloed van verzuim.

Samenwerking met andere centrales

Als een auto ritten voor een andere centrale moet uitvoeren dan wordt er naar gestreefd dat het transport naar de andere centrale zo min mogelijk lege vracht is door bij voorkeur de auto ook een rit op de weg ernaar toe te laten uitvoeren.

F.6 Factory Veghel

F.7 Factory Den Bosch

Appendix G Storyboards for prototype

Two storyboards have been developed based on the activities: operational use and maintenance.

G.1 Operational use

Pete, the fictional user of the system, starts the system and selects a period to check its delivery-performance. He selects the dates (usually a period of 1 month) and waits until the system finishes calculations and the overview of the delivery-performance is shown. Pete looks at the key-performance indicators and notices that the Transit-Mixers scored lower on the fault-indicator compared to last month. He decides to zoom in to gain more understanding why this has happened. The zoomed level lists all VNT transit-mixers specifying the percentage of faulty trip-data per transit-mixer for that period. While scrolling through the list – sorted by highest fault percentage – Peter spots a transit-mixer that usually isn't "that faulty". He zooms into that transit-mixer and discovers that it was faulty during 2 weeks. Peter decides to call Marc, a fictional operator of the related factory, and finds out that the transit-mixer was operated by a replacement driver in those two weeks, who wasn't properly instructed about use of the fleetcontrol-device. Based on this information Pete decides to improve instructions to replacement drivers at that factory.

After closing the zoomed views on faulty transit-mixers Pete checks the scores on efficiency. Productivity increased compared to last month as well as turnover. Pete checks the productivity yardstick graph to gain understanding whether the increased turnover is the only cause for improved productivity. The graph confirms his gut-feeling: productivity only improved on peak-days. Pete checks whether last month's efforts to reduce costs of overwork show any results. The score didn't change compared to last month. Pete zooms in to gain insight into these results specified per factory. From the graphs it became clear that despite some factories did improve scores on overwork of 3p-transit-mixers while other factories have more overwork overall. Pete makes a memo to interview all factories about how they experience last month's means, and to give compliments where appropriate. Before going to lunch Pete zooms in on unavailability to check the specified scores on planning of unavailability and to check whether all operators properly planned out resources in the TMS. Based on his first glance he decides to go to lunch because the scores weren't as good as expected and need a closer look.

G.2 Maintenance

While importing data on a weekly basis, Pete performs the other maintenance-tasks of the system with a monthly interval. He checks whether the scales to calculate the scores

need to be adjusted to gain better signals of improvement and he checks whether the targets set – which support the management’s strategy – maintain viable, and adjusts these when/where appropriate. At this time Pete has only worked with the system for 3 months therefore he wants to get more feeling for the scales and targets before considering a change. So he decides to make a copy of the system and experiment with that in the coming months. He wants to experiment with the overwork-scales. Currently the scales are configured in such a way that overwork of all types of transit-mixers⁵ are equal. This makes those easy to read and to understand. Pete wants to gain insight into the effects of lowering the reward for long overtime of 3P transit-mixers. Consequently he opens the configuration menu of this scale and reduces the domain by 1 hour of said resource-type. After checking the scale the system prompts the user whether he is sure of the change. Once confirmed the system prompts the user to recalculate all scores. Since recalculation may take a long time to complete, Pete decides to do the recalculations when he doesn’t need to use the pc (overnight).

Pete updates the system with the latest data by clicking the “import”-button in the main window and the system starts importing data from the data-sources TMS and personnel-planner. During the highly automated import-process Pete is prompted with some pop-up dialogs about changes in statuses of transit-mixers. Three transit-mixers are identified. From the list he recognizes one of the trucks as sold and swiftly updates its status in the system. The second transit-mixer on the list had its depot changed. Pete checks the TMS and finds out that it depot was changed by accident. He amends this error and contacts the operator who most likely changed the status. The third transit-mixer was identified as a new transit-mixer and is entered into the system. After completing this task, the system resumes the update-process which was completed after a short while.

⁵ VNT, VNT-trailers, and 3P

Appendix H Goal/means-diagrams

This document contains the goal/means-diagrams used to connect the strategy-map to the business processes. The goal/means-diagram refers to business processes mapped in Appendix B.

H.1 “Order fulfilment”

Perfect order fulfilment is about accepting and delivering all orders on time and on specification. The goal/means-diagram is shown in Figure H-1.

To improve quality –and readiness of order-specification two means are identified:

- Increase customer management (D2.1-D2.4, P4.1)
- Increase forecasting accuracy (D2.2-D2.4, P4.1)

Improvement of quality and readiness of customer’s financial state has been placed outside of the scope of this project.

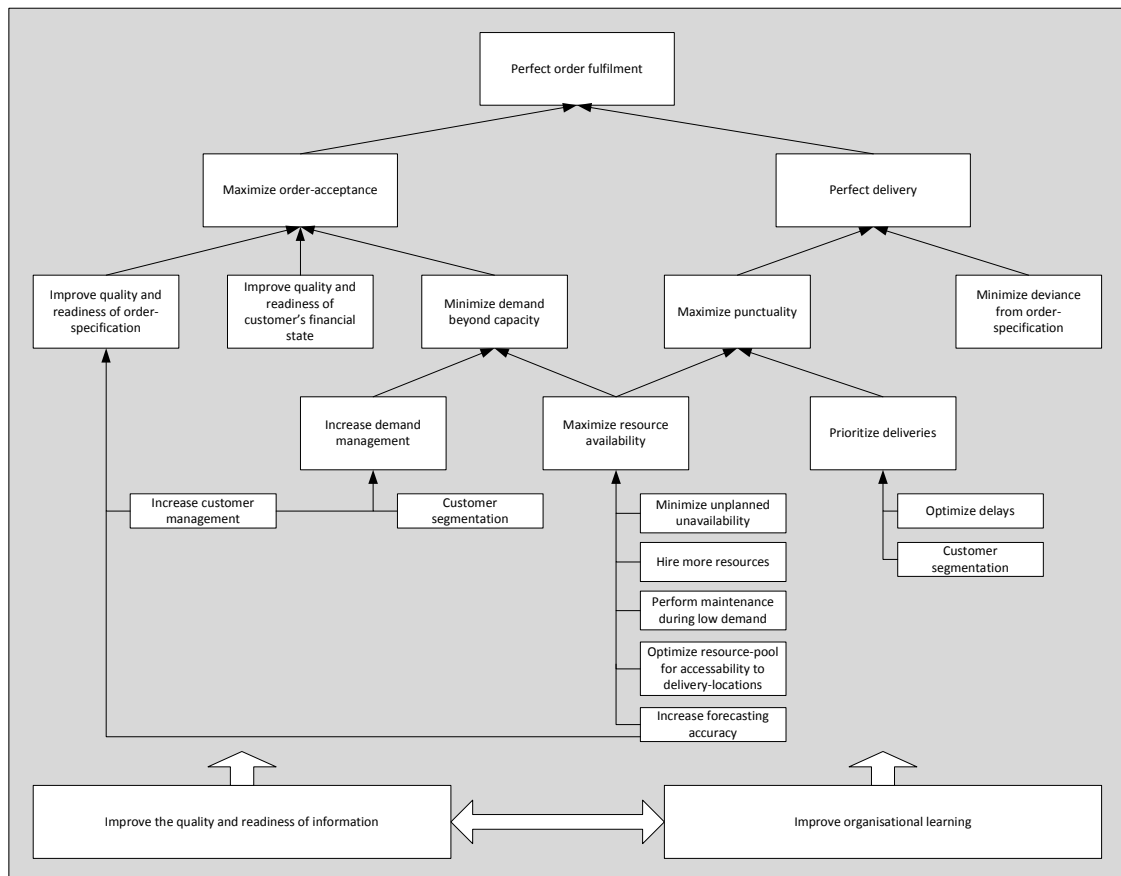


Figure H-1: Goal/means-diagram for “Perfect Order Fulfilment”

To minimize demand beyond capacity peak-demand should be minimized and resource-availability should be maximized. Demand-management can be increased by customer-segmentation. To maximize the availability of resources five means are identified:

- Minimize unplanned unavailability (P4.4)
- Hire more resources (P4.4.3)
- Perform maintenance during low-demand (P4.4.4)
- Optimize resource-pool for accessibility to delivery-locations (P1, P4.4)
- Increase forecasting-accuracy (D2.2-D2.4, P4.1, P4.4.3)

To maximize punctuality resources should be made available to meet demand and to overcome delays (see above), and deliveries should be prioritised.

To prioritise deliveries two means are identified:

- Optimize delays (D2.5) to minimize the effects on overall order fulfilment.
- Apply customer-segmentation (P4.1)

H.2 “Increase resource performance”

Increasing resource performance is about increasing yield of the distribution resources by increasing their productivity and utilization (see Figure H-2).

Increasing utilization is about minimizing idle-times of resources. To this end non-value-added activities of resources (e.g. maintenance) should be performed when demand for value added activities is minimal, and the available resources for performing the value-added activities should be reduced.

Increasing productivity is about increasing the combined effectiveness and efficiency of resources. Thus doing more (turnover) with less (available resources). To this end customer value should be created to increase turnover and resources should be reduced as well as overtime should be minimized to reduce resource-availability.

To maximize non-value-added activities during low-demand three means are identified:

- Increase suppliers relations management (P4.4.4).
- Reduce unplanned maintenance (P4.4.1, P4.4.4)
- Increase forecasting accuracy (P4.3, P4.4, D2.5)

To reduce resource availability five means are identified:

- Rent-out overcapacity (P4.4.3) by renting-out manned transit-mixers to competitors.
- Increase load per resource (P4.1, P4.4.3, D2.5) to reduce the required deliveries per customer order.
- Increase demand management (D2.1, D2.2, D2.3, P4.1, P4.3) to reduce peak-demand and to improve quality and readiness of information.
- Reduce service level (P4.1, P4.4, D2.5) to minimize both the availability of resources and to minimize overtime by customer-segmentation.

- Increase activity-efficiency (D2.2-D2.9, P4) of (non) value added activities. Cycletime can be reduced as a result of minimizing slack enabled by improved quality and readiness of information and by customer-segmentation. Maintenance-duration can be reduced by increasing maintenance management.

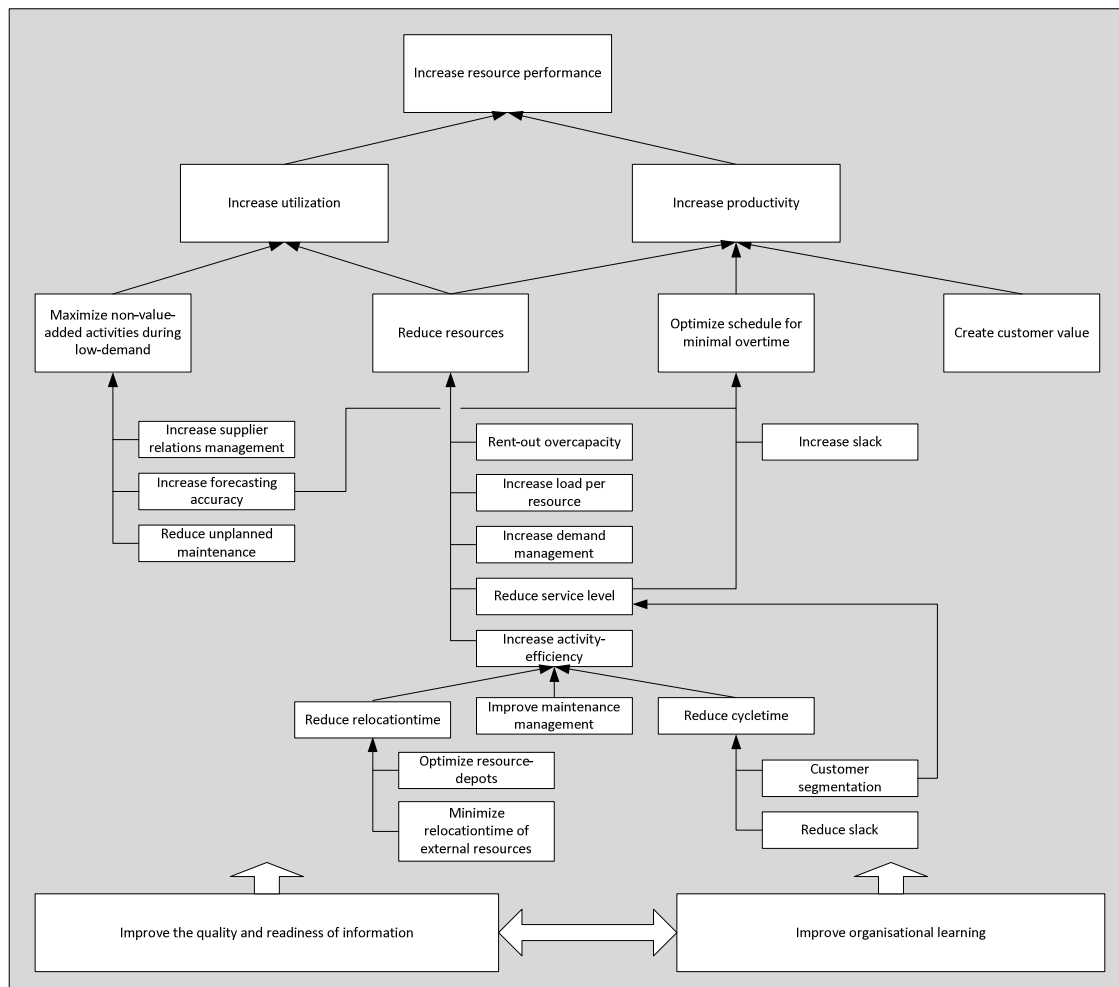


Figure H-2: Goal/means-diagram of "Improve resource performance"

To optimize schedule for minimal overtime three means are identified:

- Increase forecasting accuracy (P4.3, P4.4, D2.5) to estimate unloading speed, pauses and volume-overshoot.
- Increase slack (P4.3) towards the end of the day as contingency to minimize overall delay.
- Reduce service level (P4.1, P4.4, D2.5) by limiting delivery-frequency at the end of the day.

Customer value is created by means of the customer value proposition, which is supported by Customer management (Figure H-2).

H.3 “Become a distribution cost contender”

To become a distribution-cost contender the organisation has to close the gap to the competition by optimizing distribution performance per customer-segment, and by reducing overhead (see Figure H-3).

Optimizing distribution performance per customer-segment is about reducing distribution costs while meeting the required service level of a customer-segment.

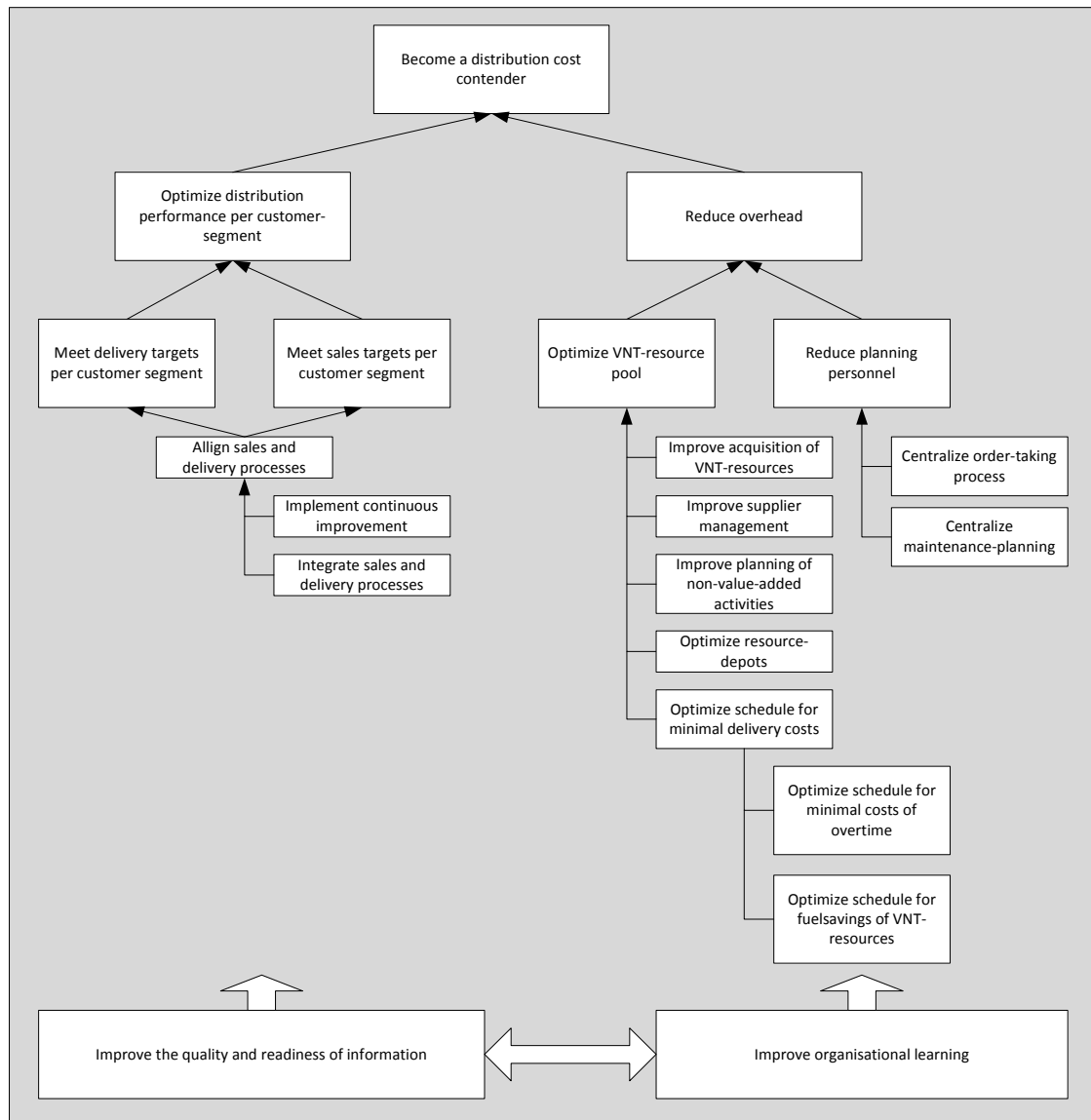


Figure H-3: Goal/means-diagram “Distribution cost contender”

In order to meet delivery-targets and sales-targets per customer segment the delivery - and sales processes should be aligned. To align these goals two means are identified:

- Implement continuous improvement to gain organisational knowledge to optimize distribution performance.

- Integrate sales and delivery process (P1, P4.1,P4.3, P4.4), (D2.1-D2.5).

Reduce overhead is about minimizing the costs of those resources that cannot directly be attributed to deliveries. To this end the VNT-resource pool should be optimized and planning personnel be reduced.

To optimize VNT-resource pool five means are identified:

- Improve acquisition of VNT-resources (P1) aims to optimize utilization and availability of resources to meet cyclical demand.
- Improve supplier management (P4.4.3) aims to increase availability of hired resources during peak-periods and to minimize relocation time of external resources.
- Improve planning of non-value-added activities (P4.4.3, P4.4.4) to optimize utilization and availability of resources to meet seasonal demand.
- Optimize resource depots (P1, P4) aims to minimize relocation-time of resources thus improving availability and productivity.
- Optimize schedule for minimal delivery costs (P4.3, P4.4, D2.5) by optimizing the costs of overwork and optimizing for fuel-savings of VNT-resources.

To reduce planning personnel two means are identified:

- Centralize order-taking process (D2.2-D2.4) aims to improve acceptance of orders and to reduce work-load per planner, thus reducing personnel.
- Centralize maintenance-planning (P4.4.4) aims to improve resource-availability and to reduce workload per planner, thus reducing personnel.

H.4 “Increase understanding of customer-segments”

In order to increase understanding of customer-segments the organisation has to define customer-segments and set targets per segment to align the organisation (Figure H-4).

- Increase understanding of customer segments is about defining customer-segments and setting targets per segment to align the organisation.
- To define customer-segments knowledge is required of the customer valuation of distribution performance and compared with the measured distribution performance. Both are required to translate the valuation to the organisation’s processes.
- To set targets per customer segment these segments should be translated to the three main processes of the internal supply chain: source, manufacture, distribute.

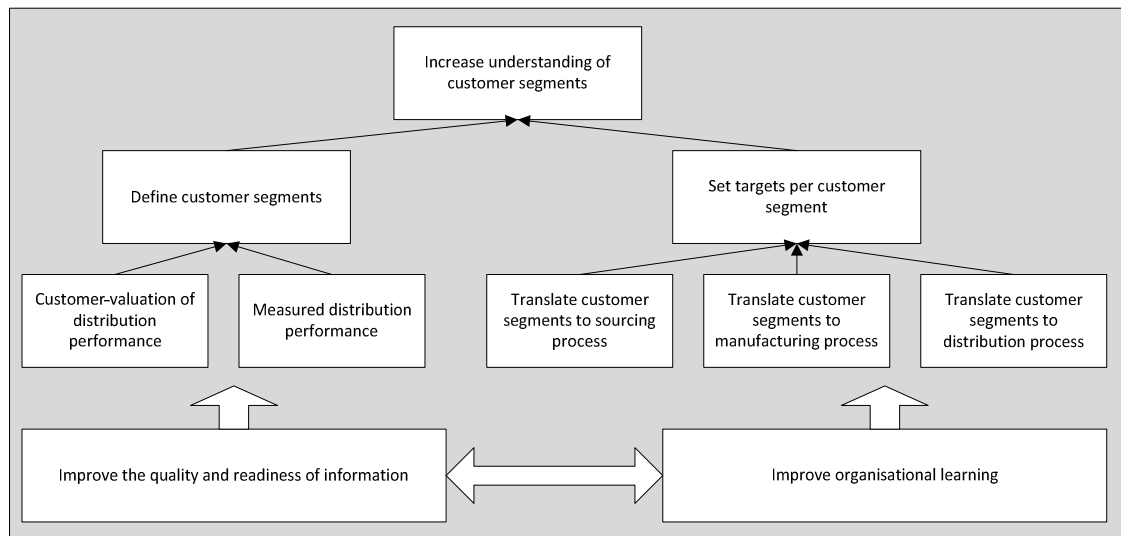


Figure H-4: Goal/means-diagram of “understand customer segments”

From the goal/means diagrams it is derived that improving the quality and readiness of information is very important. The TMS is the medium for data-readiness of planning and scheduling optimisation activities.