Professional Service Firms:

Business Model Analysis - Method and Case Studies

DISSERTATION
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submitted by

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The University of St. Gallen, Graduate School of Business Administration, Economics, Law and Social Sciences (HSG) hereby consents to the printing of the present dissertation, without hereby expressing any opinion on the views herein expressed.

St. Gallen, October 19, 2009

The President:

Prof. Ernst Mohr, PhD

To Chrissoula, Nick and Sophia.
Thank you for your enduring love and patience.
σας αγαπώ απέραντα.

Preface

> If you go to your grave without painting your masterpiece, it will not get painted. No one else can paint it. *Only you.*
>
> *(G. MacKenzie)*

This dissertation presents the results of research on the analysis of business models. The research was carried out between December 2005 and July 2009 as part of my doctoral studies at the Institute of Information Management (IWI) of the University of St. Gallen (HSG)[1].

Working on this dissertation has been the most rewarding educational experience in my life: intellectually stimulating, operationally challenging and directly beneficial to my work as a consultant.

I left university and my potential career in mathematics at the age of twenty-two and went straight into IT and management consulting—as time went on I felt I should find a way of using both my mathematical background and my (IT-)modelling skills to deepen my understand of economics and business. I had always been attracted to the business model concept and during my previous studies[2] at HSG I realised that this concept was not only fuzzy to me, but also to many others—it therefore seemed sensible to dive deeper into this topic.

I am particularly grateful to my supervisor Prof. Robert Winter for taking on an external and mature doctoral student. Prof. Leo Brecht also immediately agreed to co-supervise my work in times which were particularly turbulent for him, and this boosted my morale considerably. I would like to thank both Prof. Winter and Prof. Brecht for the valuable insights they shared during the past years.

The doctoral students at the HSG were very welcoming to me as an external stu-

[1] Because the research for this dissertation is relevant internationally, it is written in English, following the British spelling convention. The spelling convention is particularly relevant here, as some words that are frequently used in this research are spelled differently in American English, e.g. modelling (British English) vs. modeling (American English) and analysing (British English) vs. analyzing (American English).

[2] Executive Master of Business Administration (EMBA) from 2003-2005.

dent, and I am grateful to Kristin Wende, Michael Hutter and Gunter Seidel for their openness and many fruitful discussions.

An important part of the research that went into this dissertation was to apply the business model analysis method developed here to real situations in real companies. At the onset of this research the task of finding the right companies was the one that carried the highest risk. After much deliberation I chose to ask companies I had worked for in the past to give me the opportunity to analyse their business models: Amazingly all of the companies asked assented, and this was very motivating at the time. I am very grateful to Roland von Bethusy-Huc, Robert Huber, Ingo Kriescher, Christoph Ostendorf, and Olaf Schmidt for their encouragement and patience—I hope the insights they gained during the modelling process, the resulting business microworlds and final case study reports made their involvement worthwhile.

Doing doctoral research and writing a dissertation is a task that is not only more time consuming, but also much more intense than I had anticipated. I have been fortunate in recent years to be well booked as a consultant, and I therefore feel very grateful towards my clients and staff, who not only provided constant inspiration and interesting assignments but also tolerated my frequent absence. In particular I would like to thank Dr. Markus Abel, Timm Buchheim, Michael Dämmer, Steffen Fiedler, Fabian Flechtmann, Andreas Gehrhardt, Matthias Heyd, Hartmut Janssen, Ullrich Krämer, Thomas Lohfelder, Claudia Lozek, Prof. Dr. Dragan Macos, Martin Petermann, Thomas Röske, Dr. Klaus Schild, Dr. Juliane Siegeris, Dr. Johannes Springer and Silvia Varadinova for their support.

I grew up in a family where the love of learning and the spirit of setting out on new endeavours abound: Knowing that Anni, Pella, David, my mother Lalage, my brothers Tobias and Thomas, and their respective families are always there for us is wonderful.

My greatest thank you goes to my wife Chrissoula and my children Nick and Sophia. I love you more than I can say and I am fully aware that I could never have done this without your support. The future belongs to you.

Oliver Grasl
Wiesbaden, October 2009

Contents

List of Tables

List of Figures

Management Summary

A good business model is essential to every firm, whether it is a new venture or an established player (Magretta, 2002, p. 4), because it positions the firm within its value network, shows how it transacts with customers and suppliers, and highlights the products that are exchanged. Most importantly, a business model makes explicit the underlying economic logic that defines how the firm creates value.

In practice it has proved difficult for firms to systematically analyse and configure their business model: The business model concept is not used consistently, either in research or in business practice (Magretta (2002, p. 4), Hedman and Kalling (2003, p. 49)); the quantitative evaluation of business models is difficult, because they are mostly only developed informally and are frequently documented only in prose (Heinrich and Winter, 2004, p. 1); the way a business model will behave over time is difficult to predict because of the complex feedback dynamics inherent in business (Sterman (2000, p. 22), Warren (2002, p. 20)).

A method for business model analysis should allow practitioners to make their business model transparent to all stakeholders and to answer questions regarding the performance of their business model under varying conditions. This dissertation contributes towards developing such a method in four steps, following a design research approach: First it examines the usage of the business model concept in both academic and business literature and proposes a comprehensive definition of the concept that explicitly covers both structural and behavioural aspects.

Based on this definition a business model metamodel is derived that identifies all constructs relevant to business models and the relationships between these constructs. The metamodel is compared to other, similar metamodels and its use is illustrated by example.

To ensure all aspects of a firm's business model are covered during analysis, a method utilising the business model metamodel is developed. One outcome of this method is a simulation model, which is used to answer strategic questions regarding the firm's business model and to make both qualitative and quantitative recommendations towards potential performance improvements.

Finally, the utility of the business model analysis method in practice is illustrated via four case studies performed at four professional service firms in the IT industry.

Zusammenfassung

Ein gutes Geschäftsmodell ist für jedes Unternehmen grundlegend, egal ob es eine Neugründung ist oder ein etabliertes Unternehmen (Magretta, 2002, S. 4): Es positioniert das Unternehmen in seinem Wertschöpfungs-Netzwerk und beschreibt, wie es mit seinen Kunden und Lieferanten interagiert. Außerdem benennt es die Produkte und definiert die Wertschöpfungs-Logik des Unternehmens.

In der Praxis ist es für Unternehmen schwierig, ihre Geschäftsmodelle systematisch zu analysieren und zu konfigurieren: Einerseits wird der Begriff des Geschäftsmodells in der Literatur nicht einheitlich verwendet (Magretta (2002, S. 4), Hedman and Kalling (2003, S. 49)), andererseits ist die quantitative Bewertung von Geschäftsmodellen schwierig, weil Geschäftsmodelle oft nur informell definiert und meist nur in Prosa dokumentiert sind (Heinrich and Winter, 2004, S. 1).

Eine Methode zur Analyse von Geschäftsmodellen sollte es Praktikern ermöglichen ihr Geschäftsmodell transparenter zu gestalten und Fragen hinsichtlich dessen Leistungsfähigkeit zu bewerten. Diese Dissertation folgt einem Design-Research-Ansatz und liefert in vier Schritten einen Beitrag zur Entwicklung einer solchen Methode: Zuerst untersucht sie die Anwendung des Begriffes “Geschäftsmodell” in der Literatur und schlägt eine umfassende Definition vor, welche sowohl die Struktur als auch das Verhalten eines Geschäftsmodells berücksichtigt.

Auf Basis dieser Definition wird anschließend ein Metamodell abgeleitet, welches alle Konstrukte identifiziert, die für Geschäftsmodelle relevant sind. Das Metamodell wird mit anderen, ähnlichen Metamodellen verglichen und seine Anwendung wird anhand eines Beispiels gezeigt.

Um sicher zu gehen, dass alle Aspekte des Geschäftsmodells eines Unternehmens während der Analyse berücksichtigt werden, wird in einem dritten Schritt eine Methode zur Analyse von Geschäftsmodellen eingeführt. Ein Ergebnis dieser Methode ist ein Simulations-Modell. Dieses Modell wird genutzt, um strategische Fragen bezüglich des Geschäftsmodells zu beantworten und sowohl qualitative als auch quantitative Empfehlungen hinsichtlich möglicher Performance-Verbesserungen zu geben.

Abschließend wird der Nutzen der Methode in der Praxis anhand von vier Fallstudien gezeigt, die in vier IT-Dienstleistungsunternehmen durchgeführt wurden.

Part I.

Motivation and Approach

Motivation of research objectives and the research approach taken.

Chapter 1.

Research Objectives

The objective of this dissertation is to develop a method to analyse all relevant aspects of a business model. To ensure both rigour and relevance, the method should:

- Be based upon a definition of the business model concept that is derived from rigorous analysis of relevant academic and business literature.
- Enable practitioners to make their business models more transparent to all relevant stakeholders, in both a qualitative and quantitative way.
- Allow practitioners to answer strategic questions relevant to the performance of their business.
- Define a model-based approach to business model analysis based on method engineering principles.
- Validate this approach by analysing the business model of four different professional service firms

1.1. Business objectives

The business practitioner is given a systematic approach for analysing current and future business models, and for understanding and simulating the implications of possible changes. Typical questions addressed from a business perspective are:

- How can the value created by a firm be increased?
- Which factors are critical to performance with respect to value creation?
- What are the implications of structural changes to the business model?
- What are the implications of changes to the policies governing the behaviour of the business model?
- How will the business model perform under particular market conditions?

1.2. Scientific objectives

From a scientific perspective this research is useful for the following reasons:

- The dissertation proposes a comprehensive, quantifiable definition of the business model concept through consolidation of current business literature. This definition extends current definitions by incorporating a behavioural perspective.
- The dissertation proposes a method for analysing the structure and behaviour of a business model, using a multi-method approach based both on object-oriented analysis and design (OOAD) and system dynamics (SD) methodologies. The method extends current metamodels approaches in enterprise modelling by incorporating business models. The metamodel is formalised as an Unified Modelling Language (UML) profile.
- This dissertation provides a basis for evaluating the performance of a business model through simulation of the business model's behaviour over time.

Chapter 2.

Research Approach

2.1. Design research

A fundamental question within management science and information management is the question of an adequate research methodology:

- How can research be done without influencing the object being researched—after all, the objects under examination are socioeconomic systems consisting of humans, organisations and technologies?
- How can "experiments" be repeated in this context?
- Can generalising conclusions be made based on singular experiments?
- How can new, innovative artifacts be created without neglecting the foundations of scientific research?

Two paradigms characterise much of the research in the information systems discipline: Design research and behavioural science (Hevner et al., 2004, p. 75). The behavioural science paradigm seeks to develop and verify theories that explain or predict human or organisational behaviour. The design research paradigm seeks to extend the boundaries of human and organisational capabilities by creating new and innovative artifacts.

Both paradigms are an important basis for research in management science and information systems, as they are positioned at the confluence of humans, organisations and technology (Davis and Olson, 1985).

The research in this dissertation is more concerned with organisational capabilities and less with the behaviour of individuals or groups of individuals, so the behavioural paradigm is not considered here.

2.1.1. Design research framework

Design research is a research methodology used to produce and apply knowledge of tasks and situations in order to create effective and innovative artifacts (March and

Smith, 1995, p. 253) and thus seeks to extend the boundaries of human and organisational capabilities (Hevner et al., 2004, p. 75). It is based on the framework outlined in Figure 2.1.

Research Activities

Research Artifacts

	Build	Evaluate	Theorize	Justify
Constructs				
Model				
Method				
Instantiation				

Figure 2.1.: Design Research Framework (March and Smith, 1995, p. 255)

The resulting artifacts are structured on the basis of software, formal logic, mathematics or precise natural language (Hevner et al., 2004, p. 76) and are defined following March and Smith (1995, p. 256-258):

Constructs Constructs are concepts from the vocabulary of a domain. They constitute a conceptualisation used to describe problems within the domain and to specify solutions.

Model A model is a set of propositions or statements expressing relationships among constructs.

Method A method is a set of steps (an algorithm or a guideline) used to perform a task. Within design research methods are based on a set of underlying constructs and a model of the solution space.

Instantiation An instantiation is a realisation of an artifact in its environment. Instantiations operationalise constructs, models and methods. It is important to note that instantiations may precede the complete articulation of their underlying constructs, models and methods—an instantiation may be created out of necessity, using intuition and experience. Only as it is studied and used are we able to formalise the constructs, models and methods on which it is based.

The research activities in the design research framework are defined following March and Smith (1995, p. 258-259) and Lee (2007, p. 49):

Build Artifacts are built to perform a specific task, thus demonstrating that such an artifact can be constructed.

Evaluate Artifacts are evaluated to determine whether any progress has been made. Evaluation requires the development of a set of metrics and the measurement of artifacts according to those metrics.

Theorise The results of the evaluation are theorised about—why did the quality or validity of the artifact turn out to be satisfactory (or why not)? This step ensures that the artifacts are developed in a rigorous manner. Rigour is an important objective of design research (Hevner, 2007, p. 23).

Justify The theories are then justified. This step ensures that the artifacts thus designed are relevant both to the research community and practitioners. Relevance is an important objective of design research (Hevner, 2007, p. 23).

Two further features of design research are important to the research presented here (Lee, 2007, p. 50): First, design research presumes an intervention in the real world, while natural science and social science consider intervention as something to be avoided because it contaminates the subject matter and can give the appearance of biasing the analysis so as to lead to favourable findings. Second, natural science and social science are interested in achieving true theories, whereas design research is primarily interested in providing utility through the creation of new and innovative artifacts and ultimately achieving efficient and effective designs.

2.1.2. Design research guidelines

Hevner (2007, p. 12) defines the following design research guidelines, whose purpose is to assist researchers, reviewers, editors and readers to understand and evaluate effective design research (Hevner, 2007, p. 11):

Design as an artifact Design research must produce a viable artifact in the form of a construct, a model, a method or an instantiation.

Problem relevance The objective of design research is to provide utility through the creation of new and innovative artifacts.

Design evaluation The utility, quality and efficacy of a design artifact must be rigorously demonstrated via well executed evaluation methods.

Research contributions Effective design research must provide clear and verifiable contributions in the areas of the design artifact, design foundations, and/or design methodologies.

Research rigour Design research relies upon the application of rigorous methods in both the construction and evaluation of the design artifact.

Design as a search process The search for an effective artifact requires utilising available means to reach desired ends while satisfying laws in the problem environment.

Communication of research Design research must be presented effectively both to technology-oriented as well as management-oriented audiences.

These guidelines are used as an evaluation framework in the concluding Chapter 22.

2.1.3. Design research—ensuring both relevance and rigour

Two major objectives of design research are rigour and relevance (Hevner, 2007, p. 23):

- While being rigorous, relevance must not be lost.
- While being relevant, sufficient rigour must be applied to create reliable, transparent results.

(Hevner, 2007, p. 25) extends the original design research cycle introduced in the last section with a rigour cycle and a relevance cycle:

- The rigour cycle ensures that the artifacts designed are firmly grounded in scientific theories and methods, practical experience and expertise, and that they are based on the rich pool of previously designed products and processes. The rigour cycle also ensures that new knowledge created flows back into the knowledge base.
- The relevance cycle ensures that the artifacts designed conform to all scientific and practical requirements from the selected domain of application and that the artifacts are instantiated and tested in the field.

The extended design research framework is illustrated in Figure 2.2.

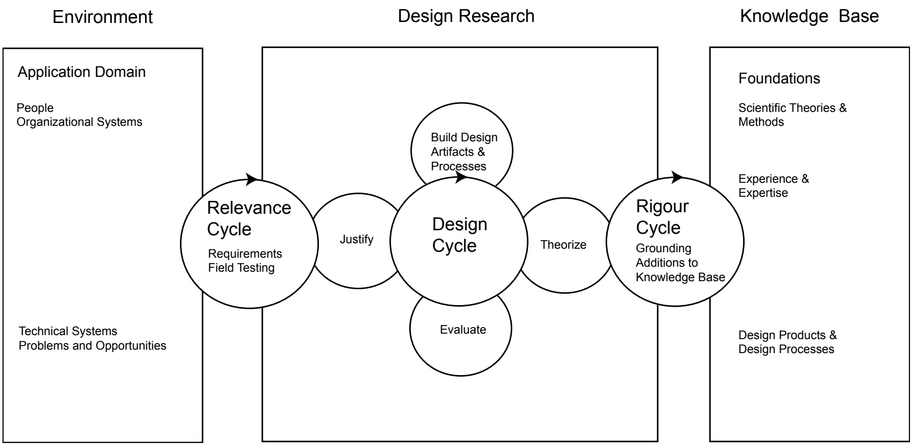

Figure 2.2.: Design research—rigorous relevance (Hevner, 2007, p. 25)

2.2. The research approach followed

The research for this dissertation follows a design research approach: Design research cycles, relevance cycles and rigour cycles are combined into an iterative approach, one iteration for each of the case studies in Part IV. The approach is illustrated in Figure 2.3, the activities are briefly described in the following paragraphs:

Initial analysis Initial analysis of literature and business requirements. Definition of research objectives, evaluation and choice of research framework.

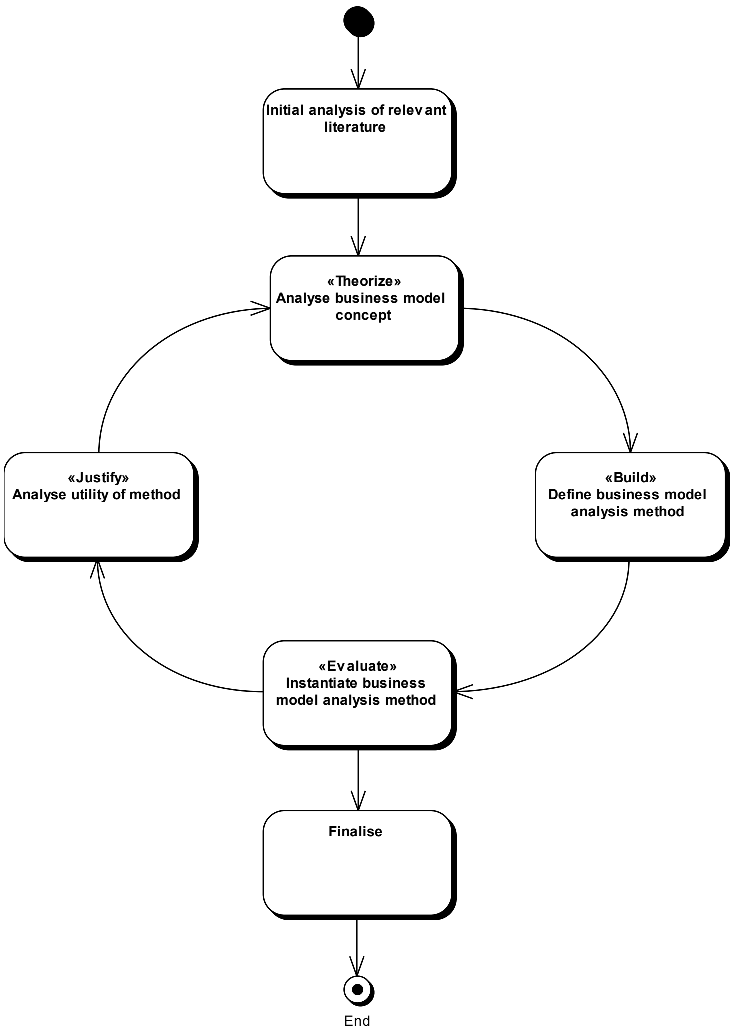

Figure 2.3.: An iterative research approach

Theorise—Analyse business model concept Analysis of existing definitions of business model by reviewing current academic and business literature. Constructs relevant to business models are identified.

Build— Define business model analysis method A new "working definition" of business model is proposed, and refined into a business model metamodel. An initial method for analysing the business model of a firm is defined based on this metamodel.

Evaluate—Instantiate business model analysis method Hevner (2007, p. 16) identifies five major evaluation methods: the observational, analytical, experimental, testing and descriptive approaches. All of these approaches could also be applied to the method developed here—but they require instantiation of the artifacts defined in order to provide a sound basis for evaluation. Therefore the observational method is chosen here, using case studies to study the artifacts defined here in depth at four existing firms. Application of the other methods is out of scope of this dissertation, but its potential is discussed in the conclusions in Chapter 22.

Justify—Analyse utility of method Justify why the method was useful both for the clients and scientific community.

Finalise Reevaluate literature given the findings from the case studies, finalise the metamodel and the business model analysis method, and draw conclusions.

The following artifacts are created during this research:

Constructs The research defines all constructs relevant to fully specifying a business model, based on Definition 14.19 of the business model concept. This definition is derived through an extensive review of current literature (cf. Chapter 14).

Model The constructs identified are related to each other in a business model metamodel in Chapter 15.

Method A method for analysing business models based on the metamodel is developed in Chapter 16.

Instantiations The method is instantiated four times at four client sites, as described in the case studies in Part IV.

2.3. Research objects—professional service firms in the IT sector

The business model analysis approach detailed in this dissertation is designed for the analysis of business models at the level of a firm. It is not the goal of this research to investigate how the general form of business models differ between industries, to identify general forms of business models within a specific industry, or to compare specific business models within a specific industry to each other. In principle, the approach developed in Chapter 16 should apply to analysis of the business model of any specific firm irrespective of its industry, because the analysis of the business model concept in Chapter 14 is not restricted to a particular industry or kind of firm.

In practice this is difficult to verify due to the large variety of firms and business models and the small number of case studies that can be conducted within the scope of a dissertation. Furthermore, to allow method verification the artifacts constructed during method instantiation need to be comparable to each other, and thus the underlying research objects should also be comparable. Therefore the case studies performed to verify the approach concentrate on firms from a specific industry, professional service firms in the information technology (IT) sector[1]. No attempt is made to identify general forms of business models at professional service firms (PSFs) (i.e. business model "patterns" or "schematics") or to reuse artifacts created in previous iterations in a systematic way.

[1] Key concepts pertaining to professional service firms are introduced in Chapter 13.

Chapter 3.

Dissertation structure

This dissertation is structured into five main parts and an appendix:

- Motivation and Objectives
- Foundations
- Business Model Analysis
- Case Studies
- Conclusions
- Appendix

The chapters of each part are briefly introduced in the following sections:

3.1. Part I—Motivation and Objectives

This part motivates the topic, defines the objectives of this research and illustrates the approach.

Ch. 1—Research Objectives Introduces the topic of business model analysis and defines the concrete research objectives.

Ch. 2—Research Approach Discusses the design research paradigm and defines the concrete research approach followed in this dissertation.

Ch. 3—Dissertation structure The current chapter, giving an overview of the dissertations structure.

3.2. Part II—Foundations

This part discusses the scientific methods and concepts that form the foundation upon which this research builds.

Ch. 4—Method Engineering Method engineering (ME) is an engineering discipline used to construct and define methods. Method engineering (ME) is used in Chapter 16 to design and construct the business model analysis method.

Ch. 5—Object-Oriented Analysis and Design A model is a representation of some part of reality that is used to understand, change, manage and control that part of reality. Object-oriented analysis and design (OOAD) is an approach to modelling business and information systems as a set of interacting objects. It is used both in developing the business model metamodel in Chapter 15 and in constructing models of business models in the case studies in Part IV.

Ch. 6—Unified Modelling Language The Unified Modelling Language (UML) is the modelling language used to create the business model metamodel and the models of the structure and behaviour of business models.

Ch. 7—System Dynamics A system is a grouping of interconnected parts. System dynamics (SD) is a method devoted to the study of the dynamic behaviour of systems utilising a visual modelling and simulation technique. It is used in Chapter 14 to analyse the dynamics of business models in general and extensively in the case studies in Part IV.

Ch. 8—System Engineering Systems engineering (SE) is a is a purposeful and goal-oriented method for engineering complex systems, based on the system thinking paradigm and a defined problem solving cycle. It is used as a basis for the business model analysis method developed in Chapter 16.

Ch. 9—Business Engineering and Strategic Management Business engineering (BE) is a holistic approach to transforming businesses at the level of strategy, processes and information systems, using repeatable processes grounded in engineering discipline. The business model concept is positioned within business engineering (BE) in Chapter 14 and the business model analysis method developed in Chapter 16 is an extension of the BE toolkit. One important question of strategic management (SM) is to understand how firms create value—Chapter 14 shows that this question is addressed by a firm's business model.

Ch. 10—Transaction Cost Theory Firms interact with each other and exchange artifacts via transactions. Transaction cost theory (TCT) analyses the effect transactions and their costs have on how firms coordinate their co-operations with other firms. The transaction model of a firm is part of its business model, as discussed in Chapter 14.

Ch. 11—Market and resource based views of the firm Business models are concerned with how a firm performs with respect to value creation. The market-based-view of the firm (MBVF) investigates the effect that markets have on a firm's performance, the resource-based-view of the firm (RBVF) investigates how a firm's resources effect its performance.

Ch. 12—Value and Value Based Management An important aspect of business models is value creation, and this chapter discusses the value concept and value based management (VBM).

Ch. 13—Professional Service Firms To ensure the result of individual case studies can be compared all firms studied in Part IV are professional service firms (PSFs).

3.3. Part III—Business Model Analysis

A method for business model analysis should allow practitioners to make their business model transparent to all stakeholders and to answer questions regarding the performance of their business model under varying conditions. As a contribution towards developing such a method, this dissertation first examines the business model concept and proposes a comprehensive definition of the term "business model". On this basis it then develops a method for business model analysis.

Ch. 14—The business model concept Starting from a thorough analysis of current academic and business literature the business model concept is discussed and a proposal is made for a comprehensive definition of this concept.

Ch. 15—A business model metamodel A metamodel is derived from the definition of the business model concept given in Chapter 14.

Ch. 16—A method for business model analysis A method for analysing the business model of a firm is developed. One outcome of the method is a model of the firm's business model conforming to the metamodel developed in Chapter 15.

3.4. Part IV—Case Studies

The method developed in Part III was instantiated four times at different PSFs. These instantiations are described here as case studies.

Ch. 17–Case Study Overview Brief overview of the case studies.

Ch. 18—transentis consulting transentis is a small partner managed consulting boutique focusing on improving value creation in complex systems through efficient and effective designs that align strategies, organisations and IT-landscapes.

Ch. 19—GFT Technologies The GFT Group is an international leading IT service provider, with business divisions representing services, resourcing and software.

Ch. 20—Valtech Deutschland Valtech is a pioneer and a thought leader in the field of Agile software development. Valtech has developed its own unique Agile adoption methodology by building on the extensive experience it has accrued over the past eleven years.

Ch. 21—K+K information systems K+K information systems is a company that has delivered information management consulting to its customers since 1994. In 2007 they added the software product *WissIntra*™ to their portfolio, a web-based process, quality and knowledge management tool.

3.5. Part V—Conclusions

This part contains the conclusions derived from the research.

Ch. 22—Critical evaluation This chapter critically evaluates the research performed and results obtained.

Ch. 23—Open issues and potential further research This chapter highlights questions that were not addressed during research and shows potential for further research.

Ch. 24—Conclusion Concluding words.

3.6. Part VI—Appendix

App. A—UML Profile A UML profile for the business model metamodel.

App. B—Curriculum Vitae The author's curriculum vitae.

App. C—Acknowledgements Further acknowledgements.

An extensive glossary, a list of acronyms and the full bibliography can be found at the end of the dissertation.

3.7. Chapter interdependencies

Figure 3.1 shows how the chapters on business model analysis in Part III and the case studies in Part IV depend on each other and on the foundation chapters in Part II.

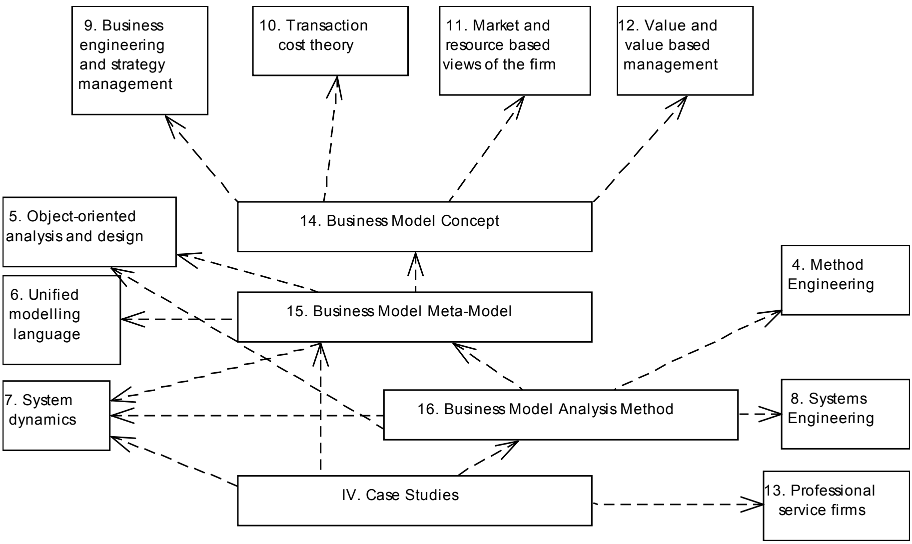

Figure 3.1.: Dependencies between dissertation chapters

Part II.

Foundations

Discussion of the scientific methods and concepts that form the foundation upon which this research builds.

Chapter 4.

Method Engineering

The method engineering (ME) approach was originally introduced by Brinkkemper (1996, p. 276) as the engineering discipline to design, construct and adapt methods, techniques and tools for the development of information systems. Brinkkemper (1996, p. 275) also introduces the following definition of the term method, which is specific to systems development: *A method is an approach to perform a systems development project, based on a specific way of thinking, consisting of directions and rules, structured in a systematic way into development activities with corresponding development products.*

Meanwhile the ME approach has been extended to creating methods for business engineering[1], *in order to ensure a repeatable, scalable, disciplined "engineering" process and facilitate increased division of labour, as opposed to individualistic "creation"* (Winter, 2003b, p. 88).

In consequence the definition of the term method also needs to be made more general: *A method is a set of steps that need to be performed to reach a specific goal* (Stahlknecht and Hasenkamp, 2004, p. 212)[2]. This definition is consistent with, and more general than the definition by Brinkkemper (1996) given above. It is also consistent with the definition by March and Smith (1995) used in design research and introduced in Chapter 2.

4.1. Defining attributes of methods

Braun et al. (2005) give a detailed analysis of the method concept in information systems research. They identify four fundamental defining attributes of methods (Braun et al., 2005, p. 3):

Goal-orientation Methods are goal-oriented. They stipulate rules on how to proceed or act in order to achieve defined goals or solve problems.

[1] The business engineering discipline is discussed in Chapter 9

[2] Not all authors see goal-orientation as a fundamental attribute of a method. A comprehensive discussion on this may be found in Braun et al. (2005).

Systematic approach If methods are to deliver rules on how to act and instructions on how to solve problems or achieve goals, they must possess a systematic structure in order to enable the deduction of concrete work steps or tasks for achieving goals.

Principles Many method specifications are closely related to design principles, i.e. general construction guidelines and/or strategies.

Repeatability In literature, some authors call for methods to be inter-subjectively repeatable.

4.2. The method engineering metamodel

The approach followed in this dissertation is based on the metamodel for ME used in the context of business engineering (Österle and Blessing, 2003, p. 80)[3], illustrated in Figure 4.1.

In terms of design research (cf. 2.1) the metamodel in Figure 4.1 is itself a model, that defines the following constructs:

Activity The activities that must be performed to create the result. Activities may be structured using sub-activities.

Meta-Model A metamodel is a model of the result that is produced by the method.

Result A result that is produced by the activities that form the method.

Role A role is a representation of an entity that actively partakes in the method by performing activities in a particular context.

Stakeholder A stakeholder is an abstraction of any entity that is interested in the results of the method.

Stakeholder Value The value that is created for the stakeholder by performing the method.

Techniques The method should identify techniques that are useful for the creation of the result. Examples for techniques used in this dissertation are creating models using UML and system dynamics.

[3] The approach used by Österle and Blessing (2003) is based on the ME principles defined by Gutzwiller (1994, p. 11)

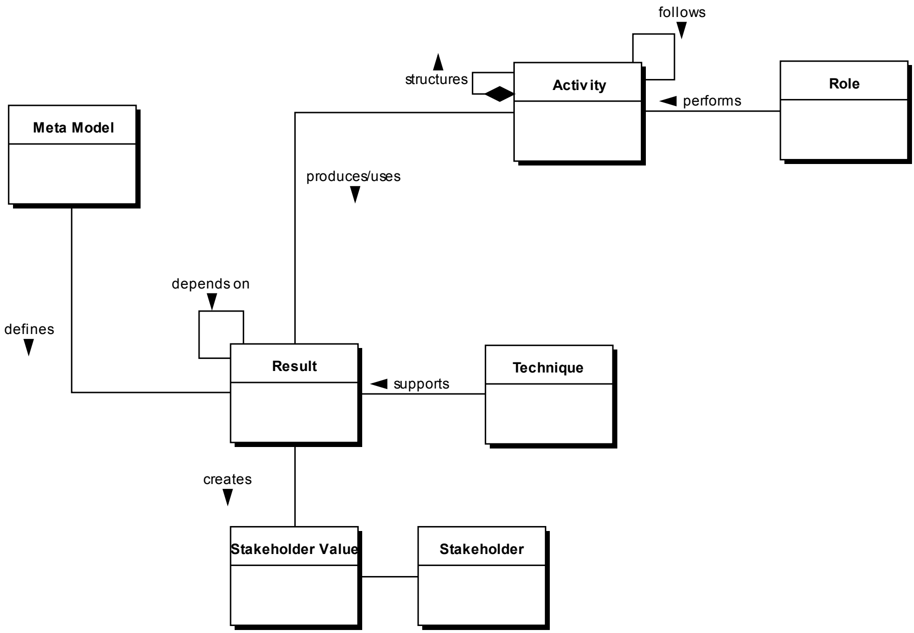

Figure 4.1.: The core relationships of the method engineering metamodel (Österle and Blessing, 2003, p. 80)

Using metamodels to define describe the results that are to be produced by a method is useful for the following reasons (Hitz et al., 2005, p. 301):

Precise description of the result In contrast to specifications based on natural language, specifications based on models are more precise and to the point.

Consistent exchange format The results created are instances of the metamodel and thus have a consistent structure. This makes it easier to exchange results between organisations, teams and tools.

Automated checking of results The metamodel specifies the syntax of the result and can therefore be used to check whether the result conforms to this syntax.

In conjunction with the detailed metamodels describing the results to be produced by application of the method, the ME metamodel can thus not only be used to ensure that the description of the method is consistent and conformant, but also that the method itself is used in a consistent and conformant manner.

4.3. Other metamodels

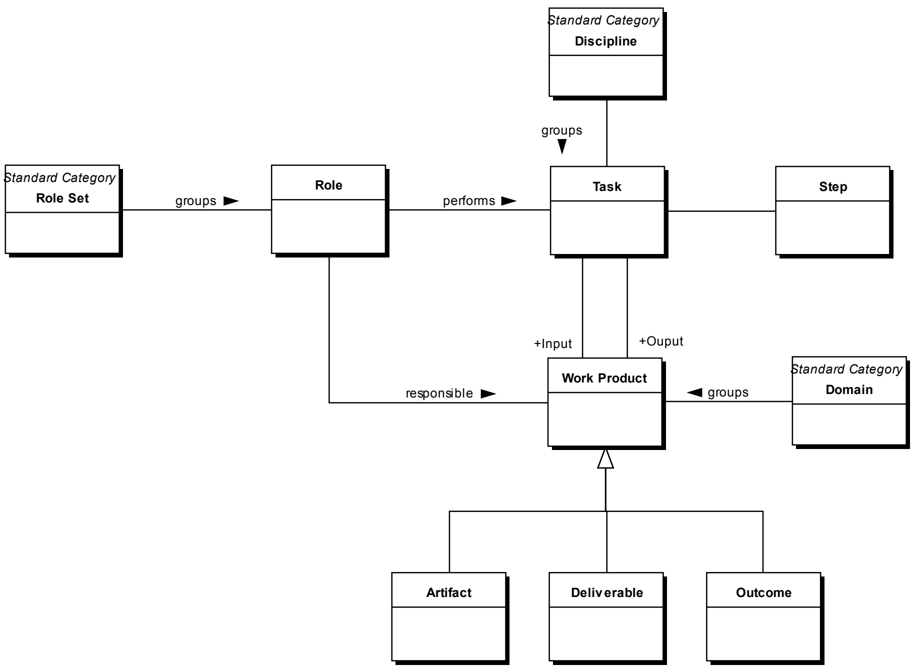

Figure 4.2.: Simplified extract of the SPEM method content metamodel (OMG, 2008c, p. 83)

The metamodel introduced above does not contain an explicit time-dimension: Some authors (e.g. Wortmann (2006, p. 98)) have therefore extended this metamodel to encompass more complex methods that explicitly consider the time dimension (e.g. phases). On the other hand, the Object Management Group (OMG) has standardised a metamodel specifically for software processes engineering methods that explicitly separates method content from process content (which addresses the time dimension)

(OMG, 2008c, p. 12). This metamodel is referred to as the Software Process Engineering Metamodel (SPEM) (OMG, 2008c) and is the basis for elaborate engineering methods such as the Rational Unified Process (RUP) and the Open Unified Process (OpenUP) (Kroll and MacIsaac, 2006). In the SPEM, *method content provides step-by-step explanations, describing how specific development goals are achieved independent of the placement of these steps within a development life cycle. Processes take these method content elements and relate them into partially ordered sequences that are customised to specific types of projects.*

A simplified extract of the SPEM that concerns method content is shown in Figure 4.2. It is similar to the method engineering metamodel depicted in Figure 4.1 but does not require an explicit metamodel for all results (which are referred to as "work products" in the SPEM).

4.4. Summary

For the business model analysis method defined in Chapter 16 this dissertation uses the method engineering metamodel defined by Österle and Blessing (2003, p. 80). An explicit definition of phases was not found necessary, because this method only has few activities, and it is envisioned that it will be used within more comprehensive business engineering methodologies such as The Open Group Architecture Framework (TOGAF) or RUP that provide their own phase model.

Chapter 5.

Object-Oriented Analysis and Design

OOAD is an approach to modelling information systems as groups of interacting objects that has been used in software engineering for many years (Booch (1990)). Each object represents some entity of interest in the system being modelled, and is characterised by its class, its state, and its behaviour. Various models can be created to show the static structure, dynamic behaviour, and run-time deployment of these collaborating objects.

5.1. OOAD and UML

Over the years a number of different notations have been defined that can be used to create such object-oriented models—the notation commonly adopted today is the UML (OMG, 2005a). This is also the notation that will be used in this dissertation. UML is discussed in detail in Chapter 6.

5.2. OOAD and business engineering

OOAD concepts have been applied to business engineering activities by various authors who recognise the need for a methodology that can be used to engineer both processes and systems (Jacobson (1994), Eriksson and Penker (2000), Marshall (2000)). Many methodologies and methods exist that employ OOAD, e.g. TOGAF (The Open Group, 2007) and the Unified Process (UP) (Booch et al. (1999), Jacobson et al. (1999)).

In the philosophy of the UP[1], no single model is sufficient to model a complex system such as an enterprise: every non-trivial system is best approached through a small set of nearly independent models (Booch et al., 1999, p. 9). In UP, the following models are created (Booch et al., 1999, p. 455):

[1]The UP is best known in its commercial variant, the RUP (Kruchten, 2003). An open-source variant OpenUP also exists (Kroll and MacIsaac, 2006).

Business model Establishes an abstraction of the business and its organisation[2].

Domain model Establishes the context of the IT-system.

Use case model Establishes the IT-system's functional requirements.

Analysis model Establishes an ideal design.

Design model Establishes the vocabulary of the problem and its solution.

Process model Establishes the IT-system's concurrency and synchronisation mechanisms.

Deployment model Establishes the hardware topology on which the IT-system is executed.

Implementation model Establishes the parts used to assemble and release the physical IT-system.

Test model Establishes the paths by which the IT-system is validated and verified.

This dissertation is only concerned with the business model. The metamodel described in Chapter 15 can be considered a formalisation of (one aspect) of this model. The UP itself does not define a metamodel for the business model. A possible metamodel for a business model that shows its connection to the system models is the business engineering metamodel (cf. section 9).

5.3. OOAD methods and techniques

Many methods and techniques have been defined within OOAD, a particularly useful method for building object-oriented models (and thus also metamodels) is noun/verb analysis: Noun/verb analysis is a very simple way of analysing text to try and find classes, attributes and responsibilities. In essence, nouns and noun phrases in the text indicate classes or attributes of a class, and verbs and verb phrases indicate responsibilities or operations of a class (Arlow and Neustadt, 2005, p. 164).

[2]The meaning of the term "business model" is more generic here than the more specific usage of the term used in the remainder of this dissertation. This specific usage is discussed in detail in Chapter 14.

5.4. Summary

OOAD defines a set of methods and techniques that are useful for enterprise modelling. In particular, noun/verb analysis is used in Chapter 15 to derive the business model metamodel. This technique is also used throughout the case studies in Part IV for modelling the structural and behavioural aspects of the PSFs visited. The commonly adopted notation for creating object-oriented models is the UML, which is discussed in depth in Chapter 6.

Chapter 6.

Unified Modelling Language

The Unified Modelling Language is a visual language for specifying, constructing, and documenting the artifacts of systems. The UML is a general purpose modelling language that can be used with all major object and component methods, and that can be applied to all application domains (e.g. health, finance, telecom, aerospace) and implementation platforms (e.g. J2EE, .NET)(OMG, 2005a, p. 9). It clearly separates structural aspects of systems (i.e. the parts a system consists of and their relationships to each other) from behavioural aspects of systems (i.e. the way the parts behave over time) (OMG, 2005b, p. 12).

The OMG is an industry consortium that develops standards for modelling, middleware and enterprise integration[1]. The OMG adopted the UML in 1997. Under the stewardship of the OMG, the UML has emerged as the software industry's dominant modelling language (OMG, 2005a, p. 21). It has been successfully applied to a wide range of domains, ranging from health and finance to aerospace and e-commerce.

In addition to its use for modelling IT-Systems, UML has been applied to modelling businesses and business processes in many publications (e.g. Eriksson and Penker (2000); Jacobson (1994); Marshall (2000)). The OMG has also published a number of standards pertaining to business modelling (cf. Chapter 9).

6.1. Metamodelling

The UML specification is defined using a metamodelling approach [2] that adapts formal specification techniques. While this approach lacks some of the rigour of a formal specification method[3], it offers the advantages of being more intuitive and pragmatic for most implementors and practitioners (OMG, 2005a, p. 11).

[1] Description found on the OMG website, www.omg.org

[2] This means that a metamodel is used to specify the model that comprises UML

[3] A more formal method would be to define the UML notation using an explicit set of axioms (Seidewitz, 2003, p. 31).

A metamodel is itself a model, that is used to describe another model using a modelling language. The term “meta” is therefore relative—depending on the perspective a model is either a model or a metamodel. It is important to note that a metamodel is not an aggregated or less detailed view of another model: a metamodel is a model at a different level of abstraction that makes statements about the structure of another model, without making statements about its content (Hitz et al., 2005, p. 300). The elements of metamodels are referred to as metaclasses.

The UML 2.0 specification itself is organised into two volumes: the UML 2.0: Infrastructure (OMG, 2005a) and the UML 2.0: Superstructure (OMG, 2005b). The former describes the UML meta-metamodel (Hitz et al., 2005, p. 324), the latter describes the UML metamodel (Hitz et al., 2005, p. 299).

6.2. The UML language architecture

6.2.1. Design principles

The UML metamodel was designed with the following principles in mind (OMG, 2005a, p. 11):

Modularity This principle of strong cohesion and loose coupling is applied to group constructs into packages and organise features into metaclasses.

Layering Layering is applied in two ways to the UML metamodel. First, the package structure is layered to separate the metalanguages core constructs from the higher-level constructs that use them. Second, a four-layer metamodel architectural pattern is consistently applied to separate concerns (especially regarding instantiation) across layers of abstraction.

Partitioning Partitioning is used to organise conceptual areas within the same layer. In the case of the Infrastructure library, fine-grained partitioning is used to provide the flexibility required by current and future metamodelling standards. In the case of the UML metamodel, the partitioning is more coarse-grained in order to increase the cohesion within packages and loosening the coupling across packages.

Extensibility The UML can be extended in two ways: A new dialect of UML can be defined by using profiles to customise the language for particular platforms and domains (e.g. finance, telecommunications, aerospace). This approach will be used in Appendix A to define a profile for modelling business models—UML profiles are explained in detail in section 6.4. Another way of extending UML is to define a new language related to UML by reusing part of the UML meta-metamodel and augmenting it with appropriate metaclasses and meta-relationships. The former approach defines a new dialect of UML, while the latter case defines a new member of the UML family of languages.

Reuse A fine-grained, flexible metamodel library is provided that is reused to define the UML metamodel, as well as other architecturally related metamodels.

6.2.2. Four-layer metamodel hierarchy

The UML is defined using a four-layer metamodel hierarchy (OMG (2005a, p. 16), Seidewitz (2003, p. 30)):

- M0—the system under study (i.e. the part of reality that is to be modelled).
- M1—user models.
- M2—metamodels.
- M3—meta-metamodels.

This metamodel hierarchy is illustrated in Figure 6.1 (Hitz et al. (2005, p. 306), OMG (2005a, p. 19)) and explained in detail in the following paragraphs.

M0—the system under study The things that are being modelled reside at level M0 of the metamodel hierarchy.

M1—user models A user model is an instance of the UML metamodel, it may contain both classifiers and objects, which are snapshots (illustrations) of instances of these classifiers. The primary responsibility of the model layer is to define languages that describe semantic domains, i.e. to allow users to model a wide variety of different problem domains, such as software, business processes, and business models.

Suppose we are trying to model a company and its employees. In the metamodel hierarchy, the real world is represented by M0. Let “Oliver Grasl” be a person in this real world. In UML models, real world entities are represented by objects. So “Oliver Grasl” (in the real world, at level M0) is an instance of an object in the user model. User models are created at level M1. The object in the user model has an attribute

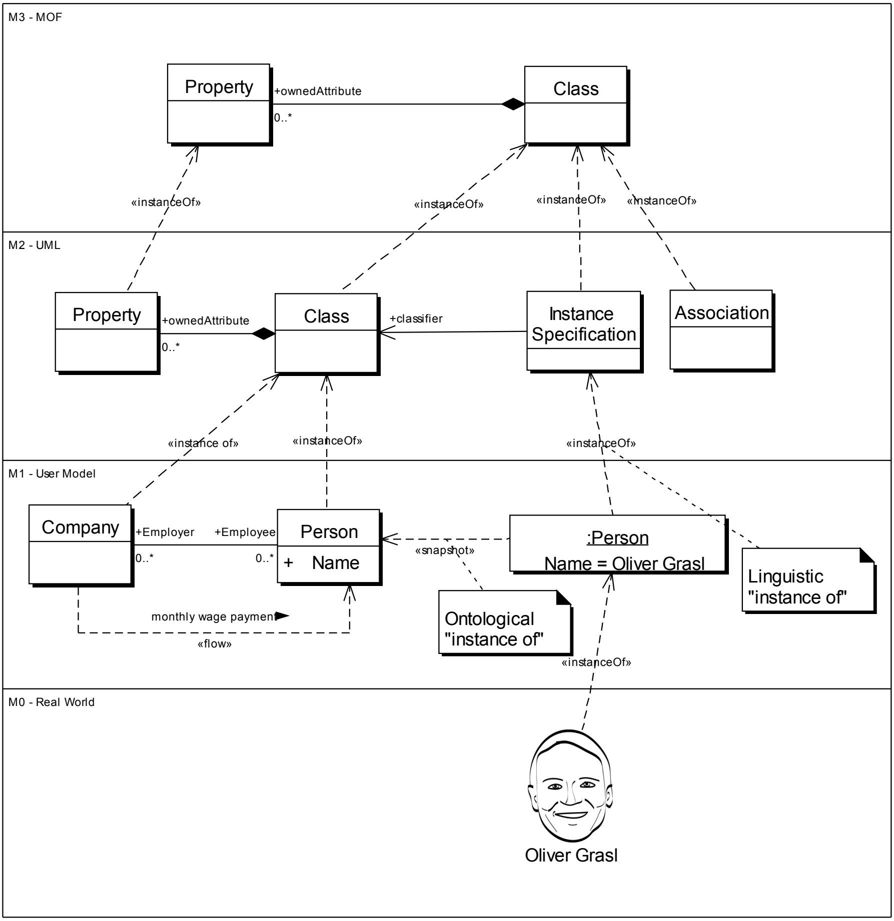

Figure 6.1.: The UML metamodel hierarchy (OMG, 2005a, p. 19)

"Name", which has the value "Oliver Grasl". The object itself has a type "Person". This type "Person" is called a class in UML, and is represented by a small named box, its name or type being "Person". It is important to note here that we have two constructs at the same level in the metamodel hierarchy (level M1 in this case), one of which is an instance at a particular point in time (a snapshot (OMG, 2005b, p. 79)), of the other. This kind of instantiation, that runs within a metamodel layer is known as *ontological instantiation* (Hitz et al., 2005, p. 306). Next to the "Person" class there is a "Company" class which has a relationship to the "Person" class. This relationship is used to denote the fact that companies have persons working for them referred to as employees, and employees work for companies referred to as their employer.

The metamodel hierarchy could stop at this stage: The IT community lived for many years without a formal modelling language, and many informal models of businesses and IT systems are created every day in business documents. But there are many reasons why it is desirable to formalise a modelling language using a metamodel to do so (Hitz et al., 2005, p. 301):

- Formalisation of a modelling language helps to ensure that everyone uses the language in a consistent way.
- A metamodel allows a model to be checked for syntactic correctness using automated algorithms that implement the rules and constraints defined by the metamodel.
- Models that are created using the same metamodel can easily be exchanged between tools that implement the same metamodel.

M2—metamodels Level M2 defines a metamodel which defines the kind of constructs that can be used in the user models at level M1. The primary responsibility of the metamodel layer is to define a language for specifying models. The layer is often referred to as M2; the UML is an example of a metamodel.

Figure 6.1 illustrates part of the UML metamodel: It defines the constructs that may be used when creating a UML model (at level M1) of the real world (at level M0). In Figure 6.1 three such constructs are shown—*classes*, *associations* and *instance specifications*:

- A class describes a set of objects that share the same specifications of features, constraints, and semantics (OMG, 2005b, p. 45). Both the construct "Company" as well as the construct "Person" (at level M1) are instances of UML classes (at level M2). The kind of instantiation that runs across metamodel layers is known as linguistic instantiation (Hitz et al., 2005, p. 306).

- An association describes a set of tuples whose values refer to typed instance (OMG, 2005b, p. 36). The relationship between Company and Person in the user model is an instance of an association. An ontological instance of an associations within the user model is called a link (OMG, 2005b, p. 36). No such links are shown in Figure 6.1.

- An instance specification is a model element that represents an instance in a modelled system (OMG, 2005b, p. 78). The construct ":Person" (at level M1) is an instance of the construct "Instance Specification" (at level M2).

- An information flow specifies that one or more information items circulate from its sources to its targets. Information flows require some kind of "information channel" for transmitting information items from the source to the destination. An information channel is represented in various ways depending on the nature of its sources and targets. It may be represented by connectors, links, associations, or even dependencies (OMG, 2005b, p. 590).

Again the metamodel hierarchy could stop at this stage. But again it becomes desirable to define the structure of UML using another metamodel—this is especially so when it is necessary to define more than one modelling language, but all languages should share the same underlying design philosophy and constructs (OMG, 2005a, p. 16). In this case, the metamodel is itself an instance of another metamodel, the meta-metamodel, meaning that every element of the metamodel is an instance of an element in the meta-metamodel. *Metamodels are typically more elaborate than the meta-metamodels that describe them, especially when they define dynamic semantics* OMG (2005a, p. 16).

M3—meta-metamodels The meta-metamodelling layer forms the foundation of the metamodelling hierarchy. The primary responsibility of the M3-layer is to define the language for specifying a metamodel. The metamodel that is used to describe UML is the meta-object-facility (MOF).

Although the MOF is a separate OMG specification defined in OMG (2004), the MOF's metamodel is specified within the UML infrastructure metamodel in (OMG, 2005a, p.11), and thus is part of the UML. Thus the UML specification uses a reflexive approach: the UML's meta-metamodel is itself described in UML (OMG, 2005a, p. 17). This is not as unusual as it may seem at first—after all, spoken languages such

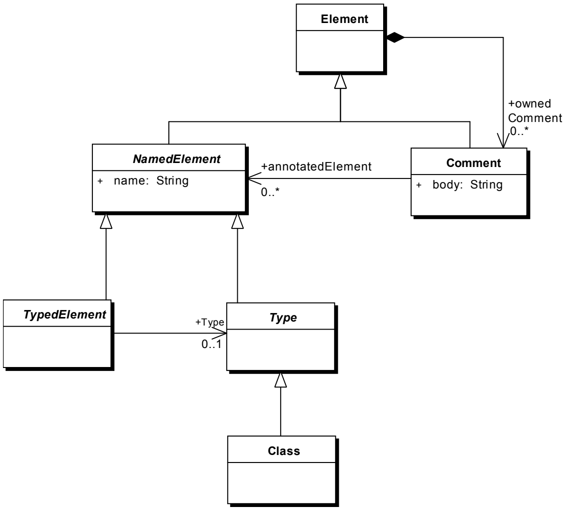

Figure 6.2.: The types metamodel (OMG, 2005a, p. 90)

as English are also studied using the English language. An alternative to using the reflexive approach is to use an axiomatic approach and define a set of axioms using natural language or a mathematical notation (Seidewitz, 2003, p. 31)—a disadvantage of this is that users then need to understand the mathematical formalism or axiomatic system.

A meta-metamodel is typically more compact than a metamodel that it describes, and often is the basis for several metamodels[4]. It is generally desirable that related metamodels and meta-metamodels share common design philosophies and constructs. However, each layer can be viewed independently of other layers, and needs to maintain its own design integrity.

Figure 6.2 illustrates a small part of the MOF that describes classes. A “Class” is a “Type” that has objects as its instances [5] (OMG, 2005a, p. 93). A “Type” is a “Named Element” that represents the type of a typed element (OMG, 2005a, p. 92). A “Typed Element” is also kind of “Named Element” that represents any element that can have a type (such as the attributes of a class) (OMG, 2005a, p. 92). A “Named

[4]The MOF is also used as the meta-metamodel of the common warehouse metamodel (CWM) (OMG, 2005a, p. 13)

[5]Objects reside at level M0 of the metamodel hierarchy.

Element" represents any element of a model that has a name (OMG, 2005a, p. 91). An finally, an "Element" is any constituent of a model (OMG, 2005a, p. 91). "Element" is a metaclass that has no superclass. It is used as the common superclass for all metaclasses in the UML metamodel (OMG, 2005a, p. 44).

The metamodel shown in Figure 6.2 also shows that all elements may have comments, and that comments are themselves model elements. It also shows that named elements, types and typed elements are abstract—there can be no instantiations of these elements in a model that conforms to the metamodel. The property "abstract" is denoted by using an italicised type face for the element name, as illustrated in Figure 6.2.

The arrow with the closed triangular head (e.g. the arrow between "Class" and "Type" in Figure 6.2) denotes a generalisation. A generalisation is a taxonomic relationship between a more general classifier and a more specific classifier. Each instance of the specific classifier is also an instance of the general classifier. Thus, the specific classifier indirectly has features of the more general classifier (OMG, 2005a, p. 51).

The arrow with an open triangular head (e.g. the arrow between "TypedElement" and "Type" in Figure 6.2) denotes an association. An association describes a set of tuples whose values refer to typed instances. An instance of an association is called a link (OMG, 2005a, p. 109).

6.3. On the run-time semantics of UML

The run-time semantics of a modelling language define a mapping between the modelling constructs available in the modelling language and an execution environment, often referred to as the "run-time environment" (OMG, 2005b, p. 8). Examples for execution environments are computer programmes being executed in some operating system, simulation environments, and ultimately the real world.

Currently the UML itself only deals with event-driven, discrete semantics (OMG, 2005b, p. 9) and does not define a dispatching method that specifies how events occurring in the run-time environment are mapped onto the behaviour defined in the UML model (OMG, 2005b, p. 10)—the dispatching method is a semantic variation point, i.e. the semantics are not specified on purpose to allow specialisation to a particular purpose or domain (OMG, 2005a, p. 23).

In consequence the UML cannot be used as a simulation modelling language as it is (Borshchev and Filippov, 2004, p. 8): Either a mapping of the relevant UML constructs into a simulation environment must be defined explicitly, or a simulation modelling language must be chosen that inherently provides such a mapping.

This dissertation follows the latter approach: A system dynamics (SD)[6] approach is used to specify the systems run-time behaviour and UML is used to specify the systems structure and the mapping of its behaviour onto this structure.

6.4. Extending the UML using profiles

UML provides several extension mechanisms to allow modellers to make some common extensions without having to modify the underlying modelling language (Rumbaugh et al., 2005, p. 115). This extensibility was a major design criterion for the UML metamodel (OMG, 2005a, p. 12). The great advantage of this "extensibility by design" over the definition of an entirely new language is that existing UML modelling tools can be used and models thus remain tool-independent (Hitz et al., 2005, p. 335).

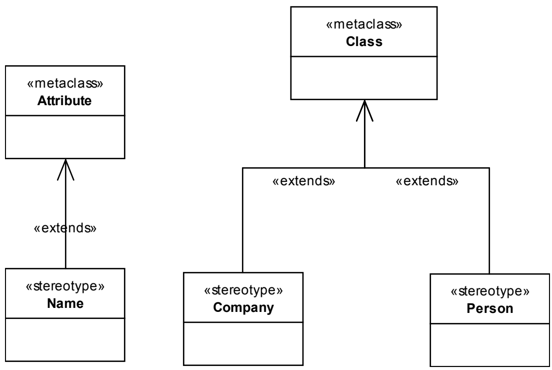

Figure 6.3.: A simple UML profile

Extensions are organised in UML profiles. A simple example of a UML profile that could form a metamodel for the user model (level M1) in Figure 6.1 is shown in Figure 6.3. A profile is a coherent set of extensions applicable to a given domain or purpose, the language mechanisms used are stereotypes, tagged values and constraints (Rumbaugh et al., 2005, p. 115).

- A stereotype defines how an existing metaclass may be extended, and enables the use of platform or domain specific terminology or notation in place of or

[6]Chapter 7 discusses SD in detail.

in addition to the ones used for the extended metaclass. Stereotype is a kind of class that extends classes through extensions. The name of the stereotype is shown within a pair of guillemets above or before the name of the model element. If multiple stereotypes are applied, the names of the applied stereotypes are shown as a comma separated list with a pair of guillemets. When the extended model element has a keyword, then the stereotype name will be displayed close to the keyword, within separate guillemets (example: «company» and «person») (OMG, 2005a, p. 192).

- Just like a class, a stereotype may have properties, which are referred to as tag definitions. Tag definitions are metaproperties, i.e they define properties of the model element themselves and not of the run-time instances at M0. An example of such a tag definition is "author", which refers to the author of the model element. A tag definition has a name and a type and is owned by the stereotype (Rumbaugh et al., 2005, p. 117). When a stereotype is applied to a model element (i.e. an instance of a stereotype is linked to an instance of a metaclass), then the model element gains the tags defined in the stereotype. For each tag, the model may specify a tagged value.

- A constraint is a semantic condition represented as text in a natural language or a specified formal language (Rumbaugh et al., 2005, p. 285), such as the Object Constraint Language (OCL) introduced in section 6.5.

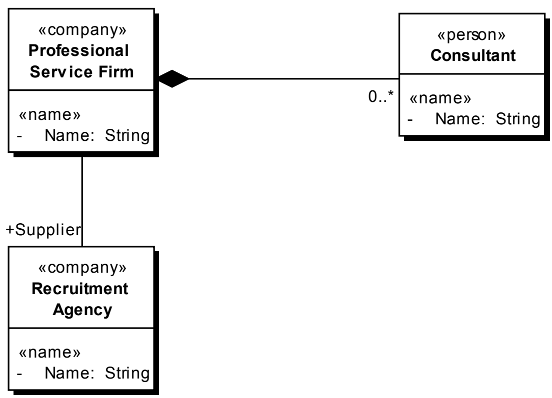

Figure 6.4.: A professional service firm modelled using the simple profile

This metamodel is applied to a model of a professional service firm in Figure 6.4: The advantage of using the profile can be seen at a glance—both *professional service firm* and *recruitment agency* have the stereotype *company*, whereas *consultant* has the stereotype *person*.

6.5. The Object Constraint Language

The OMG has also standardised a constraint language known as the OCL (OMG, 2003). The Object Constraint Language is a text language for writing navigation expressions, Boolean expressions, and other queries (Rumbaugh et al., 2005, p. 490).

An OCL-Expression resulting in a collection of all employees of a company based on the model in Figure 6.1 is “company.employee”. An employee’s list of employers is defined as “person.employer”.

6.6. Summary

The UML is used extensively in Chapter 15 to define a business model metamodel at level M2 of the metamodel hierarchy. OCL is used to specify some derived attributes of this metamodel. A UML profile formalising this metamodel is defined in Appendix A.

The UML is also used to construct user models of the business models analysed in the case studies defined in Part IV. These user models reside at level M1 of the metamodel hierarchy and conform to this business model metamodel.

Chapter 7.

System Dynamics

Systems are pervasive—humans live and work within social systems, IT technology creates complex technical systems.

The term “systems thinking” became widely popular in the 1990’s due to the very influential book “The Fifth Discipline” by Senge (1990). This book is based on a long tradition of research into systems and their behaviour that was started in the 1940’s by Wiener (1961) and continued through Bertalanffy (1976) and Forrester (1961).

Within the systems community, there is much discussion about the relationship between systems thinking and system dynamics (Richmond, 1994, p. 135 ff). This dissertation follows Richmond (2000, p. 3) in using the term systems thinking in a very broad fashion to mean either of following:

- A holistic perspective on reality that sharpens awareness of wholes and of how the parts within those wholes interrelate.
- A set of tools for studying systems—such as causal loop diagrams, stock and flow diagrams and simulation models.
- A specific vocabulary that expresses understanding of systems, such as “reenforcing and balancing feedback loops”, “stocks” and “flows”.

System dynamics (SD) is a method devoted to the study of systems, and is thus a tool within the systems thinking tool kit. It uses simple graphical notations to model systems: causal loop diagrams and stock and flow diagrams.

Other methods for studying and simulating systems exist, such as discrete event modelling (discussed in Pidd (2004)) and agent based modelling (Terano et al. (2005), Sterman (2000, p. 896)). These approaches are compared to each other in Borshchev and Filippov (2004, p. 3), who classify these approaches according to their suitability for simulation at high levels of abstraction (strategic level) versus low levels of abstraction (operational level): Discrete event modelling is more suitable to simulation at the operational level, SD is more suitable for simulation at high levels of abstraction, agent based modelling can be used at all levels of abstraction. The following sections show that SD is a sufficient simulation method for modelling and simulating business models, which are positioned at the strategic level of the BE map[1]. Though agent based modelling is not considered here in the following, this does not mean that this approach is not a viable alternative to using SD.

7.1. Open systems and feedback systems

Before analysing systems in detail, it is important what exactly is meant by the term "system". This dissertation uses a very broad definition:

Definition 7.1 *A system is a grouping of interconnected parts (Sherwood, 2002, p. 3).*

Systems can be classified as "open" systems and "feedback systems" (Forrester, 1968, p. 1-5). *An open system is characterised by outputs that respond to inputs, but where outputs are isolated from and have no influence over the inputs* (Forrester, 1968, p. 1-5). An example of an open system is a sensor that automatically opens the blinds of a window when the sun rises. The inputs are the rays of light from the sun, the output is the signal that causes the motor to open the blind.

Feedback systems have a closed loop structure that bring results from past action of the system back to control future action—so feedback systems are influenced by their own past behaviour (Forrester, 1968, p. 1-5). Extending the blind control system, a feedback systems would be a system that not only opens the blinds when the sun rises, but also adjusts the blinds during the day to ensure the room is not subjected to direct sunlight.

Even though open systems can consist of many parts and thus become very complex (high detail complexity), experience shows that the behaviour of even small feedback systems consisting of few parts (and thus low detail complexity) can be very difficult to predict in practice (high dynamic complexity) (Sterman, 2000, p. 21).

7.2. Causal loop diagrams

The simplest way of showing the parts of a system and how they interrelate are influence diagrams or causal loop diagrams: They show the relevant parts of a system using textual identifiers, the links between the parts are drawn using arrows pointing in

[1] The positioning of business models at the strategic level of the BE map is discussed in Chapter 9 and in Chapter 14

the direction of influence. Small $+$ or $-$ signs are used to show whether the influence is positive or negative (also referred to as positive or negative link polarity)[2].

A simple example from the business realm is the effect of schedule pressure in projects (Grasl, 2008d), illustrated in Figure 7.1: Schedule pressure typically increases the number of hours the team works per week (the workweek), hence the $+$-sign. The higher the workweek, the higher the delivery rate. A high delivery rate decreases the number of open tasks remaining (hence the $-$-sign).

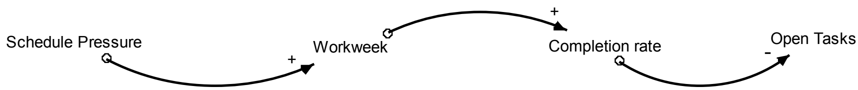

Figure 7.1.: Simple influence diagram showing the effect of schedule pressure

An important exercise in examining systems is to actively look for feedback loops ("closed loop thinking"): This ensures that unintended consequences are uncovered (Richmond, 2000, p. 18). Short consideration of the diagram in Figure 7.1 shows that if the number of open tasks goes down, then schedule pressure also decreases—this creates a feedback loop: This is a balancing feedback loop, because it ensures that schedule pressure only goes up when the number of open tasks is to high. Balancing loops are frequently denoted by placing a (B) in the centre of the loop.

Whether a loop is balancing (B) or reenforcing $(+)$ is easily determined by following the link polarity around the loop and observing the following rules:

- Two subsequent links with polarity $+$ and $+$ are equivalent to a link with polarity $+$
- Two subsequent links with polarity $+$ and $-$ are equivalent to a link with polarity $-$
- Two subsequent links with polarity $-$ and $+$ are equivalent to a link with polarity $-$

[2]Sometimes an alternative notation using an *s* (same) and *o* (opposite) is used instead of the $+$ and $-$. Richardson (1986) discusses both notations and comes to the conclusion that it is better not to use *s* and *o*.

- Two subsequent links with polarity $-$ and $-$ are equivalent to a link with polarity $+$

In most situations schedule pressure also has an effect on how efficiently work is performed, less time being wasted on nonproductive tasks. So increased efficiency increases productivity, which has a positive effect on the delivery rate. A quick check on the link polarity shows that this is also a balancing loop. Unfortunately high schedule pressure can also lead to a decrease in thoroughness. Although this increases productivity, it can also lead to an increase in the number of tasks that need to be reworked and thus increase the number of open tasks. This is a reinforcing loop. These interdependencies are shown in Figure 7.2.

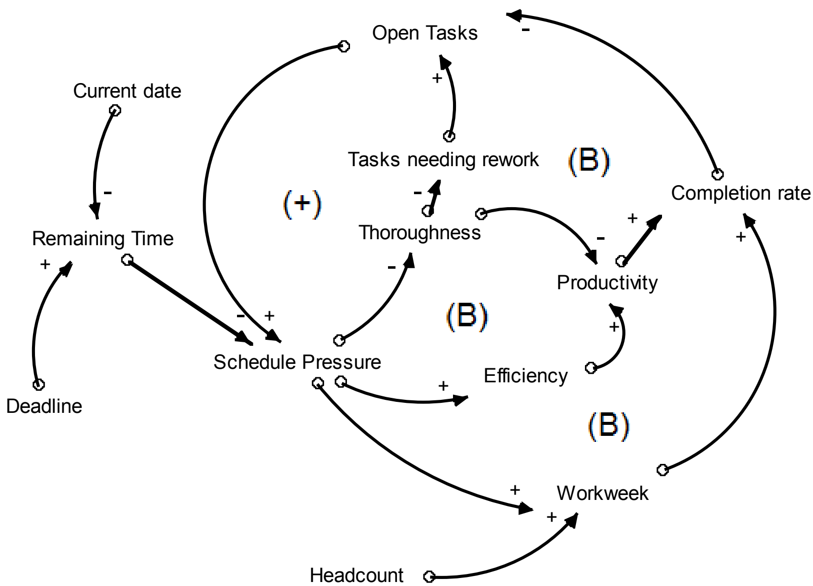

Figure 7.2.: Causal loop diagram showing the effect of schedule pressure

As observers, causal loop diagrams are very useful in many modelling situations: They are well suited to represent interdependencies and feedback processes. They are used effectively at the start of a modelling project to capture the mental model of all those involved. They are also useful to communicate the results of a completed modelling effort.

Examples for concrete feedback loops at the level of business models are:

- The cost for supplies will depend on the amount of supplies bought. The cost of supplies is a determinant of the price of the product sold. The price influences the perceived value of the product, and there the quantities of product sold. The higher the quantity sold, the more supplies need to be bought (Sterman, 2000, p. 375).
- The unique knowledge a consulting company has influences the type of customer it can serve. The type of customer a consulting company serves influences the capital a company can raise, which again influences the kinds of talent a consulting company can attract. This again influences the knowledge a consulting company has (Rode, 2001, p. 104).
- The more service suppliers a full-service provider has, the more customers he will attract. The more customers a full-service provider has, the easier it is to find service suppliers who are willing to subcontract due to this market presence (Weill and Vitale, 2001, p. 124).

But due to their informal nature causal loop diagrams suffer from a number of limitations and can easily be abused (Sterman, 2000, p. 191):

- Even quite simple causal loop diagram can result in very complex dynamic behaviours which are very difficult to predict with certainty (Sherwood (2002, p. 272), Richardson (1986, p. 169)).
- Causal loop diagrams do not distinguish between two fundamentally distinct aspects of feedback systems: the parts of the system that can be measured instantaneously (referred to as stocks or levels) and the rates at which this parts are changing (commonly referred to as flows or rates). Along with feedback, stocks and flows are the central concepts of dynamic systems theory (Sterman, 2000, p. 191).

7.3. Stock and flow diagrams

The last section showed that to go beyond simply analysing and visualising the feedback structure of a systems, a more powerful method is needed than causal loop diagrams, one that can distinguish between the stock and flow structure, that allows for precise specification of all parts and their interrelations and thus can provide a basis for simulating the behaviour of the system and creating an extensive microworld[3] to explore the behaviour of the system.

Stock and flow diagrams along with the mathematical expressions that specify each construct provide such a method[4]. They can always be mapped onto the corresponding causal loop diagram, but usually contain more variables and are more precisely specified (Sherwood, 2002, p. 274).

Stocks are accumulated over time via flows. Stocks represent the state of a system at any given instant in time, the flows represent the rate at which these stocks are changing at that particular instant.

The key feature of stock and flow diagrams is that each construct can be precisely specified using a mathematical formalism—viewed from a mathematical perspective such fully specified stock and flow models are just a way of visualising a corresponding set of integral equations.

In most cases these integral equations cannot be solved analytically, but due to the computing power available today even in portable laptops it is possible to solve the equations numerically using computer simulation techniques[5].

The notation used in stock and flow diagrams was originated by Forrester (1961) and was based on a hydraulic metaphor—the flow of water into and out of reservoirs. Stock are represented by small boxes, flows by small regulators attached to flow pipes that lead into or out of stocks. The model boundary is also explicitly modelled in this diagram: Delivered tasks simply disappear out of the system into a small cloud—these clouds represent the model boundary. Complex flows can be disaggregated into their constituent parts using converters, which are represented by small circles. Converters are referred to as such because they convert inputs into an output.

A simple example is that of a bathtub[6]: At any given time the stock of water is indicated by the level of water in the bathtub. It is the cumulative result of water flowing into the bathtub via the tap, and out of the bathtub via the drain. The crucial point here is that the systems dynamic behaviour is fully specified by defining its current state (the stocks) and the current rate of change of these stocks (the flows). The power of system dynamics stems from the fact that these stocks and flows can be

[3]The term *microworld* was coined by Papert (1993).

[4]e.g. Sterman (2000, p. 191), Forrester (1968, p. 1-8), Dierickx and Cool (1989, p. 1506).

[5]The integral equations are actually converted into difference equations, which are then calculated numerically, in small time steps. The difference equations resulting from an SD-model are defined in section 7.4

[6]The bathtub metaphor is used by Dierickx and Cool (1989, p. 1506) and Sterman (2000, p. 194). The presentation here is the author's.

modelled using a very simple and intuitive notation.

A diagram showing the bathtub situation is shown in Figure 7.3

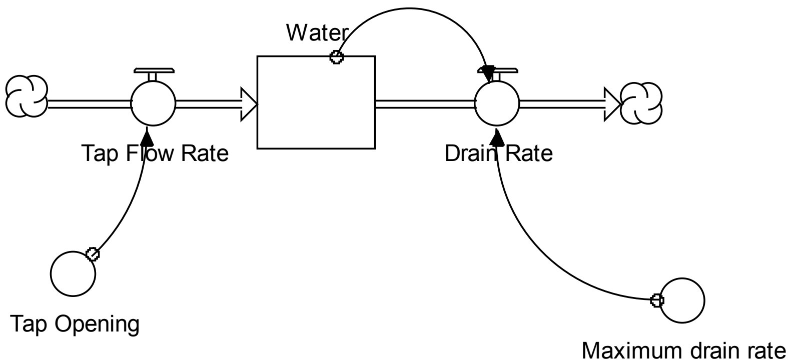

Figure 7.3.: System Dynamics Model showing water flowing into and out of a bathtub

Let us assume a constant tap flow rate depending on how far the tap is opened to keep the model simple. The drain rate depends on the amount of water in the bath: if there is no water in the bath, the rate will be zero, there will also be a maximum rate depending on the width of the drain. The integral equation for the amount of water in the bathtub at time T in this simple model is:

$$Water(T) = \int_0^T Tap\_Flow\_Rate(t) - Drain\_Rate(t)dt \tag{7.1}$$

$$Tap\_Flow\_Rate(t) = Tap\_Opening \tag{7.2}$$

$$Drain\_Rate(t) = MIN(Water(t), Maximum\_Drain\_Rate) \tag{7.3}$$

Assuming $Tap\_Open = 2\ litres/time\_unit$ and the maximum drain rate is $1\ litre/time\_unit$, the water level will accumulate as displayed in Figure 7.4.

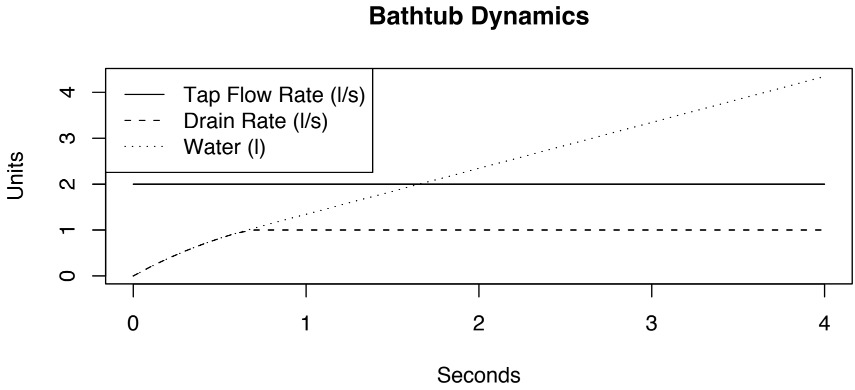

Figure 7.4.: Accumulation of water in a bathtub

7.4. System dynamics metamodel

SD does not have a standardised metamodel for validating the structure of causal loop diagrams or stock and flow diagrams[7]. Chang and Tu (2005) discuss an approach to integrating SD and UML, but they do not use or define a metamodel. Diker and Allen (2005) define an XML schema for system dynamics models, which is similar in structure to the metamodel defined here. Barros et al. (2001) define a metamodel for SD using Backus Naur Form (BNF)[8] instead of UML. Their metamodel is similar in complexity to the metamodel presented in the following paragraphs, but proposes extensions to SD that are not needed in the models created in this dissertation. Myrtveit (2000) discusses object-oriented extensions to SD.

A simple metamodel for system dynamics[9] is shown in Figure 7.5. The metamodel has the following constructs:

[7]No standardising body exists for system dynamics. The de facto standard is defined by Forrester (1968), but each system dynamics tool implements this standard in slightly different ways using slightly different notations. This was verified in discussion with Karim Chichakly, the head of product development at isee systems. isee systems are the creators of *iThink*[TM], the SD-modelling and simulation tool that is used to create the SD-models for this dissertation.

[8]BNF is a formal notation to describe the syntax of a programming language.

[9]The metamodel was developed by the author in discussion with Karim Chichakly.

Stock Stocks represent the state of a system at any given instant in time. Stocks can only be influenced by flows.

Flow Stocks are accumulated over time via flows. The flows represent the rate at which these stocks are changing at that particular instant. Flows are special kinds of converters. Flows directly affect the stocks they flow into or out of. They can also be inputs to other converters.

Constant A converter whose function is constant or just depends on time.

Converter Converters are used to disaggregate the complex functions that define flows into their constituent parts. Converters may be influenced by stocks and can influence other converters. In general, they convert inputs into an output. Unlike flows (who are special kinds of converters), they cannot directly influence a stock.

Module Modules are used to aggregate other model elements and thus provide layers of abstraction.

Initial Value A constant specifying the initial value of a stock.

Function A mathematical expression that defines how the converters inputs are combined to produce an output. The expression may include functions that depend just on time (e.g. the current date).

With the help of this metamodel and the OCL, the difference equations that form the heart of the simulation model can now be defined as follows:

$$
\begin{aligned}
Stock(0) &= Initial\_Value && (7.4)\\
Stock(t) &= Stock(t-dt) + dt \times (\textstyle\sum Stock.Inflow(t-dt) && (7.5)\\
&- \textstyle\sum Stock.Outflow(t-dt)) &&\\
Converter(t) &= Converter.Function(Converter.Input(t)) && (7.6)\\
Flow(t) &= Flow.Function(Flow.Input(t)) && (7.7)
\end{aligned}
$$

7.5. System dynamics method

Sterman (2000, p. 87) defines a process for constructing system dynamics models consisting of the following steps:

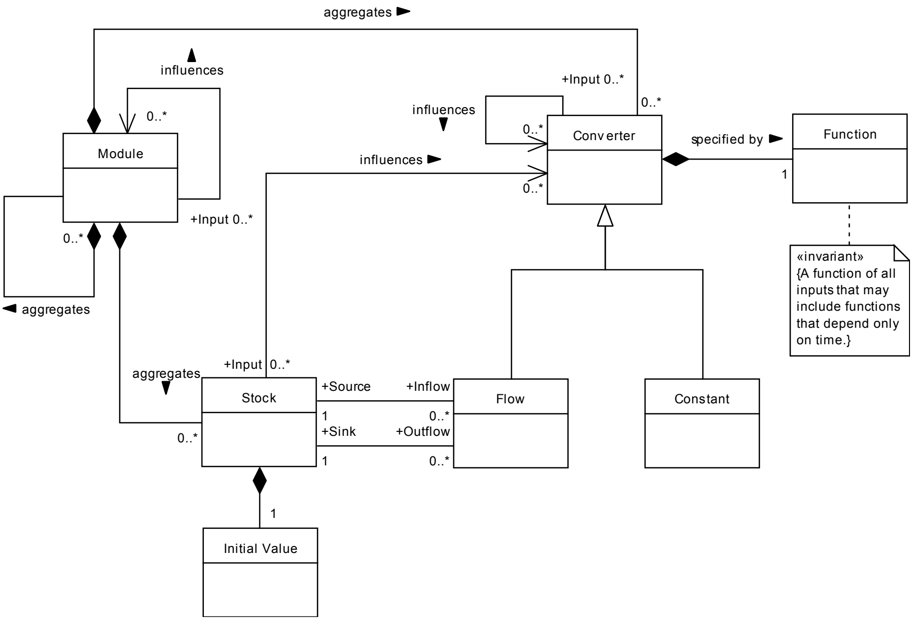

Figure 7.5.: Meta-model for system dynamics

Problem articulation In this step the problem is stated precisely, in particular the key variables and their historical behaviour. The model boundary is defined.

Dynamic hypothesis In this step a dynamic hypothesis is formulated that explains the dynamics as endogenous consequences of a feedback structure. A model is constructed using causal loop diagrams and stock and flow diagrams.

Model formulation Specification of current policies (structure and decision rules). Estimation of parameters, behavioural relationships and initial conditions. Tests for consistency with model purpose and model boundary.

Model testing Testing of the model in comparison to reference modes.

Policy design and evaluation Evaluation of possible environmental conditions and specifications of scenarios. Design and evaluation of new policies.

The process is illustrated in Figure 7.6.

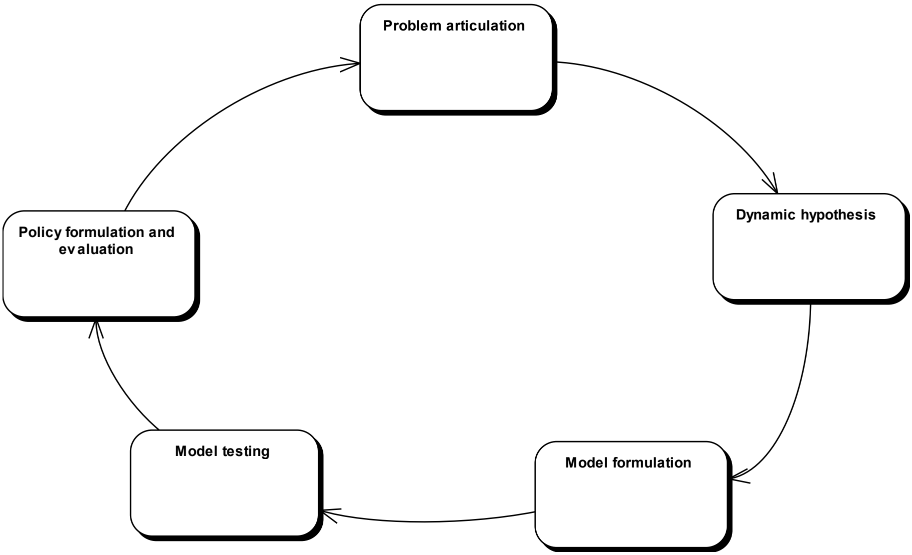

Figure 7.6.: Activities of the system dynamics method (Sterman, 2000, p. 87)

7.6. Simple project simulation

The stock and flow technique introduced in the last section will now be applied to the project dynamics analysed in section 7.2.

A brief examination of the outer balancing loop in Figure 7.2 reveals that *Open Tasks* is a stock. The only way this stock can be changed is by delivering tasks, the *Delivery rate* is therefore a flow. The schedule pressure is derived from the deadline (a constant), the current date, and the number of open tasks. The workweek is a property of the system that somehow depends on schedule pressure—this relationship will be examined in detail shortly. The delivery rate itself depends on the workweek. Figure 7.7 shows the corresponding stock and flow diagram.

In order to simulate the model, all constructs must be fully specified.

The *Remaining_Time* is calculated from the current date and the deadline, as shown in equation 7.8.

$$Remaining\_Time = Deadline - Current\_Date \tag{7.8}$$

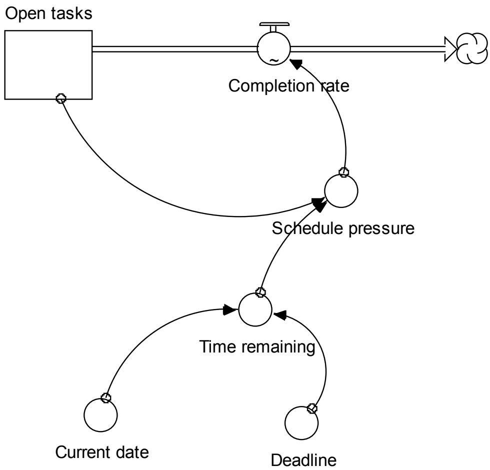

Figure 7.7.: Initial stock and flow diagram of project

If the deadline has passed, the remaining time should remain at 0 and not become negative. This can be achieved using the $MAX(x,y)$ function, which compares two values x and y and chooses the larger one:

$$Remaining\_Time = MAX(Deadline - Current\_Date, 0) \tag{7.9}$$

What about schedule pressure? The more tasks remain open, and the less time that remains to complete them in, the greater schedule pressure becomes. An initial formulation could be:

$$Schedule\_pressure = \frac{Open\_Tasks}{Remaining\_Time} \tag{7.10}$$

In this formulation schedule pressure becomes endless as soon as the deadline is reached and time remaining is zero. Defining a range from 0 to 2.5, a better formulation is

$$Schedule\_pressure = MIN(\frac{Open\_Tasks}{MAX(Remaining\_Time, 1)}, 2.5) \tag{7.11}$$

The *MIN*-function ensures that schedule pressure can be at most 2.5. The *MAX*-function ensures that no division by 0 occurs. The range from 0 to 2.5 is arbitrary – the value 2.5 means that the project only has 40% of the time actually needed to complete all open tasks.

What effect does schedule pressure have on completion rate? Sterman (2000, p.567) offers interesting insights: Experience shows that most people invest less time in projects when schedule pressure is low, but work overtime when schedule pressure is high. The relationship is non-linear an can best be modelled with a graphical function (also referred to as a table function), which defines how two variables depend on each other by explicitly defining each pair of points defining the relationship using a lookup table (Sterman, 2000, p. 552).

A possible graph showing the effect of schedule pressure on completion rate is shown in Figure 7.8: If schedule pressure is low, the completion rate goes down to 75% of the nominal rate. If schedule pressure is high, the rate goes up to at most 125% of the nominal rate.

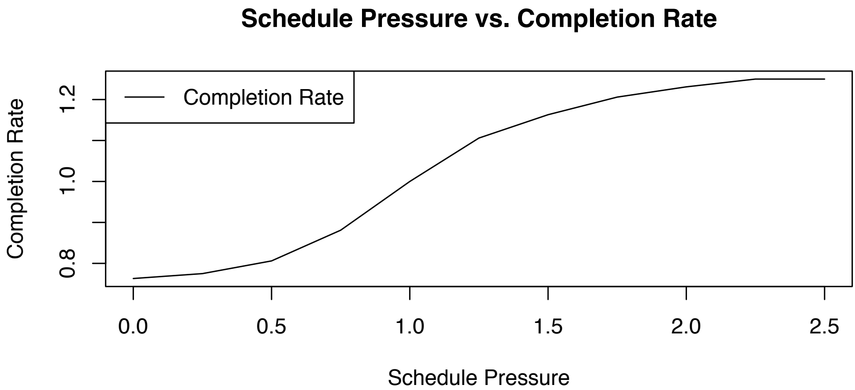

Figure 7.8.: Effect of schedule pressure on completion rate

One consequence of the non-linear effect of schedule pressure on completion rate is, that a project with a very tight schedule still manages to make its deadlines, and a project with a loose schedule takes longer than expected. Assuming that the nominal time to complete a task is 1 day, then simulation shows, that a project with 100 tasks finishes after 100 days. A project with only 80 tasks takes 93 days to complete (instead of the expected 80), a project with 110 tasks takes 102 days to complete, and a project with 120 tasks takes only 106 days. The results of the simulation are displayed in Figure 7.9.

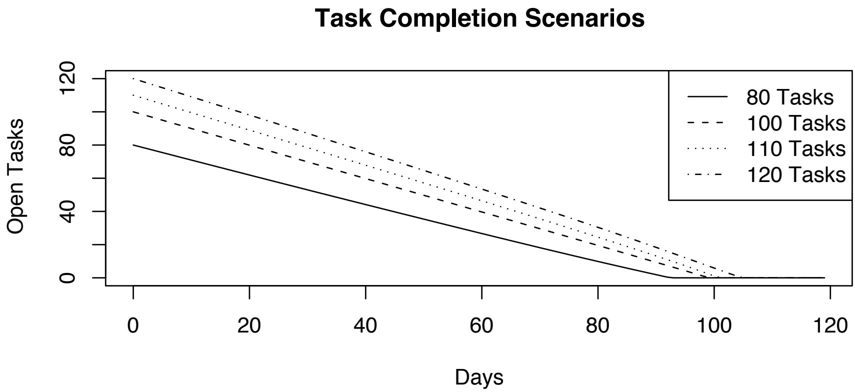

Figure 7.9.: Task completion scenarios

Comparison of the stock and flow model in Figure 7.7 to the causal loop-model in Figure 7.2 shows that we still need to consider the effect of schedule pressure on efficiency (assuming thoroughness is constant for now). Also the project headcount is not included in the current model, and this surely has an effect on the completion rate.

A more elaborate stock and flow model including these aspects is shown in Figure 7.10.

In this model, the completion rate has been disaggregated to account for the headcount, which was subsumed in the workweek in the previous model:

$$Completion\_rate = Headcount \times Workweek \times Productivity \tag{7.12}$$

Productivity is a measure of how much time it takes to complete a task. Ideally productivity is equal to the nominal time per task. In practice it depends on the efficiency

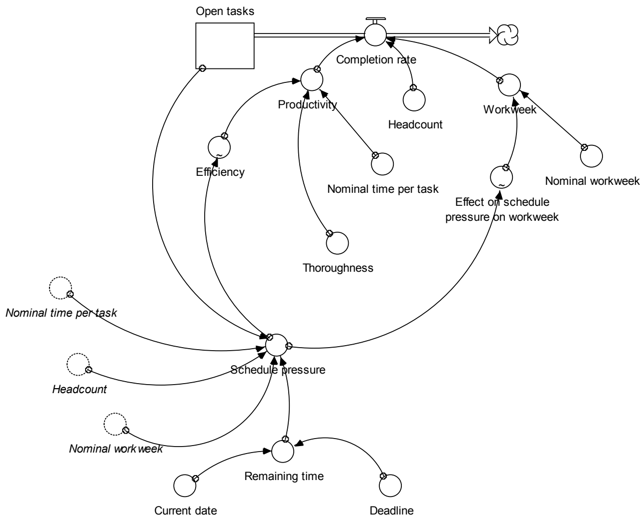

Figure 7.10.: A more elaborate stock and flow diagram of a project

(which is a measure of how much time is wasted between tasks) and thoroughness (which is a measure of quality):

$$Productivity = \frac{Efficiency}{Nominal\_time\_per\_task \times Thoroughness} \tag{7.13}$$

Also schedule pressure has been disaggregated: It measures whether it is possible to complete all open tasks in the time remaining until the deadline is reached, considering the nominal workweek, the headcount and the nominal time per task:

$$Schedule\_Pressure = MIN\left(\frac{\left(\frac{Open\_Tasks \times Nominal\_time\_per\_task}{Headcount \times Nominal\_Workweek}\right)}{MAX(Remaining\_Time, 1)}, 2.5\right) \tag{7.14}$$

The effect of schedule pressure on efficiency is again modelled using a graphical function. This function is displayed in Figure 7.11.

Simulating this model paints an interesting picture—irrespective of whether the project starts with 80, 100 or 120 tasks, the project always completes after ca. 100 days, as displayed in Figure 7.12. As soon as schedule pressure goes down, the team

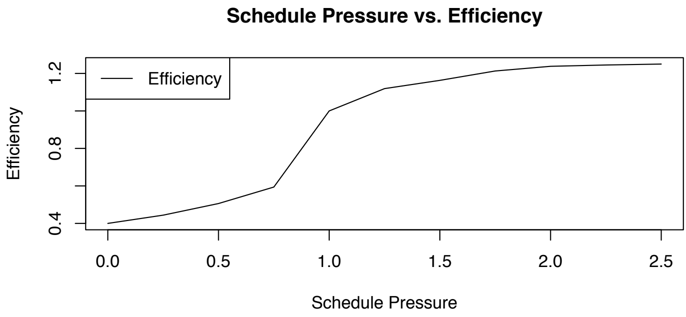

Figure 7.11.: The effect of schedule pressure on efficiency

efficiency goes down, and the project takes longer than it needs to. This may well be the explanation for Parkinson's Law, which states that the effort needed to do an amount of work always expands to fill the time available to do it (Parkinson, 1955, p. 1).

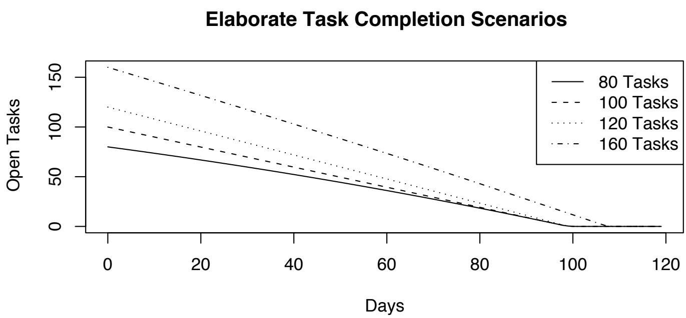

Figure 7.12.: Tasks completion scenarios for the elaborated project model

Though the current model still does not answer many questions, such as the effect of schedule pressure on quality and rework, it would lead to far to further elaborate this model here. The effect of disruption and delay in projects is discussed in Eden et al.

(2000), a comprehensive survey of the application of system dynamics to projects is given by Lyneis and Ford (2007).

7.7. Summary

This chapter introduced important tools and concepts of systems thinking and system dynamics: Causal loop diagrams and stock and flow diagrams. To illustrate these ideas a simple model of task completion in projects was developed and various scenarios were simulated.

A comprehensive introduction to the system dynamics method is given by Sterman (2000) who shows how the system dynamics method is applied to business issues. The dynamics of competitive strategy are explored in Warren (2002), the dynamics of strategy in general are explored in Morecroft (2007) and Warren (2008). Strategic issues concerning the marketing of knowledge-based professional service firms in particular are explored in Rode (2001).

System dynamics is used in the business model analysis method defined in Chapter 16 to create simulation models of the business models being analysed. Such simulation models are discussed extensively in the case studies presented in Part IV.

Chapter 8.

Systems Engineering

Systems engineering (SE) is a purposeful and goal-oriented method for engineering complex systems, based on the system thinking paradigm and a defined problem solving cycle (Haberfellner et al., 2002, p. XVIII).

8.1. Systems thinking

The way systems engineering (SE) uses the term systems thinking is consistent with its use within the system dynamics (SD) community (cf. Chapter 7): *Systems thinking is a way of thinking that enables better understanding and engineering of complex systems* (Haberfellner et al., 2002, p. 4).

In particular, systems thinking encompasses (Haberfellner et al., 2002, p. 4):

- *Terms* to describe complex entities and relationships.
- *Model-based methods* to represent real, complex systems without having to simplify them unduly.
- Approaches that support *holistic* thinking.

Within SE the term system is defined as a grouping of interconnected parts, which is also consistent with the definition used within SD.

8.2. The problem solving cycle within systems engineering

The problem solving cycle used in SE is illustrated in Figure 8.1[1]. The problem solving cycle is inherently iterative and consists of three major steps (Haberfellner et al., 2002, p. 47):

Clarify goals What is the current situation, which objectives are to be achieved?

[1] The systems engineering approach is described in detail in Haberfellner et al. (2002).

Develop potential solutions Given the current situation and the objectives, what approaches are there to achieving this? As a result of this activity it may be necessary to go back to the *clarify goal* activity because new aspects become apparent during solution development.

Select solutions Evaluate the approaches and choose the best and most appropriate ones. As a result of this activity it may be necessary to go back to the *clarify goals* or *develop potential solutions* activities due to new aspects becoming apparent during solution selection.

Each of these steps is again subdivided into minor steps (Haberfellner et al., 2002, p. 47-55)—for convenience these sub-steps are summarised here in sequence, the containment of the minor steps within the major steps is illustrated in Figure 8.1.

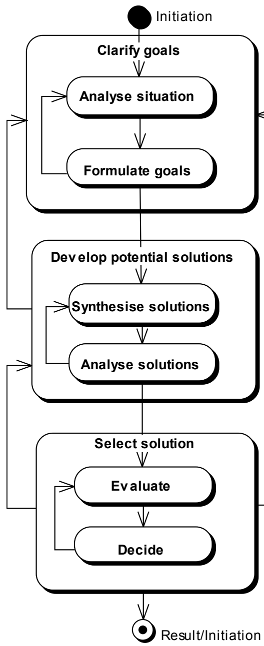

Figure 8.1.: Problem solving cycle within the system engineering method (Haberfellner et al., 2002, p. 48)

Analyse situation Analysis of the current situation.

Formulate goals Formulation of the goals that are to be achieved. As a result of this activity it may be necessary to go back to the *analyse situation* activity due to new findings during goal formulation.

Synthesise solutions This is the creative, constructive activity within the problem solving cycle. Based on the situation analysis and the formulated goals possible solutions are elaborated.

Analyse solutions This is a critical, analytical, "destructive" activity—the purpose of this activity is to ensure the proposed solutions fulfil all goals. Frequently it is necessary to rework the solutions based on the analysis, thus going back to the *synthesise solution* activity.

Evaluate Systematic evaluation of all solutions that remain after the last *analyse solutions* activity.

Decide Choice of the most appropriate solution based on the evaluation in the *evaluate* activity. As a result of this activity it may be necessary to go back to the *evaluate* activity due to new decision and evaluation criteria becoming apparent.

8.3. Summary

SE is an engineering discipline for complex systems, that provides its own problem solving cycle. It is more general in scope than SD (Chapter 7), OOAD (Chapter 5), UML (Chapter 6) and BE (Chapter 9).

The SE problem solving cycle is used here as a basis for the business model analysis method defined in Chapter 16.

Chapter 9.

Business Engineering and Strategy Management

High customer expectations, internationalisation of business relationships, and increasing pressures on cost structures lead to frequent and widespread changes in processes. In addition, corporations often acquire and merge new companies, change their strategies, and invest in new business models. New technologies also force companies to rethink how their processes are implemented.

Change is no longer something that just happens to companies—change is actively embraced. The process of transformation can be difficult, emotional, even painful—it is a permanent challenge to all those involved.

9.1. The business engineering map

Business engineering is a holistic approach to this transformation process: it deals both with hard facts (such as business strategy, business processes, information systems) and soft facts (resistance to change, employee motivation, politics, and power) (Österle and Winter, 2003, p. 12). These areas of concerns are illustrated in the BE map in Figure 9.1[1].

The St. Gallen approach to business engineering follows the principles of method engineering introduced in Chapter 4, to ensure the results achieved are not "one-off" acts of creativity, but are repeatable processes firmly grounded in engineering discipline (Österle and Blessing, 2003, p. 88ff).

At the centre of the St. Gallen approach to business engineering is the metamodel shown in Figure 9.2[2]. It describes all the constructs that are relevant to business engineering and the relationships between them.

Other well documented metamodels exists that are useful for business engineering:

[1]The BE map is adapted from Österle and Winter (2003, p. 12). The term "information and communication systems" has been replaced by the term "application and technology" following Lankhorst (2005, p. 318) to avoid confusion with the more general use of the term "system" in this dissertation.

[2]The original model is not layered to the business engineering map and is in German. Layering and translation by the author.

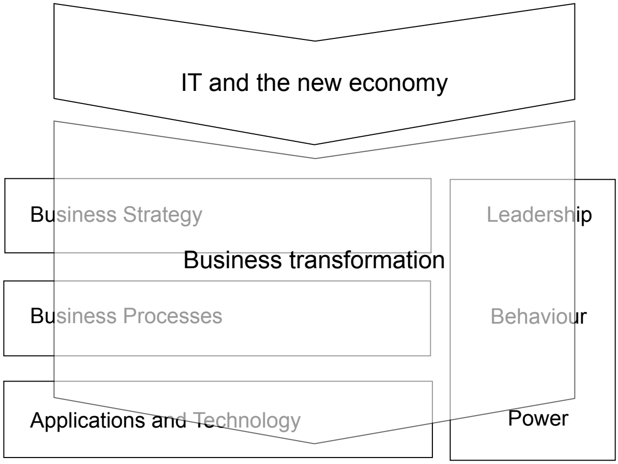

Figure 9.1.: Business Engineering Map (Österle and Winter, 2003, p. 12)

- Marshall (2000) introduces the enterprise metamodel, the top-level structure of which is shown in Figure 9.3. The enterprise metamodel is not as comprehensive in scope as the business engineering metamodel, because it does not cover the application and technology layer of the BE map. It is very extensible due to its clear distinction between entities and the roles they may have in a particular business context—this approach will be used in the business model metamodel developed in Chapter 15.
- Eriksson and Penker (2000) define many metamodels for modelling a business, in particular its processes (Eriksson and Penker, 2000, p. 65) and its organisation (Eriksson and Penker, 2000, p. 241).
- The OMG has standardised a metamodel situated within the business strategy layer referred to as the *business motivation model (BMM)* (OMG, 2008a). This BMM is primarily concerned with modelling business plans: the ends (vision, goals and objectives) a firm wishes to realise and the and the means (mission, strategy and tactics) by which these are to be achieved (OMG, 2008a, p. 12).
- The OMG has also standardised a metamodel situated within the business process layer referred to as the *business process definition metamodel (BPDM)*

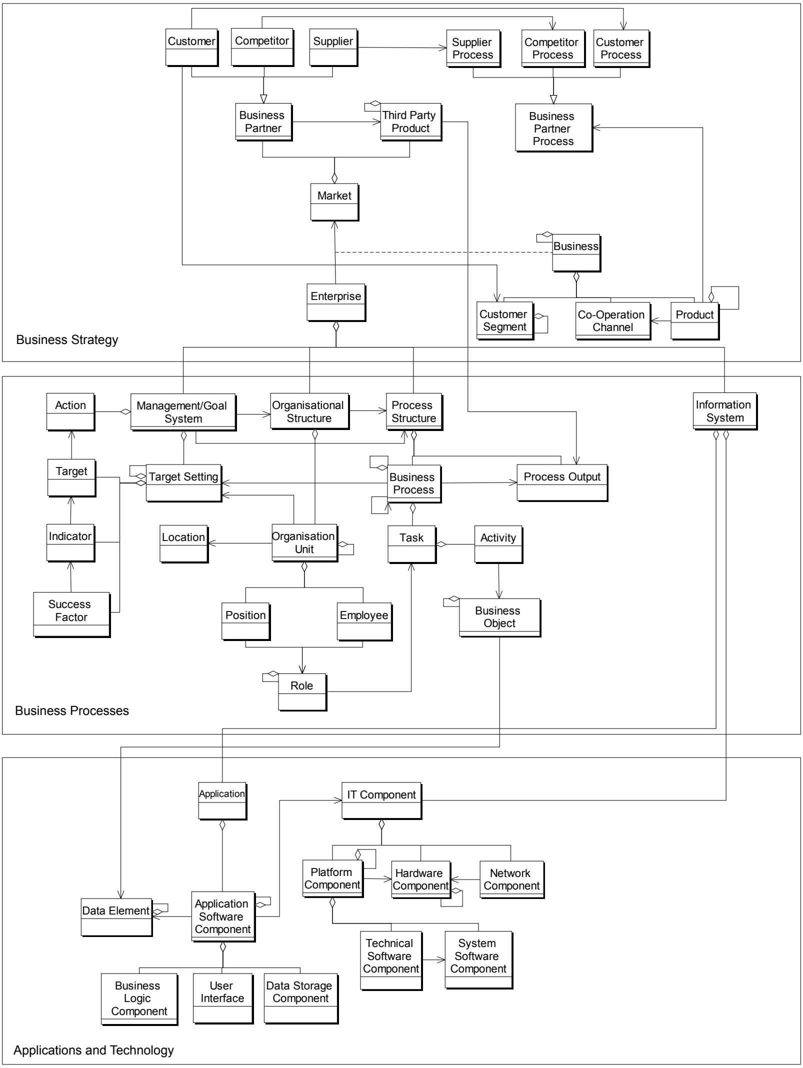

Figure 9.2.: Business engineering metamodel (Österle et al., 2007, p. 193)

(OMG, 2008b). The BPDM is concerned with modelling business processes.

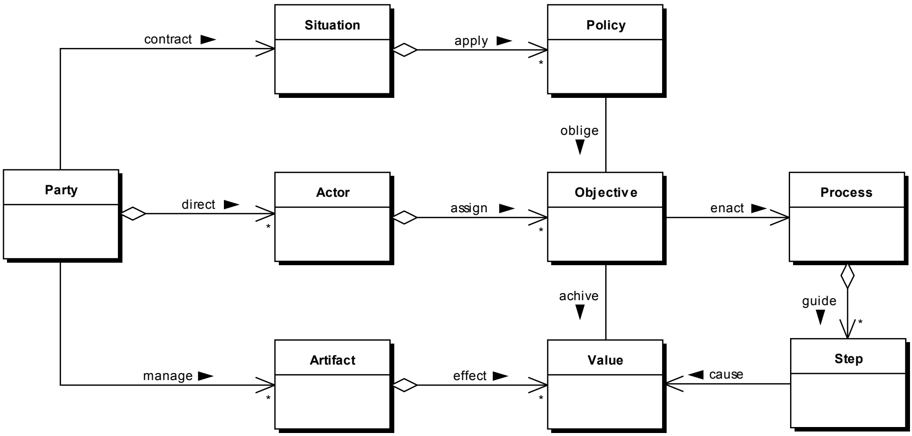

Figure 9.3.: Enterprise metamodel (Marshall, 2000, p. 21)

9.2. Questions of strategy management

One of the layers of the business engineering map is the business strategy layer: Many definitions of the term *strategy* exist[3], this research follows Grant (2008, p. 17) in defining strategy to be the plans, policies and principles by which individuals or organisations achieve their objectives, and strategy management to be the process that is concerned with how a firm develops and executes such strategies.

As Porter (1996, p. 3) emphasises, strategy is not about doing things better—this is the concern of operational effectiveness—strategy is about about doing things differently; hence, the essence of strategy is making choices (Grant, 2008, p. 19). Müller-Stewens and Lechner (2005, p. 30) identify five major strategic choices that face a firm's top management:

Initiation: How are strategic initiatives shaped within the firm? A strategic initiative is defined to be an "impulse" that changes the development of the firm significantly (Müller-Stewens and Lechner, 2005, p. 28). Examples for such

[3] A number of common usages are listed in (Grant, 2008, p. 17)

initiatives are entering a new market, co-operating with new partners or implementing a new business model. Strategic initiatives are not necessarily shaped top-down (i.e. by the firm's top management), but can also be started bottom-up (i.e. driven by the firms employees) or take on a mixed, bipolar form (Müller-Stewens and Lechner, 2005, p. 65).

Positioning: How is the firm positioned towards its stakeholders? A stakeholder is anyone who is affected by a course of action taken by the firm or anyone who can affect the actions taken by the firm (Müller-Stewens and Lechner, 2005, p. 29). Typical stakeholders are customers (satisfaction gained), employees (wages and salaries), investors (interest), government(taxes), shareholders (profit), suppliers (sales) or even competitors (Müller-Stewens and Lechner (2005, p. 141); Grant (2008, p. 35)). The goal of positioning a firm towards its stakeholders is to understand how customers view the firm in comparison to its competitors with respect to those criteria they deem relevant for the particular product the firm is offering. Using this understanding the firm can identify both gaps between the customers perception and its own perception and also positions that may not have been taken yet by its competitors (Meffert and Bruhn, 2004, p. 168). Examples for positioning criteria for PSFs are the degree of service formalisation (i.e. are services performed in an ad-hoc fashion or do they follow a formally defined process) and the degree of specialisation (i.e. are the services specialised to a particular area of expertise or does the company claim to cover all areas) (Meffert and Bruhn, 2004, p. 170).

Value Creation: How does the firm create value for its stakeholders? Value creation initiatives focus on developing a firms value creation capabilities, such as its core competencies, its human resources and value adding business processes. These capabilities are also relevant for the firm‘s positioning strategy, because they constrain the positioning options available to the firm (Müller-Stewens and Lechner, 2005, p. 29).

Change: How is the firm transformed through strategic initiatives? This question is concerned with how to implement the positioning and value creation strategies by transforming the enterprise at an operational level (Müller-Stewens and Lechner, 2005, p. 29), under consideration of both the hard facts and soft facts (Österle and Winter, 2003, p. 12).

Performance Measurement: How are initiatives monitored and assessed? The objective here is to identify new initiatives as early as possible, to assess which changes they entail (Müller-Stewens and Lechner, 2005, p. 693) and to provide early feedback on the efficiency of execution and effectiveness of results.

9.3. Summary

The research presented here is firmly grounded in the tradition of strategy management and business engineering: It is concerned with analysing how firms create value (through the business models they implement), which—as the list of strategic questions shows—is an aspect of strategic management and the business strategy layer illustrated in Figure 9.1. One result of this research is a metamodel for modelling business models (cf. Chapter 15) situated within the business strategy layer of the business engineering metamodel in Figure 9.2.

Chapter 10.

Transaction Cost Theory

The formation and development of co-operations between firms respectively between networks of firms is frequently analysed using the theory of transaction costs.

The basis unit of analysis in transaction cost theory (TCT) is the transaction, which is defined as the exchange of a product via an interface (Richter and Furubotn (2003, p. 55) based on Williamson and Ouchi (1981)). The costs arising from initiation, control, and performance of such a transaction are referred to as transaction costs. A basic assumption of transaction cost theory is that firms involved in a transaction choose a form of coordination which minimises the cost of this transaction.

The importance of transaction costs was first highlighted by Coase (1937), who asked why not all forms of co-operation between firms are accompanied by contracts that are made via a market and showed that transaction costs are important criteria in evaluating different forms of coordination between firms. Mahadevan (2000, p. 61) points out that a dramatic reduction in transaction costs lies at the heart of the success of new e-commerce business models.

10.1. Transaction cost drivers

The costs of a transaction depend on both the specificity of a transaction, and on the form of coordination (see Figure 10.1, Picot et al. (2001, p. 55)). The specificity of a transaction is so much the higher, the higher the loss in value that is incurred when the resources that are needed to perform the transaction are no longer used for this kind of transaction, but are used in the best alternative transaction (Picot et al., 2001, p. 51). For example standard software may well be used after a particular customer relationship has ended, but software developed specifically for this customer may well be worthless in an other context.

Picot et al. (2001, p. 55) discerns between hierarchical, market and hybrid forms of coordination: Vertically integrated coordination is best for highly specific transactions. This is due to the fact that outside of this transaction there are no alternative usages for this specific investment, so there is a dependency between the contracting

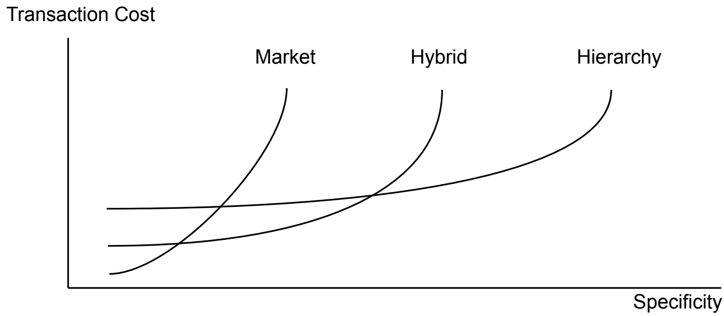

Figure 10.1.: Transaction costs vs. specificity and coordination-type Picot et al. (2001, p. 55)

parties. Therefore specific tasks can be managed most efficiently by organising them hierarchically (i.e. within a company).

If the tasks are not specific, the relationship between the parties is not important. In this case coordinating transactions via the market is the most efficient solution.

An intermediate form of cooperation is the hybrid form, which is characterised by long-term relationships to avoid opportunistic behaviour on the one hand and economic independence on the other hand.

Viewed from the transaction cost perspective the advantage of organising transactions in a particular way depends on the properties of the transactions, especially on their specificity. New information- and communication technology not only reduces the fixed transaction costs, but also changes the variable costs through new forms of cooperation. Also advantages due to know-how are no longer important due to the rapid diffusion of innovation in world-wide networks.

10.2. Summary

The transactions that span the boundary of a firm are useful in analysing a firm's business model (Zott and Amit, 2007, p. 6). The revenues generated by these transactions and the transaction costs associated with them are the basis for calculating the total value generated by a business model (see Equation 12.11 of Chapter 12). Transactions are thus also an important construct within the business model metamodel derived in Chapter 15.

Chapter 11.

Market and resource based views of the firm

The goal of this research is to create a method for analysing business models. Broadly speaking a business model is a set of assumptions about how an organisation will perform by creating value for all the players on whom it depends (Magretta, 2003, p. 44). In order to analyse this performance, an understanding is needed of the factors that influence a firm's performance in general and in particular with respect to value creation.

Much research has been spent on this question and in essence two major viewpoints can be distinguished that complement each other (Mandal, 2007; Barney, 2001; Müller-Stewens and Lechner, 2005): The first viewpoint treats the firm as a "black box" that is competing in a market and examines the firm's performance as a function of factors that are exogenous to it, such as the influence of customer preferences, fixed costs and the role of entry barriers. This viewpoint is know as the *Industrial Organisation Approach* (Mandal, 2007, p. 118) or *market-based-view of the firm (MBVF)* (Müller-Stewens and Lechner, 2005, p.13).

The second viewpoint treats the firm as a "white box" and postulates that the most significant part of inter firm differences in performance can be accounted for by *Ricardian rents*[1] that arise from the heterogeneity of resources in firms (Mandal, 2007, p. 119). This viewpoint is known as the resource-based-view of the firm (RBVF) (Mandal, 2007, p.119).

11.1. The market based view of the firm

The objective of the market-based-view of the firm (MBVF) is to understand the relationship between a firm's environment, its behaviour, and its performance. An important theoretical framework based on the market based view of the firm is the structure

[1]Rents are the extra profits earned by a firm that can successfully exploit special resources belonging to them (Mandal, 2007, p.118). *Ricardian rents* are rents that arise from exploiting a resource that is special because it is limited or in insufficient supply. They are named after the economist David Ricardo, whose work focused on the economic consequences of owning land (Barney, 2001, p. 152).

conduct performance (SCP) model (Barney, 2001, p. 75). This model is based on the work of Mason (1939) and Bain (1968) and is summarised in Figure 11.1: The current structure of the industry, such as the number of competing firms, the homogeneity of current products and the cost of entry and exit directly affect the firm's behaviour or conduct, such as the prices the firm sets for its products, the way it differentiates its products and how it uses its market power. The firm's conduct influences its performance compared to the average of all firm's in this particular industry.

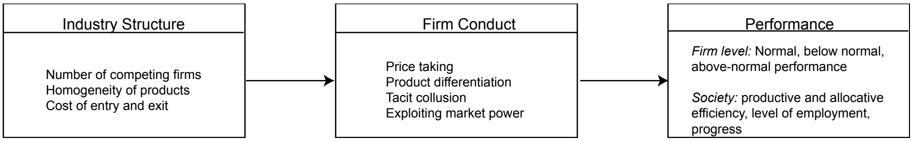

Figure 11.1.: The structure-conduct-performance model (Barney, 2001, p. 76)

To a firm seeking competitive advantage and above normal profit, an *environmental threat* is anything outside of the firm that seeks to reduce the level of that firm's performance (Barney, 2001, p. 78).

Starting from the SCP model Porter (1980) developed the five forces model that classifies all environmental threats that affect a firm within a particular industry into five categories (Figure 11.2):

- Rivalry among existing firms.
- Bargaining power of suppliers.
- Bargaining power of buyers.
- Threat of new entrants.
- Threat of substitute products and services.

11.2. The resource based view of the firm

The resource-based-view of the firm (RBVF) asserts that firm performance is a function of firm resources (Barney, 2001, Chapter 5), where resources are defined as stocks of available factors that are owned or at least controlled by the firm (Amit and Schoemaker, 1993, p. 40). The resource based view was made popular by publications of

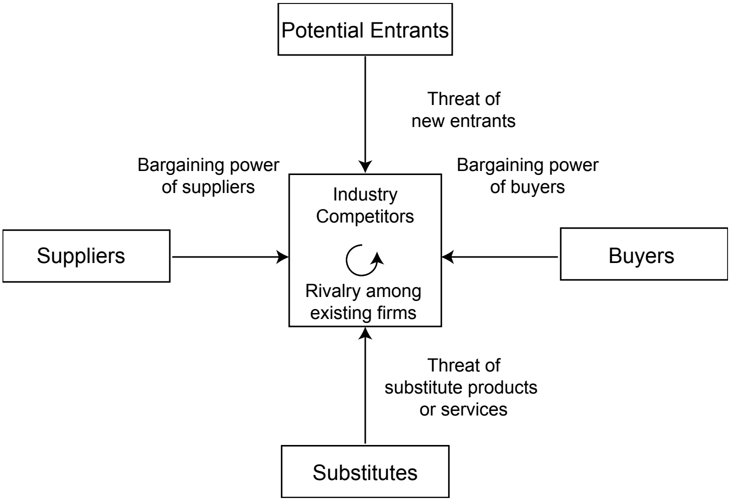

Figure 11.2.: The five forces model of environmental threats (Porter, 1980, p. 4)

Penrose (1959), Wernerfelt (1984), Peteraf (1993), and Prahalad and Hamel (1990). The term "resource based view" was coined by Wernerfelt (1984, p. 171), Prahalad and Hamel (1990, p. 79) made the term "core competence" popular.

Teece et al. (1997) introduced the concept of *dynamic capability*. In this context, "dynamic" refers to the capability to renew competencies so as to achieve congruence with a changing business environment, and "capability" emphasises the key role of strategic management in adapting, integrating and reconfiguring organisational skills and resources (Teece et al. (1997, p. 516); Mandal (2007, p. 123)).

Some authors play particular attention to the specific resource "knowledge"(e.g. Nonaka (1994); Nonaka and Takeuchi (1995); Grant (1996)) but this concept does not play a distinctive role in this research.

Black and Boal (1994) point out that resources are not necessarily valuable by themselves, but sometimes may only be so in combination with others. Miller and Shamsie (1996) observe that whether a resource is valuable may also depend on the context in which a firm is operating.

A distinctive feature of resources is that they accumulate or deplete over time: their current level cannot change instantaneously, but is the result of adhering to a set of consistent policies over a period of time: Resources are thus stocks that are accumulated by choosing appropriate time paths of flows over a period of time (Dierickx and Cool, 1989, p. 1506).

As discussed in Chapter 7, such stocks and flows can be modelled both graphically and mathematically using the systems dynamic method. A method that combines system dynamics with the RBVF to form an approach to strategy development referred to as *strategy dynamics* is developed by Warren (2002), who observers that the RBVF can be expressed using mathematical equations: The performance of the firm Π at time t depends on the levels of strategic resources R_1 to R_n, on discretionary management choices M, and on exogenous factors at time E (Warren, 2002, p. 307ff):

$$\Pi(t) = f[R_1(t), \ldots, R_n(t), M(t), E(t)] \tag{11.1}$$

The current level of a resource R at time t is the sum of its net rates of accumulation since time $t = 0$, plus its initial quantity:

$$R_i(t) = \int_0^t r_i(t)dt + R_i(0) \tag{11.2}$$

The current rates of accumulation r_i of resource r_i at time t are themselves functions of the current level of (potentially) all existing resources, including that of the resource r_i itself, on management choices M, and on exogenous factors E:

$$r_i(t) = f_i[R_1(t), \ldots, R_n(t), M(t), E(t)] \tag{11.3}$$

Mandal (2007, p. 127) classifies a number of the papers mentioned so far along the two dimensions "interaction of resources" and "development of resources over time". This is summarised in Figure 11.3.

It is important to note that the terms resource, competence and capability are used differently by different authors. This research follows the discussion of the terms "resources" and "capabilities" by Amit and Schoemaker (1993) and the definition of "competence" given by Barney (2001): They define a firm's *strategic assets* to be the set of difficult to trade and imitate, scarce, appropriable and specialised *resources* and *capabilities* that bestow the firm's competitive advantage (Amit and Schoemaker, 1993, p. 36). Dierickx and Cool (1989, p. 1510) view resources as "strategic" when they are not tradeable, not imitable and not substitutable. This research uses the term "asset" to refer to both resources and capabilities. The term "strategic" is not used but is implicit: any asset relevant to a particular business model is a strategic asset. Neither dynamic capabilities nor knowledge play an exposed role in this research, therefore they are both subsumed under the generic term "capability". This leads to the following definitions:

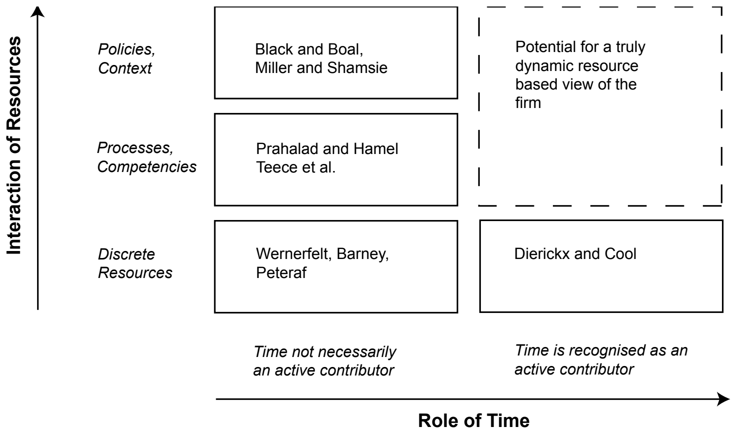

Figure 11.3.: Scope for dynamics in the RBVF (Mandal, 2007, p. 127)

Asset Assets are the resources and capabilities that are needed by a firm to operate its processes and produce goods and services.

Resource Resources are stocks of available factors that are owned or controlled by the firm. They are converted in to final products by using a wide range of other firm assets and bonding mechanisms such as technology, management information systems, and more (Amit and Schoemaker, 1993, p. 35). Barney (2001, p. 156) further differentiates these resources into financial resources, physical resources, human resources and organisational resources.

Capability Capabilities refer to a firm's capacity to deploy Resources, usually in combination, using organisational processes, to effect a desired end. They are information-based, tangible or intangible processes that are firm-specific and are developed over time through complex interactions among the firm's resources (Amit and Schoemaker, 1993, p. 35).

Competence (Core) competencies are complex sets of resources and capabilities that link different businesses in a diversified firm through managerial and technical know-how, experience and wisdom (Barney, 2001, p. 414).

11.3. Summary

As will be discussed in Chapter 14 a business model defines how a firm utilises its resources and capabilities in interacting with product and factor markets. Viewed from this perspective, a business model combines both aspects of the market based and resource based views of a firm. But while a business model depends on the current structure of the industry it operates in (e.g. in a new market a firm may well own an entire value chain, while in a developed market it may only be part of a highly differentiated value chain), it is not concerned with how a firm positions itself against its rivals nor with which particular products the firm should sell (see Table 14.1 and Zott and Amit (2007, p. 3)).

Chapter 12.

Value and Value Based Management

As will be discussed in Chapter 14, a firm's business model defines the underlying value logic that ensures that the firm creates value for all its stakeholders. *Value based management* is an approach to management that argues that the contributions of individuals and groups toward the creation of value should be measured using appropriate performance measures and that rewards should be structured accordingly (Martin and Petty, 2000, p. 5). Figure 12.1 illustrates the key elements of value based management: Value creation, value measurement and rewards[1].

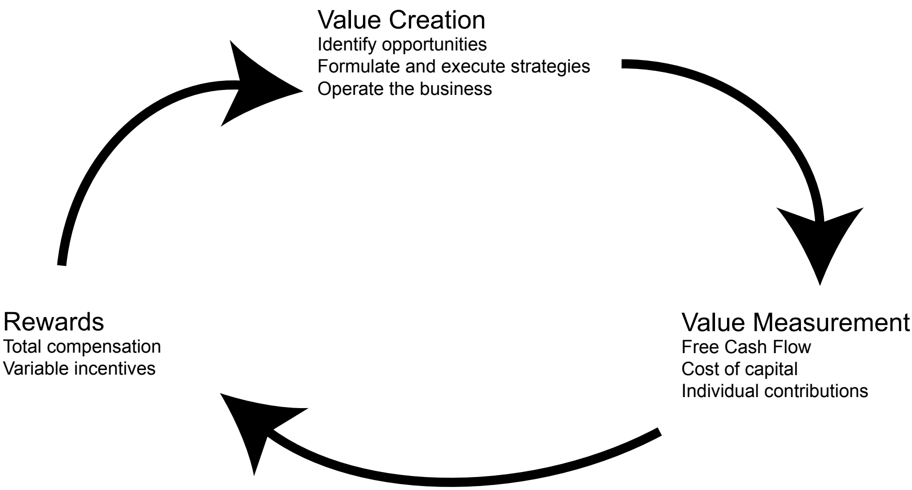

Figure 12.1.: Key elements of value based management (Martin and Petty, 2000, p. 6)

[1] Martin and Petty (2000) uses the term economic value added (EVA), which is a registered trademark of Stern Steward & Co. and is synonymous with the generic term economic profit(Koller et al., 2005, p. 406). Koller et al. (2005, p. 697) show that economic profit is equivalent to discounted free cash flow as used here.

12.1. Value created

But what exactly is meant by the term “value”? A basic model for measuring the value created in business interactions is offered by Brandenburger and Stuart (1996, p.7 ff):

$$value\_created = willingness\_to\_pay - opportunity\_cost \tag{12.1}$$

Equation 12.1 is illustrated in Figure 12.2. In this model, value is not created by a single player alone—the supplier, the firm under consideration (referred to as the the *focal firm* following Zott and Amit (2007, p. 3)), and the buyer all have a share in value creation. This is due to the fact that the value created is not calculated using the actual price charged for a product and the actual costs that arise in buying resources from the supplier—instead the value is calculated by taking into account the buyer’s willingness to pay for a product and the supplier’s opportunity cost for the resources in question.

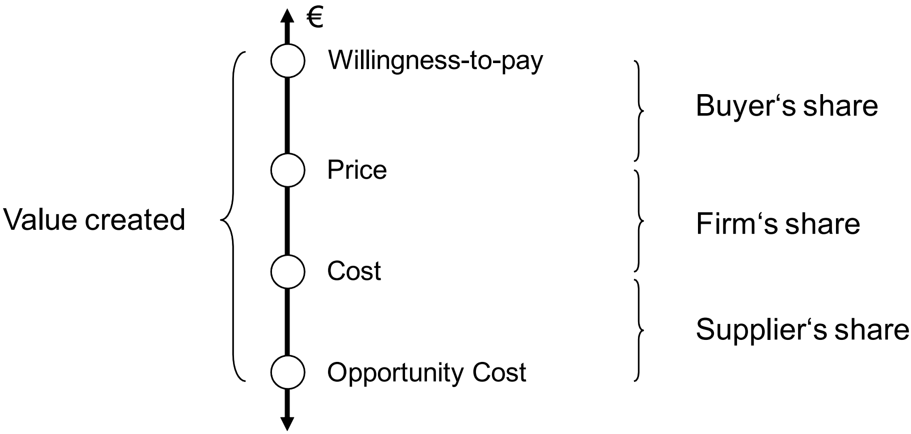

Figure 12.2.: A basic model for measuring the value created in business interactions Brandenburger and Stuart (1996, p. 11)

Brandenburger and Stuart (1996) define the term willingness-to-pay using the following thought experiment:

> *The buyer is interested in acquiring a certain quantity of product from the firm. Imagine that the buyer is first simply given this quantity of*

> *product free of charge. The buyer must find this situation preferable—typically, in fact, strictly preferable—to the original status quo. Now start taking money away from the buyer. If only a little money is taken away, the buyer will still gauge the new situation (product minus a little money) as better than the original status quo. But as more and more money is taken away, there will come a point at which the buyer gauges the new situation as equivalent to the original status quo. (Beyond this amount of money, the buyer will gauge the new situation as worse.) The amount of money at which equivalence arises is the buyer's willingness-to-pay for the quantity of product in question* (Brandenburger and Stuart, 1996, p. 8).

A similar, but reversed argument is applied to the opportunity cost:

> *The firm is interested in acquiring a certain quantity of resources from the supplier. The thought experiment this time consists in taking this quantity of resources away from the supplier and giving the supplier money in return. The amount of money that leads the supplier to gauge the new situation (money minus resources) as equivalent to the original status quo defines the supplier's opportunity cost* (Brandenburger and Stuart, 1996, p. 9).

The willingness-to-pay will always be higher (or at most equal to) the price of the product, or else the buyer will not by the product. A similar argument holds for the supplier's opportunity cost:

$$willingness\_to\_pay \geq price \tag{12.2}$$
$$opportunity\_cost \leq cost \tag{12.3}$$

12.2. Value added

In practice it is difficult to determine the willingness-to-pay and the opportunity cost. An other measure of the value created by a company is the value added (Müller-Stewens and Lechner (2005, p. 370), Grant (2008, p. 35)):

$$\begin{aligned}
value_added &= revenue - cost_of_sales \\
&= operating_expenses + operating_income \\
&= wages + rent + royalties + license_fees + interest \\
&+ taxes + depreciation + profit
\end{aligned} \tag{12.4}$$

This formula balances operating expenses and operating income: two firms may create equal value added, but one may be profitable due to superior organisation, while the other makes a loss. It also does not take into account the fact that a firm needs to invest some of the value created back into the firm to ensure that value generation can be continued in the future, therefore it does not show all aspects of a firm's performance.

12.3. Economic value added and economic profit

As discussed in Koller et al. (2005, p. 54ff), the best indicator for value that considers these operational factors is the free cash flow (FCF). By definition the free cash flow is the total cash available for distribution to owners and creditors after funding all worthwhile investment activities (Higgins, 2007, p. 22)[2]:

$$\begin{aligned}
FCF &= operating_income \\
&+ depreciation \\
&- tax \\
&+ non_operating_income \\
&- net_investment_current_assets \\
&- net_investment_fixed_assets
\end{aligned} \tag{12.5}$$

In order to calculate the value of a firm, the cash flow is discounted for the future at the rate of rate of return that investors expect to earn from investing in a company (Koller et al., 2005, p. 61). This discount rate is known as the weighted average cost of capital (WACC). A firm's weighted average cost of capital is an opportunity cost that arises to the firm's shareholders because the firm is using its capital to fund its

[2]Equation 12.5 is defined in Warren (2002, p. 11).

operations and not investing it elsewhere (Martin and Petty, 2000, p. 64). The WACC must include both the costs of debt (which arise because of interest that must be paid to the firm's creditors) and the cost of equity (which arises because the firm could be investing its equity elsewhere) The costs are weighted according to the target levels of debt and equity compared to the total value of financing using market-based values (Koller et al., 2005, p. 292). For a company financed solely with debt and equity we can define $capital = debt + equity$ (Koller et al., 2005, p.111):

$$
\begin{aligned}
WACC &= Cost\_of\_debt \times (1 - tax\_rate) \times \frac{debt}{capital} \\
&+ Cost\_of\_equity \times \frac{equity}{capital} \qquad (12.6)
\end{aligned}
$$

To estimate the cost of equity it is necessary to determine the expected rate of return of a firm's stock. As expected rates of return are not observable, this is achieved using asset pricing models that translate risk into expected return. One such model is the capital-asset pricing-model (CAPM): The CAPM[3] postulates that the expected rate of return on any security equals the risk-free rate plus the security's beta times the market risk premium (Equation 12.7). The risk-free rate and the market risk premium are common to all companies, only beta varies across companies. Beta represents a stock's incremental risk to a diversified investor, where risk is defined by how much a companies stock varies with the average of the entire stock market (Koller et al., 2005, p. 294) and is thus a measure of a stocks volatility compared to the market average. Betas can therefore be estimated by comparing the fluctuations of the companies stock price compared to a standard index using regression analysis[4]. One such standard index is the Standard & Poor's (S&P) 500 stock index[5] (Higgins, 2007, p. 301-303). Many stock brokerage companies and investment services regularly publish the betas of virtually all publicly traded stock[6] (Higgins, 2007, p. 304).

[3] It would lead too far to discuss the CAPM here in detail. The CAPM is discussed at length in a number of modern finance textbooks, e.g. Brealey and Myers (2002), Copeland et al. (2005) and Higgins (2007).

[4] Benninga (2000, p. 185-199) contains a discussion on estimating betas and testing the CAPM

[5] Standard & Poor's is a company offering indexing services for the world's financial markets. The S&P 500 Index is widely regarded as the best single gauge of the U.S. equities market. Similar indexes exist for other markets, e.g. the S&P Europe 350 for the European market and the S&P Global 1200 for the global market.

[6] e.g. Motley Fool, www.fool.com and Bloomberg, www.bloomberg.com list a company's beta along with the current stock price.

$$\begin{aligned} Cost\_of\_equity &= Risk\_free\_rate \\ &+ Company\_beta \times market\_risk\_premium \end{aligned} \tag{12.7}$$

As the firm's FCF is likely to change in the future, so an average projected growth rate $Growth$ must also be taken into account. Finally we arrive at the formula defining the intrinsic value of a firm, which is well-established in the finance literature (Koller et al. (2005, p. 54), Martin and Petty (2000, p. 72)):

$$economic\_profit = \frac{FCF}{WACC - Growth} \tag{12.8}$$

12.4. Total value added

The economic profit (Equation 12.8) includes non-operating income, which in many cases will not be generated by the firm's business model. To find a measure that only includes the value generated by the business model itself, Zott and Amit (2007, p. 6 ff) adapt value as defined in Equation 12.1 to a many-to-many setting based on the individual transactions[7] that take place between supplier and customer using the total value added (TVA)—the total value added is essentially defined to be the revenue generated less the cost incurred in supporting the transactions that generate that revenue:

Let $Price(Transaction)$ be the price that a customer pays for a product or service acquired in transaction $Transaction$, or for the right to participate in this transaction. Denote the firm under consideration (the focal firm) with $Firm$, and the firms suppliers and partners (other than the customers) with $Supplier_i$, where i is an index ranging from 1 to N_s, the total number of suppliers and partners the firm interacts with. Let $Revenue(Supplier_i, Transaction)$ be the revenues the focal firm $Firm$ gets from partner $Supplier_i$ in a particular transaction $Transaction$. Let $Cost(S_i, T)$ denote the flow of revenues from $Firm$ to $Supplier_i$ in transaction $Transaction$, and let $Cost(Firm, Transaction)$ be $Firm$'s costs of providing its own resources within this transaction[8]. Then the value added by firm $Firm$ in transaction $Transaction$ can be expressed as:

[7] Firms interact via boundary spanning transactions (Zott and Amit, 2007, p. 3). A transaction takes place when a product is exchanged via a separable interface (Richter and Furubotn, 2003, p.55).

[8] Amongst others these resources could include financial capital, human capital or know-how. Resource types are discussed in detail in Chapter 15.

$$
\begin{aligned}
Value(Firm, Transaction) &= Price(Transaction) \\
&+ \sum_{i=1}^{N_s} Revenue(Supplier_i, T) \\
&- \sum_{i=1}^{N_s} Cost(Supplier_i, Transaction) \\
&- Cost(Firm, Transaction)
\end{aligned} \tag{12.9}
$$

The TVA generated by firm $Firm$ is the value created in all types of transactions $Transaction_j$ that the business model enables, where j is an index ranging from 1 to N_T, the total number of transactions the business model supports or enables. Let $Frequency(Transaction)$ be the frequency that transaction T is carried out. Then TVA can be calculated as:

$$
TVA = \sum_{j=1}^{N_T} Value(Firm, Transaction_j) \times Frequency(T_j) \tag{12.10}
$$

Inserting equation 12.9 into equation 12.10 yields

$$
\begin{aligned}
TVA &= \sum_{j=1}^{N_T} ((Price(Transaction_j) \\
&+ \sum_{i=1}^{N_s} Revenue(Supplier_i, Transaction_j) \\
&- \sum_{i=1}^{N_s} Cost(Supplier_i, Transaction_j) \\
&- Cost(Firm, Transaction_j)) \\
&\times Frequency(Transaction_j))
\end{aligned} \tag{12.11}
$$

It is important to note here that TVA includes some operative expenses because the costs incurred in performing a transaction are taken into account. This thus leads to the following inequalities:

$$
TVA \leq value\_added \leq value\_created \tag{12.12}
$$

12.5. Return on value added

In practice firms are not only interested in the TVA defined in Equation 12.11, but also need to monitor operative success. A possible measure for the performance of a firm with respect to value creation might therefore be the return on value added (ROVA). The return on value added compares FCF to TVA [9]:

$$ROVA = \frac{FCF}{TVA} \tag{12.13}$$

12.6. Summary

A comprehensive, quantitative model of a firm's value creation performance should compare the total value added (TVA) to the free cash flow (FCF)[10] and thus explicitly state:

- The revenues the firm expects to make in selling its products.
- The cost of external resources needed to produce these products (cost of goods sold).
- The cost of developing and producing these products (operations).
- The investments needed to keep the business running.

[9] ROVA is discussed by Müller-Stewens and Lechner (2005, p. 369). They use profit instead of FCF in the numerator. As profit can be heavily influenced by factors that have nothing to do with operations or the business model (such as financing activities), FCF is used here instead of profit.

[10] Actually discounted TVA should be compared to economic profit—assuming the discounting factors are identical for both terms, they cancel out. In cases where the projected growth of FCF and of TVA are different, economic profit should be compared to discounted TVA.

Chapter 13.

Professional Service Firms

The objective of the research described here is to develop a method for business model analysis and to apply this method to real firms. To ensure the artifacts developed in the client systems are comparable the case studies will concentrate on professional service firms in the IT sector. Key concepts pertaining to professional service firms are introduced in this chapter.

Definition 13.1 *A professional service firm is a firm in which professional skills form the basis of its offering to customers (Young, 1961, p. 1). Examples of such PSFs are lawyers, doctors and consultants.*

Two aspects of professional work create the special management challenges of professional service firms (Maister, 1997, p. xv):

Customisation Professional services require a high degree of customisation, so that approaches from the industrial or mass consumer sectors, based on the standardisation, supervision and marketing of repetitive tasks and products are difficult to apply.

Client contact Most professional services have a strong component of face-to-face interaction with the client.

Both of these characteristics demand that professional service firms attract and retain highly skilled individuals. The primary consequence of this is that the professional service firm must actively compete in two markets simultaneously: the product market for its services, and the factor market for its productive resources, the professional work force (Maister, 1997, p. xv).

13.1. Key performance indicators

Maister (1997, p. 32-39) shows that four major factors affect the performance of project based professional service firms with respect to profit: the ratio of senior to junior staff referred to as the firm's leverage, the average fee charged per unit of time, the percentage of billable time referred to as utilisation, and the profit margin.

$$\begin{aligned}\frac{Profit}{Partner} &= \frac{Profits}{Fees} \times \frac{Fees}{Hours} \times \frac{Hours}{Staff} \times \frac{Staff}{Partners} \\ &= Margin \times Value \times Utilisation \times Leverage\end{aligned} \tag{13.1}$$

Maister (1997) refers to the first two factors as *health factors* and the latter to factors as *hygiene factors*, indicating that to become high performers firms should concentrate on the health factors.

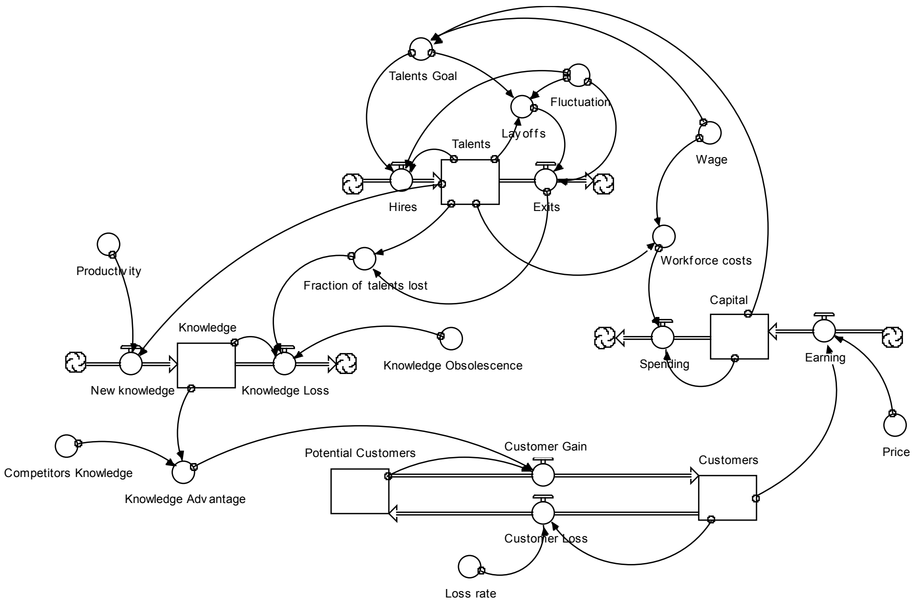

Figure 13.1.: System dynamics model of a knowledge provider (Rode, 2001, p. 105)

A number of system dynamics studies have explored the behaviour of professional service firms, mainly concentrating on staff utilisation and leverage: Warren (1998) concentrates on resource dynamics and the implications of quality, Rode (2001) discusses the reenforcing effects between a firm's reputation and the talents it can attract, Bayer and Gann (2006) discuss bidding strategies and workload dynamics and Kunc (2008) concentrates on finding the right staff ratios to ensure both short term demands (such as developing new business and delivering projects) and long term demands (such as developing junior staff) are met.

Rode (2001) uses a SD-approach to analyse strategic options for companies specialised in providing goods and services in which knowledge is an important factor of production—professional services firms Rode (2001, p. 14-16) refers to as "knowledge providers". Consulting firms provide an example for such knowledge providers. Rode shows how the resources customers, capital, knowledge and talent interact as a feedback system to ensure value creation. The basic system dynamics model used by Rode (2001) is illustrated in Figure 13.1.

13.2. Summary

This research—and in particular the case study in Chapter 20—contributes by taking a holistic approach that analyses the performance of a professional service firm with respect to all of the four key performance indicators leverage, utilisation, fees and profit margin based on the time senior staff allocates to the following tasks:

- Project acquisition and delivery.
- Contact and customer maintenance.
- Service innovation and development.
- Hiring junior staff.

Part III.

Business Model Analysis

Analysis of the business model concept and development of a method for business model analysis.

Chapter 14.

The Business Model Concept

This chapter analyses the business model concept and develops a definition which is used as a basis for method development in subsequent chapters. It takes a systemic approach and views a business and its business model as a system, as discussed in Chapters 6, 7 and 8. To ensure the definition of business model developed here is comprehensive, it should answer the following questions:

- What is the purpose of a firm's business model, i.e. which of the strategic questions raised in Chapter 9.2 is addressed by the business model?
- Which are the relevant constructs[1] of the business model?
- What are the structural and behavioural aspects of a business model[2]?
- What is the boundary of the business model concept, i.e. which potential constructs are definitely not part of the concept?[3]

This chapter first reviews current approaches and definitions of the business model concept based on business and academic literature, in section 14.1. These definitions are then analysed in section 14.2 in order to identify common constructs. Based on this analysis, a definition of the business model concept is synthesised in section 14.3 and is positioned within the business engineering framework in section 14.4.

[1] Definition 7.1 of the system concept speaks of "parts", not "constructs". The term "constructs" is used here following the design science-research approach discussed in Chapter 2.

[2] The OMG specifications on UML identify the structural and behavioural aspects of systems, as discussed in Chapter 6.

[3] The importance of the system boundary is highlighted Chapter 7.5, based on Sterman (2000, p. 87). This is also discussed in Haberfellner et al. (2002, p. 6)

14.1. Current approaches and definitions

This section reviews current approaches and definitions of the business model concept based on business and academic literature.

The literature mentioning the business model concept is extensive, as shown by the surveys provided by Hedman and Kalling (2003) and Pateli and Giaglis (2004). The search process for literature relevant to this section ran as follows:

- The search started with a review of current textbooks on strategy management mentioning the business model concept (Müller-Stewens and Lechner (2005, p. 410), Grant (2008, p. 21), Johnson and Scholes (2003, p. 469), Eden and Ackermann (1998, p. 79)).
- IWI-publications relevant to the topic were reviewed (Alpar et al. (2002), Braun (2003), Heinrich and Leist (2003), Österle and Blessing (2003), Österle (2003), Winter (2003a), Heinrich and Winter (2004), Laupper (2004), Kagermann and Österle (2006), Österle et al. (2007)).
- Original papers and secondary literature referenced in these publications where then reviewed.
- The search process stopped as soon as a definition was found that fulfilled the criteria given above and the case studies discussed in Part IV were completed[4].

14.1.1. Relevance of the business model concept

A good business model is essential to every firm, whether it is a new venture or an established player (Magretta, 2002, p. 4), because it positions the firm within its value network, shows how it transacts with customers and suppliers, and highlights the products that are exchanged. Most importantly, a business model makes explicit the underlying economic logic that defines how the firm creates value.

Many firms operate with a conceptually very simple business model: They supply a product that meets a consumer need and sell it at a price that exceeds the cost of production. Other firms have more complex business models: They supply a service for free but charge for advertising (Grant, 2008, p. 21).

Hamel (2000, p. 63) argues that in future business model innovation will be the key to creating new wealth: Competition takes place not between products or companies, but between business models. This is echoed by Kagermann and Österle (2006,

[4]The entire research process is discussed in Chapter 2.2.

p. 17), who predict that in future innovative business models will be more important for business success than innovative products.

The following discussion shows that the term "business model" appears frequently both in business and academic literature, so the concept obviously has some appeal. But Magretta (2002, p. 8) comes to the conclusion that *much like the term strategy, the term business model is used sloppily, being stretched to mean everything and ending up meaning nothing*. Hedman and Kalling (2003, p. 49) remark, that *the concept is often used independently from theory, meaning model components and their interrelations are relatively obscure*.

14.1.2. Business models and value creation

A whole set of definitions found in literature indicate that a firm's business model should explain how a firm creates value. A good starting point is the following definition by Magretta (2003, p. 44):

Definition 14.1 *A business model is a set of assumptions about how an organisation will perform by creating value for all the stakeholders on whom it depends, not just its customers. In essence, a business model is a theory that is continually being tested in the marketplace.*

Who are the stakeholders mentioned in this definition? Grant (2008, p. 35) identifies the following generic stakeholders, based on a decomposition of the value added-equation 12.4 introduced in Chapter 12:

- Employees, who receive wages and salaries.
- Governments, who receive taxes.
- Shareholders, who partake in the profit generated.
- Customers, who are satisfied if their willingness-to-pay is greater than the actual price they pay.
- Suppliers, such as investors who receive interest and providers of products and services.

Magretta (2002, p. 4) also notes:

Definition 14.2 *A business model should answer the questions:*

- *Who is the customer?*
- *What does the customer value?*
- *How do we make money in this business?*
- *What is the underlying economic logic that explains how we can deliver value to customers at an appropriate cost?*

In accordance to this definition, Grant (2008, p. 21) views a business model as a statement of the basis on which a firm will generate revenue and profit.

Müller-Stewens and Lechner (2005, p. 410) adopt the following viewpoint:

Definition 14.3 *A business model defines how a firm's particular configuration of its value chain is made concrete by adopting a capitalisation perspective which answers the question "How do we make money in this business?"*

The business model bridges the gap between strategic and operative management by answering the questions:

- *Which services shall be offered to which customers?*
- *How and within which structure shall these services be offered?*
- *How do I win, foster and keep appropriate customers?*
- *How shall the revenue model be defined concretely?*

The aspects of business model mentioned in this definition are illustrated in Figure 14.1.

Mahadevan (2000, p. 59) offers a similar definition and sees the following constructs behind the business model concept:

Definition 14.4 *A business model is the unique blend of three streams that are critical to business—the value stream, the revenue stream and the logistical stream:*

- *The value stream identifies the value proposition for the business partners and buyers.*
- *The revenue stream is a plan for assuring revenue generation for the business.*
- *The logistical stream addresses various issues related to the design of the supply chain of the business.*

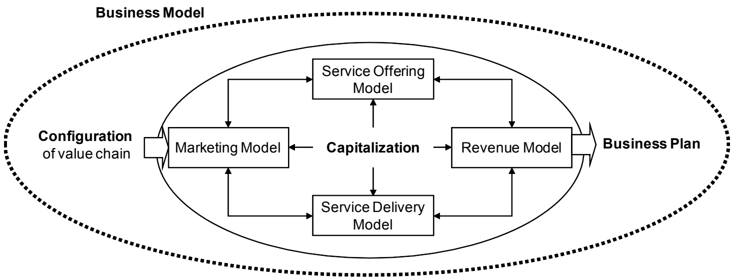

Figure 14.1.: Aspects of a business model (Müller-Stewens and Lechner, 2005, p. 410)

14.1.3. Business models and positioning

The last section points to the fact that a business model should answer the strategic question of value creation. This section investigates the relationship of the business model concept to the question of how to position a firm within a market.

A definition quoted frequently[5] is by Timmers (1998, p.32):

Definition 14.5 *A business model is an architecture for the product, service and information flows, including a description of the various business actors and their roles, of the potential benefits for the various business actors and of the sources of revenues.*

Timmers (1998, p. 32) explicitly goes on to say:

> *A business model in itself does not yet provide understanding of how it will contribute to realising the business mission and objectives of any of the companies that are actors within the model. We also need to know about the companies' marketing strategies in order to assess the commercial viability of the business model and to answer questions like how the competitive advantage is being built, what the positioning is, what the marketing mix is, which product marketing strategy is being followed* (Timmers, 1998, p. 32).

[5] Johnson and Scholes (2003, p. 496), Braun (2003, p.38), Weill and Vitale (2001, p.34), Kagermann and Österle (2006, p.17), Chen (2003, p.27).

Thus Timmers (1998) explicitly separates the business model from the product-market-strategy. This separation is also seen in the definition of business model given by Zott and Amit (2007, p. 3)[6]:

Definition 14.6 *The business model is a structural template of how a focal firm transacts with customers, partners, and vendors; that is, how it chooses to connect with factor and product markets. It refers to the overall gestalt of these possibly interlinked boundary spanning transactions.*

	Business Model	**Product Market Strategy**
Definition	A structural template of how a focal firm transacts with customers, partners, and suppliers. It captures the pattern of the firm's boundary spanning connections with factor and product markets	Pattern of managerial actions that explains how a firm achieves and maintains competitive advantage through positioning in product markets
Main Questions Addressed	How to connect with factor and product markets?	What positioning to adopt against rivals?
	Which parties to bring together to exploit a business opportunity, and how to link them to the focal firm to enable transactions (i.e. what exchange mechanisms to adopt?)	What kind of generic strategy to adopt (i.e. cost leadership and/or differentiation)?
	What information or goods to exchange among the parties, and what resources and capabilities to deploy to enable these exchanges?	When to enter the market?
	How to control the transactions between the parties, and what incentives to adopt for the parties?	What products to sell?
		What customers to serve? Which geographic markets to address?
Unit of analysis	Focal firm and its exchange partners	Firm
Focus	Externally oriented: focus on the firm's exchange with others	Internally/externally oriented: focus on a firm's activities and actions in light of competition

Table 14.1.: Business model vs. product market strategy concepts (Zott and Amit, 2007, p. 5)

Zott and Amit (2007) view of the distinction between business model and product market strategy is made explicit in Table 14.1. This matches the viewpoint adopted by Grant (2008, p. 21): A business model is a preliminary to strategy, that is only concerned with the viability of the basic business concept; even if the business model

[6] Also in Amit and Zott (2001, p. 493). Winter (2003a, p. 4) and Heinrich and Winter (2004, p. 4). Heinrich and Winter (2004, p. 8 ff) also define a business model metamodel that is discussed in Chapter 15.5.

is sound, the firm still needs a strategy that will allow it to survive against competitors that are using the same business model. Müller-Stewens and Lechner (2005, p. 28-29) also explicitly distinguish between positioning (defined by a firm's product market strategy) and value creation (defined by a firm's business models) in their model of strategy management.

Osterwalder (2004, p. 15)[7] provides a detailed analysis of business model literature and gives the following definition, echoing parts of Definition 14.2, Definition 14.5 and Definition 14.6:

Definition 14.7 *A business model is a conceptual tool that contains a set of elements and their relationships and allows expressing a company's logic of earning money. It is a description of the value a company offers to one or several segments of customers and the architecture of the firm and its network of partners for creating, marketing and delivering this value and relationship capital, in order to generate profitable and sustainable revenue streams.*

Definition 14.7 explicitly mentions the "network of partners" and includes not only the partners needed to create products, but also those needed to market and deliver these products.

14.1.4. Business models and the business idea

Definition 14.1 sees a business model as a theory that is continually being tested in the market place. In a similar vein, van der Heijden (2005, p. 60) introduces the concept of *business idea*, which comes very close to the concepts of business model discussed so far:

Definition 14.8 *An organisations business idea defines (van der Heijden, 2005, p. 74):*

- *The societal/customer value created by the organisation.*
- *The nature of the competitive advantage exploited (differentiation, structural cost advantage)* [8].

[7] Osterwalder (2004, p. 44 ff) also defines a business model metamodel that is discussed in Chapter 15.5.

[8] van der Heijden (2005, p. 74) only mentions the first two explicitly. Treacy and Wiersema (1995) introduce the similar concept of *value disciplines* and mention the value discipline *customer intimacy* (Treacy and Wiersema, 1995, p. 123). This is the relevant value proposition for many professional service firms as discussed in ten Have et al. (2003, p. 196)

- *The distinctive resources and capabilities, owned by the organisation, which allow it to create and appropriate value.*
- *The reinforcing feedback loop, which turns the idea into a self-sustaining engine for ongoing survival and growth.*

This definition explicitly includes the nature of the competitive advantage exploited: this aspect of a firm's strategy is typically addressed by its positioning strategy and not by its value creation strategy, as illustrated in Table 14.1[9].

As pointed out in van der Heijden (2005, p. 74) the business idea is systemic in nature and is best represented using causal loop diagrams (cf. section 7.2). A generic feedback loop applicable to most businesses is presented in Figure 14.2: Unique insights into the evolving needs in society lead to an entrepreneurial invention. This leads to an unique activity set and in turn to a competitive advantage. The business generates positive results that can be invested into strategic investments and learning, which again leads to distinctive resources and competencies. These resources and competencies help refine the unique activity set, thus closing the reinforcing feedback loop.

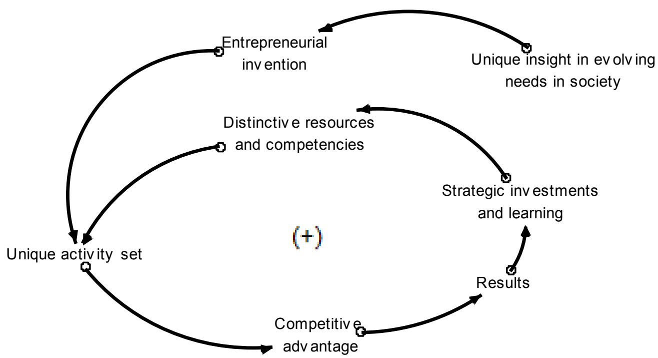

Figure 14.2.: Constructs of the business idea (van der Heijden, 2005, p. 75)

[9] see also Müller-Stewens and Lechner (2005).

The reinforcing feedback loop at the heart of a knowledge provider's business model is identified by Rode (2001, p. 104) and illustrated in Figure 14.3: Great talent brings deep knowledge, which attracts customers. Revenue from customers increases the capital available to the knowledge provider, which helps attract new talent. (Rode, 2001) elaborates this causal loop diagram (CLD) into a stock and flow diagram as shown in Figure 13.1 and discussed in Chapter 13.

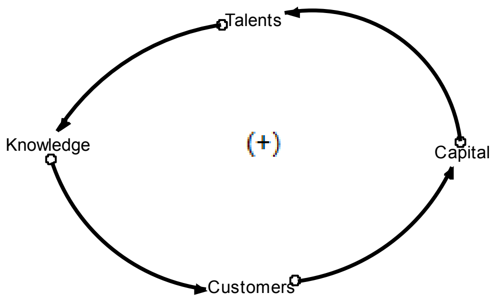

Figure 14.3.: The business idea of a knowledge provider (Rode, 2001, p. 104)

14.1.5. Business models link competencies to aspirations

Even though all the definitions given above refer to the value created for the stakeholders involved in the business, only the definition of business idea given by van der Heijden (2005) mentions the unique capabilities a firm needs in order to create products of value—the capabilities that have become widely known as the "'core competency":

In the RBVF (cf. section 11.2) the terms resources, capabilities and competency are used more or less interchangeably (Barney, 2001, p. 157). (Barney, 2001, p. 414) gives the following definition of core competency:

Definition 14.9 *Core competencies are complex sets of resources and capabilities that link different businesses in a diversified firms through managerial and technical know-how, experience and wisdom.*

Eden and Ackermann (2000, p. 14) explicitly mention competencies in their definition of business model, which is visualised in Figure 14.4:

Definition 14.10 *The ability to link competencies to aspirations forms the business model.*

Eden and Ackermann (2000, p. 19) state that the behaviour of the business model is likely to be dynamic, involving feedback loops which will in their own right produce systemic patterns over time (for example, cyclical, or growth/decline behaviour), and that this means that the sustainability of some patterns of distinctive competencies is also dynamic.

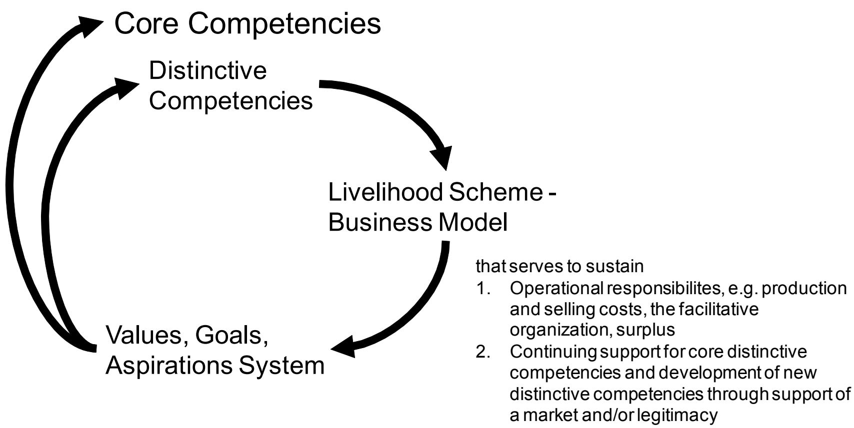

Figure 14.4.: Business models link competencies to aspirations (Eden and Ackermann, 2000, p. 13)

14.2. Analysis of current definitions

The definitions examined in the preceding sections show that the term business model is used with different meaning and intent. It is also used by many different authors in different contexts, as discussed in (Pateli and Giaglis, 2004, p. 304).

As a basis for the derivation for the comprehensive definition of business model given in Definition 14.19, this section provides a critical analysis of the definitions discussed so far.

For ease of reference the concepts discussed in the following sections are summarised in Table 14.2, along with the authors who use these concepts.

		Value Creation	Value Network	Transactions	Economic Logic	Customers & Product Markets	Goods & Services	Suppliers	Resources & Capabilities	Assumptions & Policies	Competitive Advantage	Geographic Markets
Magretta (2003)	Def. 14.1	+	+							+		
Magretta (2002)	Def. 14.2	+			+	+	+					
Müller-Stewens and Lechner (2005)	Def. 14.3	+	+	+	+	+	+		+			
Mahadevan (2000)	Def. 14.4	+	+		+							
Timmers (1998)	Def. 14.5	+	+			+	+	+			−	−
Zott and Amit (2007)	Def. 14.6		+	+		+	+	+			−	−
Osterwalder (2004)	Def. 14.7	+	+		+	+	+	+				
van der Heijden (2005)	Def. 14.8	+			+	+			+		+	
Eden and Ackermann (2000)	Def. 14.10	+			+				+	+		
Comprehensive definition	Def. 14.19	+	+	+	+	+	+	+	+	+	−	−

Table 14.2.: Comparison of business model definitions

14.2.1. Value creation

Most of the definitions refer to the fact that business models show how a firm creates value for some or all of the business actors involved, and the discussion in Chapter 12 shows that value, value creation and value based management are very relevant concepts for business. Following Zott and Amit (2007, p. 5) the term "party"[10] is used to denote these business actors. The term "value network"[11] is used to denote all the parties involved in a particular business model. The term transaction is used to denote interactions between parties. This leads to the following definitions:

Definition 14.11 *A party's value network is the set of parties it deals with through transactions.*

Definition 14.12 *A party's business model defines how it creates value for all parties*

[10]Magretta (2003, p.44) refers to parties as "players", Timmers (1998, p.32) refers to them as "business actors", Schierenbeck and Wöhle (2008, p.29) refer to them as "economic entity", Lesourne et al. (2006, p. 2) use the term "economic agent".

[11]The term value network is used by Stabell and Fjeldstad (1998, p. 413 ff), Marshall (2000, p. 24) and Winter (2003a, p. 1), Bovet and Martha (2000, p. 1 ff) use the term value net. Müller-Stewens and Lechner (2005, p. 377) use the term "activity system". Mahadevan (2000, p. 59) uses the term logistical stream, Österle (2003, p. 32) uses the term "value creation network".

within its value network.

Definition 14.3 and in particular Figure 14.1 are also not fully covered yet: The revenue model is covered if all transactions are specified (leading to the mathematical model developed in equation 12.11). But Definition 14.3 also makes reference to a marketing model. In Table 14.1 Zott and Amit (2007) argue that a firm's business model should be distinct from a firm's product market strategy, and this distinction is also made by Müller-Stewens and Lechner (2005). Müller-Stewens and Lechner (2005, p. 410) do not offer an explicit definition of the term "marketing model"—but it is safe to assume that a firm will have "marketing transactions" that make its products known within a market. As generic transactions and product markets are included in Table 14.2, no extensions are needed to accommodate the marketing model.

Definition 14.3 also mentions a service offering and service delivery model: The service offering is accommodated in Table 14.2 via goods and services, the service delivery model via transactions[12].

Instead of focusing on products and services[13], Zott and Amit (2007, p. 6) use the concept of transactions in their Definition 14.6: A transaction takes place between two or more parties in the business model, and products may be exchanged during these transactions.

These boundary spanning transactions will often have a fixed cost associated with them even if no transaction is ever carried out—therefore it is useful to think of a transaction as having some kind of "conduit" that the transaction is supported by. This construct is supported by Weill and Vitale (2001), who introduce the term channel and make the following definition:

Definition 14.13 *A channel is a conduit by which a firm's products are offered or distributed to the customer.*

Now the following definitions can be made towards a comprehensive definition of business model:

Definition 14.14 *A transaction is performed over a channel.*

Definition 14.15 *A business model identifies the channels it provides to support its transactions.*

[12]The specific kinds of transactions a business model includes are discussed in Chapter 15.1.8

[13]From here on both goods and services are considered to be specialisations of products. This is discussed in detail in Chapter 15

14.2.2. Black-box view

It is less clear from Definition 14.12 whether a business model takes a purely external view of value creation, or includes "firm internals", such as concrete business processes. This becomes clearer on comparing Definition 14.5 (taking a purely external view) with Definitions 14.10 and 14.3, which take a view including internals, such as delivery process and competencies. Definition 14.6 also takes a strongly external view, but Zott and Amit (2007) model of total value created (cf. equation 12.11) shows that at least the cost that a firm incurs in providing its own resources and capabilities to a transaction needs to be considered. These resources or capabilities could be material or immaterial, involving humans or not. So while it makes sense to take an external view in the definition of the business model concept, in order to clearly differentiate this concept from operational concepts such as business processes and organisational structure, it also makes sense to explicitly include the resources and capabilities the firm needs in order to create value:

Definition 14.16 *A business model explicitly states the business policies that govern the channels and transactions it supports and the development of resources and capabilities needed to create the products or services it sells, and how these policies are connected to each other.*

A business model is not concerned with positioning strategy, or with the business processes and activities that are needed to perform transactions, support channels, or develop products and services[14].

In this definition the business model concept thus takes a black box view of a firm: It shows which boundary spanning transactions are performed and which products flow across its boundaries, and it identifies the capabilities needed to perform theses transactions, but it does not define the concrete actions that are performed.

14.2.3. Business policies and assumptions

In Definition 14.1 Magretta (2003, p. 44) also speaks of business models being a set of assumptions that are made about how a business model will perform. This point is included in Definition 14.17.

Definition 14.17 *A business model uncovers all business assumptions that are made about how a firm will perform in relevant markets.*

[14] All transactions defined in the business model must be supported by business processes, which thus realise the business model. Depending on how efficiently these processes are implemented the value created will be greater or lesser, without changing the business model itself.

14.2.4. Value logic

In Definition 14.2 Magretta (2002, p. 4) mentions the underlying “economic logic”. This concept can be made more precise now in terms of the self-sustaining loop mentioned by Eden and Ackermann (2000, p. 19) and in the Definition 14.8 of business idea by van der Heijden (2005). The term “economic logic” is very broad, therefore the term “value logic” is used here instead to highlight the focus on value creation[15]:

Definition 14.18 *A business model identifies the value logic, which shows how resources and capabilities are used to create products, attract customers and drive value creation in a self sustaining feedback loop.*

14.3. A comprehensive definition of the business model concept

Based on the preceding discussion the Definitions 14.12, 14.14, 14.15, 14.16, 14.17 and 14.18 can now be put together to form the following comprehensive definition of the term business model:

Definition 14.19 *A party’s business model shows how it creates value for all the parties within its value network by defining its value logic and showing which goods and services are exchanged via transactions between these parties.*

The ***value network*** *shows which channels a firm provides to connect the parties in the product and factor markets.*

The ***transaction model*** *shows which transactions are supported or enabled via the channels of the value network, and which products and artifacts are exchanged during these transactions.*

The ***value logic*** *shows how resources and capabilities are used to support transactions, create products, attract customers and drive value creation in a self sustaining feedback loop.*

A business model also states the business policies that govern the channels and transactions it supports and the development of capabilities needed to create the products it sells, and how these policies are connected to each other. It uncovers all assumptions that are made about how a party will perform in relevant markets.

A business model is only concerned with the viability of the value logic and not with the strategies that implement this logic in a particular market or position the firm against competitors. It is also not concerned with the concrete business processes that

[15] Table 14.1 differentiates between “value creation”’ and “value appropriation” logic. The more general term “value logic” is used here because it is shorter.

are needed to perform transactions, support channels, or develop goods and services.

By their very definition, business models thus have structural and behavioural aspects:

- The structural aspect shows how a focal firm connects to its value network via channels.
- The behavioural aspect shows how products and artifacts are exchanged over these channels via transactions and identifies the self-sustaining feedback loop that defines the focal firm's value creation logic.

A generic value network and transaction model is depicted in Figure 14.5: The party under consideration exchanges products and artifacts with suppliers and customers, using its resources and capabilities. Exchanges with customers create revenue, exchanges with suppliers create cost.

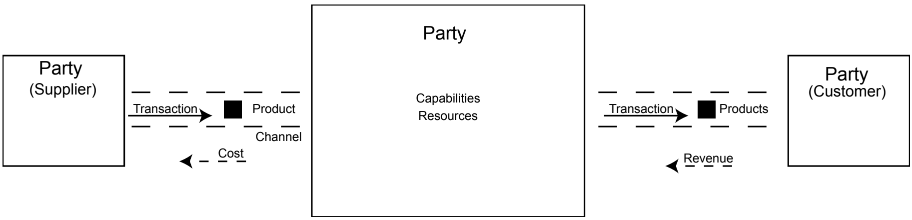

Figure 14.5.: Generic value network and transaction model

At a generic level, the value creation logic is illustrated in Figure 14.6[16]: The firm's resources and capabilities are used to create products and attract customers. Delivering products to customers generates revenue and thus an inflow of cash—this cash is used to buy more resources and is invested into capabilities, which again lead to products and customers. Interaction with customers also has a direct effect on capabilities, e.g. in the form of increased customer intimacy and new knowledge.

[16]This is similar, but more concrete than, the self-sustaining loop defined by van der Heijden (2005) and illustrated in Figure 14.2. The concept of competitive advantage is explicitly omitted because this is not consistent with the definition of business model given in Definition 14.19.

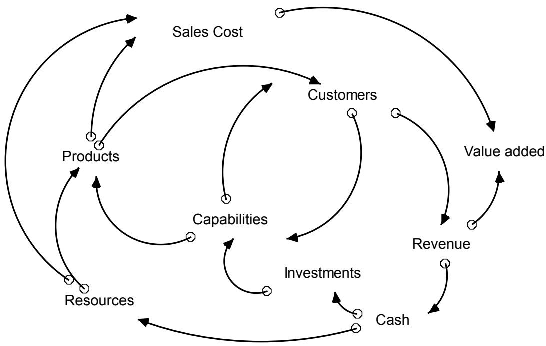

Figure 14.6.: Generic value logic

14.4. The business model concept within business engineering

With the understanding of the business model concept developed in the preceding sections, it is now time to position this concept within the business engineering framework introduced in Chapter 9.

The business model concept is located within the strategy layer of the business engineering map because by Definition 14.19 it defines a firm's value creation strategy. This definition also makes clear that the business model concept is neither concerned with positioning a firm within a market or defining its competitive strategy, nor with business operations[17] needed to realise the business model.

This can be summarised as follows: In order to deliver value to the customer, a firm needs to define its value creation strategy by defining its business model (value network, transaction model, value logic). It also must define its value appropriation strategy by positioning itself in particular markets (market strategy) and against its rivals (competitive strategy). Finally, value can only be realised if a firm defines appropriate business operations. Figure 14.7 illustrates these connections[18].

In practice value appropriation, value creation and value realisation are not independent but strongly influence each other. This becomes most obvious when viewing the

[17] Business operations are defined to be the collection of all activities and organisational structures needed to operate a firm. Both the business process and applications and technology layers of the BE map introduced in Chapter 9 are part of business operations.

[18] Braun (2003, p. 39) comes to a similar conclusion, but explicitly distinguishes between corporate strategy and business strategy.

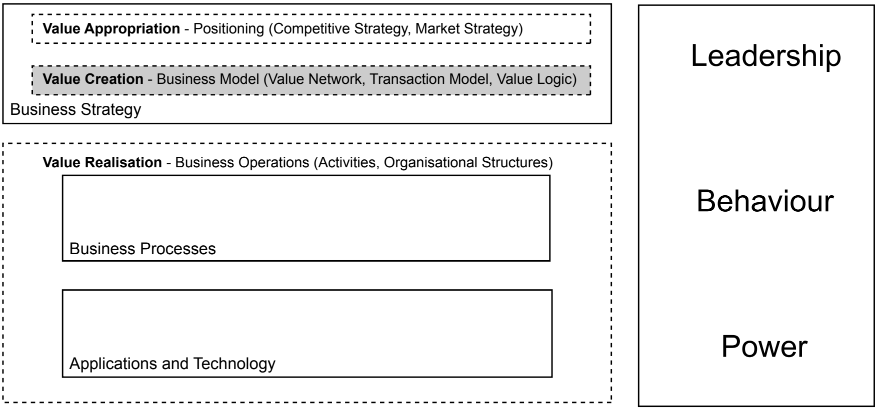

Figure 14.7.: Business Models within the business engineering framework

dynamics of a business: Figure 14.8 extends Figure 14.6 and illustrates the dynamic interdependencies between the markets and the business.

14.5. Summary

This chapter analysed the business model concept as used in current academic and business literature and derived the comprehensive Definition 14.19. This definition answers all the questions raised at the beginning of this chapter, regarding a business model's purpose, its relevant constructs, its structure and behaviour, and its boundary:

- The purpose of a business model is to show how a firm creates value.
- The relevant constructs of a business model are show in Table 14.2 and explicitly mentioned in Definition 14.19. These constructs are analysed in detail and set in relation to each other in the business model metamodel derived in Chapter 15.
- The definition covers the structural and behavioural aspects of a business model through the value network, the transaction model, and the value logic.

- Definition 14.19 explicitly defines the boundary of the business model concept. The position of the business model concept within BE is discussed in section 14.4.

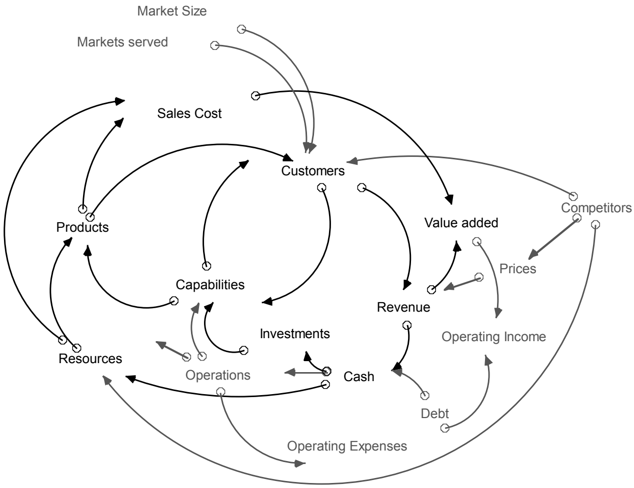

Figure 14.8.: Dynamic interdependencies between markets and business

Chapter 15.

A Business Model Metamodel

Based on Definition 14.19 of the business model concept derived in the preceding chapter, this chapter develops a metamodel that can be used as a basis for modelling the structure and the behaviour of business models[1]:

- The structural aspect defines the constructs relevant to the business model being analysed, and their relationships to each other.
- The behavioural aspect defines how these constructs interact at run-time and how the value created by the business model develops over time.

The metamodel developed in this chapter is a UML model at level M2 of the UML metamodel hierarchy[2]. It is used to create models (at level M1) of business models, which, despite the use of the term "model", are themselves an aspect of the business being studied and thus reside at level M0. For this reason the metamodel developed in this Chapter is referred to as the business model metamodel. A M2-level UML profile that maps this user model onto the UML and SD notations may be found in Appendix A.

As the business engineering metamodels introduced in Chapter 9 show, businesses are complex systems, and many different aspects need to be considered in practice. It is therefore very easy to fall into the trap of over-elaboration[3] when defining a metamodel. To avoid this, the research that went into this chapter follows the principle of parsimony (*be parsimonious, start small and add*, (Pidd, 2003, p. 86)) and the principle of decomposition (*divide and conquer, avoid mega-models*, (Pidd, 2003, p. 90)) with the goal of creating a minimal, coherent metamodel that can be extended if needed.

This chapter has the following sections:

Types and relationships This section identifies all the types that are needed to specify a business model and the relationships between them.

[1] Cf. the discussion on structure, behaviour and run-time semantics in Chapter 6
[2] The UML metamodel hierarchy is discussed in Chapter 6
[3] Pidd (2003, p. 82-104) contains an extensive discussion on the pitfalls and principles of modelling.

Entity attributes This section illustrates how the metamodel may be extended by defining attributes for particular elements within the metamodel, the entities.

Views and abstraction layers This section identifies the views and abstraction layers that are useful in modelling a business model.

Example illustrating the metamodel An example is given to show how the metamodel and the views may be used in practice.

15.1. Types and relationships

15.1.1. Core constructs

Given definition 14.19 of the business model concept we can now easily identify the core constructs involved in a business model using noun/verb analysis[4]:

> A *party's* business model defines how it creates *value* for all the parties within its *value network* by defining its *value logic*.
>
> The value network shows which *channels* a firm provides to connect the parties in the product and factor markets.
>
> The *transaction model* shows which *transactions* are supported or enabled via the channels of the value network, and which *products* and *artifacts* are exchanged during these transactions.
>
> The value logic shows how *resources* and *capabilities* are used to support transactions, create products, attract *customers* and drive value creation in a self sustaining feedback loop.
>
> A business model also states the *business policies* that govern the channels and transactions it supports and the development of capabilities needed to create the products it sells, and how these policies are connected to each other. It uncovers all *assumptions* that are made about how a firm will perform in relevant markets.
>
> A business model is only concerned with the viability of the value logic and not with the strategies that implement this idea in a particular market or position the firm against competitors. It is also not concerned with business operations, i.e. the concrete activities that are needed to perform transactions, support channels, or develop goods and services.

[4]Noun/verb analysis is introduced in Chapter 5.

The following nouns can be identified, listed here in alphabetical order:

Artifact Generally, an artifact is something created by a human for a practical purpose (Merriam-Webster, 2009). Specifically in this context, an artifact is anything exchanged during a transaction besides the products themselves, e.g. a proposal or a product description sheet.

Asset Following Amit and Schoemaker (1993, p.35) the term "asset" is introduced as a generalisation for resources and capabilities. An asset is a resource (e.g. physical property, intangible right) or capability that has economic value. Important examples are plant, equipment, land, patents, copyrights, and financial instruments such as money or bonds (Samuelson and Nordhaus, 1995, p. 744). A firm needs assets to enable its transactions, maintain channels and create its products.

Business Assumption The assumptions a firm makes about the value it can create by implementing the business model under consideration Magretta (2003, p. 44).

Business Policy The rules that govern the structure, behaviour and dynamics of the business model.

Capability Capabilities refer to a firm's capacity to deploy resources, usually in combination, using organisational processes, to effect a desired end. They are information-based, tangible or intangible processes that are firm-specific and are developed over time through complex interactions among the firm's resources (Amit and Schoemaker, 1993, p. 35).

Channel A channel is a conduit by which a firm offers its products (Weill and Vitale, 2001, p. 61). These products are exchanged via a transaction.

Party Any legal entity engaged within the business model. Examples for other parties besides firms are public authorities and public households (Schierenbeck and Wöhle, 2008, p.29). Magretta (2003, p.44) refers to parties as "players", Timmers (1998, p.32) refers to them as "business actors". The focal firm whose business model is being examined is itself a party. The term "party" is used by Marshall (2000, p. 103), by Eriksson and Penker (2000, p. 241) and by Fowler (1997, p. 18).

Product A product is any good or service produced by a business. Businesses are characterised by the fact that they produce goods or service beyond their own need and can therefore offer them to other economic agents via a market (Schierenbeck and Wöhle, 2008, p.30). Products whose wide availability typically leads to smaller profit margins and diminishes the importance of factors other than price are referred to as commodities.

Market A party operates within a market. A market is an arrangement whereby buyers and sellers interact to determine the prices and quantities of a product. Some markets (such as the stock market or flea market) take place in physical locations; other markets are conducted over the telephone or are organised by computers (Samuelson and Nordhaus, 1995, p. 756).

Resource Resources are stocks of available factors that are owned or controlled by the firm. They are converted in to final products by using a wide range of other firm assets and bonding mechanisms such as technology, management information systems, and more (Amit and Schoemaker, 1993, p. 35). Barney (2001, p. 156) further differentiates these resources into financial resources, physical resources, human resources and organisational resources.

Transaction Firms interact via boundary spanning transactions (Zott and Amit, 2007, p. 3), which are supported or enabled by channels. A transactions takes place when a product is exchanged via a separable interface (Richter and Furubotn, 2003, p.55).

Transaction model By its very definition transaction model is not viewed as a type within the metamodel, but as a particular view of the business model (see discussion in section 15.3).

Value The value created by the firm (Müller-Stewens and Lechner (2005, p.369), Zott and Amit (2007, p. 6 ff)).

Value logic By its very definition value logic is not viewed as a type within the metamodel, but as a particular view of the business model (see discussion in section 15.3).

Value network By its very definition value network is not viewed as a type in its own right, but as a derived attribute of party. A formal definition of value network based on the metamodel developed here is given in equation 15.2.

Upon closer examination of this list it becomes clear that assets and products are not fundamental constructs in their own right, but are roles of entities that are handled

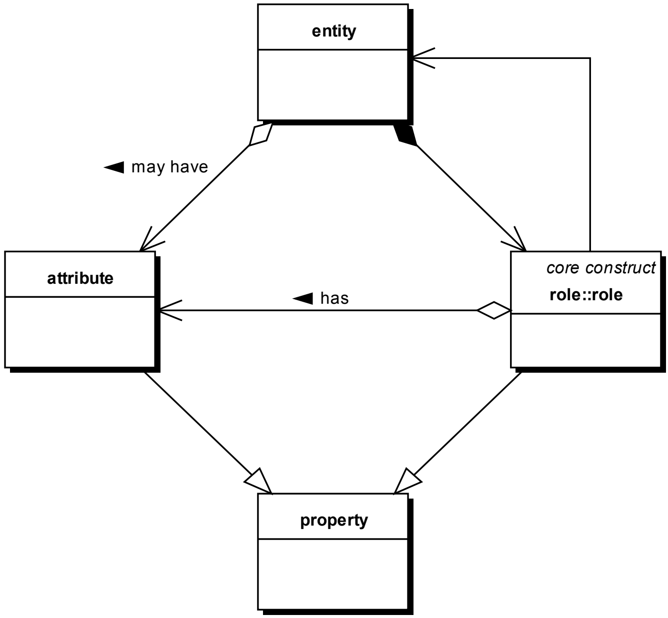

Figure 15.1.: Entity role metamodel (Marshall, 2000, p. 98)

within the transactions: A product sold by a firm to another firm may turn into an asset for this firm. To deal with the fact that a particular entity may change roles within its lifetime and may have many different roles at the same time, the entity role metamodel is introduced, following Marshall (2000, p. 98). This metamodel states that an entity (which is an abstraction of anything that has an identity) may have many properties that describe it in detail—these properties are abstracted using attributes[5] and roles (which represent the entity in a particular context). The same argument holds true for the "party" construct—a human being may be both a resource and part of a value network in its role as a consumer. The entity role metamodel illustrated in Figure 15.1.

[5]Marshall (2000, p. 98) uses the term "value" instead of the term "attribute"—the term "value" is not used here in this context to avoid misunderstanding with the use of the term as defined in Chapter 12.

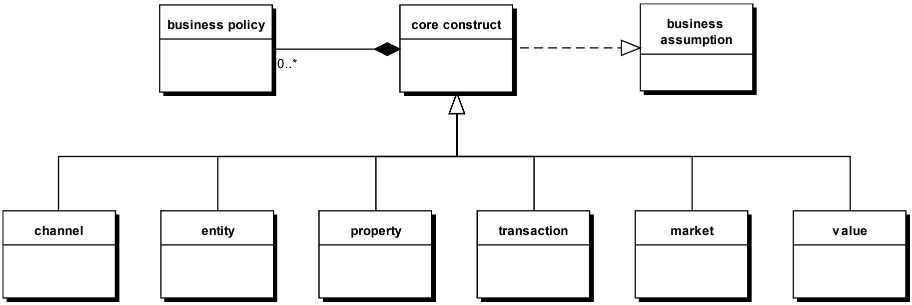

Figure 15.2.: The core constructs of a business model

This leads to the definition of the core constructs visualised in Figure 15.2. Business policies can apply to any of the core constructs. Business assumptions may also constrain any of the core constructs. Each of the core constructs in the metamodel may have subtypes, these are discussed in the following sections.

15.1.2. Core relationships

The relationships between these core constructs are detailed in the following and illustrated in Figure 15.3: A party operates in a particular market and communicates with its customers via the channels it provides. Consumers thus are defined as those parties that are at the receiving end of a channel that is provided by a party who is the provider in this context. Parties interact with other parties via transactions, which are supported by these channels. Products are exchanged within transactions, running from supplier to customer. Each transaction can have many suppliers, but there can only be one customer (e.g. in delivering a book from a bookshop, both the bookshop and the delivery service are suppliers, but the buyer is the only consumer). Assets may be needed to provide a channel or produce a particular product.

Based on the model in Figure 15.3, a firm's value network and transaction model can be defined using the OCL:

$$
\begin{aligned}
party.value\_network &= party.channel.transaction.supplier \\
&+ party.channel.transaction.customer \\
&+ party.channel.consumer
\end{aligned}
\tag{15.1}
$$

$$\begin{aligned} party.transaction\_model &= party.channel.transaction \\ &+ party.channel.transaction.product \end{aligned} \quad (15.2)$$

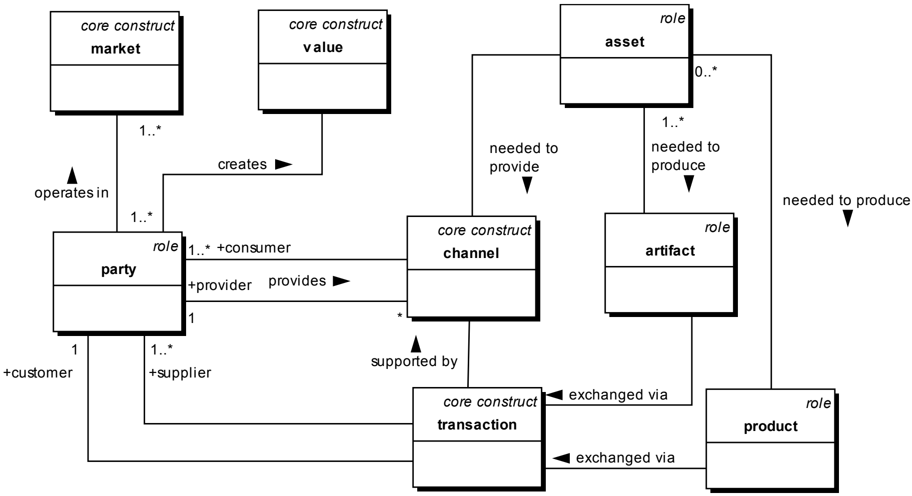

Figure 15.3.: The core relationships of the business model metamodel

15.1.3. Entity subtypes

Eriksson and Penker (2000, p. 77)[6] identify the following kinds of entity, illustrated in Figure 15.4:

Information A representation of a concept or thing as information. It is important to separate the information about a thing from the thing it represents. Information is the knowledge increment brought about by a transaction; i.e. it is the difference in conceptions interpreted from a received message and the knowledge before the transaction (Eriksson and Penker (2000, p. 258) referencing Falkenberg et al. (1996)). The rise of the network economy has highlighted the fact that information is a good in its own right (Picot et al., 2001, p. 61)—in this case the corresponding entity also has the role "good".

[6]Citing Gale and Eldred (1996).

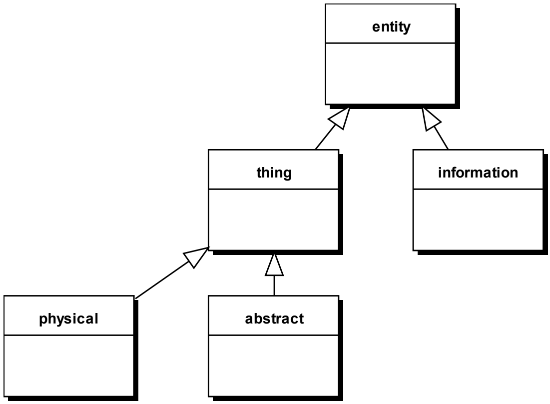

Figure 15.4.: Entity subtypes

Thing A thing is an object that can be concrete and physical (such as a human being) or abstract, such as mathematics (Eriksson and Penker, 2000, p. 258).

Physical An entity with material reality that occupies a volume of space (Eriksson and Penker, 2000, p. 77).

Abstract An idea or concept that is not physical (Eriksson and Penker, 2000, p. 77).

15.1.4. Role types

Following the discussion on the entity role metamodel in section 15.1.1 roles must now be defined for the entities. As discussed there, the roles “artifact”, “asset”, “product” and “party” can be derived directly from Definition 14.19 of the business model concept.

Artifact Something created by humans for a practical purpose (Merriam-Webster, 2009).

Asset Defined in section 15.1.1. Subtypes of asset are defined in section 15.1.7.

Product Defined in section 15.1.1. Subtypes of product are defined in section 15.1.5.

Party Defined in section 15.1.1.

These roles are illustrated in Figure 15.5.

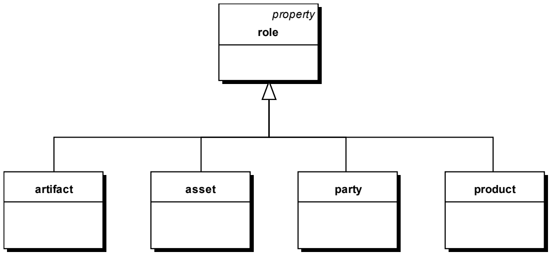

Figure 15.5.: Role types

15.1.5. Product types

When it comes to the products that may be exchanged in transactions it is useful to differentiate between goods and services (Zott and Amit (2007, p. 6), (Schierenbeck and Wöhle, 2008, p. 30), Richter and Furubotn (2003, p. 55)). These product types are illustrated in Figure 15.6.

Service A service is a non-physical product that may only be exchanged once between actors within a transaction.

Good A good is a physical product.

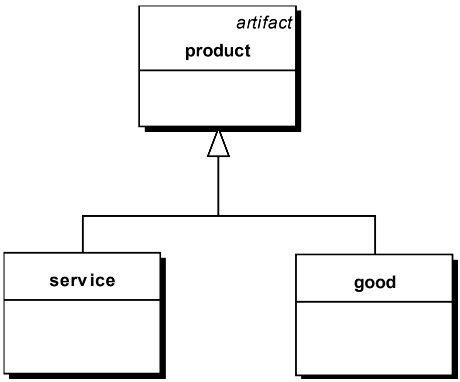

Figure 15.6.: Types of product

15.1.6. Channel types

While creating the models during method instantiation (cf. Part part:case-studies) it was not found necessary to differentiate between different channel types. Therefore, following the principle of parsimony no subtypes of channel were added to the metamodel.

15.1.7. Asset types

The following types of asset may be needed to implement a business model, illustrated in Figure 15.7:

Resource Resources are stocks of available factors that are owned or controlled by the firm. They are converted in to final products by using a wide range of other firm assets and bonding mechanisms such as technology, management information systems, and more (Amit and Schoemaker, 1993, p. 35). Barney (2001, p. 156) further differentiates these resources into financial resources, physical resources, human resources and organisational resources.

Capability Capabilities refer to a firm's capacity to deploy resources, usually in combination, using organisational processes, to effect a desired end. They are information-based, tangible or intangible processes that are firm-specific and are developed over time through complex interactions among the firm's resources (Amit and Schoemaker, 1993, p. 35).

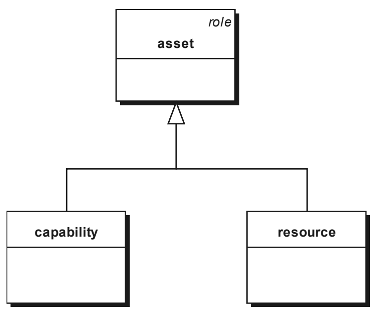

Figure 15.7.: Types of asset

15.1.8. Transaction types

Following the discussion of transaction types in Chapter 14.2, the metamodel contained a number of transaction subtypes[7]. Application of the metamodel during the method instantiations that led to the case studies in Part IV made clear that this distinction was not necessary at the level of the business modelmetamodel, as no distinction between transactions was necessary at level M2 of the metamodel hierarchy. It was found sufficient to distinguish between transactions at the M1 (user-model) level, and thus following the principle of parsimony no subtypes of channel were added to the metamodel.

To ensure the possible transaction types are not lost, they are listed here[8]:

- Marketing transactions are needed to make a product or brand known in a particular market (Müller-Stewens and Lechner, 2005, p. 410).
- Sales transactions are needed to sell a product to a customer (Müller-Stewens and Lechner, 2005, p. 410).
- Delivery transactions are needed to delivery a product to a customer (Müller-Stewens and Lechner, 2005, p. 410).
- Recruiting transactions are needed to hire and fire full-time employees or contract temporary personnel (Maister, 2000, p. 52).
- Purchasing transactions are needed to purchase resources from suppliers Mahadevan (2000, p. 59).
- Stakeholder relationship transactions are needed to manage the relationships to key stakeholders such as the public, customers, investors, shareholders and business partners (Müller-Stewens and Lechner (2005, p. 369), Maister (1997, p. xv)).

[7] In particular “marketing” and “service delivery” subtypes

[8] This list was used as a checklist during model creation, it does not claim to be complete.

15.1.9. Value accounting types

The following types are needed to quantify the value created by a business model. These types are derived from the terms of the TVA equation (see Equation 12.11):

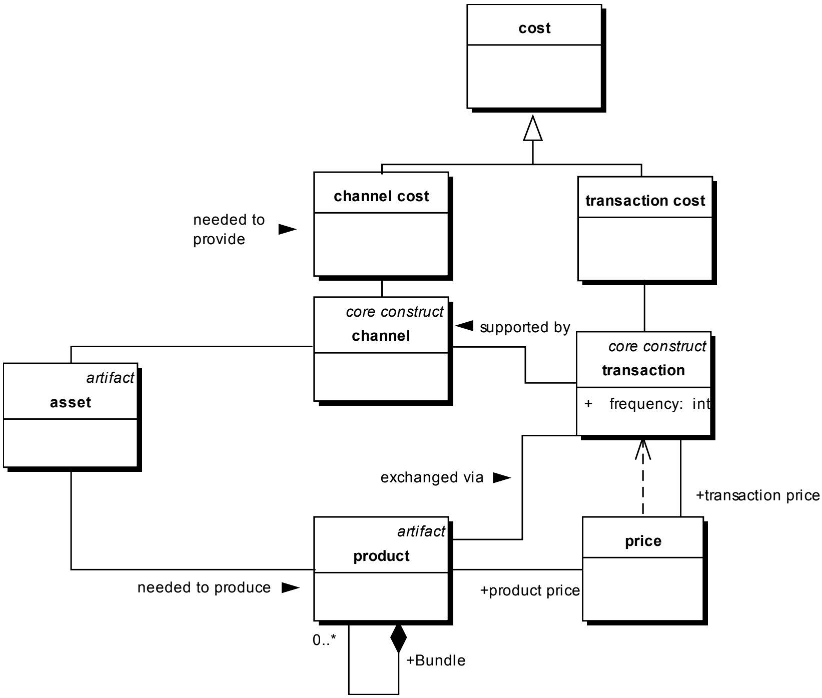

Figure 15.8.: Value accounting types

Value The value generated by the business model. A measure of the benefit a firm creates for its stakeholders. Concrete measures for value generated by a firm used in this document are the free cash flow discounted by the weighted average cost of capital and the firm's growth rate, the TVA and the ROVA.

Price The price a customer pays for a product or for the right to take part in a transaction. The price charged for a product will itself depend on the particular transaction in many cases (cf. equation 12.11).

Cost The cost of performing a transaction, providing the channel the transaction is carried out over, or for maintaining capabilities and resources.

Frequency The frequency a particular transaction is performed at. This is an attribute of the transaction.

The value types and their relationships to other constructs in the metamodel are illustrated in Figure 15.8.

15.1.10. Assumption types

Although assumptions can be made about many aspects of a business model's performance (e.g. financial performance, scalability, sustainability,...) defining such subtypes of assumption was not found to be of advantage whilst performing the case studies.

15.2. Entity attributes

As indicated in the entity role metamodel in Figure 15.1, each entity may have a set of attributes that describe it in detail. These attributes will depend on the entity's roles in most cases. During method instantiation it was not found necessary to define such attributes, the purpose of this section is to illustrate the extensibility of the business model metamodel with respect to these attributes, using the entity "party" as an example.

When it comes to parties (or legal entities), Schierenbeck and Wöhle (2008, p. 29) discern between:

Business A business is an economic agent that creates goods or services beyond its own need and can thus provide them to other economic agents. Businesses are characterised by the fact that they depend on a combination of assets (such as resources, capabilities), they must be economically efficient (i.e. the revenues are greater than the costs) and they need to in financial equilibrium (Schierenbeck and Wöhle, 2008, p. 30).

Firm A firm is a business that is privately owned, autonomous and seeks to maximise profit (Schierenbeck and Wöhle, 2008, p. 31).

Public Enterprise A public enterprise is a business that is owned by the public, is not autonomous and follows a planned economy (i.e. the production level is not determined by the market but determined by the government) (Schierenbeck and Wöhle, 2008, p. 31).

Public Authority A public authority is similar to a public enterprise but is not incorporated (Schierenbeck and Wöhle, 2008, p. 31).

Private Household A private household is an economic agent that does not create goods or services or only creates them for its own use (Schierenbeck and Wöhle, 2008, p. 29).

These constructs are illustrated in Figure 15.9.

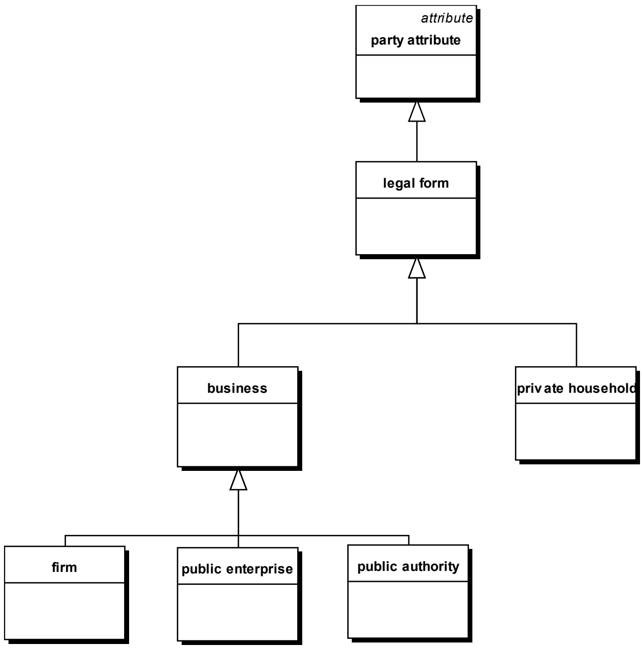

Figure 15.9.: Party attributes

15.3. Views and abstraction layers

15.3.1. Views

Models of systems may themselves become large and hard to understand. To deal with this issue, it is useful to separate a large model into distinct views. A view is a projection of a model, which is seen from one perspective or vantage point and omits entities that are not relevant to this perspective (Rumbaugh et al., 2005, p. 678). It is a representation of a whole system from the perspective of a related set of concerns (The Open Group, 2007, p. 297).

When identifying views it is useful to follow the principles of the UML and to separate structural and behavioural aspects of a system: the *StructuralFeatures* (OMG, 2005a, p. 80) and the *BehaviouralFeatures* (OMG, 2005a, p. 30). Winter (2003b, p. 91) also makes the distinction between static models and dynamic models.

These categories fit well to the three major aspects of a business model: the value network (structural), the transaction model (behavioural), and the value logic (behavioural). A detailed examination of the transaction model concept shows that transactions not only have behaviour, but also structure: Transactions exchange products which depend on resources.

The following views were found to be useful in modelling a business model:

Value Network view This defines the parties, the channels connecting them and the resources needed to provide the channel.

Transaction view This defines the business transactions that the business model supports or enables and how they flow within the value network.

Product view This defines the products that are exchanged by the transactions and the resources they depend on.

Value logic view This defines the self-sustaining feedback loop that drives value creation.

15.3.2. Abstraction layers

Winter (2003b, p. 90-91) introduces a useful framework for categorising models along three dimensions:

As-Is vs. Should-Be As-Is models depict reality as it is, should be models define a desired future state. The model created here is primarily an as is model, as it is used to analyse business models as they are. This as is model is then used to analyse potential changes to the business model.

General vs. Specific General models are models that are applicable to many situations, specific models are specific to a particular situation. For example, the entity-role metamodel introduced in section 15.1.1 is a very general model, the business model metamodel is more specific, but in principle applicable to many businesses. The models of business models that are created based on this metamodel are specific to a particular firm.

Aggregation vs. Decomposition Aggregated models show reality at a high level of abstraction, highly decomposed models show reality at a very detailed level. For the models of business models that were developed during this research it was found that only one level of abstraction was needed for the value network views, assumption views and policy views. Two levels of abstraction were found useful for the value logic view: an aggregated view of the business model that identifies the value network, the products, transactions and the major causal loops of the value logic—this model is referred to as the *conceptual business model*, and a decomposed view that identifies all aspects in more detail (if necessary), referred to as the *detailed business model*. Table 15.1 shows how the views identified in the previous sections map onto these models.

View	**Conceptual model**	**Detailed model**
Product	list of products	products
Transaction	list of transactions	connection to parties
		connection to products
		connection to channels
Value Logic	major causal loops	full stock and flow model
Value network	parties	—
	channels	—

Table 15.1.: Business model views and abstraction layers

15.4. Illustrative Example

In order to validate the metamodel that has been derived from analysis of current literature it is useful to validate the metamodel by creating a model of an existing metamodel. In order to fully concentrate on this goal, the content of the business model described here is entirely based on the full-service provider business model described in detail by Weill and Vitale (2001, p. 111-128) and illustrated in Figure 15.10.

The model will be created using the UML and SD notations introduced in Chapter 6 and Chapter 7 respectively.

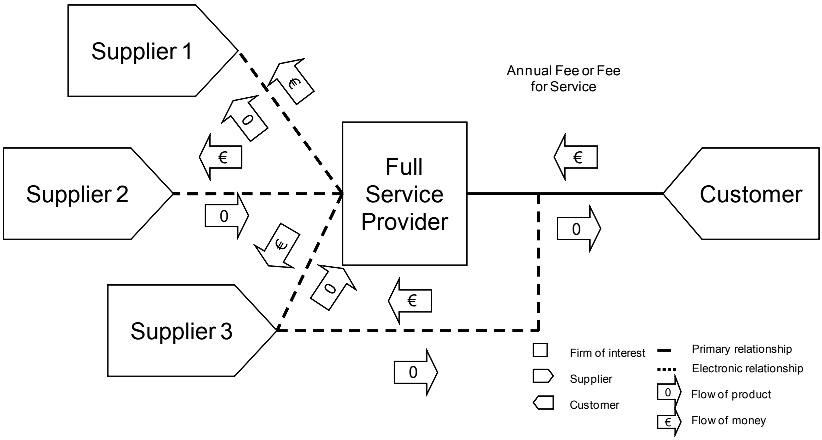

Figure 15.10.: Schematic of the full service provider business model (Weill and Vitale, 2001, p. 111)

The diagram in Figure 15.10 illustrates both relationships between the business actors (i.e. the structure) but also the transactions (i.e. the behaviour) at a very abstract level.

15.4.1. Assumptions

Weill and Vitale (2001, p. 124) provide the following assumptions concerning the full service provider schematic:

- *The full-service provider aims to meet the complete needs of a target customer segment in one domain by integrating the firm's own products and services with those of selected third party providers .*

- *The full service provider owns the customer relationship, thus knowing more about its customers' needs than any other player in the industry.*
- *Normally a customer will only have one service provider in each domain.*
- *The firm uses its customer database to identify opportunities for cross-selling products from its existing range and adding new products to the range.*
- *The full service provider model offers customers lower transaction costs for search, specification, ordering and fulfilment.*
- *Suppliers are motivated to deal with the full service provider, even at the risk of losing direct customer contact, in order to make additional sales and be part of a major market presence.*
- *Marketing and billing for the suppliers is simplified.*
- *The sales of the supplier come at a lower price than direct sales to the individual customers.*
- *The full service provider is motivated primarily by the opportunity to capture some of the value it adds by understanding the customer's complete situation.*
- *By lowering the customer's overall costs, the full-service provider can further integrate itself into the customer's organisation and share the value created by the partnership.*

15.4.2. Value network

The following parties are part of the full service provider business network. They are illustrated in Figure 15.11.

Full Service Provider The full-service provider aims to meet the complete needs of a target customer segment in one domain by integrating the firm's own products and services with those of selected third party providers.

Customer Customers benefit from lower transaction costs for search, specification, ordering and fulfilment.

Supplier Suppliers are motivated to deal with the full service provider, even at the risk of losing direct customer contact, in order to make additional sales and be part of a major market presence.

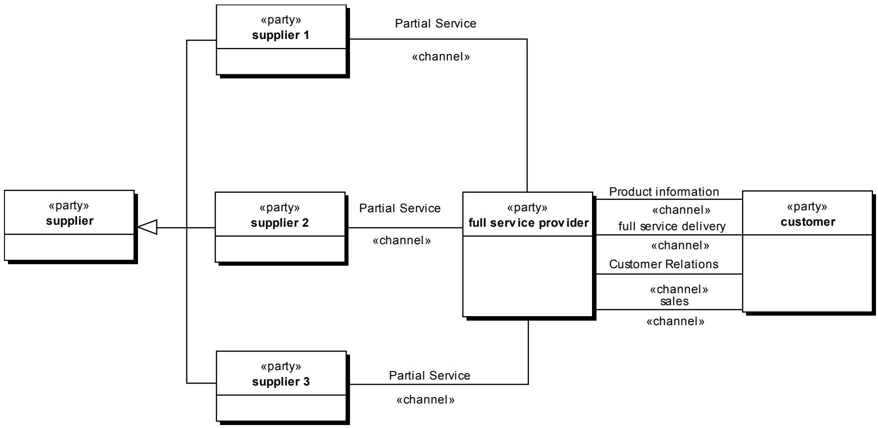

Figure 15.11.: Full service provider value network

Each of the channels in Figure 15.11 itself has structure. For brevity's sake only the full service channel is discussed in detail here and visualised in 15.12:

Full Service Channel The full-service provider delivers its service over a service channel.

IT Infrastructure The resource IT Infrastructure is needed to provide the full service.

Other assets required to implement the full service provider model are:

Relationship Management Full service providers are dependent on their ability to form and manage relationships with customers and with key suppliers in the value chain.

Customer Information Management This includes collecting, synthesising, and analysing information about customer segments and their desires.

Product Information Management This includes matching the customer information with currently available service offerings while identifying opportunities for new product creation.

Brand Management Full service requires a trusted brand to thrive. The brand sets the expectation for high quality and the ability to credibly deliver all the consumers' needs in their domain.

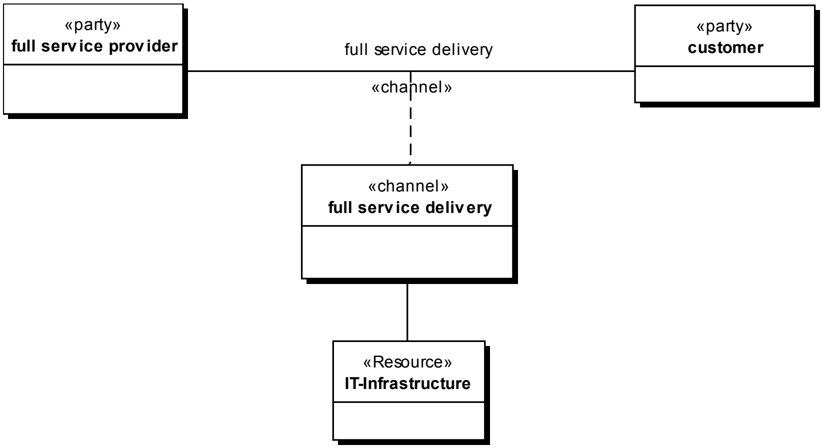

Figure 15.12.: Full service channel

15.4.3. Transactions

The full service provider implements the following transactions (Figure 15.13):

- Search for Products.
- Specify products.
- Order products.
- Fulfil order.

15.4.4. Products

A full service provider sells its own products as well as third party products delivered by its suppliers. Additional revenues stem from annual membership fees paid by suppliers, from transaction fees charged to its customers, from commissions on the third party products, and from listing fees charged to the suppliers for the inclusion of these products in the full service provider's product portfolio. The product and revenue structure is shown in Figure 15.14.

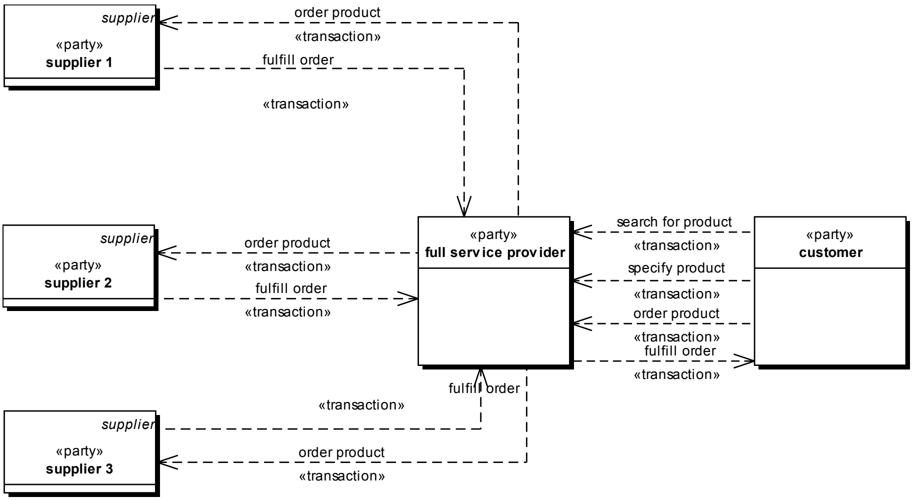

Figure 15.13.: Full service provider transactions

15.4.5. Value logic

The following facts can be inferred from the critical success factors identified by Weill and Vitale (2001, p. 125 ff):

1. The more suppliers a full service provider cooperates with, the larger his potential customer base.
2. The more suppliers a full service provider has, the more attractive his product portfolio becomes.
3. The more customers a full service provider has, the higher his revenue will be.
4. The more capital a full service provider has, the easier it is to attract new suppliers and customers.
5. The order rates and the size of the customer base affect the size of the commission, which themselves affect the revenue.
6. The more attractive the full service providers brand is, the more likely a customer will buy from the full service provider and the easier it is to find new partners.

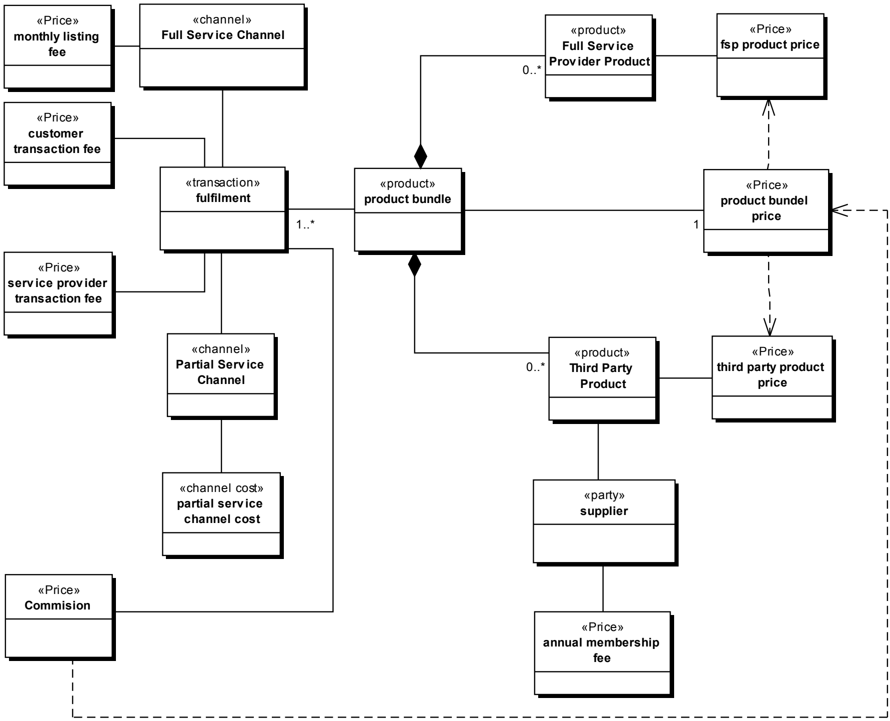

Figure 15.14.: Full service provider product and revenue model

A CLD of the full service provider value logic summarising these effects is displayed in Figure 15.15

15.4.6. Value dynamics

Weill and Vitale (2001) do not provide enough information to derive a completely specified simulation model of the full service provider business model. This model is therefore omitted here.

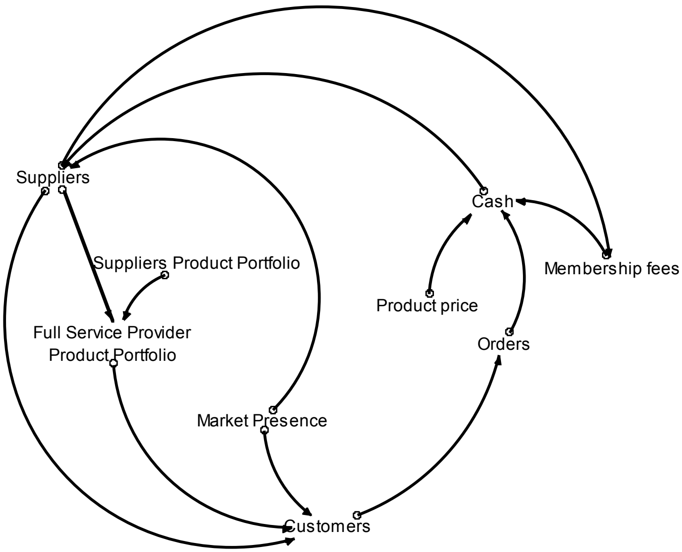

Figure 15.15.: Value logic of full service provider

15.5. Comparison to other metamodels

In this section the business model metamodel, which was derived from Definition 14.19 at the beginning of this chapter, is compared to similar metamodels developed by other authors[9]:

- The conceptual strategy model developed in Heinrich and Leist (2003, p. 341 ff) and Heinrich and Winter (2004, p. 8ff). As the name suggests, this metamodel has a wider scope than the business model metamodel developed here, focusing on strategy[10] in general, not only on business models. But Heinrich and Winter (2004, p. 8) explicitly claim that *such a model would incorporate "strategy" as*

[9]Braun (2003) also develops a business model metamodel specific to financial services which is not discussed here in detail.

[10]Heinrich and Winter (2004, p. 4) interpret "strategy" to mean *a pattern of actions or decisions (planned or emerging) that explain how a firm achieves and maintains competitive advantage*. This usage of the term "strategy" is more akin to the concept of "product market strategy" discussed in Chapter 14.1.3 than to the concept of "strategy" discussed in Chapter 9.2.

well as "business model" aspects, making a comparison of the two metamodels worthwhile.

- The business model ontology developed in Osterwalder (2004, p. 43ff). This ontology is based on Definition 14.7, which is discussed in Chapter 14.1.3.

15.5.1. Comparison to the conceptual strategy model

The conceptual strategy model has two views: the external view and the internal view.

The external view of the conceptual strategy model The external view focuses on the selling side of a firm and corresponds to the MBVF discussed in Chapter 11.1 (Heinrich and Winter, 2004, p. 8). The constructs of the external view (shown in Figure 15.16) are discussed in the following paragraphs.

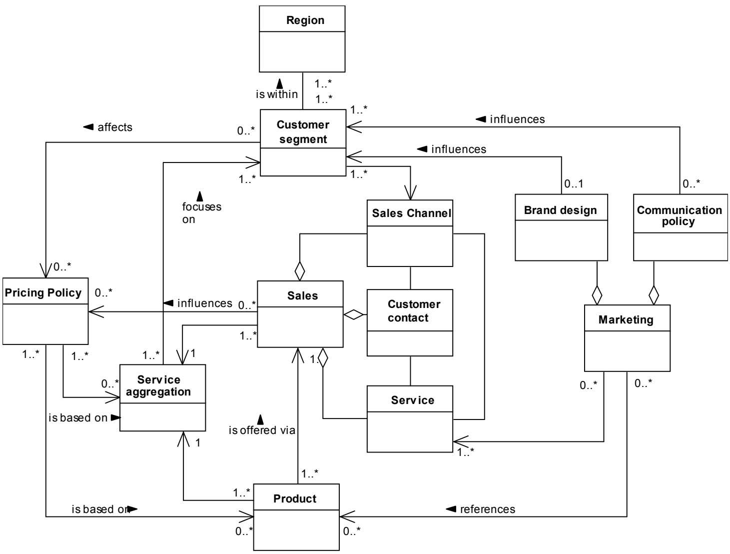

Figure 15.16.: External view of the conceptual strategy model (Heinrich and Winter, 2004, p. 9)

The "region" in the conceptual strategy model represents the spatial property of markets (Heinrich and Winter, 2004, p. 9) and thus corresponds to the more general "market" construct in the business model metamodel. The "customer segment" corresponds to the "party" construct: the business model metamodel does not explicitly differentiate between customers and suppliers at the M2-level, as discussed in section 15.1.1. The conceptual strategy model does not contain a construct for "supplier".

The "communication policy" and "brand design" constructs do not have a direct counterpart in the business model metamodel—the former could be viewed as a specialisation of the "business policy" construct, the latter as a specialisation of the "capability" construct. The act of influencing according to the communication policy and utilising the brand design is modelled using a (marketing) "transaction" over a (marketing) "channel" in models that conform to the business model metamodel. The conceptual strategy model does not have general constructs corresponding to transactions and channels, but defines the specialisations "sales channel" and "customer contact".

The specific "pricing policy" of the conceptual strategy model can be modelled using the more general "business policy" construct in conjunction with the "price" construct of the business model metamodel.

The "product", "service" and "service aggregation" constructs correspond well to the general "product" and specific "good" and "service" constructs in the business model metamodel.

The internal view of the conceptual strategy model In contrast to the external view the internal view of the conceptual strategy model corresponds to the RBVF discussed in Chapter 11.2 (Heinrich and Winter, 2004, p. 10). The constructs of the internal view (shown in Figure 15.17) are discussed in the following paragraphs:

The "organisational structure and behaviour" and "corporate culture" constructs do not have counterparts in the business model metamodel: As discussed in Chapter 14.3, Definition 14.19 of the business model concept purposely does not cover business operations and thus also not the organisational structure and behaviour—the only behavioural constructs defined in the business model metamodel are the "transactions" and the "business policies" governing them.

The effects of "corporate culture" on the behaviour of the business model could be modelled using the generic "business policy" construct, and corporate culture itself could be modelled as an "asset" if relevant to the success of a particular business model, but corporate culture is currently not directly defined as a construct in the business model metamodel.

The general "value chain characterisation" construct in the conceptual strategy model does not have a counterpart in the in the business model metamodel—models based on the business model metamodel model the value chain directly, identifying the parties, channels and transactions.

The “competencies” construct corresponds directly to the “asset” construct in the business model metamodel, the “impact” a competency has on the value chain is modelled using links to the “channels” and “products” they support.

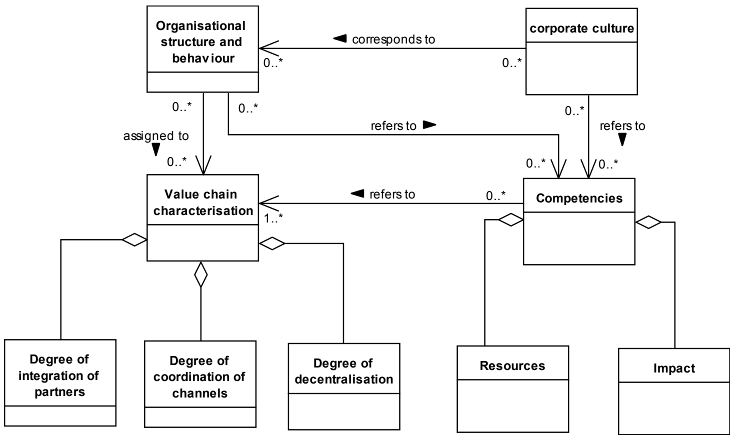

Figure 15.17.: Internal view of the conceptual strategy model (Heinrich and Winter, 2004, p. 11)

Discussion Given the different scope and starting point of the business model metamodel and the conceptual strategy model, some differences are to be expected: the business model metamodel is more detailed when it comes to modelling the value network and the transactions between the parties; the conceptual strategy model is more specific when modelling sales and pricing policies. Not defining specialisations for policies and channels is consistent with the goal of creating a minimal metamodel. This dissertation does not attempt to classify business models, so the more general construct “value chain characterisation” is also not explicitly needed in the business model metamodel.

15.5.2. Comparison to the business model ontology

The business model ontology emphasises four views a business model ought to address (Osterwalder, 2004, p. 42):

Product view This view defines what business the firm is in and the products and the value propositions offered to the market.

Customer interface view This view identifies the firm's target customers, defines how products and services are delivered to these customers and how it builds strong relationships with them.

Infrastructure management view This view defines how the company efficiently performs infrastructural or logistical issues, with whom, and as what kind of network enterprise.

Financial aspects view This view defines the revenue model, the cost structure and the business model's sustainability.

The constructs needed to model the views are shown in Figure 15.18. The business model ontology contains one general construct "actor", which represents the firm being analysed or one of its suppliers—this construct therefore corresponds well to the "party" construct of the business model metamodel.

The product view of the business model ontology The product view contains two constructs: the "value proposition", which is comprised of a set of "offerings". The offering corresponds well to the "product" in the business model metamodel. The value proposition *describes the way a firm differentiates itself from its competitors and is the reason why customers buy from a certain firm and not from another* (Osterwalder, 2004, p. 50). Following this definition the value proposition is part of a firm's positioning strategy and therefore purposely not part of the business model metamodel, as discussed in Chapter 14.3.

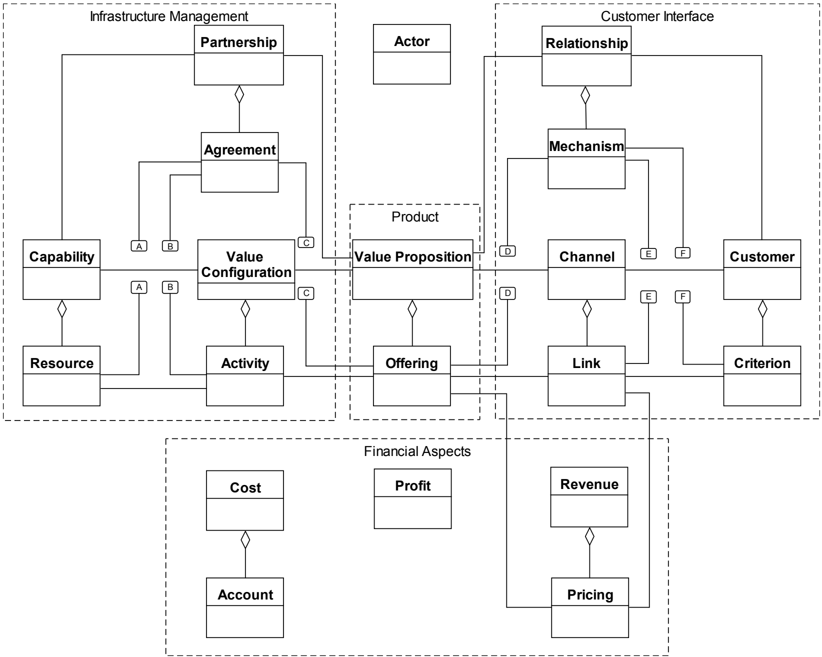

Figure 15.18.: Business model ontology (Osterwalder, 2004, p. 44)

The customer interface view of the business model ontology The "customer" construct of the business model ontology is modelled using the "party" construct in the business model metamodel, which sees customers and suppliers as roles a party may have in the context of a transaction and not as an explicit type at the M2-level. The "criterion" construct is used to describe a customer in detail, it does not have a direct counterpart.

The "channel" construct corresponds directly to the construct of the same name in the business model metamodel. In this metamodel the refinement of channels into "links" is modelled using aggregations of channels, no separate construct is defined for this purpose.

The "relationship" construct represents the relationship a firm has with its customers, and can be refined using "mechanisms", which represent a function that is needed to build a relationship with a customer. In the business model metamodel these concepts are modelled using channels to represent the structural aspect of a relationship, and transactions to represent the activities that a firm performs to build a relationship with the customer.

The infrastructure management view of the business model ontology The main construct of the infrastructure management view is the "activity", which represents any activity that a firm or one of its partners performs to create value for its customers. The business model metamodel intentionally does not model activities at the level of business processes, but abstracts them using the "transaction" construct, which represents the interactions a firm has with the other parties in its value network.

In the business model ontology the "value configuration" represents a set of activities and also a classification of the kind of value configuration a firm has[11]. The former aspect corresponds to a mixture of the "transaction model" of the business model metamodel, which is a behavioural view containing all the transactions a firm has with customers and suppliers, and the "value network", which is a structural view showing all channels that connect the firm to its customer and suppliers; the latter aspect is not covered in the business model metamodel, which intentionally does not attempt to classify business models.

In the business model metamodel the "partnership" construct found in the business model ontology is modelled using "channels" that connect the focal firm to the "parties" it has such partnerships with. The "agreements" are represented by "artifacts" in this case.

The constructs "capability" and "resource" of the business model ontology have direct counterparts in the business model metamodel.

The financial aspects view of the business model ontology The "cost" and "pricing" constructs of the business model ontology directly correspond to the "cost" respectively "price" constructs of the business model metamodel. The construct "revenue" is not represented directly in the business model metamodel but is a derived property, depending on the "frequency" of a "transaction" and its "price".

The "profit" construct is not included in the business model metamodel: in order to calculate profit the operating expenses a firm generates must be known, and these depend on business operations, which are deliberately excluded from the business model metamodel. Instead, the business model metamodel concentrates on "value", which can be calculated based solely on cost and price.

[11] Osterwalder (2004, p. 84) explicitly differentiates between value chain, value shop and value network.

Discussion Apart from slightly different terminology, the business model ontology and the business model metamodel are quite similar. The business model metamodel is more strongly separated from positioning strategy and business operations than the business model ontology—this separation is by design, as discussed in Chapter 14.3. The business model ontology does not contain constructs for specifying the assumptions and policies governing the structure and behaviour of a business model. These constructs are important to the business model metamodel because they are needed to specify the run-time behaviour of the business model.

15.6. Summary

This chapter developed a business model metamodel based on the comprehensive definition of the business model concept given in Definition def:business-model. The metamodel was illustrated using an example and compared to other metamodels that have a similar purpose. The next chapter defines a method for business model analysis that utilises the business model metamodel.

Chapter 16.

A Method for Business Model Analysis

This chapter defines a method for business model analysis. The approach followed in defining this method is based on the method engineering concepts introduced in Chapter 4: Originally method engineering was conceived as an engineering discipline to design, construct and adapt methods, techniques and tools for the development of information systems (Brinkkemper, 1996, p. 276). Meanwhile the method engineering approach has been extended to the engineering of enterprises as a whole, to ensure repeatable, scalable and disciplined *engineering* (as opposed to individualistic *creation*) and to facilitate division of labour in large business engineering efforts (Winter, 2003b, p. 88).

Following the criteria identified by Braun et al. (2005, p. 2), a method will be constructed that is goal-oriented, based on clear principles, and is systematic. Braun et al. (2005, p. 2) also mention the attribute "repeatable"—this is also a desirable attribute for the method developed here, but although the method was instantiated and verified in four distinct cases (cf. Part IV), all instantiations were performed by the author himself and therefore the method has not been repeated independently.

The goals and principles of the business model analysis method are analysed in the following sections. To ensure that the method is systematic, it will be constructed in conformance to the method engineering metamodel introduced in Chapter 4:

Stakeholder The stakeholders affected by the results the method produces.

Stakeholder Value The results created in applying the method must produce concrete value for the stakeholders.

Result The results that are produced by the method.

Role The entities partaking in a method assume various roles that perform the activities.

Activity The activities that must be performed to create the result. These activities may be structured hierarchically.

Metamodel A model of the results that are produced by the method. This result is frequently itself a model, whence the name metamodel.

Technique The method should identify techniques that are useful in creating the results. Examples for techniques used in this method are creating models in UML (cf. Chapter 6) and using system dynamics (cf. Chapter 7).

Method construction itself follows a simple problem solving process consisting of three steps, which are used to structure the following sections:

Understand the situation—method analysis Analyse the various aspects that need to be considered in defining a method for business model analysis.

Specify the solution—method definition Define the method based on the forgoing analysis. The method definition pulls together the results of the analysis and presents them in a systematic way.

Verify the solution—method validation The chosen verification method for this research was to instantiate the method at four firms. The resulting case studies are presented in Part IV.

16.1. Method analysis

A method is a set of steps that need to be performed to reach a specific goal (Stahlknecht and Hasenkamp, 2004, p. 212)[1]. To ensure all necessary aspects of the method are defined, and that these are also sufficient, it is therefore important to formulate the overriding goals that are to be achieved by performing the method.

The objective of this dissertation is to develop a consistent method to analyse the structure and the behaviour of a business model. To ensure both rigour and relevance, the method should:

- Be based upon a definition of the business model concept, derived from rigorous analysis of relevant academic and business literature.
- Enable practitioners to make their business models more transparent to all relevant stakeholders, in both a qualitative and quantitative way.

[1] It is interesting to note that not all authors see goal-orientation as a fundamental attribute of a method. A comprehensive discussion on this may be found in Braun et al. (2005).

- Allow practitioners to answer strategic questions relevant to the performance of their business.
- Define a model-based approach to business model analysis utilising both object-oriented analysis and design and system dynamics based on method engineering principles.
- Validate this approach by analysing the business model of four different professional service firms

Based on Chapters 14 and Chapters 15 this objective can now be extended by:

- One outcome of the method is a model of the business model being analysed that is an instantiation of the business model metamodel defined in Chapter 15.

This section analyses the various aspects that need to be considered in defining a method to achieve this goal and conforming to the method engineering metamodel using the steps—each step builds upon and extend the insights reached in the preceding steps:

1. *Stakeholder analysis* At the beginning it is important to analyse which stakeholders are interested in the method and its results and what value should be created for them.
2. *Results analysis* Once it is clear what value is to be achieved the results that are likely to create this value can be defined.
3. *Activity Analysis* Given the expected results, it is possible to define the activities that need to be performed to create this results.
4. *Meta-model and Technique Analysis* Given the results, these can now be formalised by defining appropriate metamodels and identify which techniques are to be used in creating these results.
5. *Role Analysis* Given the activities distinct organisational roles can now be assigned to the activities.

16.1.1. Stakeholder analysis

The objective of this section is to analyse which stakeholders are interested in the method developed here and which value the method should create for them.

As noted in Chapter 9, business models are part of the business strategy layer in the business engineering map displayed in Figure 9.1. Strategy management and strategy analysis is typically performed by members of top management or their staff, so the firm's top management is one potential stakeholder. Depending on the context this will be the managing director or CEO (in firms implementing a single business model) or business unit managers (in larger corporations deploying multiple business models in different business units).

Furthermore, the numerous stakeholders affected by a business model (cf. Chapter 14.1.2) also need to be considered, leading to the following list of potential stakeholders:

- Top management (chief executive officer (CEO) or managing director (MD)), who are responsible for improving the performance of a business model.
- Employees, who receive wages and salaries and are responsible for operationalising and executing a business model.
- Governments, who receive taxes.
- Shareholders, who partake in the profit generated.
- Customers, who are satisfied if their willingness-to-pay is greater than the actual price they pay.
- Suppliers, such as investors who receive interest and providers of products and services.

Though this list may seem long, all but the government stakeholder were encountered in the design research case studies performed to validate the method developed here (cf. Part IV), but not all stakeholders were encountered in every case. To overcome this problem it makes sense to differentiate between the client (whom the business model analysis is being performed for) and the stakeholders who may be affected by the analysis: In all case studies performed within this research the client was a member of the firm's top management, so the firm's top management is certainly the main stakeholder the method developed here is directed at. To ensure all other stakeholders are considered during business model analysis it is necessary to ensure that these stakeholders are identified during the first step of the method.

What value ought the business model analysis produce for a firm's top management? As analysed in Chapter 14, a business model defines how a firm creates value by identifying its value network, its its value logic and relevant business policies. As value creation is fundamental to business success, analysing these aspects of a business is itself of value to a firm's top management. In the concrete situations encountered within the case studies presented in Part IV, management was interested in all three of these aspects. During the conversations that arose while performing business model analysis another need became transparent—that of making their business model transparent to relevant stakeholders both qualitatively and quantitatively (especially financial stakeholders), leading to the following list:

- Verifying existing and finding new policies that would increase value creation, mainly pertaining to allocation of resources (without changing the underlying value network or value logic)
- Creating a learning environment for those employees that have to put new or changed business policies into effect.
- Exploring the effect of changes to the value network and value logic, and verifying that these would have the desired effect.
- Making the business model transparent to all stakeholders, in a qualitative and quantitative way.

No comprehensive survey was undertaken to analyse top managements requirements with respect to analysing their business models.

16.1.2. Results analysis

Given the stakeholders and the value that is to be created for them, the results that are likely to create this value can now be identified.

The method defined here proposes an approach to business model analysis based on visual models ("model-driven approach") and simulations, and therefore one major result of the approach is to build a model of the business model that is consistent with the metamodel defined in Chapter 15. This is very much a question of preference and choice, as a number of other approaches to strategy analysis in general and to business model analysis in particular exist. This is exemplified by the numerous textbooks on strategy analysis and strategic management (e.g. Grant (2008), Müller-Stewens and Lechner (2005), Johnson and Scholes (2003)) and business plans (e.g. Cristea et al. (2007), Hofmeister (2003)).

Many successful examples of using models and simulations to analyse business problems exist within the business engineering and management science domain (e.g. Sterman (2000), Pidd (2003), Baumöl et al. (2005)) and a number of arguments can be raised in favour of a model-driven approach:

- *In an increasingly complex and interconnected world external and explicit models that capture the essence of a particular situation provide a way of managing risk and uncertainty and allow those involved to explore the possible consequences of decisions and plans before taking action* (Pidd, 2003, p. 24).
- *Models are useful because it is difficult to comprehend complex systems in their entirety. Models help visualise the system as it is or how it could be. They allow specification of a systems structure and behaviour and help document the decisions that were made in analysing or designing a system* (Booch et al., 1999, p. 6).
- *Models*[2] *provide low-cost laboratories for learning. Unlike reality, they have a known structure, variable level of complexity, and they allow for controlled, repeatable experiments. Any action taken can be stopped in order to reflect, and decisions that are dangerous, infeasible, irreversible or unethical in real systems can be taken in the model* (Sterman, 2000, p. 34-35).

As discussed in Chapter 9, analysing business models is an activity within the strategy management domain. Strategy is the art of making choices (Grant, 2008, p. 18), and the goal of business model analysis is to help the client make the right strategic choices about his firm's business models. Many strategic choices can and must be made about business models, and therefore an important first result of business model analysis is a list of clearly formulated strategic questions that needed to be answered by performing the analysis. The need for such questions can be motivated from a number of perspectives:

- The complexity of the metamodel defined in Chapter 15 shows that there are potentially very many choices that can be made about a business model and its concrete implementation within a firm.
- The activity analysis in section 16.1.3 shows that an important starting point for any problem solving activity is clear formulation of goals (Haberfellner et al.,

[2]Sterman (2000, p. 34) uses the term "virtual world" here, borrowing the phrase from Schön (1991). Warren (1998) uses the term "microworld", inspired by Papert (1993). This is also the term used in this dissertation.

2002, p. 50). Grant (2008, p. 19) points out that strategy is about asking the right questions, therefore the method proposes to formulate the goals as questions that should be answered by the business model analysis.

- The method for business model analysis proposed here is a model-based approach. An important first step in modelling is the clear articulation of the problem that is to be solved (Sterman, 2000, p. 87). This is important, as any model is a representation of reality intended for some definite purpose (Pidd, 2003, p. 10)—the strategic questions are a form of problem articulation that help define the purpose of the model.

As discussed in Chapter 14, there are a number of generic strategic questions any business model should answer. These as listed in Table 16.1.

What is the party's value network?
How does the business model generate value?
What is the underlying value logic?
Who are the party's customers, and which products are offered to them?
Which transactions are performed between parties?
How are resources allocated to the main transactions?

Table 16.1.: Generic strategic questions

The case studies that were performed to validate the method proposed here (cf. Part IV) raised a number of specific strategic questions concerning PSFs, as listed in Table 16.2.

Are high-volume or high-headcount better to increase revenue?
Will this reconfiguration of our value network help us to fulfil our business plan?
How should resources be distributed between transactions to maximise value?
Can the growth projection in the business plan be fulfilled given the initial resources?
How do revenue and gross margin depend on initial resource allocations?
What is the impact of worsening marketing conditions?

Table 16.2.: Specific strategic questions for professional service firms

The goal of the business model analysis method is to answer the concrete strategic questions raised by the client. Van der Heijden (1998, p. 351) points out that one way of performing strategic analysis and answering strategic questions pertaining to business ideas (and in extension business models) is to test them within different scenarios.

Scenarios have been used through the ages as a tool to explore the future—they were used by early philosophers like Plato and Machiavelli and military strategists such as von Clausewitz and Sun Tzu (Bradfield et al., 2005). There is also rich support for the use of scenarios in strategy analysis in management literature:

- Scenarios are a tool for systematically looking into the future. They describe a possible future development of the system or situation under consideration (Weber et al., 2005, p. 19)[3].
- They form the basis of scenario-based planing as discussed in van der Heijden (2005, p. 113-130): *Scenarios are the best available language for strategic conversation, as it allows both differentiation in views, but also brings people together towards a shared understanding of the situation, making decision making possible when the time has arrived to take action.*(van der Heijden, 2005, p. xviii)
- Scenario analysis is used in business plans to estimate how a business will develop under varying assumptions. Typically three scenarios are developed, the normal or base case (this is the expected future development), the best case (all chances and positive conditions are realised) and the worst case scenario (all risks and negative conditions are realised) (Cristea et al., 2007, p. 135).
- Scenarios can be used both in a qualitative and quantitative fashion, based on probabilistic models or simulation models (O'Brien et al. (2007, p. 216), Sterman (2000, p. 86)).

The scenarios that are relevant in the context of business model analysis are those that are needed to answer the strategic questions. Based on the scenarios, recommendations can be made that answer the strategic questions.

Summarising this discussion, the business model analysis method should produce the following results to satisfy stakeholder needs:

Client list List of all clients the business model analysis is being performed for, as shown by the stakeholder analysis in section 16.1.1.

Stakeholder list A concrete list of all stakeholders the business model analysis is being performed for, as shown by stakeholder analysis in section 16.1.1.

[3]A simple metamodel for scenarios may be found in Figure 16.3

Strategic Questions Clearly formulated strategic questions are needed as a starting point in order to define the model boundaries and scope.

Business model The major result of applying the business model analysis method is a comprehensive model of the business model that conforms to the metamodel derived in Chapter 15. As discussed there in section 15.3, the business model is modelled at two levels of abstraction: the conceptual model and the detailed model.

Scenarios Specific scenarios that answer the strategic questions based on the model of the business model.

Recommendations Recommendations on changes that ought to be made to the business model or the policies used in implementing it. These recommendations should be substantiated by the scenarios.

16.1.3. Activity analysis

Given the results that are to be produced by the methods, it is now possible to identify the activities that need to be performed to create this results.

Viewed from a systemic perspective, a firm is a system, and the firm's business model is a subsystem of this system. It therefore is valid to base a method for analysing a firm's business model on a more general systems engineering method. One such method is the systems engineering approach described in Chapter 8.

Using this generic process and the required results identified in section 16.1.2 as a basis, Table 16.3 defines the concrete tasks that must be completed within each activity in the context of business model analysis. The activities in this table have been renamed to reflect their specific nature better, according to the following mapping:

- Analyse situation $\mapsto$ Understand the business model
- Formulate goals $\mapsto$ Formulate strategic questions
- Synthesise Solution $\mapsto$ Construct business model
- Analyse Solution $\mapsto$ Verify business model
- Evaluate $\mapsto$ Evaluate scenarios
- Decide $\mapsto$ Answer strategic questions

The activities are shown in Figure 16.1.

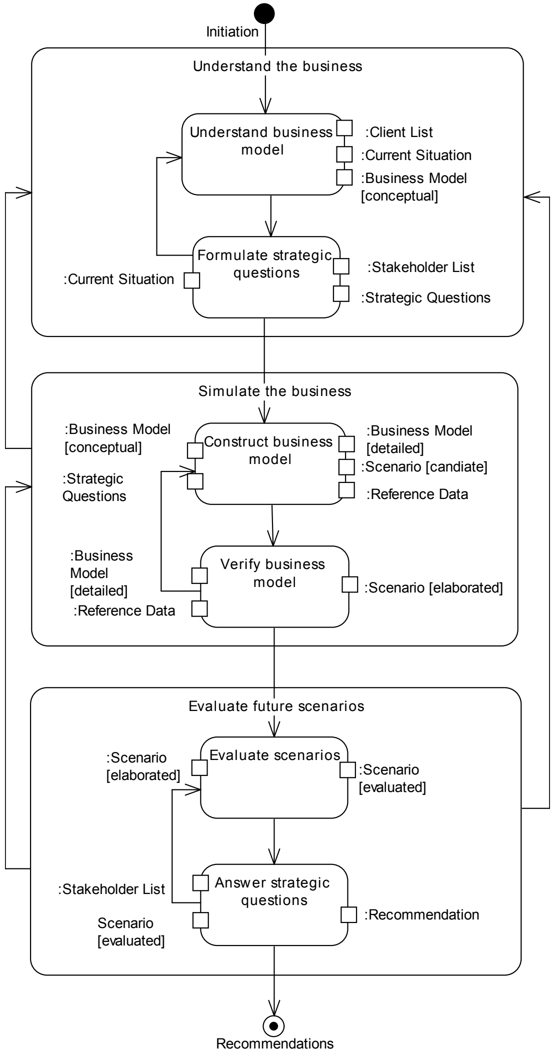

Figure 16.1.: Business model analysis activities

Activities	Objectives	Results
Understand business model	Analysis of Clients	Client list
	Analysis of current situation	Current Situation
	Conceptual description of the firms business model	Conceptual business model
Formulate strategic questions	Elaboration of strategic questions	Strategic questions
	Analysis of stakeholders	Stakeholder list
Construct business model	Elaboration of business model	Detailed business model
	Scenario identification	Candidate Scenarios
	Specification of reference data	Reference data
Verify business model	Verification of model	
	Analysis of scenarios	Elaborated Scenarios
Evaluate scenarios	Evaluation of scenarios	Evaluated Scenarios
Answer strategic questions	Answer strategic questions	Recommendations
	Make recommendations	

Table 16.3.: Mapping of activities, tasks and results

16.1.4. Meta-model and technique analysis

Given the results, these can now be formalised by defining appropriate metamodels and identify which techniques are to be used in creating these results: For each of the results defined in Table 16.3 a metamodel needs to be defined. Techniques which are suitable for creating these results are also identified.

Client list

The client list is a simple list of all clients the business model analysis is being performed for, no specific metamodel is needed.

Mostly no specific technique is needed for client identification, though in complex situations force field analysis may be useful to ensure all clients are identified and their attitude towards the business model analysis project is evaluated correctly. It is out of scope of this dissertation to define force field analysis in detail, useful references are Grasl et al. (2004, p. 121) and Lombriser and Abplanalp (1998, p. 344).

Stakeholder list

The stakeholder list is a simple list of all clients the business model analysis is being performed for, no specific metamodel is needed.

Mostly no specific technique is needed for stakeholder identification, though in complex situations force field analysis may be useful to ensure all stakeholders are identified and their attitude towards the business model analysis project is evaluated correctly. It is out of scope of this dissertation to define force field analysis in detail, useful references are Grasl et al. (2004, p. 121) and Lombriser and Abplanalp (1998, p. 344).

Current situation

A short description of the current situation the firm is in. A checklist defining information that could be contained in this description is shown in Table 16.4.

Number of employees
Revenue and profit in recent years
Client situation
Major assets
Major strategic issues

Table 16.4.: Checklist for current situation

No specific metamodel is needed for analysis of the current situation. A useful technique for analysing the current situation is to ask open questions using the above list of questions.

Business model

A suitable metamodel for the model of the business model, necessary views based on this metamodel, and appropriate model types are defined in Chapter 15.

It is clear from the discussion in Chapter 14 and the metamodel developed in Chapter 15 that the business model concept is not a simple one: The firms business partners, customers, products and pricing structure are not independent, but connected to each other in multiple ways, leading to structural complexity. The transactions between these actors, and the channels supporting these transactions frequently involve numerous activities that must be coordinated over many partners, leading to high behavioural complexity. Part of the value created in these transactions must be fed back into the system to support the channels and transactions the firm implements. This feedback leads to dynamic complexity.

System dynamics approaches are well suited to dealing with the dynamic complexity encountered in business systems and are therefore a useful technique for modelling the dynamic aspects of business models.

But the stock and flow models used in system dynamics do not have the language mechanisms to define complex structural relationships. A useful technique for modelling the structural aspects of business models are UML (discussed in Chapter 6) and the concepts from OOAD (discussed in Chapter 5).

Recommendations

The recommendations are a collection of recommended actions derived from scenario analysis. No specific metamodel is needed.

A useful technique for checking completeness of the recommendations is to cross-check all strategic questions and scenarios and to ensure that answers are provided to each question and actions are derived from each scenario.

Reference data

The reference data consists of data sets used to calibrate and verify the system dynamics model. Two kinds of data can be distinguished: Data Sets used to set the constants to the correct value, and data sets used to verify the predicted behaviour of dynamic elements. A metamodel for reference data is illustrated in Figure 16.2.

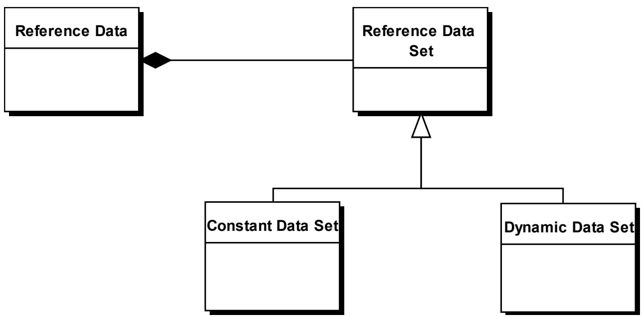

Figure 16.2.: Reference data metamodel

Suitable techniques for extracting reference data are data mining techniques, a useful reference is Pyle (2003).

Scenarios

The scenarios define an expected behaviour of the business model for specific initial conditions (cf. the discussion in section 16.1.2). A scenario description therefore consists of:

- Brief description.
- List of initial conditions.
- List of key performance indicators.
- Projected behaviour of key performance indicators.
- Derived conclusions.

A suitable metamodel for scenarios is displayed in Figure 16.3.

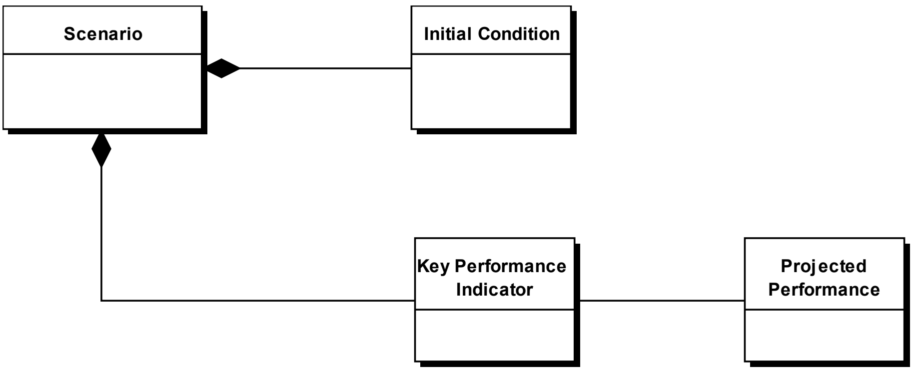

Figure 16.3.: Scenario metamodel

Given the system dynamics model of the business model, a useful technique for scenario definition and scenario analysis is simulation (cf. the discussion in Chapter 7).

Strategic questions

A brief list of strategic questions that should be answered by scenario analysis. No specific metamodel is needed. A useful technique to elicit strategic questions is to ask open questions using a checklist based on Table 16.1.

16.1.5. Role analysis

Given the activities distinct organisational roles can now be assigned to the activities.

As in any problem solving process it it sensible to define a role that is responsible for this process as a whole. Tho reflect the business oriented nature of this work, the role *business engineer* was chosen for this. This role is discussed at length in Baumöl and Winter (2003, p. 49).

Top management is a major stakeholder of the method and participates in the analysis. Staehle (1991) identifies eight functional roles that a manager must enact: the visionary, the strategist, the planer, the organiser, the controller, the networker, the crisis manager and the innovator. As discussed in Chapter 14.4 business models are situated in the strategy layer of the business engineering framework the strategic aspect of top managers work is most relevant here, although vision and innovation also play a role. Therefore the strategist (Schreyögg, 1991, p. 90) was identified as the relevant management role for business model analysis. The domain expert was added to cater for the fact that further functional expertise may be needed depending on the situation—during the case studies this was mainly information pertaining to financial controlling.

Business Engineer Business engineers with general knowledge of the business coordinate the analysis process and maintain the results produced.

Strategist Business strategists participating in the firm's strategic development are key to business model analysis as they provide the broad knowledge of the business needed for the analysis.

Domain Expert Experts from specific domains within the firm that provide specific information for particular areas of the model (e.g. controlling information, information pertaining to specific processes,...).

Whereas the business engineer will frequently be somebody from outside of the firm, the other roles will typically be fulfilled by somebody from the firm (a client or stakeholder). Depending on the size of the firm these roles may be fulfilled by one or more persons.

16.2. Method definition

In this step the method is defined based on the forgoing analysis. The method definition pulls together the results of the analysis and presents them in a systematic way.

This section defines a complete method for business model analysis, based on the analysis in the foregoing section:

- Business model analysis goals
- Business model analysis principles
- Business model analysis method

16.2.1. Goals

The goals of business model analysis are:

- Analysis of the structure and behaviour of a given party's business model on the basis of a model of the business model that conforms to the business model metamodel defined in Chapter 15.
- Identification of strategic questions concerning the business model.
- Development of scenarios that explore these questions in detail.
- Derivation of recommendations concerning these strategic questions, based on the scenario analysis.

16.2.2. Principles

During instantiation of the method a number of principles were found to be useful—the list is not exhaustive and reflects current experience:

Top-Down Approach A top-down approach, starting with the firm's business idea, which is then refined into a full model of the business model, proved successful. The top-down approach is discussed in Haberfellner et al. (2002, p. 30)

Bottom-up reuse Reuse of specific sub-models proved useful especially when modelling the dynamic aspects of business models. Reuse of models is an important subject within the information sciences (e.g. Fettke and Loos (2005) discuss reference models in the context of business engineering, Eriksson and Penker (2000) contains a number of reusable models of business aspects) and is also discussed in the system dynamics community, though in a less formal manner due to the lack of a metamodel approach in system dynamics (e.g. Richmond (2000) discusses a number of reference models).

Separation of concerns Building models with a clear separation of concerns is important to ensure changes to one part of the model do not affect other parts (Booch et al., 1999, p. 156). This is achieved here through a clear separation of views and separation of the models according to the major transactions the business supports.

Early model testing Early testing of simulation models dynamic behaviour against reference data and modellers experience proved essential. This was performed as early as possible, before the model was regarded as complete. Testing of system dynamics models is discussed in detail in Sterman (2000, p. 845-893).

16.2.3. Method

The method is defined following the method engineering metamodel.

- Stakeholders
- Activities
- Roles
- Results and metamodels
- Techniques

Stakeholders

The stakeholders of the business model analysis method are:

- Top management, who are responsible for improving the performance of a business model.
- Employees, who receive wages and salaries and are responsible for operationalising and executing a business model.
- Governments, who receive taxes.
- Shareholders, who partake in the profit generated.
- Customers, who are satisfied if their willingness-to-pay is greater than the actual price they pay.
- Suppliers, such as investors who receive interest and providers of products and services.

Activities

The activities performed within business model analysis are listed in table 16.3, shown in Figure 16.1 and briefly described in the following paragraphs.

Understand the business In this activity important aspects of the firm's business model are discussed with the firm's management:

The objective of the activity "Understand the business" is to clarify the firm's current situation and discuss the firm's value logic.

Once this has been established, strategic questions concerning the firm's business model are discussed in the activity "Formulate strategic questions". The overall objective of business model analysis is to answer these strategic questions by following the activities outlined here. The list of stakeholders affected by the analysis is also completed in this step.

In practice, these activities are typically performed on-site at the clients premises.

Activities	Techniques	Results
Understand value logic	Force Field Analysis	Client list
		Current Situation
		Value logic
Formulate strategic questions		Strategic questions
	Force Field Analysis	Stakeholder list

Table 16.5.: Understand the business—activities, techniques and results

Simulate the business Within the activity "Construct business model" a formal model of the business model is constructed based on the business idea. The list of strategic questions is used to generate a set of candidate scenarios which need to be evaluated. Quantitative reference data for simulating the scenarios and verifying the model is defined and extracted from the firm's business intelligence systems or estimated based on the clients experience.

This activity will typically consist of off-site analysis work performed by the business analysts and data mining activities performed by the firm's staff.

In the activity "Verify business model" the model is calibrated and tested using the reference data, and the candidate scenarios are elaborated.

This phase will typically consist of off-site analysis work performed. The scenarios are then presented and discussed at on-site workshops.

Activities	Techniques	Results
Construct business model	OOAD, SD	Business model
	Data Mining	Reference data
Verify business model	SD	Verified model
	Scenario Analysis	Elaborated Scenarios

Table 16.6.: Simulate the business—activities, techniques and results

Evaluate future scenarios Within the activity “Evaluate scenarios” the scenarios developed in the preceding steps are evaluated with the clients.

In the activity “Answer strategic questions” recommendations are made in answer to the strategic questions. The final recommendations are then presented to the clients.

Activities	Techniques	Results
Evaluate scenarios	Evaluation of scenarios	Evaluated Scenarios
Answer strategic questions	Answer strategic questions	Recommendations
	Make recommendations	

Table 16.7.: Evaluate future scenarios—activities, techniques and results

Roles

The following roles are necessary in performing business model analysis:

Business Engineer Business engineers with general knowledge of the business coordinate the analysis process and maintain the results produced.

Strategist Strategists participating in the firm’s strategic development are key to business model analysis as they provide the broad knowledge of the business needed for the analysis.

Domain Experts Domain experts provide specific information relevant to building particular areas of the model and data for model calibration.

Results and metamodels

The results produces a number of results which are described in the following list. Suitable techniques and metamodels have been defined for most results, as shown in Table 16.8. A mapping of the results created, to the activities they are created in and used by, is given in Table 16.9.

Result	**Technique**	**Meta-Model**
Client List	force field analysis	—
Current Situation	Checklist 16.4	—
Business model	OOAD	Chapter 15
	system dynamics	
Recommendations	Cross-check with	—
	scenarios and strategic questions	—
Reference Data	data mining	Figure 16.2
Scenario	SD simulation	Figure 16.3
Stakeholder List	force field analysis	—
Strategic Questions	Checklist 16.1	—

Table 16.8.: Mapping of results to techniques and metamodels

Business model A model representing the structural, behavioural and dynamic aspects of the party's business model. The model conforms to the metamodel defined in Chapter 15.

Client list List of all clients the business model analysis is being performed for, as shown by the stakeholder analysis in section 16.1.1.

Current Situation Description of the party's current situation.

Recommendations Recommendations on changes that ought to be made to the business model or the policies used in implementing it. These recommendations should be substantiated by the scenarios.

Reference Data The reference data consists of data sets used to calibrate and verify the system dynamics model. Two kinds of data can be distinguished: Data Sets used to set the constants to the correct value, and data sets used to verify the predicted behaviour of dynamic elements.

Scenarios Scenarios that answer the strategic questions based on the model of the business model

Stakeholder list A concrete list of all stakeholders the business model analysis is being performed for, as shown by stakeholder analysis in section 16.1.1.

Strategic Questions Clearly formulated strategic questions are needed as a starting point in order to define the model boundaries and scope.

Result	**Output from**	**Input to**
Conceptual business model	Understand value logic	Construct business model
Client List	Understand value logic	
Current Situation	Understand value logic	Formulate strategic questions
Detailed business model	Construct business model	Verify business model
Recommendations	Answer strategic questions	
Reference Data	Construct business model	Verify business model
Scenario	Construct business model Verify business model Evaluate scenarios	Answer strategic questions
Stakeholder List	Formulate strategic questions	Answer strategic questions

Table 16.9.: Mapping of results to activities

16.3. Method validation

In this step the method defined in the last step is verified. The chosen verification method for this research was to instantiate the method at four firms, as discussed in Chapter 2.2. To increase readability and for ease of reference the resulting case studies are presented here in separate chapters, in Part IV.

Part IV.

Case Studies

Case studies verifying the business model analysis method.

Chapter 17.

Overview of the case studies

A method to analyse the structure and the behaviour of a business model should enable practitioners to make their business models more transparent to all relevant stakeholders, in both a qualitative and quantitative way; and to allow practitioners to answer strategic questions pertaining to the performance of their business model.

As a contribution towards developing such a method Part III of this dissertation:

- Examined the business model concept and proposed a comprehensive definition in Chapter 14.
- Derived a metamodel from this definition in Chapter 15.
- Defined a method for business model analysis utilising modelling and simulation techniques in Chapter 16.

This part of the dissertation aims to validate the approach via case studies conducted at four professional service firms.

It was not the goal of the research presented here to investigate how business models differ between industries or which specialisations a business model can have within a particular industry—in principle the approach developed should apply to all business models. However, to increase the potential for the reuse of the insights gained in the analysis projects and to ensure that these results can be compared to each other the study was be restricted to professional service firms (such as IT system integrators, IT consultants or management consultants).

The following firms participated in the study:

- GFT Technologies AG
- k+k information services GmbH
- transentis management consulting GmbH & Co. KG
- Valtech Deutschland GmbH

17.1. Cost and benefits for firms participating in the study

The method defined here provides the business practitioner with an approach to analysing current and future business models, and to understanding and simulating the implications of possible changes to it.

Typical strategic questions addressed by the business model analysis performed were:

- How can a firm increase the value it creates?
- Which client and product mix is best?
- Which pricing policy should be adopted?
- Which factors are critical to the business models performance?
- How will the business model perform if market conditions change?

The analysis method cannot be performed at client sites without attention from the firms management—depending on the firm's size the chief executive officer or the manager responsible for developing a particular business model was involved. Domain experts were also be needed on an ad hoc basis to help elaborate particular aspects of the model: In particular the firms financial controlling experts are needed at certain stages of the analysis to provide access to the data required to calibrate the models and make quantitative predictions.

The total effort required from firms participating in the study varied between 10-20 person-days over a period of ca. three months.

Firms taking part received the following benefits:

- The firms management was given the opportunity to raise strategic questions concerning their business model. The business model analysis was performed for them with little impact on their time and no financial investment.
- The firm was given a detailed report consisting of a formal description of the business model, an analysis of various scenarios relevant to the strategic questions posed by the firms management and recommendations for business model development.
- The firm's business model was compared to other business models of firms with a similar background, increasing the learning potential for all participating firms.

17.2. Final project deliverables

The firms were provided with the following deliverables as a result of the business model analysis projects:

- The relevant case study report, as presented in the following chapters.
- A UML-model of the business model[1].
- A SD-model of the business model[2].
- A simulation microworld based on the SD-model that allows exploration of the business model's dynamics including and beyond the scenarios detailed in the case study reports [3].

17.3. Structure of the case study reports

The case study reports contain the results of the business model analysis method as defined in Table 16.8. The case studies all have an identical structure, which is illustrated in Table 17.1 together with a mapping of case study section to business model analysis results.

Case Study Section	**Business Model Analysis Result**
Introduction	Client List
	Stakeholder List
Current situation	Current situation
Conceptual overview of business model	Conceptual business model
Strategic questions	Strategic questions
Business model details	Detailed business model
Scenarios	Scenarios
	Description of reference data
Recommendations	Recommendations

Table 17.1.: Mapping of case study structure to analysis results

[1] The UML model was provided as an *Enterprise Architect*^{TM} model.

[2] Using the SD-metamodel defined in Chapter 7.4 as a basis, the SD-model could also be defined in UML. This approach was not practical due to the lack of simulation capabilities in the UML-tool.

[3] The SD model including the microworld was provided to participants as an *iThink*^{TM} model.

The case study reports are presented here in chronological order. To illustrate the mathematics behind the SD-models, the Valtech case study in Chapter 20 is more detailed and explicates a number of the policies and assumptions as mathematical equations. The other reports are not quite so detailed concerning the mathematics, for two reasons:

- All companies modelled are professional service firms with similar business models and similar mathematics.
- In practice it was found better to keep the case study reports succinct and to refer directly to the SD-models when reviewing details. All SD-models are full simulation models and therefore by necessity all assumptions and policies are fully defined as mathematical equations in those models[4].

[4]The Valtech SD-model in Chapter 20 consists of ca. 350 mathematical equations, the other models are similar in size.

Chapter 18.

transentis consulting

transentis is a small partner managed consulting boutique focusing on improving value creation in complex systems through efficient and effective designs that align strategies, organisations and IT-landscapes.

18.1. Current situation

The firm has a flat hierarchy: the partners managing the firm, and the consultants working for them. Thus the growth of the company is limited by the number of consultants a partner can manage (the partner leverage), and the business each partner generates—beyond that the firm can only grow by adding new partners.

The firm has no formal business relationships beyond those to freelance consultants, its customers, and the business contacts each partner maintains.

The consulting services provided by the firm are sold as coherent projects on a time and material basis. Business is generated through repeat business from existing customers and through the network of business relationships.

18.2. Conceptual overview of the business model

18.2.1. Products

The firm sells consulting projects as a service to its customers. The projects are delivered on a time and material basis.

18.2.2. Value network

The following actors are part of the full service provider business network. They are illustrated in 18.1.

Contacts The firm's partners maintain a network of business contacts. These are important as they are a source of leads for generating new business.

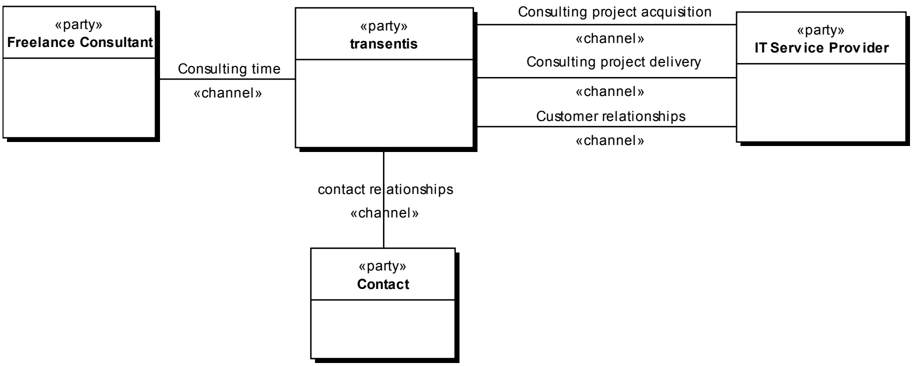

Figure 18.1.: transentis' value network

Freelance consultants The firm depends on freelance consultants for the staffing of its projects during peak times. These are mostly recruited from the network of business relationships via the recruitment channel.

IT service providers The firm's customers are IT service providers. The firm sells consulting projects via its sales channel and supplies consulting time via its supply channel. Customers and customer projects are also important for making and maintaining new business relationships via the partner channel.

18.2.3. Transactions

The main transactions the firm engages in are:

- Sell projects.
- Deliver projects.
- Hire and fire (freelance) consultants.
- Maintain business contacts.
- Maintain customer.

18.2.4. Value logic

Transentis' value logic is shown in Figure 18.2: Partners are responsible for maintaining contacts and customers, and managing projects. Contacts lead to new projects and thus new customers; current customers lead to repeat projects. Projects lead to new contacts, which again lead to new projects and customers. If effort required to deliver projects is greater than the effort partners can deliver, freelance consultants are hired to assist in project delivery. The number of partners is constant.

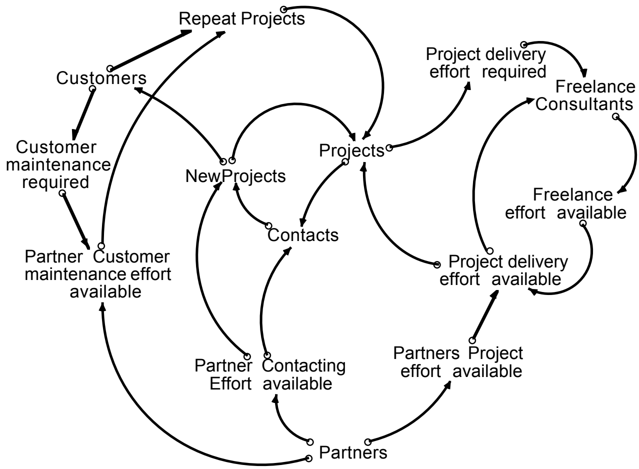

Figure 18.2.: transentis value logic

18.3. Strategic questions

After ten years of existence and a brief period of initial growth, the firm has not managed to grow much beyond the partners and a few consultants—the partners are not fully leveraged.

In the past the following pattern has been observed: Each partner builds a stable client relationship and secures enough business from this relationship to hire some extra consultants.

After some years the customer relationship breaks, the consultants are lost. It takes some time to build a new client relationship of equal strength and hire new consultants.

Based on these observations, the following strategic question was asked:

Strategic Question 18.1 *What drives growth more—stable customer relationships, the number of new customer relationships generated via the network of business relationships, or the size of consulting projects sold?*

18.4. Business model details

18.4.1. Product details

transentis' product view is illustrated in Figure 18.4.1

The firm sells consulting projects as a service to its customers. The projects are delivered on a time and material basis (person-days). Partners and employed consultants draw wages, freelance consultants charge a daily rate which is a fixed percentage of the daily rates charged to the customer.

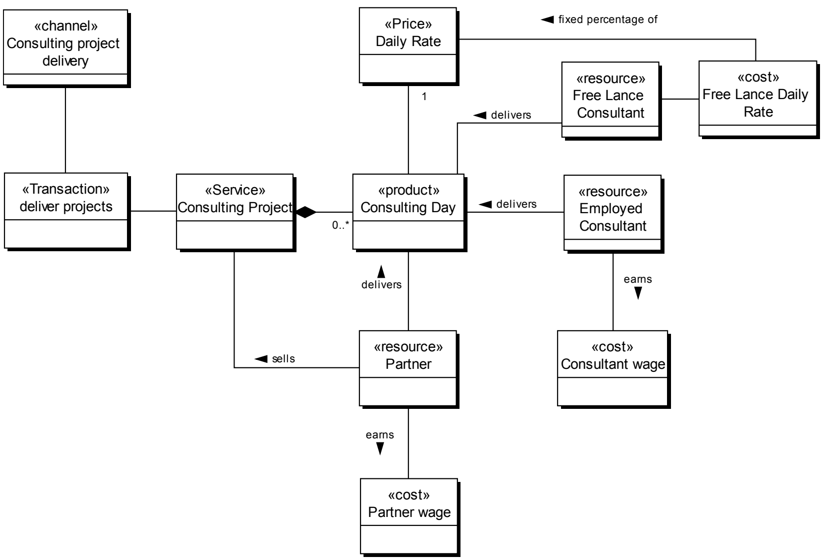

Figure 18.3.: The firms product view

Projects are sold to IT service provider managers on the basis of leads—these leads can either be generated through the managers themselves (repeat business) or through business relationships maintained by the partners.

18.4.2. Transaction details

transentis' transaction view is illustrated in Figure 18.4:

- Sell projects, exchanging proposals.
- Deliver projects, exchanging projects.
- Hire and fire (freelance) consultants, exchanging freelance contracts.
- Maintain business contacts, exchanging contact data and sales information.
- Maintain customer, exchanging contact data and sales information.

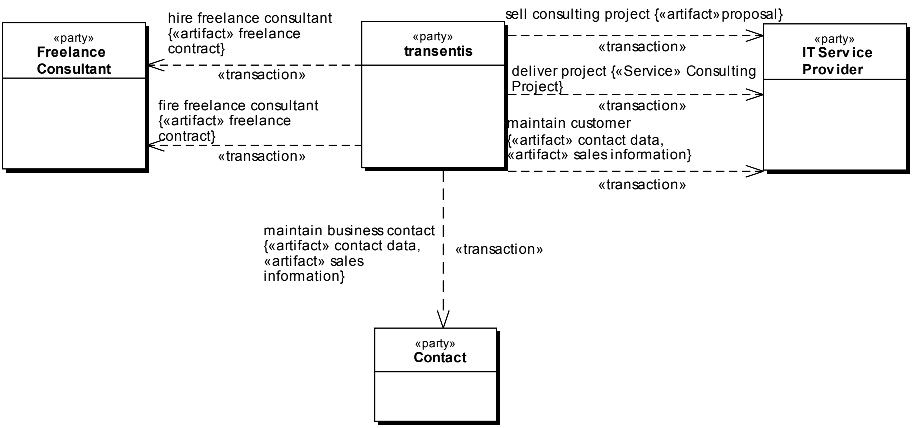

Figure 18.4.: transentis' transaction view

18.4.3. Value dynamics

transentis' value dynamics business model examines how the elements of the structural model (such as customer, consultant, projects sold) are changed by the business transactions (such as selling projects, hiring and firing consultants) in the behavioural model.

The structural and behavioural model therefore forms an important basis for developing and validating the dynamic model.

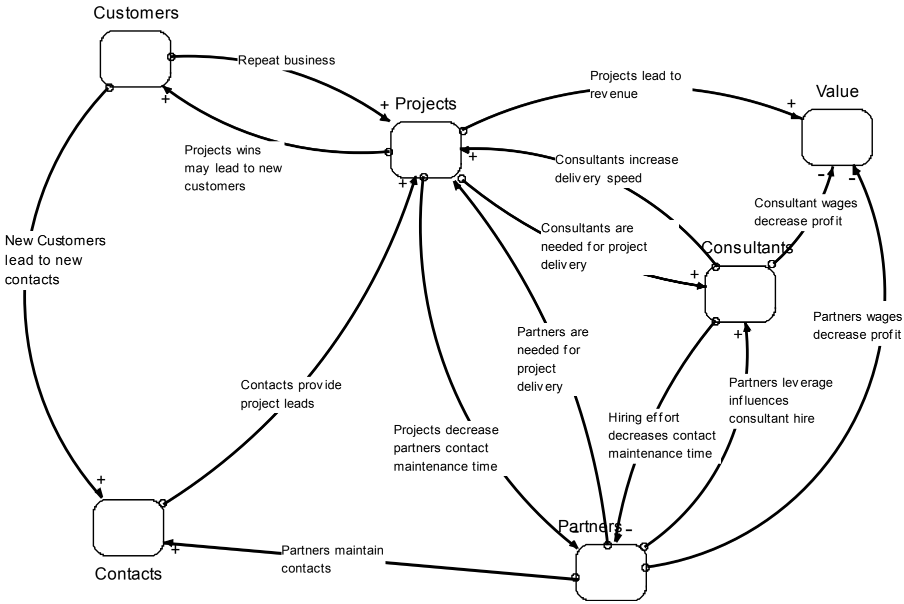

Figure 18.5.: Value dynamics view

An overview of the value dynamics is given in Figure 18.5 and briefly discussed here:

Partners The heart of the business model is formed by the firm's partners, who are responsible for enacting all of the firms policies regarding the business model. The number of partners the firm has is fixed in the model—this reflects the fact that the firm currently has no policy for changing its partnership structure.

Contacts Each partner maintains a list of contacts, who provide leads that may ultimately lead to new projects and customers—maintaining contacts costs partner's time, which is then not available for project work and consultant management. If the partners invest to little time in their contacts the number of contacts diminish, reducing the number of leads generated.

Projects Partners are also responsible for following up on leads, writing proposals and winning new projects. Projects may be won from new customers or from current customers (repeat business). In the firms experience winning a new customer is much harder than winning repeat business from a current customer, a fact that is reflected in the model via two distinct sales pipeline, one for new customers and one for repeat business. The firm just has one product ("consulting projects")—projects are characterised by total project effort and the average team size deployed.

Consultants Consultants are needed to delivery projects and are hired and fired by the partners. The hiring and firing policies implemented in the model are very simple—consultants are hired (or fired) as soon as the number of consultants needed for project delivery exceeds (or falls under) the number of consultants available.

Customers Customer maintenance essentially is done via contact maintenance (all customers are contacts, but not all contacts are customers). Customers have a finite lifetime in order to reflect that the consulting products offered by the firm may become obsolete.

Value This model takes a simple approach to accounting the value generated—the revenues generated are reduced by partners and consultants wages and summed over the firms lifetime. The resulting value is essentially the amount of capital available to the firm to invest into new services.

To answer the strategic question posed in Chapter 18.3 we will concentrate on the following aspects of the dynamic model in this chapter:

- Sell and deliver project transactions dynamics.
- Hire and fire consultants dynamics.
- Customer acquisition dynamics.
- Value generated dynamics.

Sell and deliver projects transactions dynamics

This part of the model discerns between the leads generated from business relationships as opposed to leads generated from current customers (repeat business). This is necessary as the transaction and success rates are different—typically repeat business is generated at the end of the current assignment. The success rates of these proposals are higher than those of proposals created for new customers. This part of the model is illustrated in figure 18.6

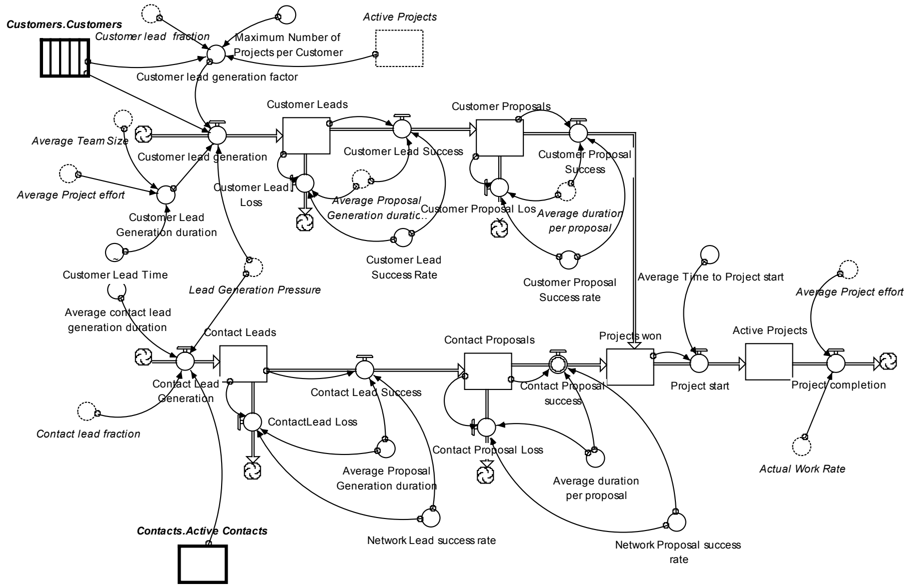

Figure 18.6.: Dynamics of the sell and deliver projects transaction

Hire and fire consultants dynamics

This part of the model has been kept simple — a fixed hiring and firing duration is assumed, and the reservoir of consultants is potentially infinite (no "war for talents"). This is acceptable in order to answer the strategic questions posed. This part of the model is illustrated in figure 18.7

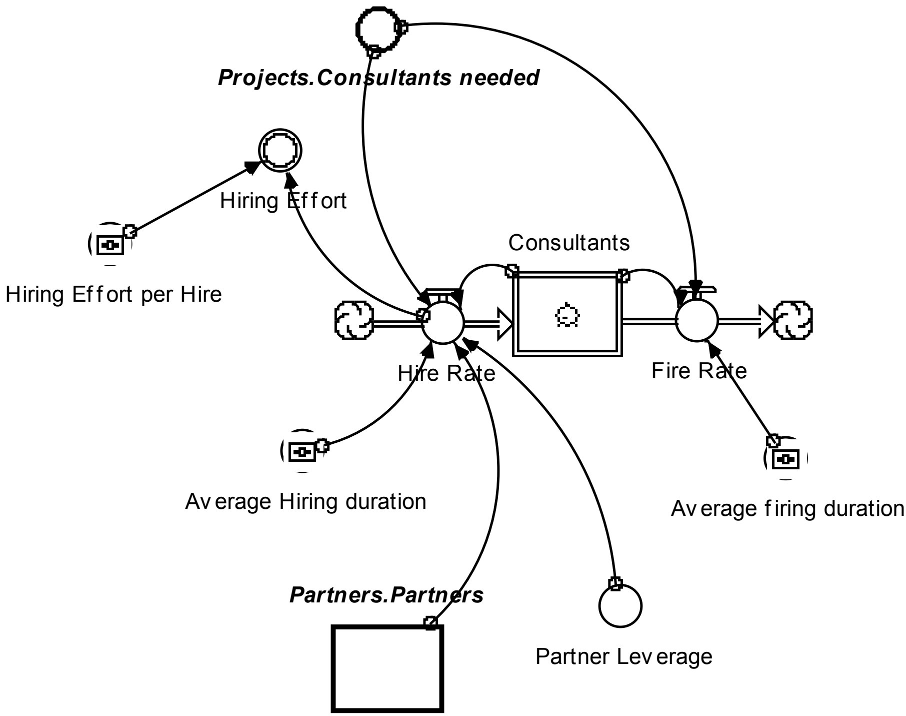

Figure 18.7.: Dynamics of the hire and fire consultants transaction

Consultants are fired as soon as the number of consultants actually needed due to the projects sold falls below the number of consultants actually available.

Customer acquisition dynamics

A new customer is generated every time a project is acquired via the business relationship channel ("network proposal success"). Customers have a finite lifetime—policies for prolonging the lifetime of a customer are not considered in this model as they are not relevant to the strategic questions being posed. This part of the model is illustrated in figure 18.8.

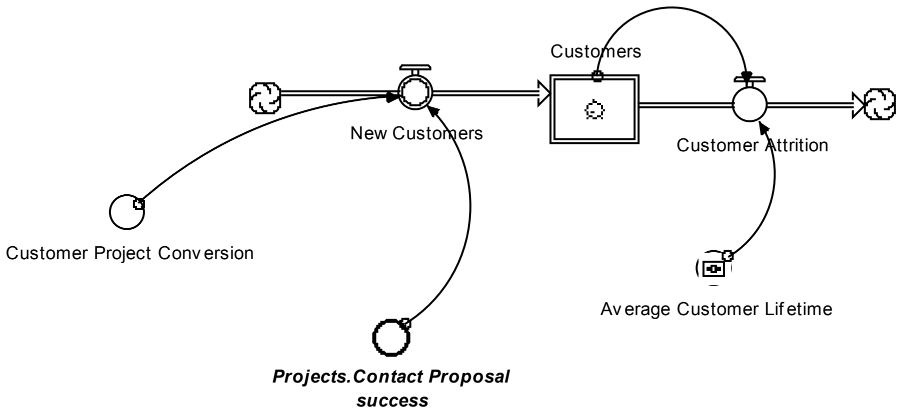

Figure 18.8.: Dynamics of the customer acquisition transaction

Value generation dynamics

This model takes a simple approach to counting the total value added by the business model—the revenues generated are reduced by partners and consultants wages (which are transaction costs in Equation 12.11) and summed over the firms lifetime. This part of the model is illustrated in figure 18.9.

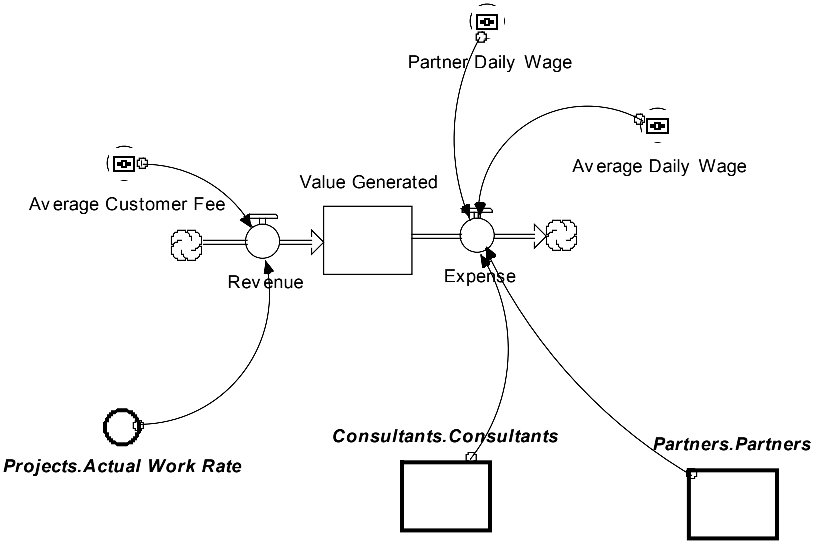

Figure 18.9.: Dynamics of value generation

18.5. Scenarios

Given the simulation model (cf. 18.4.3) we can now test various scenarios to answer the strategic questions (cf. 18.3):

Reliance on current customers. How does the value created by the firm perform when the firm relies on current customers only and does not actively seek new projects?

Growth What size of project does the firm need to be selling in order to grow? Does this depend more on the size of projects sold (the total effort), or on the typical size of the team deployed at the clients site?

18.5.1. Reliance on current customers

Scenario 1

In this scenario a simulation was conducted with the following initial parameters:

- Average project effort was set to 300 person-days.
- Average team size was set to 1 person teams.
- Number of partners was set to 1.
- Average customer lifetime was set to 30.000 days — as the simulation only ranges over 3.000 days, this effectively means customers have an infinite lifetime.

In this situation the business model is stable, but little growth is achieved, as displayed in the graphs in figure 18.10.

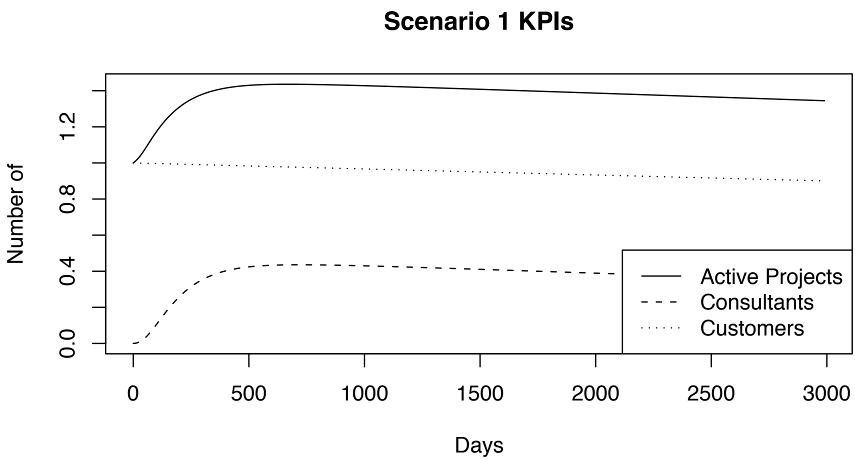

Figure 18.10.: KPIs for the "repeat business only" scenario

The value generated in this scenario is displayed in figure 18.11.

18.5.2. Growth

Scenario 2—One person teams

To analyse growth scenarios a first simulation was conducted with the following initial parameters:

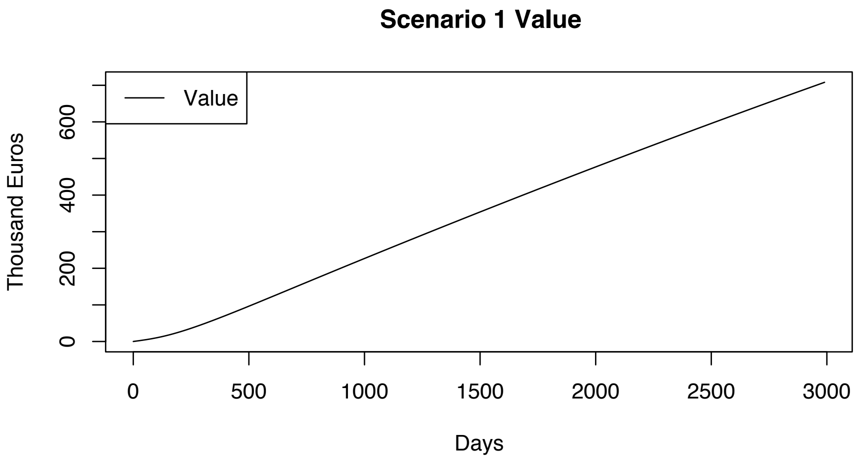

Figure 18.11.: Value generated in the “repeat business only” scenario

- Average project effort was set to 300 person-days.
- Average team size was set to 1 person teams.
- Number of partners was set to 5.
- Average customer lifetime was set to 1.000 days.

In this scenario the PSF achieves a maximum size of five consultants after three years, and then remains stable (figure 18.12). The value generated in the first year is negative though, break even is not achieved until the third year.

The value generated in the “one-person-team” growth scenario is displayed in figure 18.13.

Scenario 3—Five person teams

A second simulation was run with the following initial parameters:

- Average project effort was set to 100 person-days.

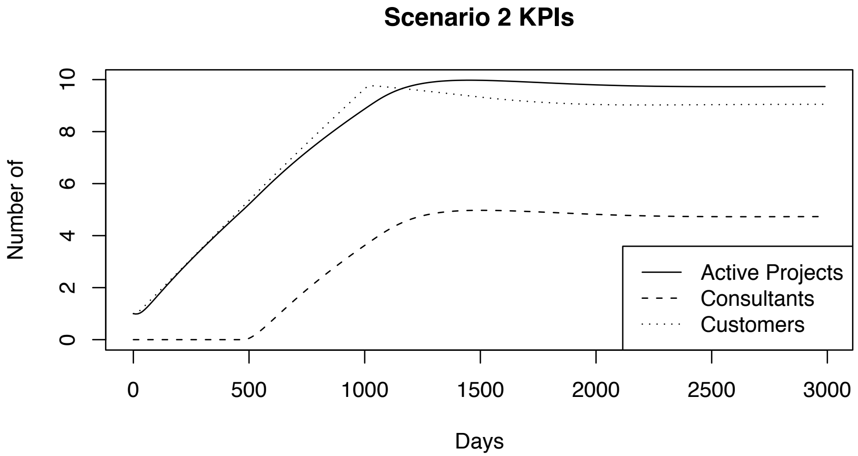

Figure 18.12.: KPIs for the “one-person-team‘” growth scenario

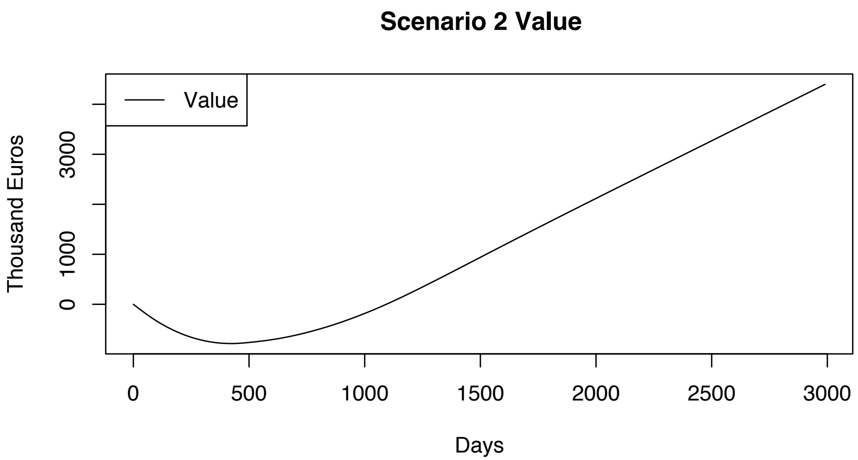

Figure 18.13.: Value generated in the “one-person-team” growth-scenario

- Average team size was set to 5 person teams.
- Number of partners was set to 5.
- Average customer lifetime was set to 1.000 days.

In this situation growth comes more easily, achieving a peak at 18 consultants after three years and stabilising at 16 consultants (Figure 18.14). The value generated was negative for the first 150 days, but then grew steadily (figure 18.15).

The simulation was then repeated with an average project effort of 300—this had little effect, indicating that team size is more important than the size of the project effort.

The value generated in the “five-person-team” growth scenario is displayed in figure 18.15.

18.6. Recommendations

Based on this analysis of the consulting boutique’s business model the following recommendations were made:

- The partners should concentrate more on selling larger teams (in terms of team size deployed in customer projects) than on selling larger projects (in terms of absolute project effort). The product structure needs to be further differentiated to achieve this.
- Reliance on repeat revenue only is dangerous—it is important to generate revenue through new customers if growth is to be achieved. Current customers should not be neglected, as they are more reliable in difficult market conditions.

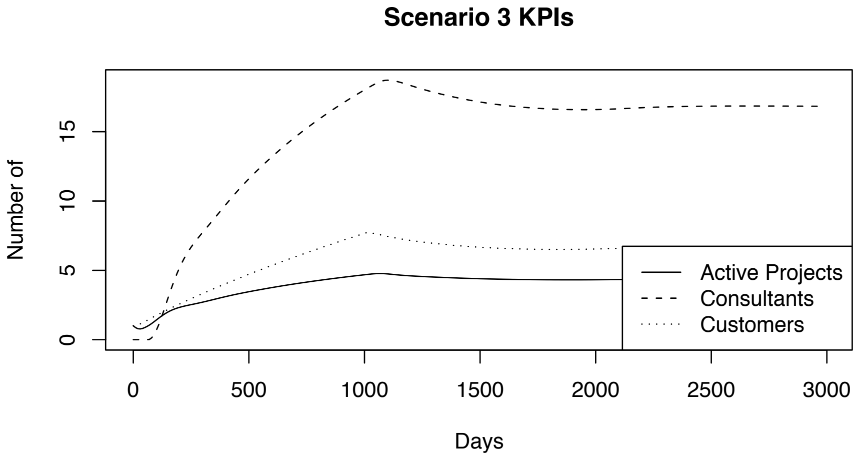

Figure 18.14.: KPIs for the “five-person-team” growth scenario

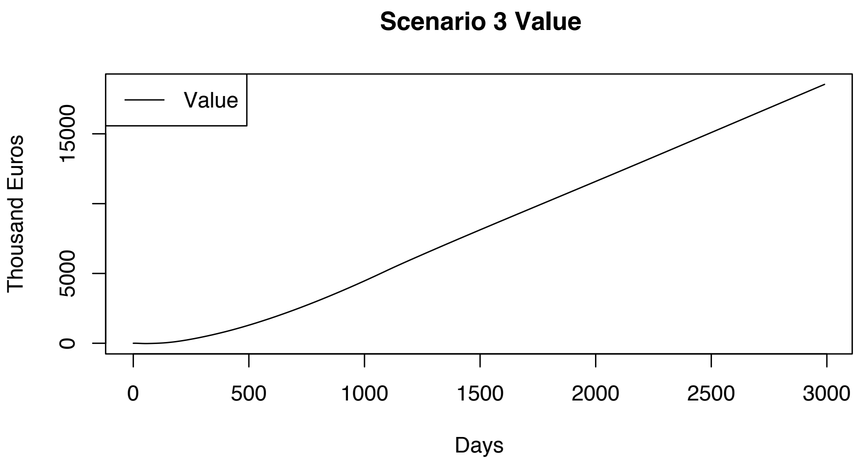

Figure 18.15.: Value generated in the “five-person-team” growth-scenario

Chapter 19.

GFT Services Germany

The *GFT Group* is an international IT service provider, with business divisions representing services, resourcing and software.

- In the services division, GFT focuses on the financial services and logistics sectors where it designs and realises IT solutions.
- The resourcing segment supplies IT specialists to companies in a variety of sectors. GFT also offers a third party management service, where it completely manages a company's IT service providers.
- The software division has developed a software product setting standards in the fields of business process optimisation, document management and digital archiving.

Founded in 1987 as a technological pioneer with innovative product solutions, the GFT Group now employs more than 1100 staff at twenty locations in Germany, UK, France, Switzerland, Spain, India and Brazil.

19.1. Current situation

This case study was carried out from May 2008 until October 2008 for GFT Services in Germany. The main participants on GFT's side was the head of business development for GFT Germany.

At the outset of this case study, GFT's main business in the logistics sector came from one major client. The head of business development was charged with setting up and expanding business the new logistics client unit using a newly formed team comprised of business developers and architects. The logistics client unit is run as a "business within the business" next to the financial services client unit.

The first three scenarios where developed in summer 2008. At this time the model's main use was as a microworld, helping to understand the dynamics and policies relevant to the initiation of the new client unit.

Scenarios four and five were developed in June 2009 to explore the potential effect of poorer market conditions due to the world financial crisis that began in 2008 and hit Germany at full force in 2009.

The head of business development reports to the COO, who was the main stakeholder for the work carried out. Further stakeholders were the team members of this newly formed team.

19.2. Conceptual overview of the business model

19.2.1. Products

GFT logistics client unit differentiates between two kinds of services it provides to its customers: *Sourcing projects* and *development projects*.

- *Sourcing projects* are projects in which the individual skills of GFT's consulting staff are provided to the customer. These projects mostly only have one team member (the consultant whose skills are being sold). These services are mostly low volume, and sales success depends more on the consultants personal skills and history than on GFT's collective ability and reputation.
- *Development projects* are projects where GFT commits itself to provide a particular service to the customer. These services are typically high volume (more than ten consultants over a longer time period), and sales success thus depend more on GFT's reputation and past history.

19.2.2. Value network

Due to the "business within a business" model the value network for the new logistics client unit has a number of parties that are part of GFT services as a whole, but external to the logistics client unit: The logistics client unit offers its services to companies in the logistics sector. It maintains business contacts who provide the project leads that lead to acquisition of projects. It can rely on the GFT project centre for timely provision of consultants and on the GFT delivery unit for providing architects and coordinating project delivery. All these units rely on *GFT resources* for recruiting full-time employees and freelancers, and on GFT corporate for providing necessary infrastructure.

To improve the contact database the logistics unit has a partnership with a logistics software company, who provide contacts concerning its logistics platform[1].

The value network is illustrated in Figure 19.1.

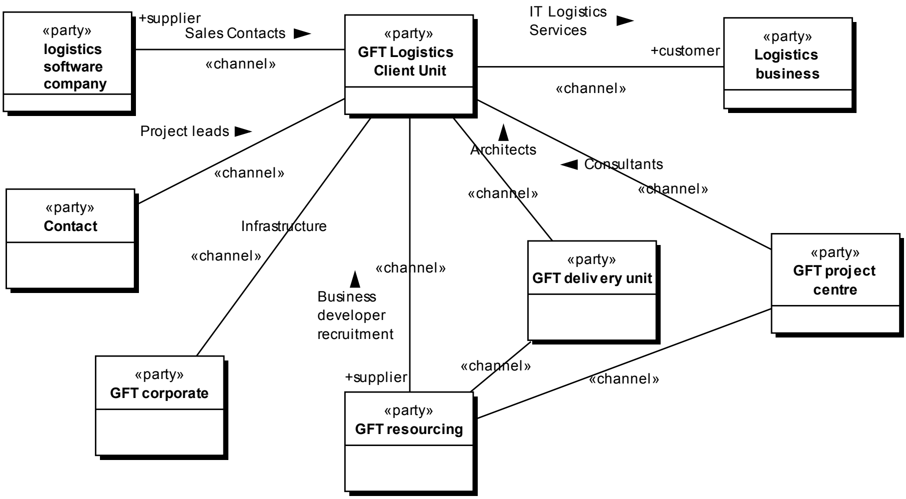

Figure 19.1.: GFT logistics client unit value network

19.2.3. Transactions

The following transactions are relevant for the GFT logistics client unit:

- Hire and fire consultants
- Contract freelance consultants
- Maintain contacts
- Maintain customer
- Sell IT services

[1] This partnership had only just been set up when the case study began. Therefore this relationship is not considered further, neither in the following pages nor in the simulation model.

- Deliver IT services
- Exchange sales information

These transactions are illustrated in Figure 19.2.

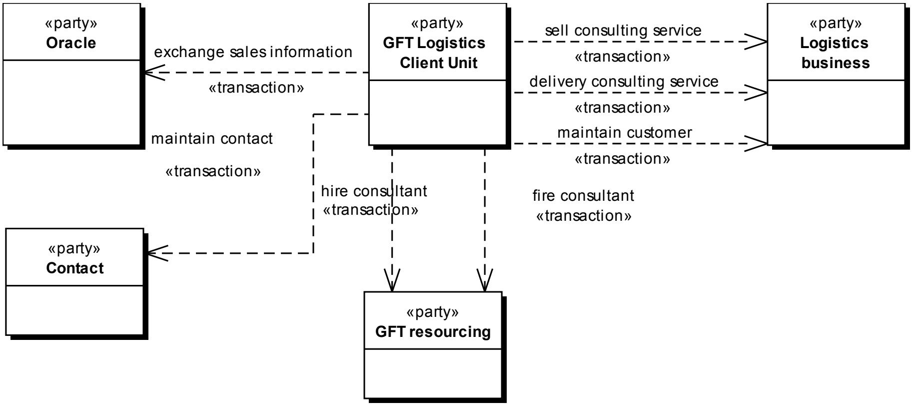

Figure 19.2.: GFT logistics client unit major transactions

19.2.4. Value logic

Six major causal loops were identified in the GFT logistics client unit value logic:

New customers Business development is mainly performed by business developers—they are supported in writing proposal by architects, who are business and IT experts. This business development effort leads to new customers and new projects. As soon as all business developers are fully utilised maintaining contacts and customers, new business developers are hired, which closes the loop.

Repeat projects Business developers must divide their time between maintaining contacts to potential new customers and in maintaining current customers. This customer maintenance should lead to repeat projects, which increases the effort needed in maintaining customers.

Project contacts New projects mostly lead to new contacts, which lead to new business.

Consultant project delivery Projects are delivered by consultants. As soon as all consultants are fully utilised freelance consultants are booked and the process of hiring new consultants begins.

Architect project delivery Architects are also consultants and assist in delivering projects. As soon as all architects are fully utilised the hiring process for new architects is started.

Architect business development Architects also assist in business development.

The value logic is illustrated in Figure 19.3.

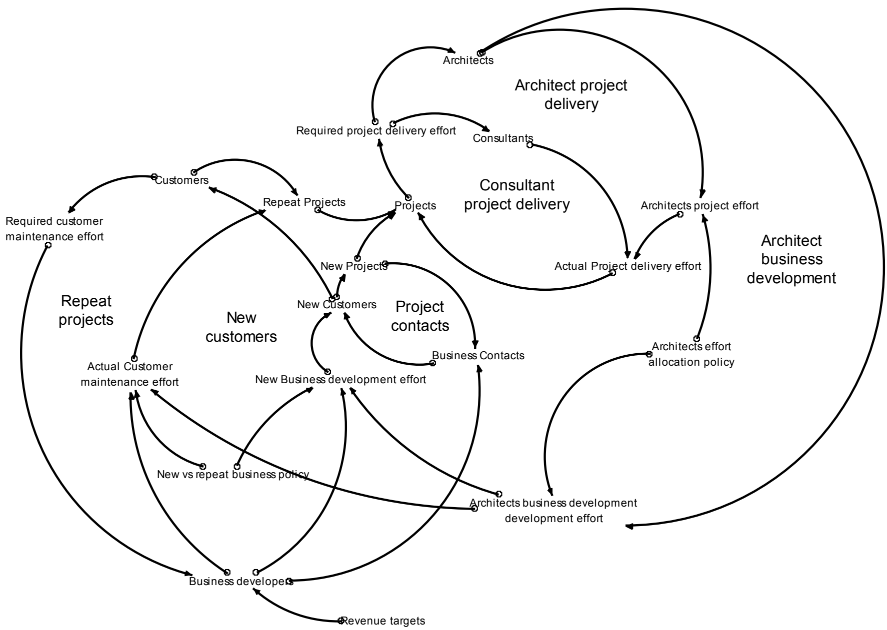

Figure 19.3.: GFT's value logic

19.3. Strategic questions

The idea behind the business model analysis work carried out for GFT was to create a microworld that could be used to explore different team deployment strategies and validate the business plan set up by the logistics client unit.

Strategic Question 19.1 *Can the growth projection in the business plan be fulfilled given the initial resources?*

Strategic Question 19.2 *How do revenue and gross margin depend on initial sales and architecture team size?*

Strategic Question 19.3 *What is the impact of worsening marketing conditions, and how should sales policies be adjusted?*

19.4. Business model details

19.4.1. Product details

The logistics client units products are shown in Figure 19.4: The logistics client units main products are IT consulting projects. These are acquired via the "sell consulting service" transaction and delivered via the "delivery consulting service" transaction. Acquisition is performed by business developers who are assisted in writing proposals by architects. Delivery is performed by consultants, who can be either architects, full-time or freelance.

Two types of project are distinguished—sourcing projects and development projects. Sourcing projects have a time and material budget and consist of single consultants. Development projects are fixed price and consist of a team of consultants.

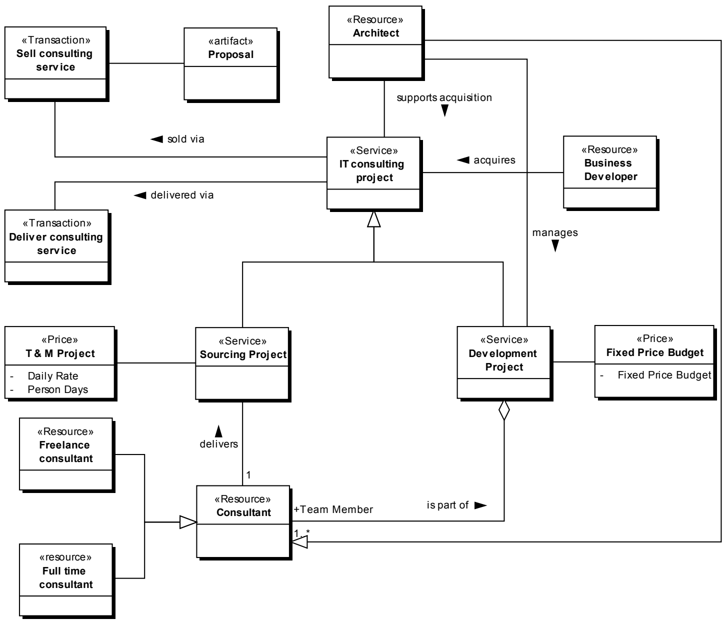

Figure 19.4.: GFT logistics client unit product view

19.4.2. Value dynamics

The SD-model has six modules, reflecting the separation of concerns within the business model. An overview of the value dynamics is given in Figure 19.5:

Sales module The business developers are employed by the client unit, but are separated into a separate module to highlight the interdependencies. The business developers are responsible for contact maintenance, project acquisition and customer maintenance—depending on the number of projects in the sales pipeline and the number of current customers demand is created on the business developers time. This is reflected in the bidirectional relationships between to the client unit and customer modules. The sales cost has an impact on the gross margin the client unit generates, hence the relationship to the value module.

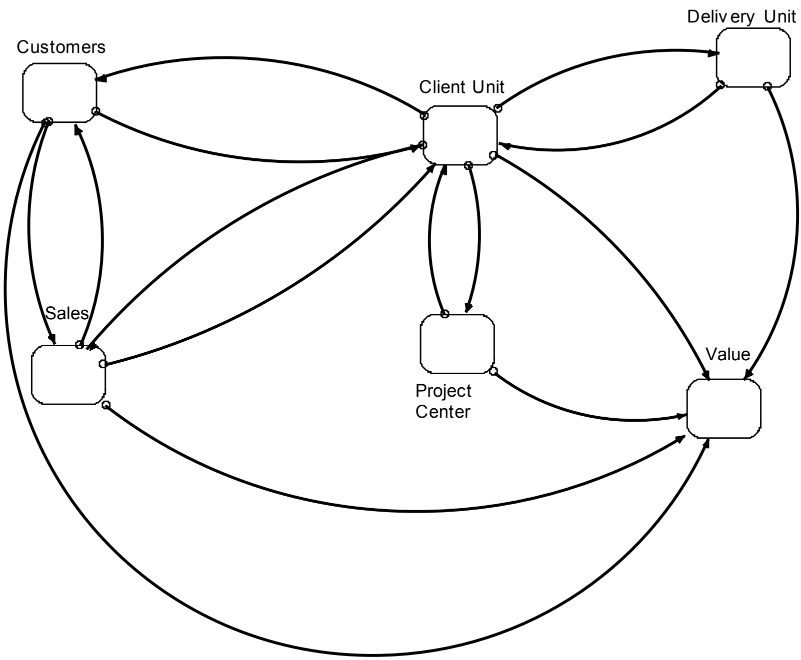

Figure 19.5.: Overview of the value dynamics

Client unit module The client unit is the hub of the model, reflecting the fact that the client unit is responsible for both project acquisition and delivery.

Customer module The customer module keeps track of the number of new and mature customers. The number of current customers has an impact on the revenue generated per customer explaining the relationship to the value module.

Delivery unit module The delivery unit provides highly qualified architects to the client unit—architects assist in project acquisition and are responsible for delivery of development projects. Depending on demand from the client unit new architects are hired. Architects wages have an impact on the gross margin, hence the relationship to the value module.

Project centre module The project centre provides full-time and freelance consultants who assist in project delivery, depending on the demand from the client unit. Consultants wages and fees have an impact on the gross margin.

Value module This module keeps track of the revenue generated and the costs incurred and calculates the gross margin generated by the client unit.

Sales module

The sales module keeps track of the business contacts that are maintained by the business developers, and of the effort required to do so. Potential contacts are first identified, and then qualified. Contact qualification takes a significant amount of business developers effort. Once contacts are qualified they need to be maintained to remain qualified: If the amount of effort spent on contact maintenance by the business developers falls below the effort required, qualified contacts are lost—this has a negative impact on the generation of new business, as discussed in section 19.4.2. Details of the sales module are shown in Figure 19.6.

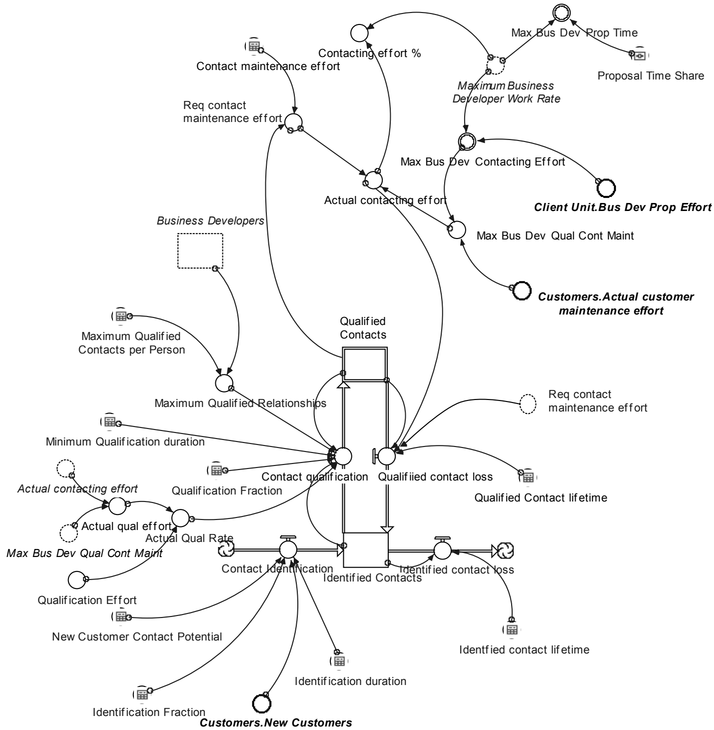

Figure 19.6.: GFT logistics sales module

Client unit module

The client unit module contains the sales pipelines for sourcing and delivery projects and keeps track of the business developers and architects needed for writing proposals, and of the architects and consultants needed for project delivery.

The sales pipelines for the sourcing and delivery projects are very similar and follow the nomenclature used by GFT, therefore only the pipeline for sourcing projects is discussed here— it is illustrated in Figure 19.7: The pipeline has two branches, one for new customers and one for repeat business.

The new customer pipeline starts with potential customers that are successfully po-

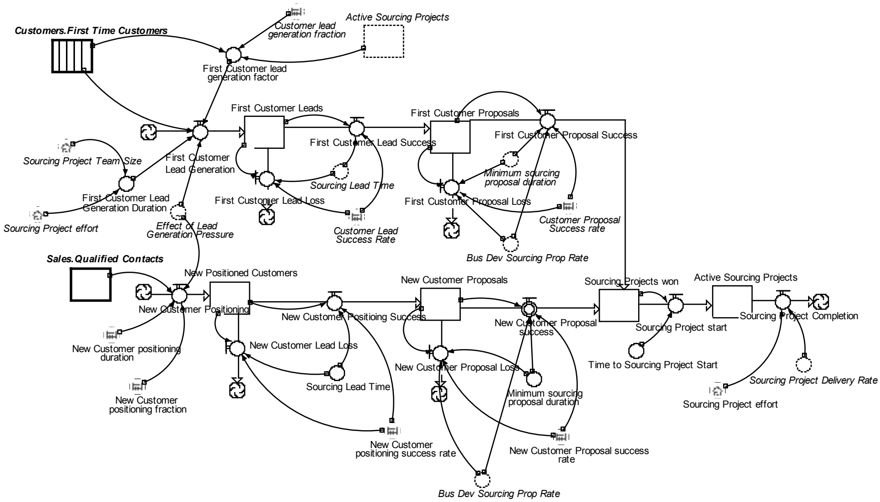

Figure 19.7.: GFT logistics client unit module

sitioned following the contacting activities carried out by the business developers. Some of the positioned customers request proposals, some of these proposals are successful leading to won projects, which become active as soon as they are started. The projects are then delivered depending on available consulting resources. The main assumption in this branch is that positioning success is affected by lead generation pressure (which again depends on the revenue targets), and on the number of contacts the business developers maintain.

The repeat customer pipeline models repeat business generated out of current projects: New project leads are generated from these projects, which may turn in to proposals, which again may lead to won projects. The main assumption in this branch is that new business is not generated until current projects are delivered.

An important assumption of the development project sales pipeline is that development projects can only be sold to regular customers.

Customer module

The customer module contains the customer ageing chain: New customers are acquired and become regular customers after a certain amount of time. Regular customers are important in the model, as experience shows that development projects can only be sold to regular customers.

Business developers must spend effort on customer maintenance—if the effort spent falls below the effort required, customers are lost prematurely. This has a negative effect on repeat business, as discussed in 19.4.2.

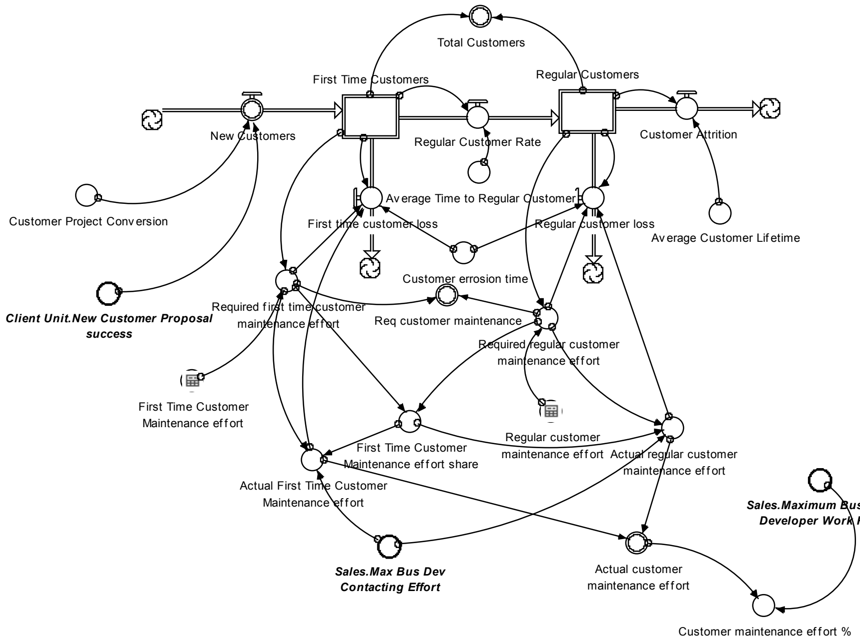

Figure 19.8.: GFT customer module

Delivery unit module

The delivery unit module is very simple and keeps track of the architects that are hired. The hiring rate depends on the demand generated in the client module.

The main assumption here is that architects are hired, but never fired. A more sophisticated model should include a firing policy, but this was not considered here as it did not have a significant impact on the scenarios discussed.

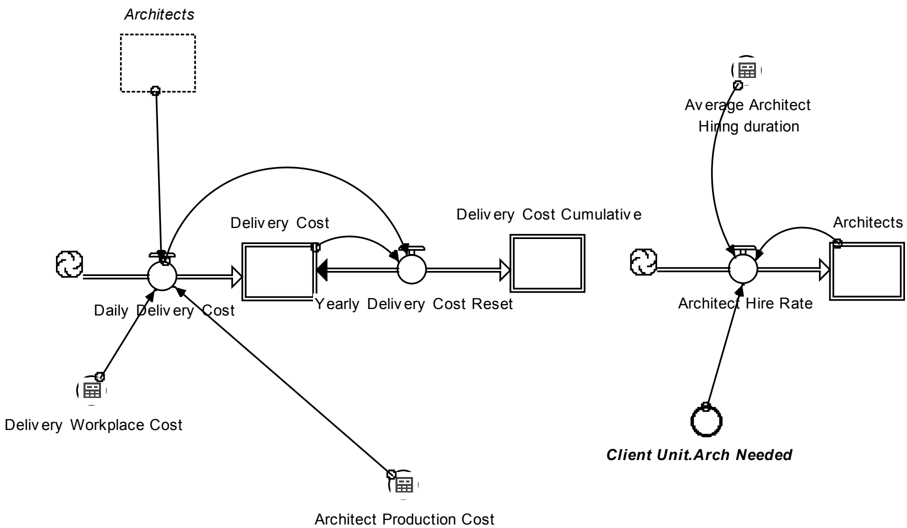

Figure 19.9.: GFT delivery module

Project centre module

The project centre module is similar to the delivery unit module in structure, keeping track of both freelance and regular consultants that are hired due to demand generated in the client unit module.

The hiring policy is such that consultants are hired whenever demand is greater than supply—as hiring consultants takes a lengthy period of time, demand is compensated in the short term using freelance consultants. Freelance consultants are fired whenever demand for consultants drops below the supply (Figure 19.10).

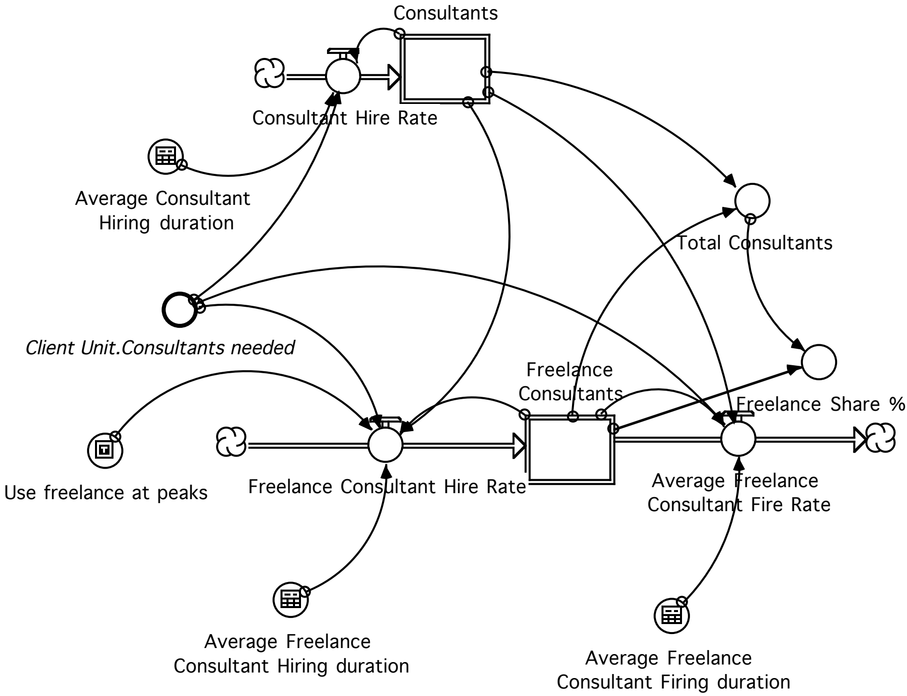

Figure 19.10.: GFT project centre module

Value module

The value module keeps track of the total revenue generated and costs incurred and uses these to calculate gross margins at three levels in accordance with the gross margins used by the GFT client units to monitor financial success[2].

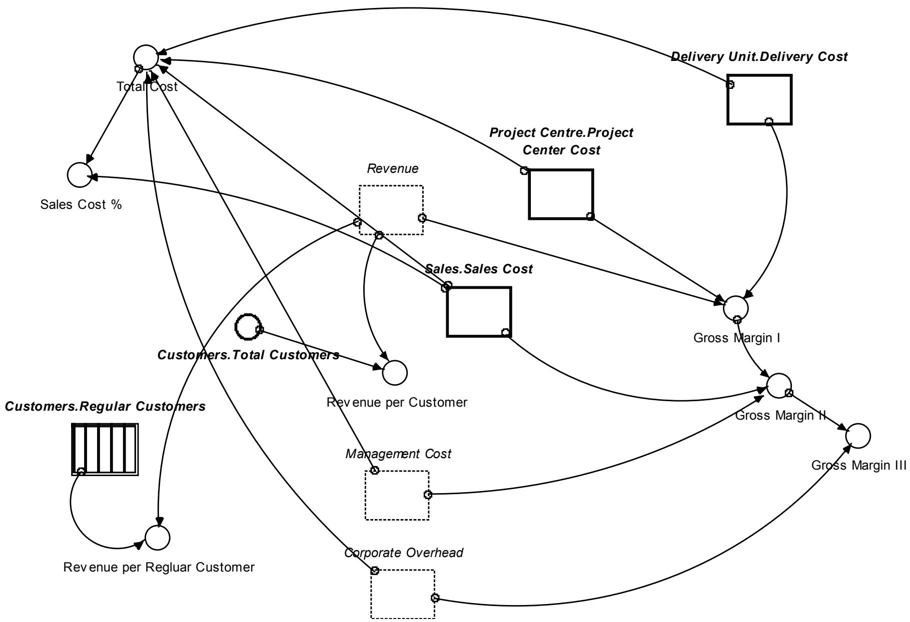

Figure 19.11.: GFT value module

[2]The total value generated by the client unit was not explicitly calculated, but is essentially equivalent to $Gross\_Margin\_III + Sales\_Cost + Management\_Cost$, because all other costs are external to the client unit.

19.5. Scenarios

Using the microworld many different scenarios where analysed, both pertaining to the strategic questions listed in section 19.3 and to new questions that arose during the analysis.

Five major scenarios are discussed here in detail:

Scenario 1: Low revenue target This scenario explores how business will develop given the revenue targets defined by the head of business development for the next 10 years. The major learning from this scenario is that will the revenue target is aggressive initially, it is not aggressive enough in later years, leading to under utilisation of business developers in later years.

Scenario 2: High revenue target In this scenario revenue targets are adjusted to be higher in later years—this leads to better utilisation of business developers and higher revenue. The overall business developer head count remains the same.

Scenario 3: Fewer architects initially The original business plan assumes the logistics client unit will start with four business developers and eight architects. This leads to negative gross margin in the first year due to poor utilisation of the architects. This scenario shows that starting with fewer architects has a positive impact on gross margin during the first year, the later years leading to similar results to those achieved in scenario 2.

Scenario 4: Worsening market conditions This scenario explores how business will develop if market conditions worsen. The main effect of this is that sales targets are not met, but also that current customers are lost because of a neglect in customer maintenance.

Scenario 5: Change of customer maintenance policy This scenario explores how business will develop in worsened market conditions if customer maintenance policy is adjusted to ensure that business developers spend more of their time talking to customers and less of their time writing proposals.

As the client unit had only just been set up, reference data from similar client units was used—in particular this is reference data pertaining to average contact and customer maintenance effort, the sales pipeline and sales success rates, the average size of acquired projects, and consulting fees and personnel cost.

19.5.1. Scenario 1: Low revenue target

The original business plan sets clear revenue targets and assumes that the logistics client unit will start with four business developers and eight architects.

This scenario explores how business will develop given the initial assumptions defined by the head of business development. Figure 19.12 shows how revenue and gross margin develop over a time period of 10 years, compared to the initial revenue target. The revenue target is to high for the first four years, but easily reached from year five onwards. Gross margin is negative in the first year.

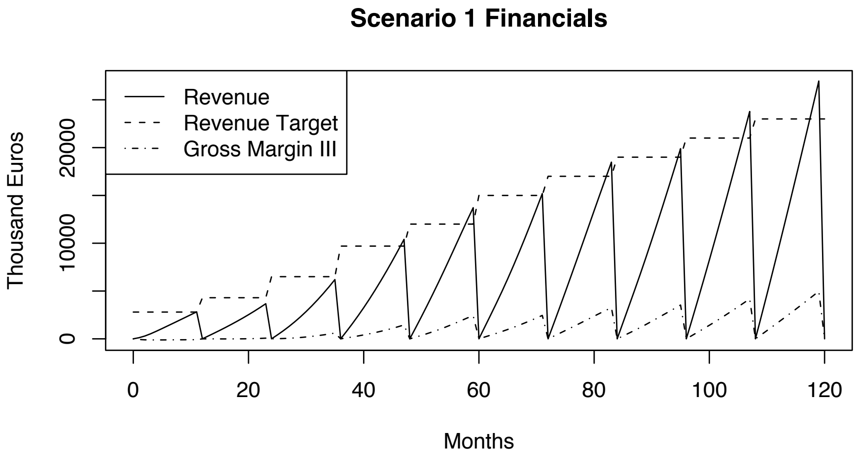

Figure 19.12.: GFT scenario 1 financials

The major learning from this scenario is that while the revenue target is aggressive initially, it is not aggressive enough in later years— this is best seen in Figure 19.13, which compares actual business developer headcount compared to the headcount required for contact maintenance, customer maintenance and project acquisition. This shows that the number of business developers needed drops rapidly after 80 months, leading to under utilisation of business developers in later years[3].

[3] The model does not include firing policies for full-time employees, so the actual headcount remains stable although the number of business developers needed falls

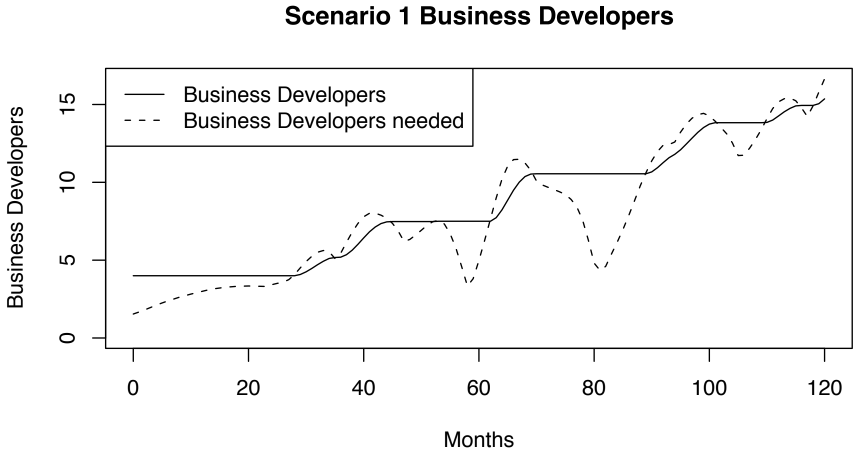

Figure 19.13.: GFT scenario 1 business developers

Another interesting learning from this scenario is shown in Figure 19.14: The sales policies implemented in the model lead to a rapid decline in new customer acquisition after 30 months, because the business developers are fully occupied with maintaining current customers. This suggests that explicit policies should be set to ensure that business developers spend time maintaining contacts and building new customers.

19.5.2. Scenario 2: High revenue target

In this scenario revenue targets are adjusted to be higher in later years, leading to higher revenues and increased gross margins. The revenue targets and revenue for this scenario are compared to those of scenario 1 in Figure 19.15.

Figure 19.16 shows that although the demand for business developers increases due to the higher revenue targets, the maximum business developer headcount remains at 10, leading to better business developer utilisation.

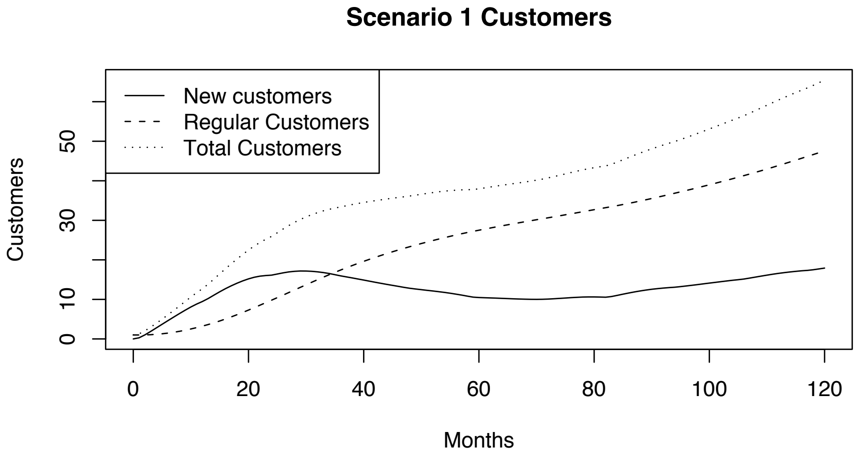

Figure 19.14.: GFT scenario 1 customers

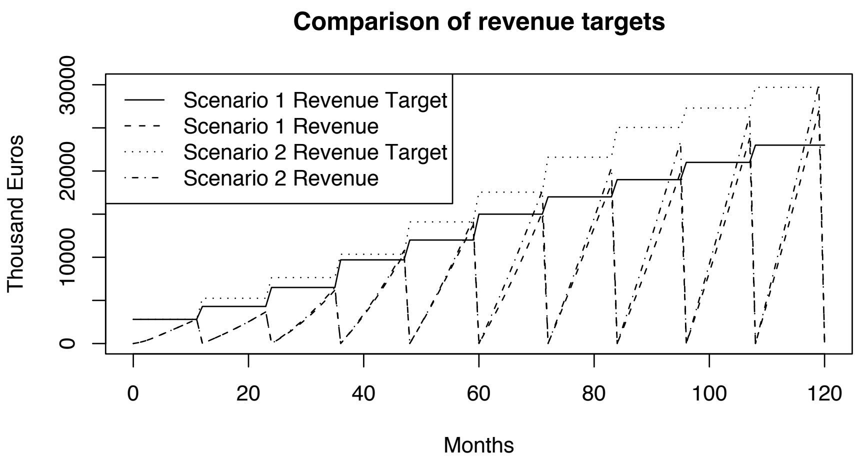

Figure 19.15.: Comparison of revenue and revenue targets

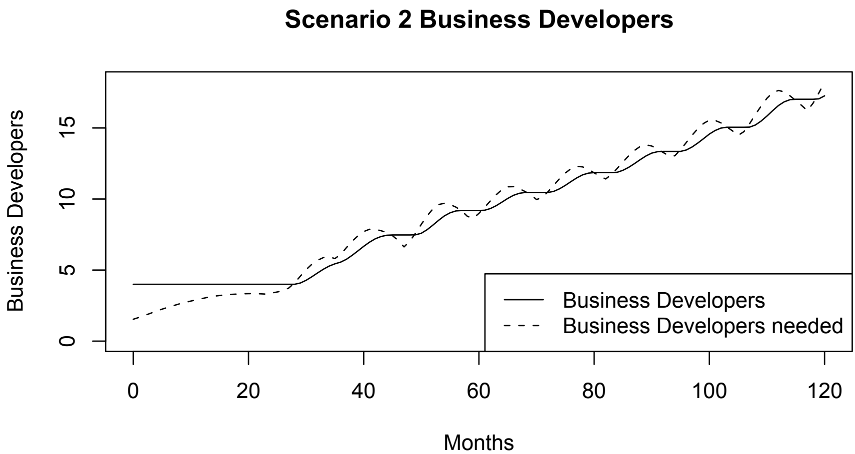

Figure 19.16.: GFT scenario 2 business developers

19.5.3. Scenario 3: Fewer architects initially

The original business plan assumes the logistics client unit will start with four business developers and eight architects. This leads to negative gross margin in the first year due to poor utilisation of the architects. This scenario shows that starting with just one architect has a positive impact on gross margin during the first year, the later years leading to similar results to those achieved in scenario 2. The gross margin development over the first three years for each scenario is displayed in Figure 19.17.

19.5.4. Scenario 4: Worsening market conditions

In Spring 2009 the effect of the world financial crisis began to be felt by the logistics client unit. One obvious change was a decline in sales success factors, another—perhaps less obvious change—was that both the effort required for writing a typical development project proposal and the face-to-face time customers expect from the business developers.

For this scenario, the exogenous parameters reflecting sales success were decreased by 20% and effort required for client maintenance was doubled. As expected, the

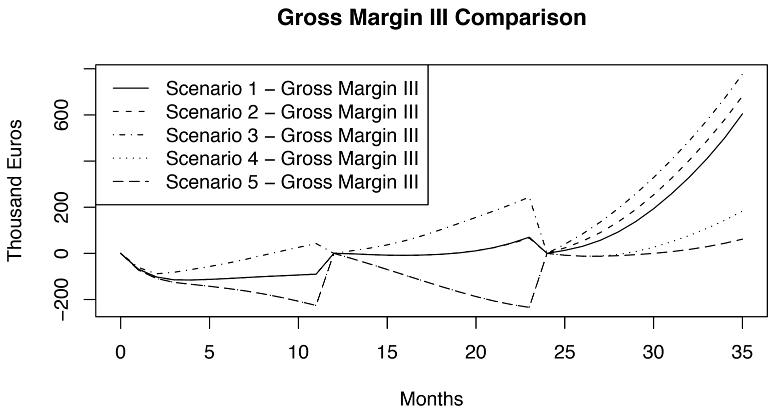

Figure 19.17.: Gross margin comparison — all scenarios

revenue targets are no longer met, even in later years. The financial performance in this scenario is shown in Figure 19.18.

An important observation here is to see how the customer base develops, as shown in Figure 19.19: Due to increased effort needed for customer maintenance, no time is left for acquisition of new clients, leading to a stable but fairly low level of customers.

19.5.5. Scenario 5: Change of customer maintenance policy

In this scenario, the sales success factors are identical to those in scenario 4, but the policy regarding how business developers split their time between contact maintenance and writing proposals is changed towards higher contact and customer maintenance. This leads to a strong improvement in financial performance as displayed in 19.20.

The reason for this stronger performance is that the change in time allocation policy leads to more time being spent acquiring new customers and therefore building a stronger customer base. This is shown in Figure 19.21.

The change in customer maintenance policy leads to a long-term increase in business developer headcount, which explains why gross margin is lower in this scenario despite good revenue development.

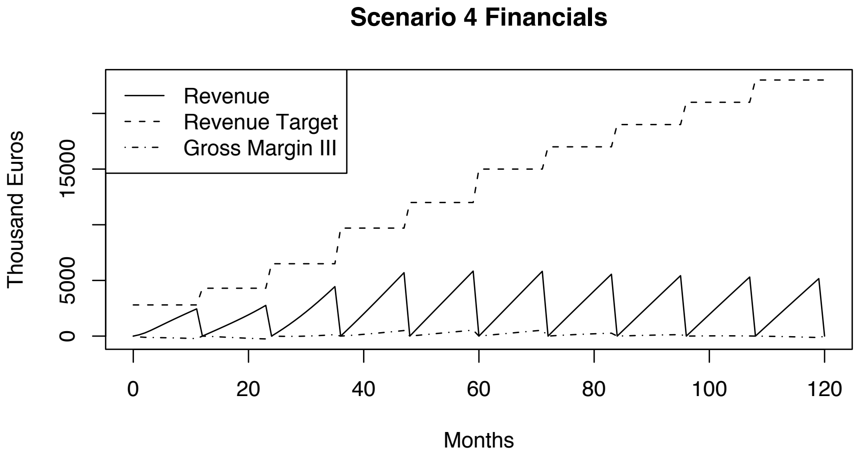

Figure 19.18.: GFT scenario 4 financials

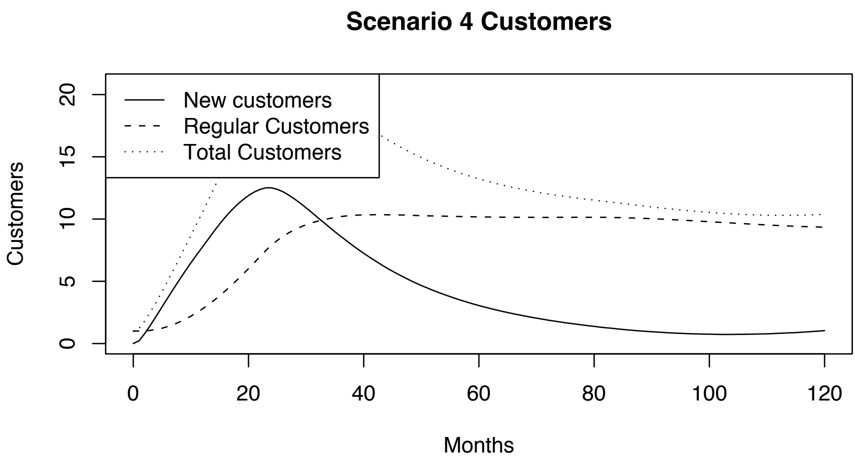

Figure 19.19.: GFT scenario 4 customers

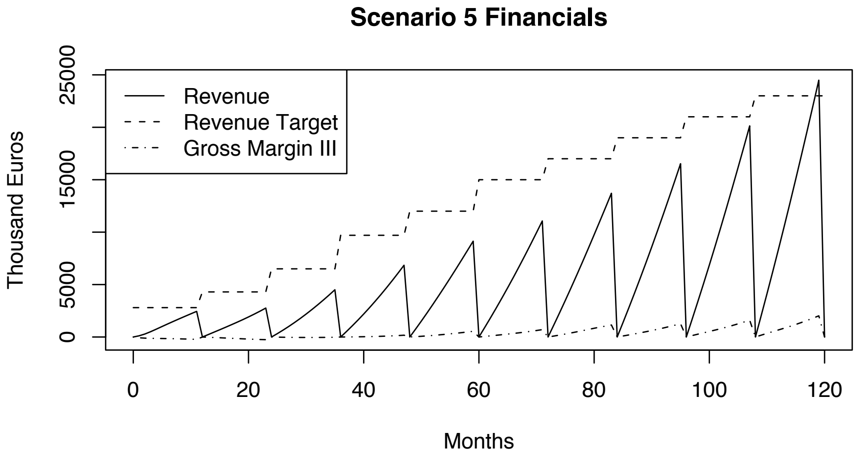

Figure 19.20.: GFT scenario 5 financials

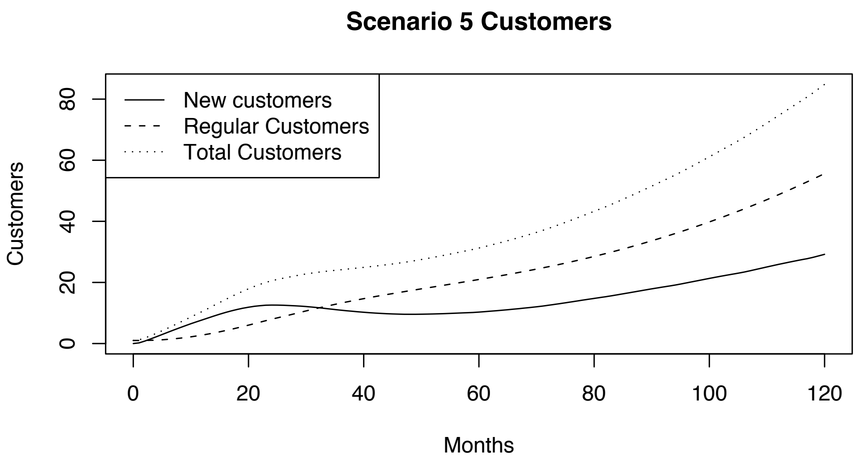

Figure 19.21.: GFT scenario 5 customers

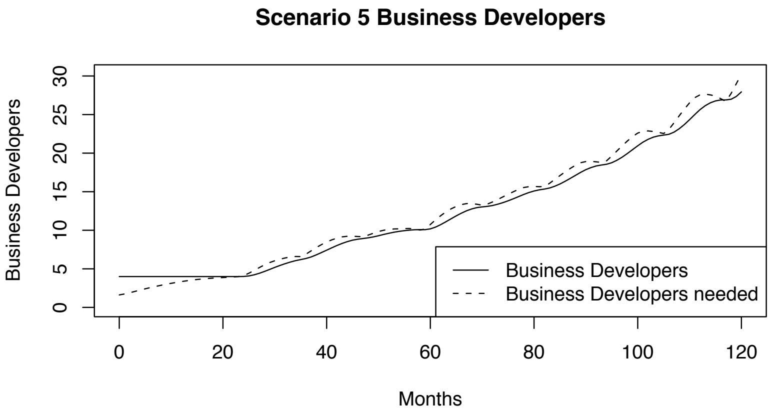

Figure 19.22.: GFT scenario 5 business developers

19.6. Recommendations

The following recommendations were derived from the scenarios evaluated:

- Adjust revenue targets to be higher in later years. As the revenue targets are long term, the assumptions regarding sales success need to be reevaluated regularly.
- To ensure gross margin is positive early the team should start with fewer architects initially.
- Critically monitor time business developers spend on writing proposals vs. time they spend on contact and customer maintenance activities.
- Ensure that customer and contact maintenance effort spent is inline with customer expectations and explicitly define appropriate time allocation policies. This is particularly important in poor market conditions were customers need more attention.
- The good revenue development depends strongly on assumptions about exogenous factors such as sales success. These factors needed to monitored regularly to ensure they are realised in practice.

Chapter 20.

Valtech Germany

Valtech is a pioneer and a thought leader in the field of Agile software development. Valtech has developed its own unique Agile adoption methodology by building on the extensive experience it has accrued over the past eleven years. This approach provides Valtech's clients with the momentum and ready-to-use structure needed to "go Agile". In addition, Valtech also provides accelerated knowledge transfer and just-in-time learning services.

Valtech offers management consulting, IT consulting and global sourcing to companies world-wide. The German division focuses on the banking and insurance, the aerospace, the telecommunication and the automotive markets. Valtech currently has over 1100 employees worldwide and over 70 employees in Germany.

20.1. Current situation

This case study was carried out from August 2008 until March 2009. The main participants on Valtech's side were the CEO and CFO of the German subsidiary. The head of business development and the branch heads where involved as needed. Major stakeholders of the analysis were Valtech's senior consulting staff, the principal consultants.

Valtech's main issue in operationalising its business model is how to divide the know-how development, project acquisition and project delivery responsibilities among its principal consultants:

- Should selling be done by dedicated sales specialists, or by Valtech's principal consultants?
- Is know-how development done by principal consultants who work on consulting projects, or by an in-house "think-tank" of senior consultants that have no other responsibilities?
- Whose responsibility is it to transfer new product know-how to more junior consultants?

- Which goals and incentives should be set for the principal consultants?

Valtech had been discussing theses issues for some time when the study began and was particularly drawn to the ideas discussed by Maister (1997) on managing professional service firms—In particular the key performance indicator (KPI)-formula for the professional services detailed in Maister (1997, p. 32-39) had been found valuable:

$$\begin{aligned} \frac{Profit}{Partner} &= \frac{Profits}{Fees} \times \frac{Fees}{Hours} \times \frac{Hours}{Staff} \times \frac{Staff}{Partners} \\ &= Margin \times Value \times Utilisation \times Leverage \end{aligned} \tag{20.1}$$

It was quickly decided by the stakeholders that improving the margin was an operative hygiene measure and that business model analysis should focus on the key performance indicators *value*, *utilisation*, and *leverage*. An early analysis—depicted in Figure 20.1—showed that these KPI's are highly dependent and that clear policies are needed concerning allocation of principals' time to sales, project delivery, innovation and standardisation:

- Utilisation depends both on the effort a typical project requires and on the number of consultants involved in a project (the project leverage).
- The project leverage is dependent on product standardisation—if the content of every project is unique then only high-skilled consultants can delivery them, leading to lower leverage.
- The value (fees) that can be generated by a project depends on how innovative the consulting product is.
- High product innovation is detrimental to product standardisation, both at the level of selling the product in a standardised way as at the level of delivering it in a standardised way.
- Standardising products also means that know-how has to be transferred to consultants, which is a further burden on principals' time.

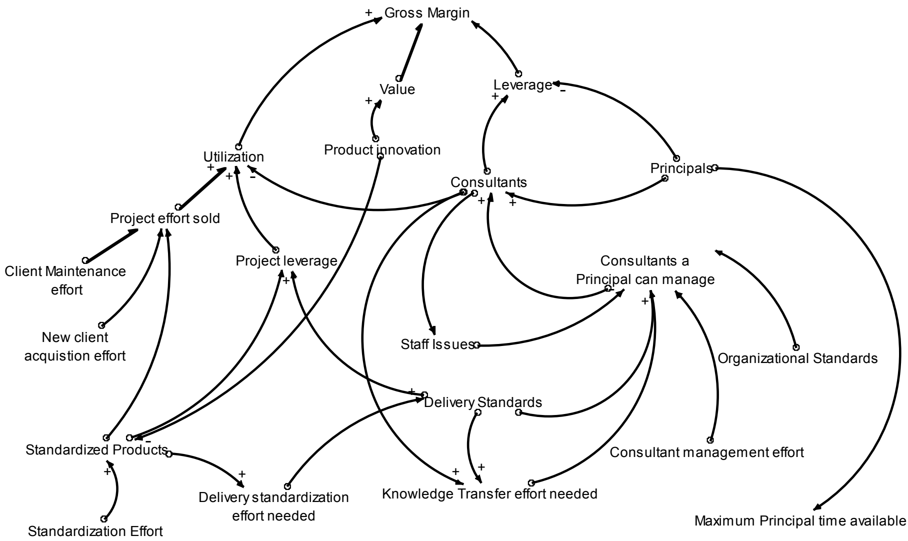

Figure 20.1.: Dynamic interdependencies between KPI's

20.2. Conceptual overview of the business model

20.2.1. Products

Valtech's products are IT consulting services that are sold and delivered in the form of projects. Two kinds of projects are distinguished: Fixed price projects and time and material projects. Sales figures show that fixed price projects are much more difficult to sell, but they offer better scalability and higher returns due to the increased risk. Time and material projects have better sales figures and are low risk, but mostly consist of a single consultant only and thus offer little scalability.

20.2.2. Value Network

Valtech's value network consists of: its customers, Valtech Offshore and important business contacts.

Valtech's Customers Valtech's customers are located within the aerospace, automotive, banking and telecom industries.

Valtech Offshore Valtech International has an offshore subsidiary located in India. The offshore capabilities are used both to widen the product portfolio through offshore services and as a resource pool.

Contacts These provide the leads that may eventually turn into new projects and thus lead to new customers.

Valtech's value network is displayed in Figure 20.2.

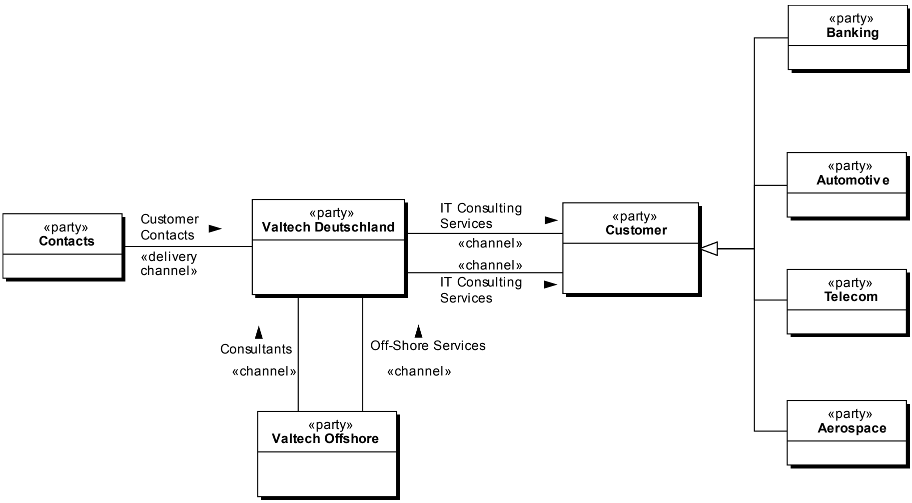

Figure 20.2.: Valtech's value network

20.2.3. Transactions

The main transactions Valtech engages in are:

Sell consulting services Consulting services are sold by the heads of branch and the principal consultants.

Delivery consulting services Consulting services are delivered by principals and consultants.

Maintain business relationships Consulting services are mostly only sold to long standing, mature business relationships. Maintaining business relationships is therefore a core transaction in the business model. Business relationships are maintained by the heads of branch and the principal consultants. Business relationships include contacts who may become customers and all current customers.

Hire and fire consultants Valtech works with as few freelance consultants as possible, so the hiring process is very important.

20.2.4. Value logic

Conceptually Valtech's value logic operates as follows: The sales process starts with a concrete business opportunity. Both the number and quality of such business opportunities have improved in recent years through access to high-level contacts with budget making power. Access to these contacts has improved due to both increased market credibility, through a sales partnership with a well-connected individual "rain-maker", and a service partnership with a tool-vendor.

The main driver for business opportunities is the product portfolio of both business and IT consulting services. If all goes well these business opportunities turn into concrete sales objectives and finally into IT solutions projects and business consulting projects [1]. These projects enable Valtech's consultants to improve both their horizontal, technically oriented skills as well as their vertical, domain oriented skills. These improved skills in turn help increase Valtech's market credibility and refine Valtech's product portfolio, leading to new business opportunities. A causal loop diagram of this conceptual model is illustrated in Figure 20.3.

Analysis of the main causal loop shows that the following capabilities are important for Valtech's business model to be successful:

- Sales capabilities for business opportunity and sales objective management.
- Consulting skills for service delivery.
- Know-How management, innovation management and product development skills for creation of up-to-date consulting products.
- Management skills to ensure that products developed match both market requirements and consultant skills.

[1] Valtech follows the Miller-Heiman sales process as discussed in Miller et al. (2005) and Miller et al. (2005), the terms *Business Opportunity* and *Sales Objective* are used accordingly.

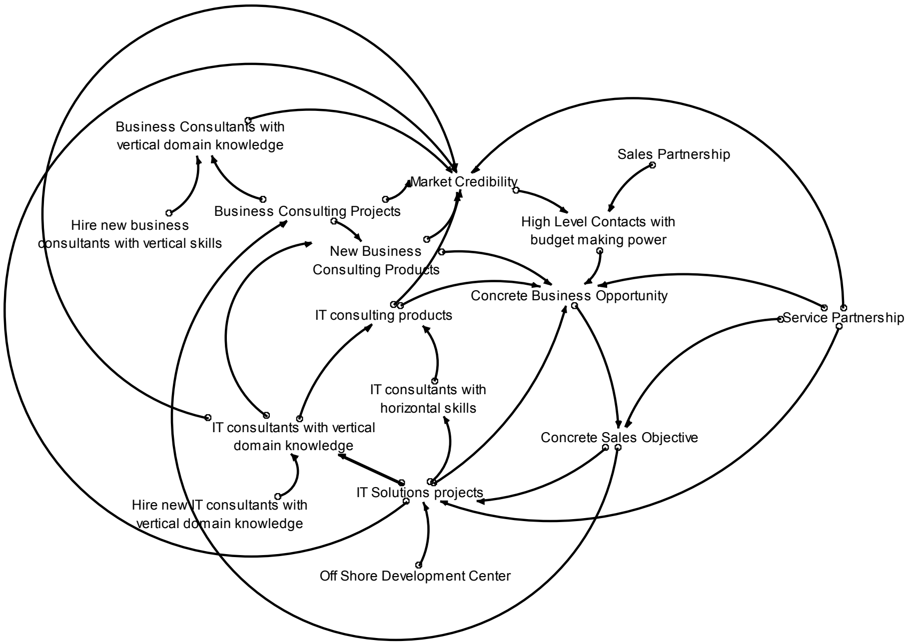

Figure 20.3.: Conceptual model of Valtech's value logic

20.3. Strategic questions

Based on the discussion above, the following strategic question was formulated:

Strategic Question 20.1 *Which organisational policies should be followed to ensure value is maximised within Valtech's business model, and how should these policies be operationalised within the organisation?*

In particular this means finding an answer to how effort should be distributed between the following tasks, given the current market and customer situation:

- Generating repeat business through client maintenance
- New customer acquisition

- Attention to project delivery
- Recruitment and consultant development
- Development of new consulting products

20.4. Business model details

20.4.1. Product details

The company distinguishes between *delivery projects* (which are fixed price) and the time and material *IT consulting* and *Solution* projects. IT consulting projects are low know-how projects with little profile, solution projects are high profile, high know-how projects.

All projects are acquired by heads of branch and principal consultant resources and are delivered by principal consultants (how take the project lead) and consultants. It is a business policy that a principal consultant should not be involved in more than two projects at a time.

Valtech's product view is shown in 20.4.

20.4.2. Value dynamics details

The value dynamics view of Valtech's business model examines how the elements of the structural model (such as customers, consultants and projects) are changed by the business transactions (such as selling projects, hiring and firing consultants) in the behavioural model.

The structural and behavioural model therefore form an important basis for developing and validating the dynamic model.

A high-level overview of the value dynamics is depicted in Figure 20.5 and briefly discussed here. The details of each module are discussed subsequently:

Principals The principals are Valtech's most senior consultants. Their top priority is writing proposals that bring new revenue. The remaining time is spent hiring and firing consultants, managing and working in projects, maintaining business contacts and creating and standardising new consulting products. Their central role in the business model is evident from 20.5: The principal module is the only module that is connected to all other modules.

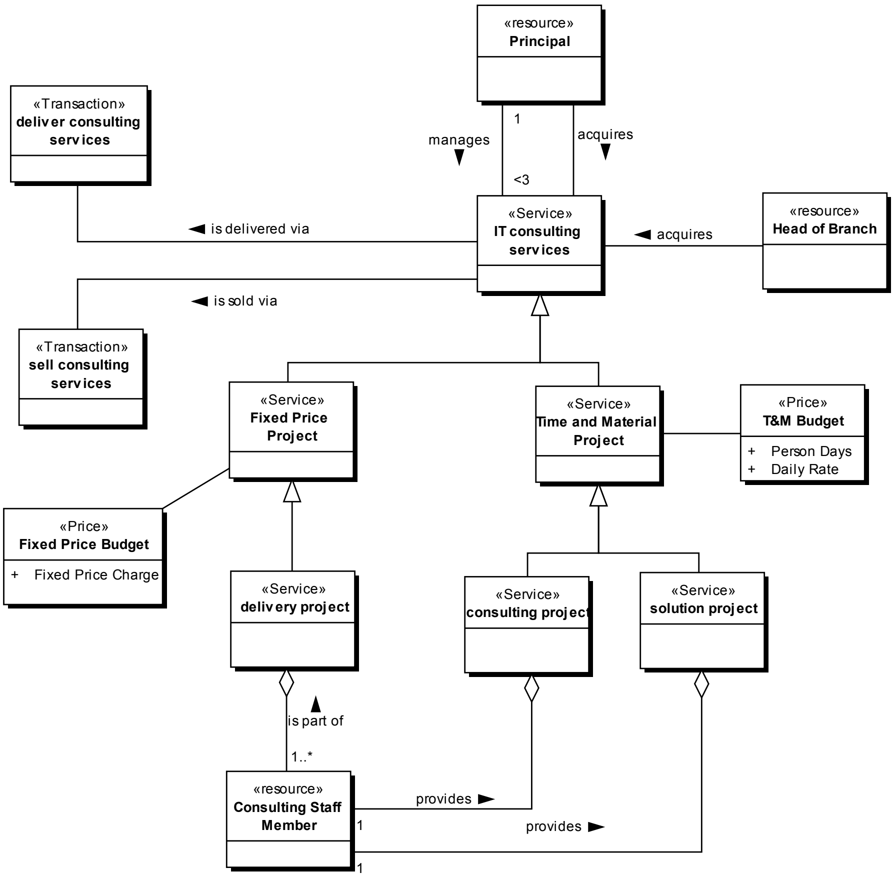

Figure 20.4.: Valtech's product view

Contacts Each principal maintains a list of qualified contacts, who provide leads that may ultimately lead to new projects and customers—identifying, qualifying and maintaining contacts costs principal's time, which is then not available for project work and consultant management. If the partners invest to little time in their contacts the number of contacts diminish, ultimately reducing the number of leads generated.

Projects Principals are also responsible for following up on leads, writing proposals and winning new projects. Projects may be won from new customers or from current customers (i.e. new business or repeat business). In Valtech's experience winning a new customer is much harder than winning repeat business from a current customer, a fact that is reflected in the model via two distinct sales pipelines, one for new customers and one for repeat business. Projects are characterised by total project effort and the average team size deployed.

Consultants Consultants are needed to delivery projects and are hired and fired by a full time recruitment officer, assisted by the principals. The hiring policy is driven by a yearly consultant growth target. This target is set by senior management and is independent of immediate demand for consultants by projects—the target is modelled as a constant, the target setting mechanisms are currently not considered. A consultant fluctuation rate is included in the model, consultant growth is constrained by a maximum principal to consultant ratio (the "maximum leverage").

Customers The customer module discerns between new and mature customers: New customers require a higher maintenance effort, mature customers are more likely to purchase substantial solution projects. Customers are maintained by principals, thus cutting back even further the time principal have for project work. It is assumed in the model that customers have a very long life time.

Products Principals are responsible for product development. This follows a simple process: Innovative ideas that arise in projects are developed into mature, marketable products. Only marketable products lead to consistently high consulting fees. To ensure high leverage in projects (i.e. deployment of more junior consultants as opposed to principals) these products must be standardised and knowledge transferred from principals to consultants.

Value Value is calculated via two gross margins: The Gross_Margin_I represents revenues minus direct project costs (which in this model is equivalent to the consultants wages), Gross_Margin_II is equal to Gross_Margin_I less the sales costs.

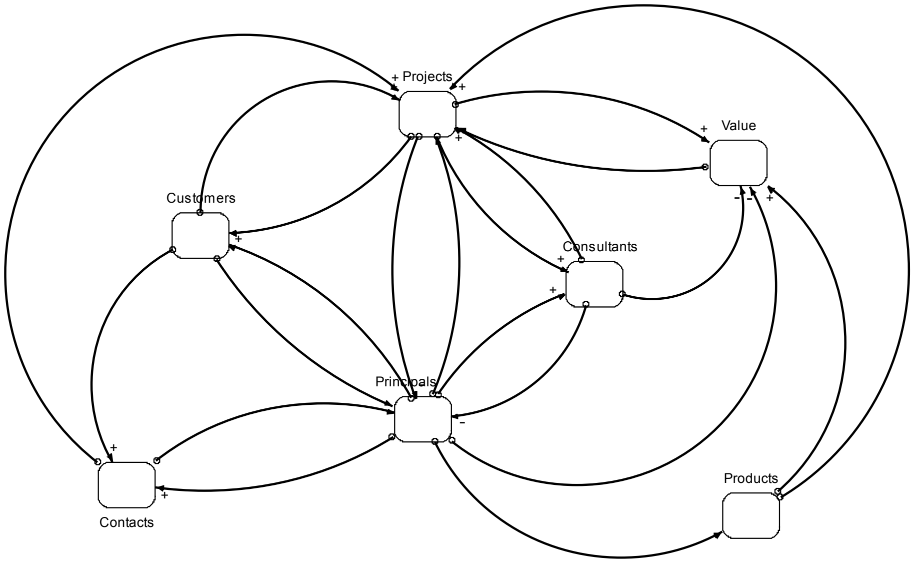

Figure 20.5.: High-Level dynamics of Valtech business model

Principal Dynamics

In the current model, the total number of principals consultants is constant. Currently Valtech has fourteen principals (including the four heads of branch) and only 45 consultants in the initial setting—as the desired principal to consultant ratio Maximum_Leverage is initialised to 20, this restriction is acceptable and does not affect the analysis:

$$Total\_Principals = Principals + Heads\_of\_Branch \tag{20.2}$$

The principals are involved in all major business processes, therefore the main task of the principal module is to manage and track principals allocation of effort to these processes. Principals allocate their time according to the following prioritisation:

1. Writing proposals
2. Hiring consultants

3. Working in projects (project management and architectural work)
4. Contact Maintenance (lead generation and client maintenance)
5. Product development

The maximum time principals can allocate is calculated as:

$$\begin{aligned} Max\_Principal\_Work\_Eff &= Total\_Principals \\ &\times Average\_Principal\_Work\_Eff \end{aligned} \tag{20.3}$$

The principals number one priority is to write proposals, in the extreme case they allocate all their time to this task:

$$\begin{gathered} Max\_Principal\_Proposal\_Eff = \\ Max\_Principal\_Work\_Eff \end{gathered} \tag{20.4}$$

In most scenarios the actual time allocated to writing proposals is less, the remaining time is allocated to the next most prior task, hiring consultants:

$$\begin{aligned} Max\_Principal\_Hiring\_Eff &= Max\_Principal\_Work\_Eff \\ &- Principal\_Work\_Eff \end{aligned} \tag{20.5}$$

The remaining time is shared between projects, contact maintenance, and product development. As either of these tasks could be a full time task, the principals have to make a conscious decision concerning their allocation of time between these tasks, leading to the following equations:

$$\begin{aligned} &Max\_Principal\_Project\_Eff = \\ &\qquad MAX(Max\_Project\_Time\_Share \\ &\quad\times\ (Max\_Principal\_Hiring\_Eff \\ &\quad-\ Hiring\_Eff), 0) \end{aligned} \tag{20.6}$$

$$Max\_Contact\_Maintenance\_Eff = \tag{20.7}$$

$$
\begin{aligned}
& MAX(Max\_Contact\_Maintenance\_Time\_Share \\
\times\ & (Max\_Principal\_Hiring\_Eff \\
-\ & Principal\_Project\_Eff), 0)
\end{aligned}
$$

$$
\begin{aligned}
Maximum\_Product\_Eff = & \\
& MAX(0, \\
& Max\_Principal\_Hiring\_Eff \\
-\ & Principal\_Project\_Eff - Contacting\_Eff)
\end{aligned} \tag{20.8}
$$

These dynamics are illustrated in Figure 20.6.

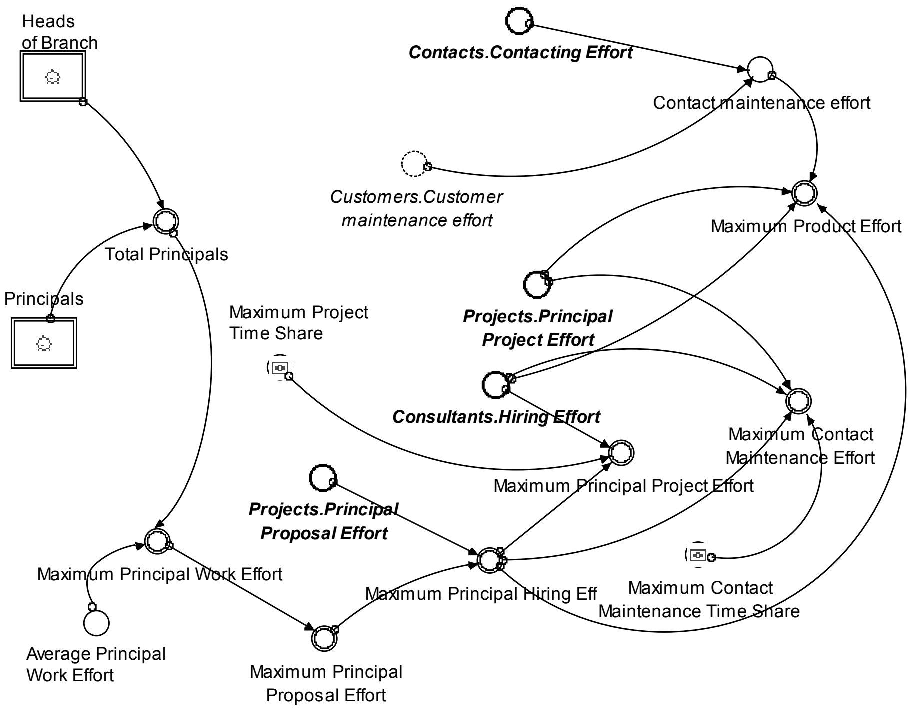

Figure 20.6.: High-Level dynamics of principal submodule

Contact Dynamics

Contacts are the basis for lead generation. They follow a fixed life cycle: First contacts must be identified. At this stage a contact is literally just that: contact information belonging to a person that may be a potential client of the firm. Identifying contacts takes time (duration)—the effort is not accounted for separately though, as contacts are mostly identified while performing other activities (such as working in projects). In the current model the only source for new contacts are new customers, as most new contacts are made within projects. Other sources could easily be added, but this does not seem necessary as there is no bottleneck here. Once contacts have been identified, they need to be qualified: Not all contacts are potential new customers. Contact qualification requires conscious principal effort and is therefore constrained by Max_Contact_Qualification_Rate (which in turn depends on the time principals have available for contact maintenance) and takes a minimum amount of time Min_Qualification_Dur. Only a certain fraction of identified contacts Contact_Qualification_Frac actually qualify. These leads to a dynamic qualification rate Contact_Qualification_Rate. This rate is constrained by the fact that a principal can only manage a limited amount of qualified contacts (Max_Qualified_Contacts_Per_-Principal=50 in the initial setting).

To remain qualified contacts require principals' maintenance time, otherwise they fall back to the identified stage. Identified contacts also have a finite lifetime, defined by Identified_Contact_Lifetime.

These dynamics are illustrated in Figure 20.7.

Project Dynamics

The project dynamics module is by far the most complex module of the dynamic model: It contains three separate project acquisition and delivery chains (one chain for each product: delivery projects, solution projects and consulting projects) and the accounting mechanisms that track the effort needed from consultants and principals during project acquisition (e.g. writing proposals) and project delivery. Structurally the chains are (almost) identical, but the actual acquisition and delivery rates differ for each project type. The structure of the model will be described here using the project chain for delivery projects.

The project chain models the life cycle of a project beginning at the initial lead, which turns into a concrete proposal, then into a project that has been won, and finally into a project that is delivered and completed.

The chain has two parallel sub-chains: One sub-chain is for projects that are won

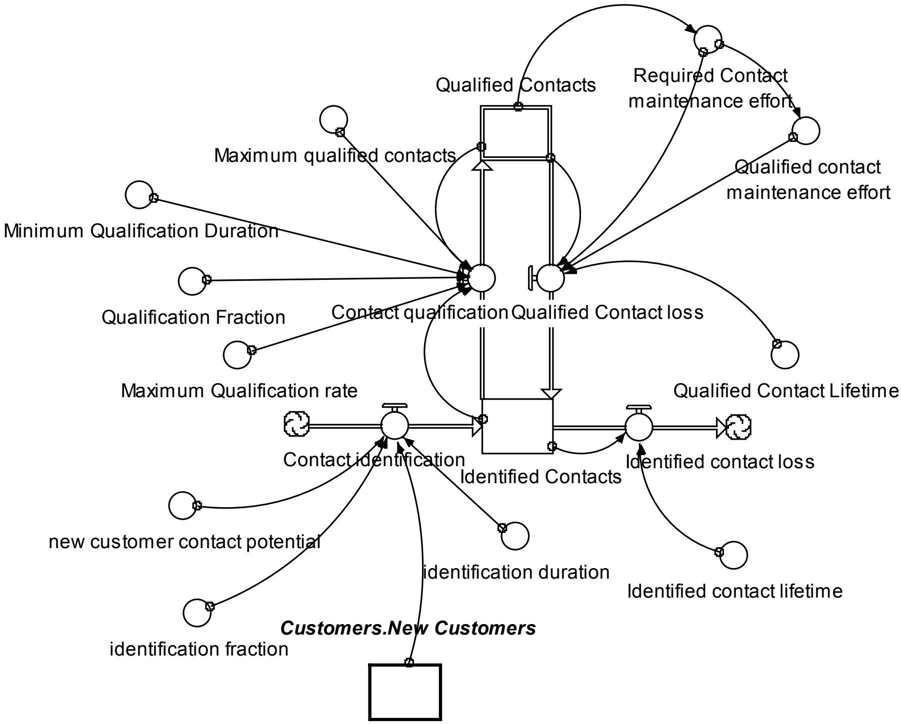

Figure 20.7.: High-Level dynamics of contact submodule

from new customers ("first time customer sub-chain"), the second sub-chain is for projects that are won from mature customers ("repeat customer sub-chain"). Especially delivery projects have been difficult to sell to first time and new customers; this is not true for consulting and solution projects.

The lead generation rate for first time customers First_Time_Delivery_Lead_Generation depends directly on the current number of Qualified_Contacts, the fraction of leads generated from these contacts First_Time_Delivery_Lead_Fraction and the time it takes to generate these leads First_Time_Delivery_Lead_Generation_Duration.

There are two further influences to the first time lead generation rate: The Lead_-Generation_Pressure and the Effect_of_Delivery_Project_per_Principal:

The Lead_Generation_Pressure represents the idea that the pressure to generate leads goes down once the targets set by management are achieved. In Valtech's case the incentive to generate leads is a financial reward that is not constrained—therefore there is always an incentive to generate more leads. For this reason Lead_Generation_Pressure is set to 1 in this model.

The Effect_of_Delivery_Project_per_Principal arises due to the fact that the number of projects a principal can manage cannot become too large and is set to

$$Effect\_of\_Delivery\_Project\_per\_Principal = \\ MAX(0, MIN(3 - 2 \times Delivery\_Project\_per\_Principal, 1)) \tag{20.9}$$

This ensures that the incentive to generate new leads goes down once each principal is responsible for one delivery project on average.

Leads must be further qualified to get to the next stage in the sales process, delivering proposals. Qualifying leads does not require any effort, but the qualification process has a fixed duration of Delivery_Lead_Closing_Duration days. Of course not all leads actually reach the next stage—only the fraction defined by First_Time_Delivery_Lead_Success_Fraction do. This is a constant that is set using historical values derived from Valtech's sales figures.

Once a project has reached the proposal stage, a large amount of principals' effort is required to move things forward and actually win the project: The less time principals can invest in writing and closing proposals, the longer this process will take. As writing proposals is the principals' top priority, the time a principal can invest on a proposal only depends on how many proposals he is currently involved in, i.e. the share of his proposal time he can devote to a particular proposal, Delivery_Proposal_Effort_Share. This effort share is calculated as the share of effort required for delivery proposals compared to the total effort required for proposals:

$$Delivery\_Proposal\_Effort\_Share = \\ \frac{Required\_Delivery\_Proposal\_Effort}{Required\_Proposal\_Effort} \tag{20.10}$$

$$Principal\_Delivery\_Proposal\_Effort = \\ Principal\_Proposal\_Effort \times Delivery\_Proposal\_Effort\_Share \tag{20.11}$$

These interdependencies are illustrated in 20.8 and 20.9.

The dynamics of writing proposals are illustrated in 20.9: Depending on the Delivery_Lead_Success_Rate and the Effort_per_Delivery_Proposal the effort required to close all proposals accumulates in the stock Delivery_Proposal_Effort.

$$\begin{aligned} &Required\_Delivery\_Proposal\_Effort = \\ &\qquad Delivery\_Lead\_Success\_Rate \\ &\quad \times \quad Effort\_per\_Delivery\_Proposal \\ &Principal\_Proposal\_Effort = \\ &\qquad MAX(MIN(Required\_Proposal\_Effort, \\ &\qquad Principals.Maximum\_Principal\_Proposal\_Effort), 0) \end{aligned} \tag{20.12}$$

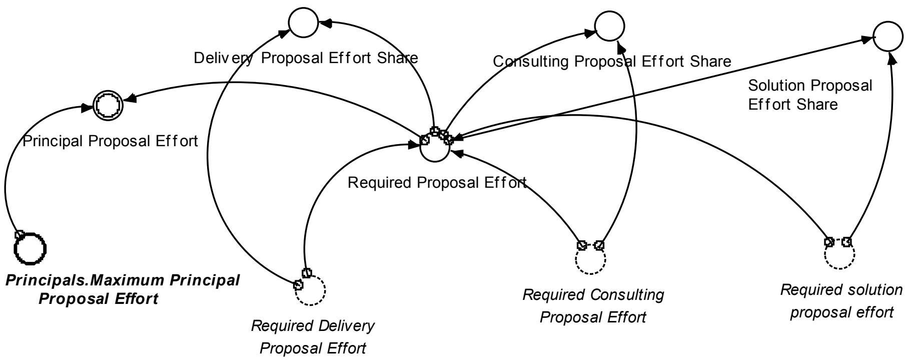

Figure 20.8.: Structure for calculating the proposal effort shares

The more effort Principal_Delivery_Proposal_Effort that Principals invest into writing proposals the faster proposals are written and closed:

$$\begin{aligned} &Delivery\_Proposal\_Writing\_Rate = \\ &\qquad Principal\_Delivery\_Proposal\_Effort \\ &\quad \times \quad Effort\_per\_Delivery\_Proposal \end{aligned} \tag{20.13}$$

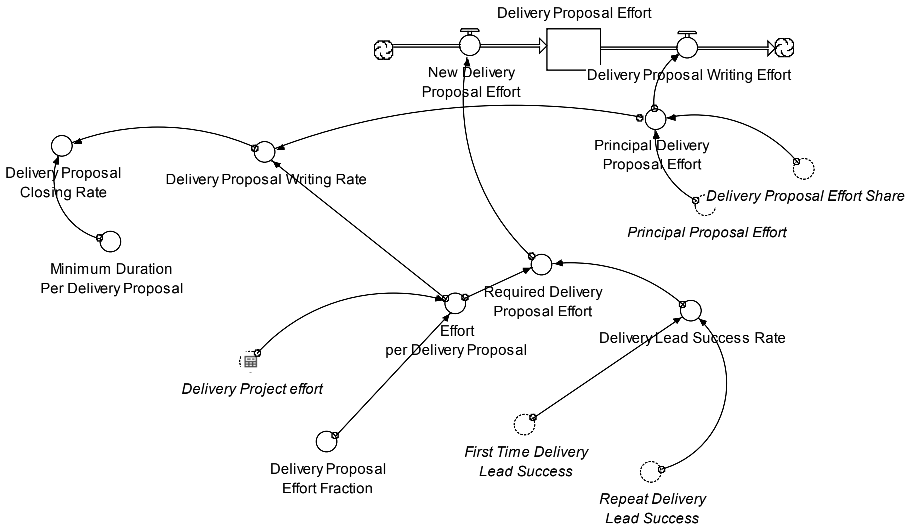

Figure 20.9.: Dynamics of writing proposals

But the closing rate Delivery_Proposal_Closing_Rate does not only depend on the time principals have available: There is also a fixed minimum duration Minimum_Duration_Per_Delivery_Proposal involved. This variable depends on many exogenous influences and is therefore set to a constant of 40 days.

$$\begin{aligned} &Delivery\_Proposal\_Closing\_Rate = \\ &\quad MIN(Minimum\_Duration\_Per\_Delivery\_Proposal^{-1}, \\ &\quad Delivery\_Proposal\_Writing\_Rate) \end{aligned} \tag{20.14}$$

In addition, only a constant fraction First_Time_Delivery_Proposal success fraction of projects are actually won. This constant was again derived from Valtech's sales figures.

Once projects are won, they wait Average_Time_To_Delivery_Project_Start time until they are started. Then delivery commences and proceeds at a rate Delivery_Project_Completion_Rate.

Project acquisition and delivery dynamics are illustrated in Figure 20.10.

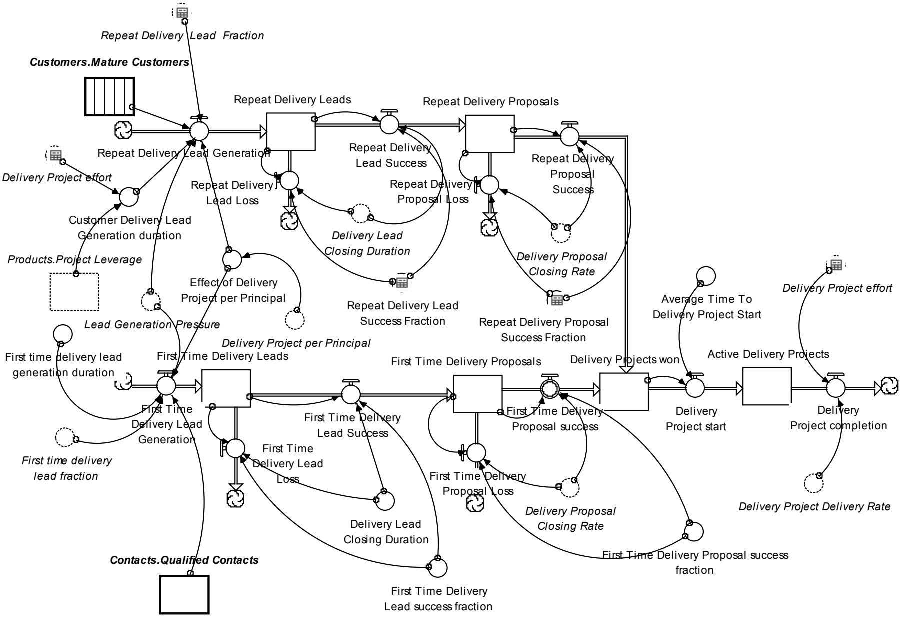

Figure 20.10.: High-Level dynamics of project acquisition and delivery

The delivery rate Delivery_Project_Delivery_Rate depends on how much delivery capacity is available (i.e. how many consultants are available for project work), and how much of this capacity is devoted to the current project.

The maximum delivery capacity Maximum_Delivery_Rate is determined by the number of consultants and principals available for project work.

$$
\begin{aligned}
Maximum\_Delivery\_Rate = & \\
& Maximum\_Consultant\_Work\_Effort \\
+ & \quad Maximum\_Principal\_Project\_Effort
\end{aligned}
\tag{20.15}
$$

The actual delivery rate may be smaller than maximum capacity: Depending on how many projects are in the pipeline, the current demand for consulting power Demand_Delivery_Rate may be smaller than the current capacity:

$$\begin{aligned} &Actual\_Project\_Delivery\_Rate = \\ &\quad MAX(MIN(Maximum\_Delivery\_Rate, Demand\_Delivery\_Rate), 0) \end{aligned} \tag{20.16}$$

The demand delivery rate is simply calculated from the staff requirements for each project category:

$$\begin{aligned} Demand\_Delivery\_Rate &= Average\_Work\_Rate \\ &\times (Delivery\_Projects\_Staff\_Needed \\ &+ Consulting\_Projects\_Staff\_Needed \\ &+ Solution\_Projects\_Staff\_Needed) \end{aligned} \tag{20.17}$$

In practice, projects mostly begin even if full manpower is not yet available, so it is acceptable to allocate delivery capacity evenly between projects. So, putting all this together, the Delivery_Project_Completion_Rate can be modelled as follows:

$$\begin{aligned} &Delivery\_Project\_Completion\_Rate = \\ &\quad Actual\_Project\_Delivery\_Rate \\ &\quad \times \frac{Delivery\_Projects\_Staff\_Needed}{Total\_Project\_Staff\_Needed} \end{aligned} \tag{20.18}$$

Project effort accounting structures are illustrated in Figure 20.11.

Consultant Dynamics

Consultant dynamics are simple compared to the project dynamics:

The initial number of consultants is set to 45, the number of consultants varies according to the fluctuation rates and hiring rates. Active firing of consultants is not considered in this model, as this rarely occurs at Valtech.

The fluctuation rate is a constant value. The hiring rate depends on a number of factors: Valtech sets an annual consultant growth target. Another factor influencing the hiring rate is the number of consultants needed due to projects that have already been sold—this factor Consultants_Needed is defined in the projects module.

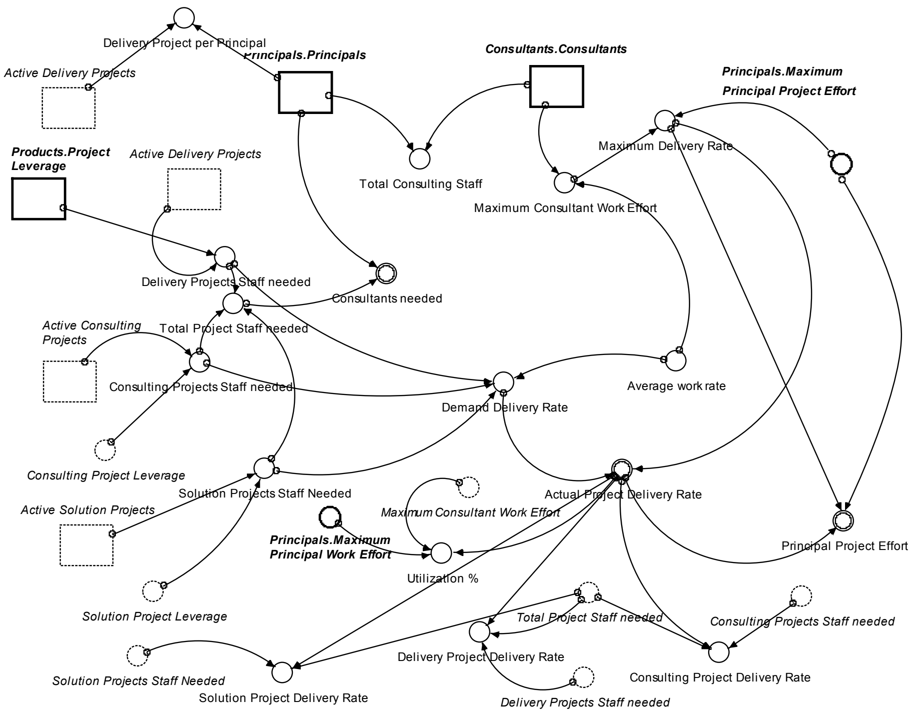

Figure 20.11.: Project effort accounting

The next factor influencing the hiring rate is the maximum consultant leverage Maximum_Leverage a principal can achieve: This represents the number of consultants a principal can manage next to his client maintenance and project acquisition and delivery effort. Currently Maximum_Leverage is set to 20 (at least two senior consultants and up to 18 junior consultants).

Finally the hiring rate also depends on the average time it takes to hire a new consultant, defined by Average_Hiring_Duration in the model. This constant value is set to 60 days in the model.

$$
\begin{aligned}
&Hiring\_Rate = \qquad (20.19)\\
&\quad MAX(MIN(MAX(Consultant\_Target, Consultants\_Needed),
\end{aligned}
$$

$$
\begin{aligned}
& Principals \times Maximum\_Leverage) \\
- \quad & Consultants, 0) \\
\times \quad & Average\_Hiring\_Duration^{-1}
\end{aligned}
$$

Consultant dynamics are illustrated in Figure 20.12.

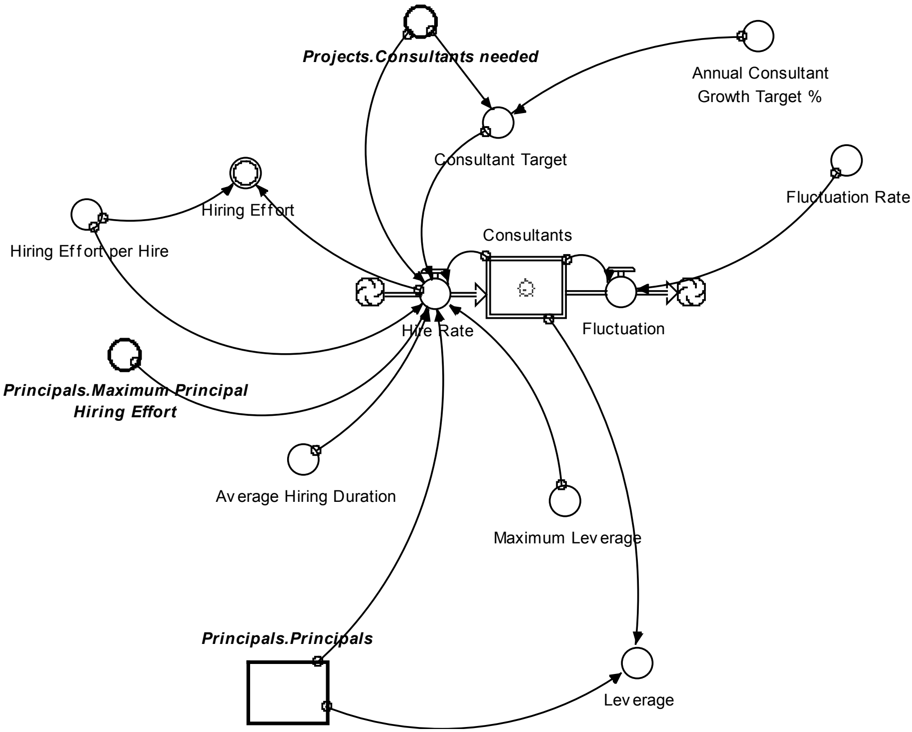

Figure 20.12.: Consultant dynamics

Customer Dynamics

Customer dynamics are kept simple: The model differentiates between new customers and mature customers. The differentiation is necessary because some services (such as delivery projects) cannot be sold to new customers.

A new customer is recorded every time a service is sold successfully to a new customer. Effort must be spent on customer maintenance to ensure customers are not lost. New customers that are successfully retained become mature customers after the Maturing_Duration, whose initial setting is 216 days (i.e. one working year).

Once customers are mature they again require maintenance effort to ensure they are not lost. Customer maintenance is done by principals. Their maximum time available for contact maintenance is allocated between new and mature customers proportionally.

Customer dynamics are illustrated in Figure 20.13.

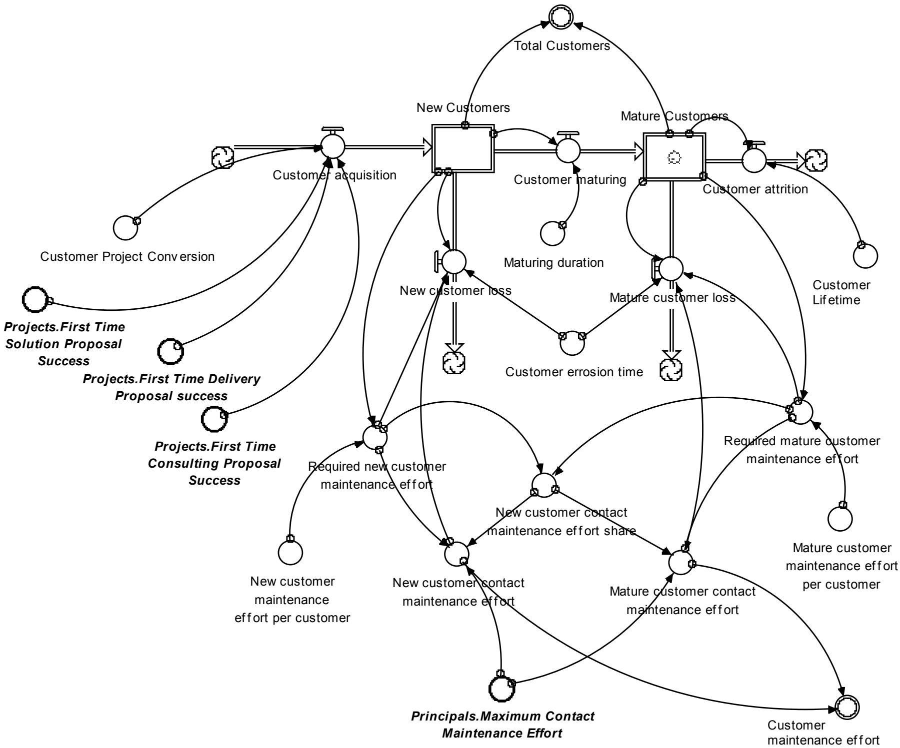

Figure 20.13.: Customer dynamics

Product Dynamics

Product (or service) innovation is the responsibility of the principal consultants. The product life cycle follows a simple pattern which is modelled as a product development chain: New ideas are considered innovation products. Some ideas are rejected, others are developed into Marketable_Products. Marketable products are products that can be marketed to customers and can be delivered by the principals involved in product development. To ensure high leverage in projects these products must be standardised into Standardised_Products.

Creating an innovation product requires effort, determined by the constant Required_Product_Innovation_Effort. Depending on the time Product_Innovation_-Effort principals allocate to product innovation, the innovation rate is calculated as

$$Product\_Innovation\_Rate = \frac{Product\_Innovation\_Effort}{Required\_Product\_Innovation\_Effort} \tag{20.20}$$

Similar equations hold for product development and standardisation rates. Depending on the typical $Product\_Lifetime$, products become obsolete.

A simple model of the product life cycle is illustrated in Figure 20.14. Though the firm's product development process is not formalised, this fits well into processes described in literature (Young, 1961, p. 249). In the current model only the time required by principal consultants is considered, time required by consultants for training is omitted.

On the basis of the product life cycle two key performance indicators can be determined:

Time to market This measures the average time it takes from the conception of an innovative idea to the creation of the marketing materials and reference projects that are needed to successfully sell projects based on the idea.

Time to standardisation This measures the average time it takes from the conception of an innovative idea to the creation of training materials and the training of junior consultants that is necessary to ensure projects based on the new idea can be delivery by junior consultants.

It is assumed that the time to market of innovative ideas has an effect on the average consulting fee that can be realised by the firm, and that time to standardisation has an effect on the project leverage—these causal effects are mentioned in Maister (1997, p. 38) and are part of senior staffs mental model, but no thorough analysis or study

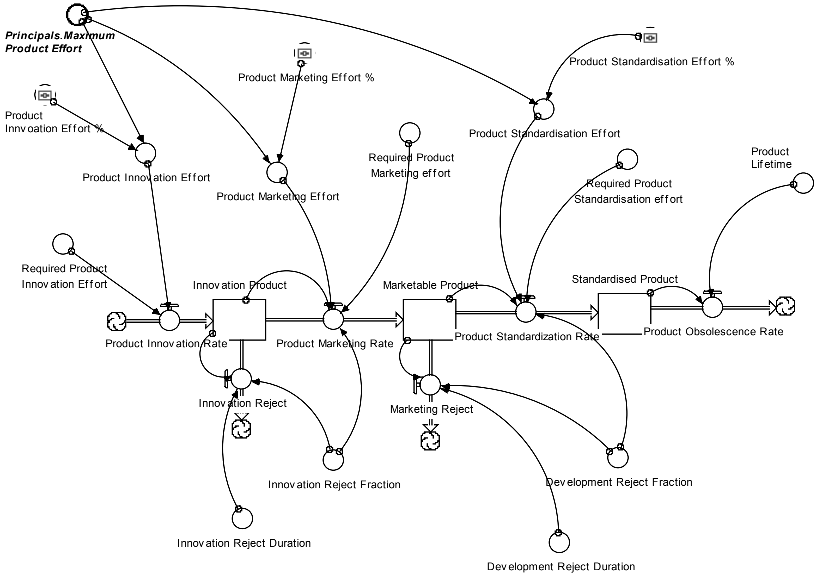

Figure 20.14.: Product dynamics

showing this effect could be found in literature. A recommendation was made to senior management to set up a measurement program to validate the model.

The effect of time to standardisation on project leverage was modelled as illustrated in Figure 20.15: Project leverage is modelled as a stock that can fall as low as *Minimum_Project_Leverage* and rise as high as *Maximum_Project_Leverage*, depending on the flows *Leverage_Win* and *Leverage_Loss*. If *Time_to_standardisation* is too long, then *Leverage_Win* is zero and *Leverage_Loss* is positive, leading *Project_Leverage* to diminish at a rate determined by the *Project_Leverage_-Adjustment* time. But if *Time_to_standardisation* is short (smaller than a constant defined by *Time_to_standardisation_excellence*), then *Leverage_Win* is positive and *Leverage_Loss* is zero. So when

$$Time\_to\_standardisation < Time\_to\_standardisation\_excellence \tag{20.21}$$

this leads to the following equation for *Leverage_win* (the equations for *Leverage_-Loss* are the exact opposite):

$$
\begin{aligned}
Leverage\_win &= MAX((Maximum\_Project\_Leverage \\
&- Project\_Leverage)/Leverage\_adjustment\_time, 0)
\end{aligned}
\tag{20.22}
$$

The fee level dynamics are modelled analogously.

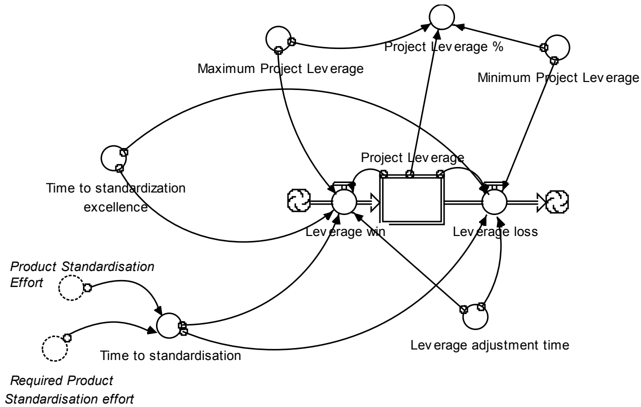

Figure 20.15.: Project leverage dynamics

Value Dynamics

The value generated is calculated via two gross margins—*Gross_margin_I* and *Gross_-margin_II*—via the following formulae:

$$
\begin{aligned}
Gross\_Margin\_I &= Revenue - Consultant\_Cost \\
&\times (1 + \frac{Travel\_Expense\_\%}{100})
\end{aligned}
\tag{20.23}
$$

$$
Gross\_Margin\_II = Gross\_Margin\_I - Sales\_Cost \tag{20.24}
$$

The revenue is accumulated daily from the consultant fees earned in project delivery. The consultant costs are accumulated from daily principal and consultant wages and the monthly bonus. The sales cost is accumulated from daily head of branch wages. Value dynamics are illustrated in Figure 20.16.

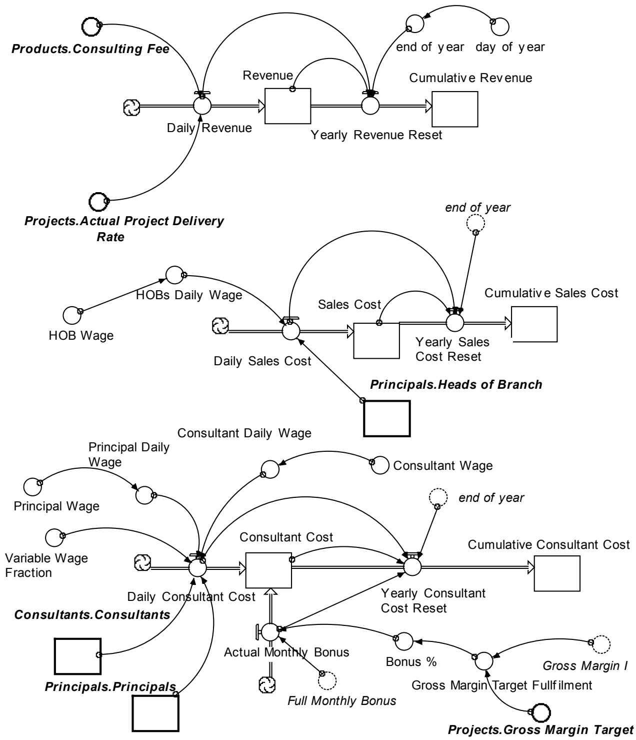

Figure 20.16.: Value dynamics

20.5. Scenarios

Matching the strategic question three scenarios were developed that differ according to how principals allocate their time to their main tasks: writing proposals, hiring new consultants, working in projects, maintaining customers and developing new products (cf. section 20.4.2).

20.5.1. Scenario 1: Base Case

The objective of the base case is to ensure the model is calibrated to match the reference mode, which was chosen to be Valtech's revenue development in recent years. In this scenario, principals devote their time to writing proposals and hiring consultants as needed. They spend up to 50% of their remaining time working projects, again as needed. Of the time remaining up to 50% is spent maintaining contacts. All of their remaining time is then spent on product innovation, with no time spent on creating marketing materials and standardisation.

Once the model has settled into steady behaviour the principals spend over 40% of their time working in projects, around 20% of their time on product development, and another 20% maintaining current customers. Just under 10% of their time is spent on writing proposals, the remaining few percent on contact maintenance and hiring new consultants. This behaviour is shown in Figure 20.17.

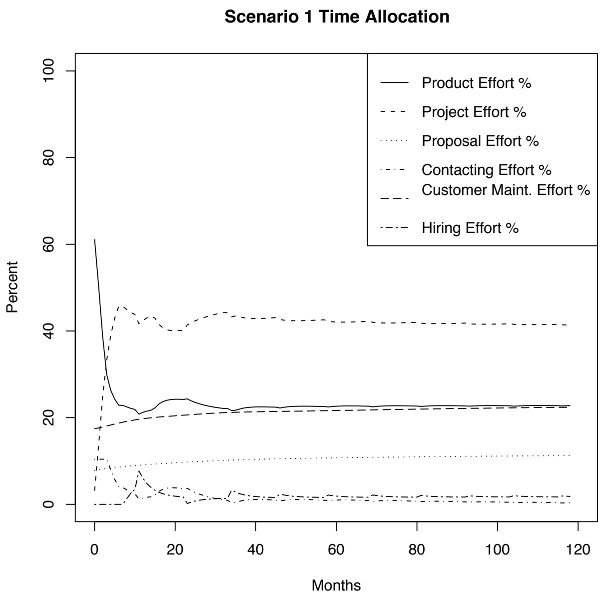

Figure 20.17.: Scenario 1 Time Allocation

The resulting financial performance over a time period of ten years is displayed in Figure 20.18: Once the model has settled into a steady state the revenue growth rate is around 6% per annum. This is mainly due to the fact that the company relies almost exclusively on maintaining current customers and does too little in acquiring new customers. Project leverage is also low due to the fact that no time is spent on product standardisation. As a result projects are mostly only staffed by one consultant (a service commonly referred to as "body leasing").

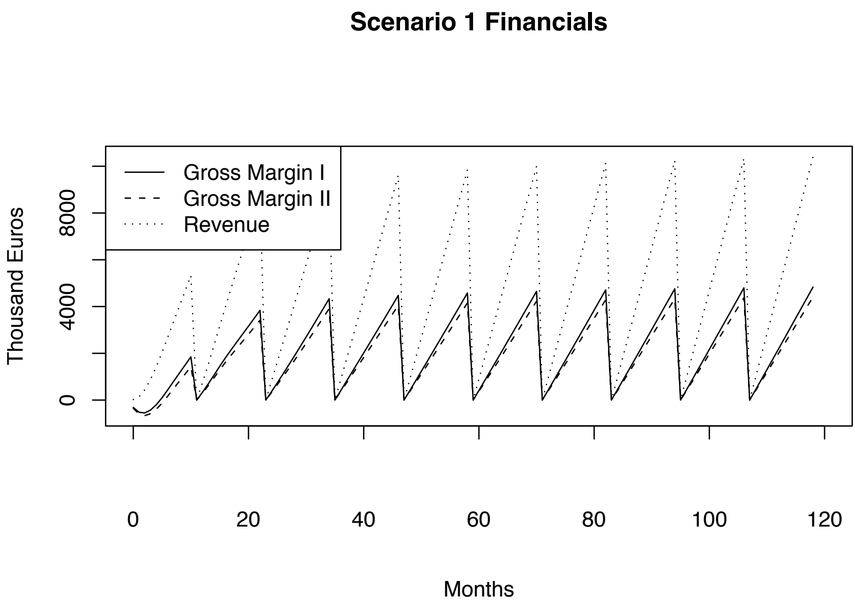

Figure 20.18.: Scenario 1 Financial Performance

The resulting Maister KPI's are displayed in Figure 20.19: Overall utilisation is good (over 80%), but leverage is low (around 20% of the maximum leverage) and both the average consulting fee as the project leverage remain at 0% (of the maximum consulting fee and project leverage respectively). Speaking in terms defined in (Maister, 1997, p. 32), the company is concentrating too much on the hygiene factors utilisation and margin and not enough on the health factors consulting fees and leverage.

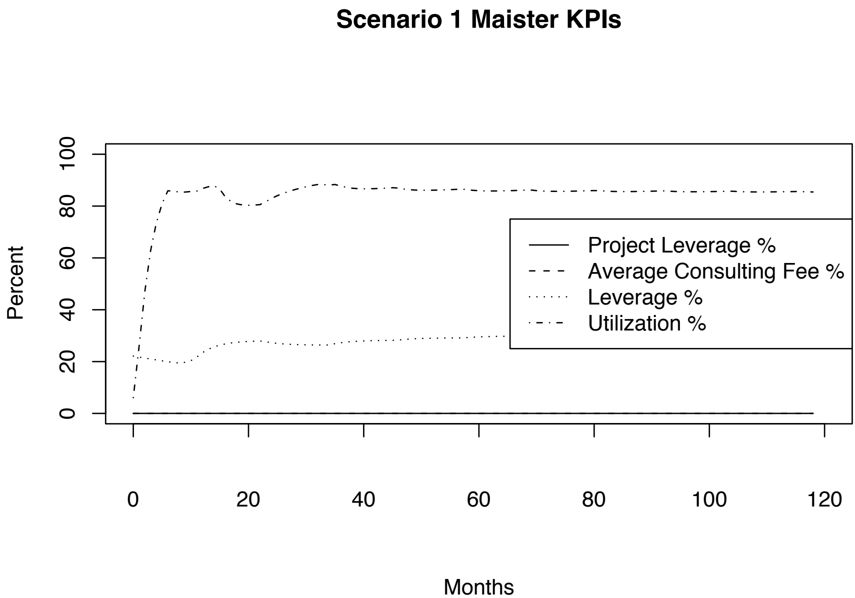

Figure 20.19.: Scenario 1 Maister KPIs

20.5.2. Scenario 2: Concentrate on the Customer

In this scenario management implements new policies concerning principals' time allocation: principals now spend no time at all earning fees in projects, but concentrate 100% of their time on client and contact maintenance. Their behaviour regarding product development is left unchanged.

This change in policy is reflected in the actual time allocation behaviour as displayed in Figure 20.20: Contact maintenance time is now stable at around 10%. As expected time spent on writing proposal's increases steadily, leading to new clients and more and more time spent on client maintenance. This leads to new client's and the resulting growth means there is a yearly peak in time spent hiring new consultants. The growth also means that less and less time is available for product development.

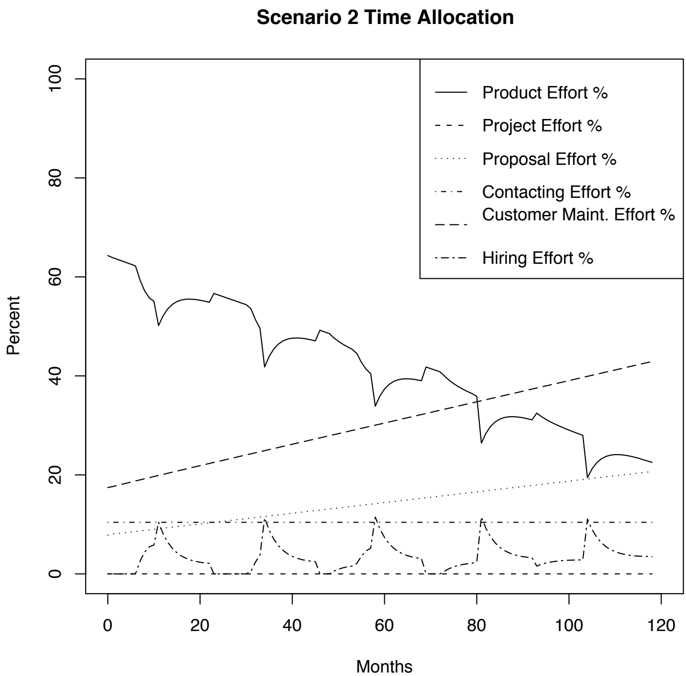

Figure 20.20.: Scenario 2 Time Allocation

The resulting financial performance is displayed in Figure 20.21: Once the company settles into a steady behaviour revenue grow's steadily at around 15% per annum.

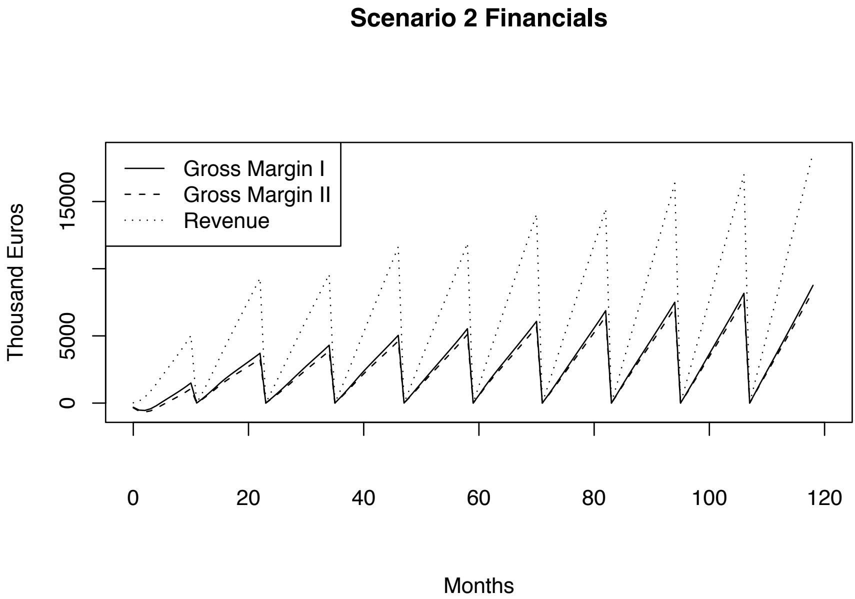

Figure 20.21.: Scenario 2 Financial Performance

The growth is also reflected in the Maister KPI's: Utilisation is still good but now slightly under 80% due to the fact principals do not earn fees themselves. Due to the growth in consultants the leverage also increases because the number of principals remains fixed. The leverage is still only at most 50% of maximum, showing the company still has too many principals. The health factors project leverage and consulting fee still have not been addressed by the new policies and they therefore both remain at 0%.

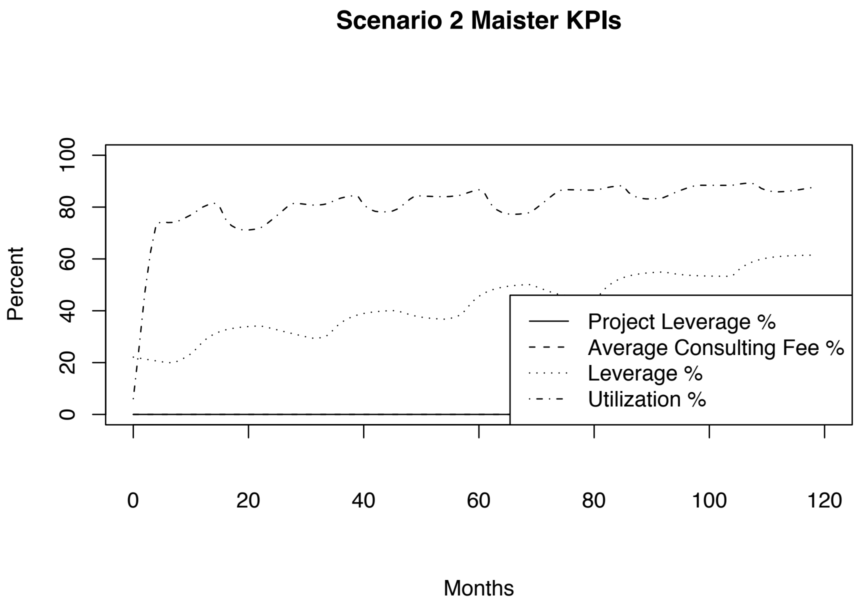

Figure 20.22.: Scenario 2 Maister KPIs

20.5.3. Scenario 3: Innovate and Standardise

In this scenario management decides to add new policies concerning the health factors project leverage and consulting fees, ensure that principals now also spend time on creating marketing materials and standardising products. Little experience exists in the field of product development and standardisation, so time is allocated according to the relative efforts required by innovation, marketing and standardisation—innovation time is set to 9%, marketing time is set to 30% and standardisation time is set to 61%.

Overall time allocation behaviour is similar to that of scenario 2—due to increased project leverage the projects are delivered more rapidly, which means more proposals need to be written overall, increasing the proposal writing time. The time allocation behaviour is displayed in Figure 20.23

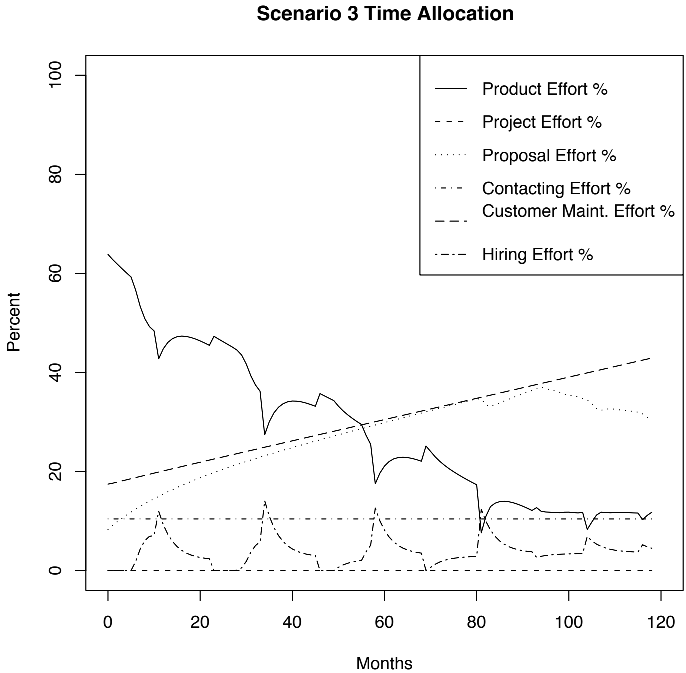

Figure 20.23.: Scenario 3 Time Allocation

The resulting financial performance is displayed in Figure 20.24: Due to increased average fees the revenue quickly jumps to a much higher level, but shrinks in year 3 and 4.

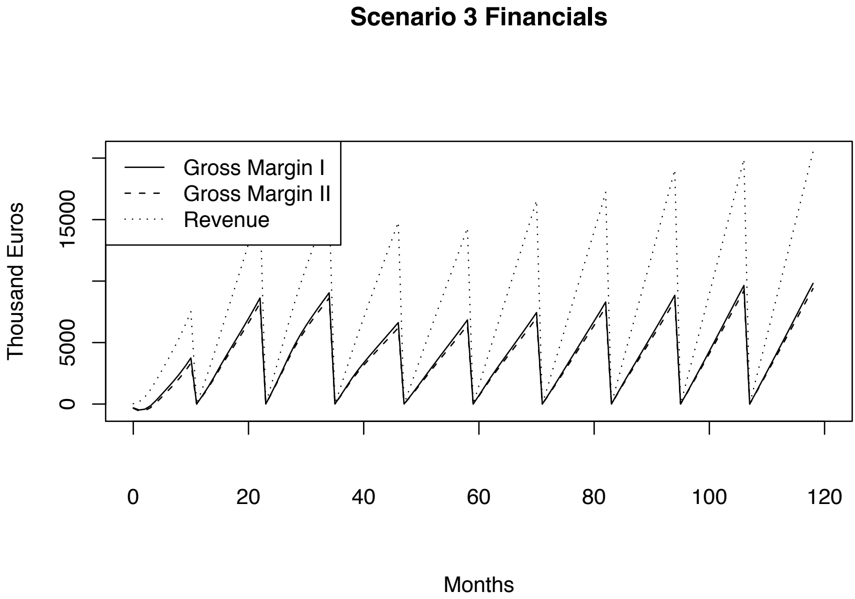

Figure 20.24.: Scenario 3 Financial Performance

This is due to the fact that the time available for product development quickly dwindles due to the increased time principals must spend writing proposals. So after an initial period of successful product development both the average fees and the project leverage rapidly decline again, as displayed in Figure 20.25.

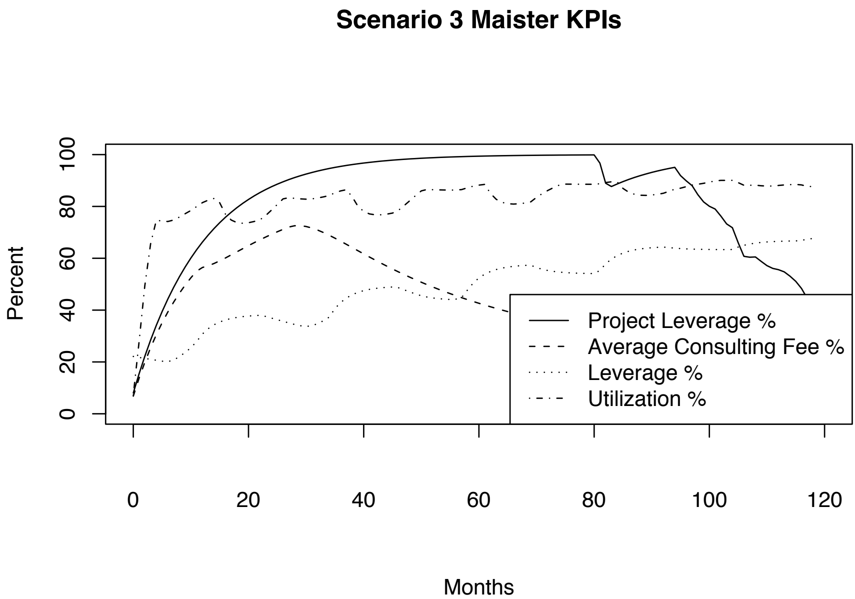

Figure 20.25.: Scenario 3 Maister KPIs

20.6. Recommendations

The prominent role the principal consultants play within Valtech's business model is made very clear by the model elaborated in the previous sections: The principals are key to all of the business transactions relevant to value creation, and the way they allocate their time to these transactions is critical to ongoing success.

The simulation scenarios demonstrate the impact the time allocation policies have on the key performance indicators (Maister KPIs): Valtech could generate even better results (especially higher leverage and fees) by simply changing the way their principal consultants allocate their time, without having to improve the underlying sales success parameters:

- A focus on high utilisation of principal consultants may seem attractive in the short term, but it keeps the firm from growing in the long term: A lot could be gained by refocusing effort from project delivery to project acquisition and contact maintenance.
- It is important that principals spend time on service innovation, but currently they concentrate to much on innovation and to little on the marketability (which results in higher fees) and standardisation (which results in higher project leverage).
- While the service development model reflects the firm's practice and is also grounded in literature, the positive effect service development may have on both average fees and on project leverage is not—Valtech should therefore set up a measurement program to track both the time principals spend on product development and also monitor the effect this has on fee levels and leverage.

Chapter 21.

K+K information services

K+K information services is a company (K+K IS) that has delivered information management consulting to its customers since 1994. In 2007 they acquired a small software company that had developed the software product *WissIntra^{TM}*, a web-based process, quality and knowledge management tool.

21.1. Current situation

This case study was carried out between October 2008 and June 2009 for the CEO of K+K IS.

K+K IS started as a spin-off from a major automobile manufacturer, and for the first thirteen years of its existence, over 90% of K+K IS revenue came from this customer. In 2007 K+K's CEO was presented with a tough challenge by the customers top management: Due to a change in the customers policy towards suppliers, K+K was required to reduce the customer's share of K+K's revenue to below 30% within five years.

21.2. Conceptual overview of the business model

21.2.1. Products

K+K differentiates between the following products:

Technical Editing Small teams consisting of one or two consultants who create technical editing (TE) for machinery, hardware and software.

Product Data Management Consulting Larger teams providing product data management (PDM) expertise.

WissIntra^{TM} server license Every customer needs at least one server license to operate WissIntra^{TM}.

WissIntra™ module The basic WissIntra™ functionality can be extended by adding modules dedicated to topics such as risk management and quality management.

WissIntra™ client Each user needed access to the WissIntra™ system needs a client license.

WissIntra™ maintenance By paying optional, yearly maintenance fees WissIntra™ customers can ensure they have access to a customer service hotline and to software updates.

21.2.2. Transactions

The following transactions are relevant for K+K IS's business model:

- Hire employees
- Contract freelance consultants
- Maintain contacts
- Maintain customers
- Sell consulting services
- Deliver consulting services
- Sell software licenses
- Purchase contact data
- Fulfil software licenses order[1], exchanging software licenses.
- Support software products[2]
- Exchange sales information
- Manage partners

[1] This transaction is not explicitly considered in the simulation model.

[2] Software support is not explicitly considered in the simulation model. Support staff are assigned to the marketing, support effort is counted as customer maintenance effort.

21.2.3. Value network

K+K IS offers its services and knowledge management software to companies interested in product data management and technical documentation services across all industries. It maintains business contacts who provide the project leads that lead to acquisition of projects. To ensure the contact database grows, new contact information is regularly purchased from direct marketing agencies.

K+K IS relies on consulting partners for timely provision of freelance consultants and actively recruits new consultants from a student consulting agency it works with. K+K IS also maintains a network of WissIntra^{TM} partners who provide contact information and leads on potential WissIntra^{TM} clients.

K+K IS's value network is pictured in Figure 21.1.

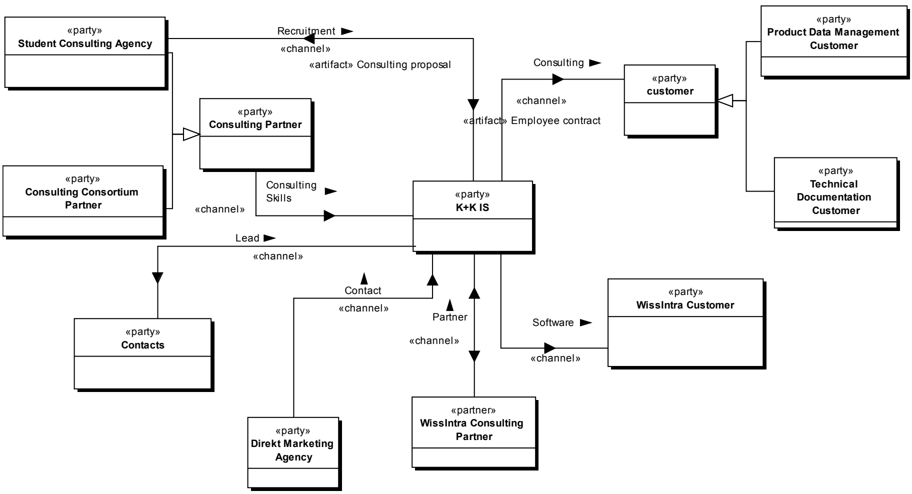

Figure 21.1.: K+K IS's value network

21.2.4. Value logic

K+K IS's value logic is divided into two separate parts, one for consulting services and one for software products. These two parts only have one construct in common, the "business contacts", as shown in Figure 21.2 and Figure 21.3. The two parts will be discussed separately.

The value logic for software products is shown in Figure 21.2: marketing staff divide their time between customer maintenance, contact maintenance and new business development. Each of these activities may lead to new or repeat license sales and new customers, which increases the burden on marketing staff's time. Sales are supported by WissIntra™ partners, who acquire new customers and sell licenses.

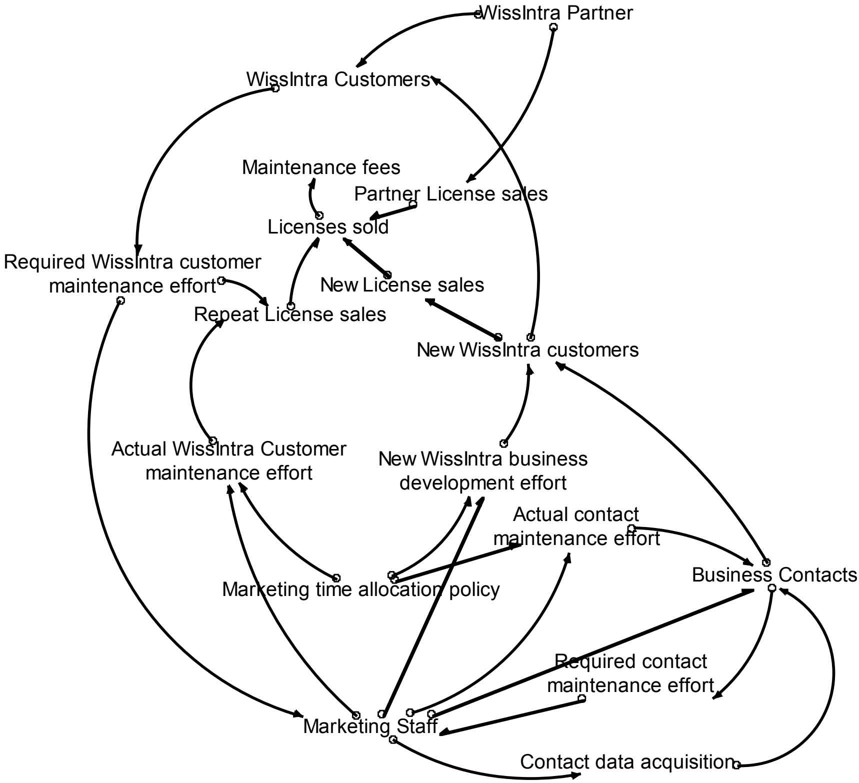

Figure 21.2.: K+K IS's value logic for software products

The value logic for consulting services is shown in Figure 21.3: lead consultants divide their time between customer maintenance, business development and project delivery. The first two activities may lead to new projects and customers, which increases the burden on lead consultants time. Business development is aided by the fact that lead consultants can use the large pool of contacts maintained by the marketing staff.

To ensure projects are delivered on time, lead consultants need to contract freelance consultants and hire new consultants.

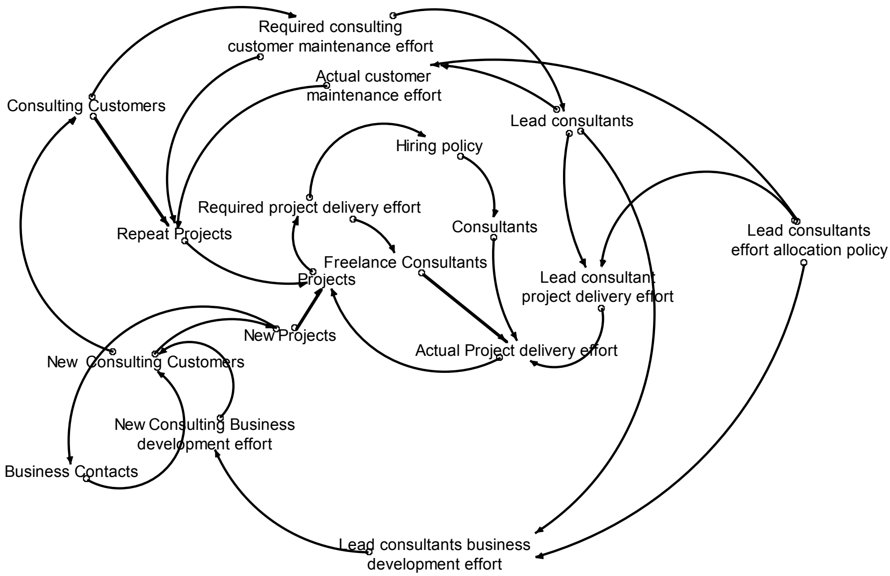

Figure 21.3.: K+K IS's value logic for consulting services

21.3. Strategic questions

The major objective guiding the business model analysis work carried out for K+K was to analyse the implications of the extension to the pure consulting business model that was effected by the acquisition of the WissIntra^{TM}product.

Strategic Question 21.1 *Given the current sales figures and the mixed consulting* *plus software product business model, will it be possible to reduce the major customer's revenue share to below 30% within five years?*

21.4. Business model details

21.4.1. Product details

K+K IS's software products are shown in Figure 21.4: The WissIntra™ system is typically offered as a bundle of licenses consisting of server, client and module licenses. Optionally clients can pay yearly maintenance fees, which gives them access to software support and software upgrades. All software products are sold by marketing staff.

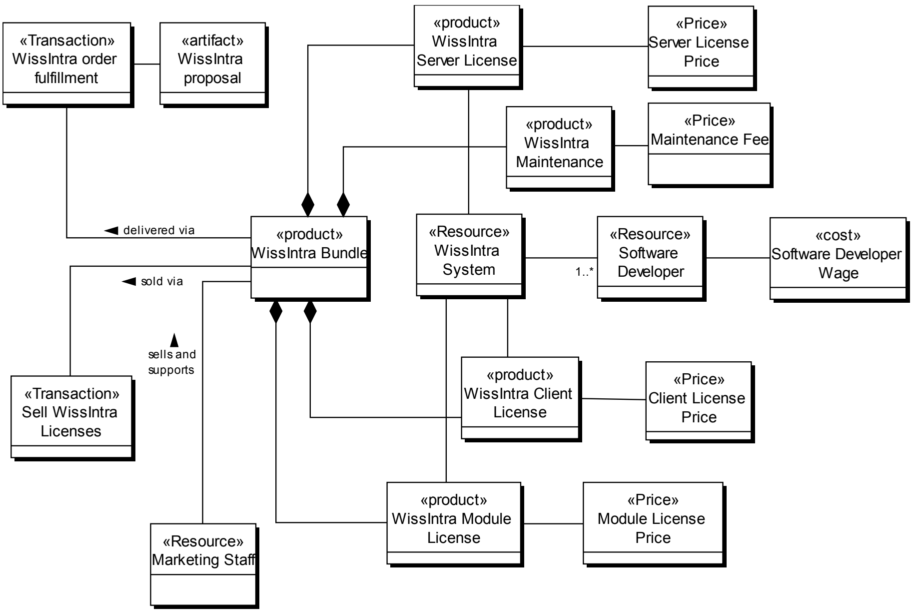

Figure 21.4.: K+K IS's software products

K+K IS's consulting services are shown in Figure 21.4: K+K IS offers expertise in PDM and TE in the form of consulting projects. Consulting projects are acquired and management by lead consultants and consist of teams of consultants.

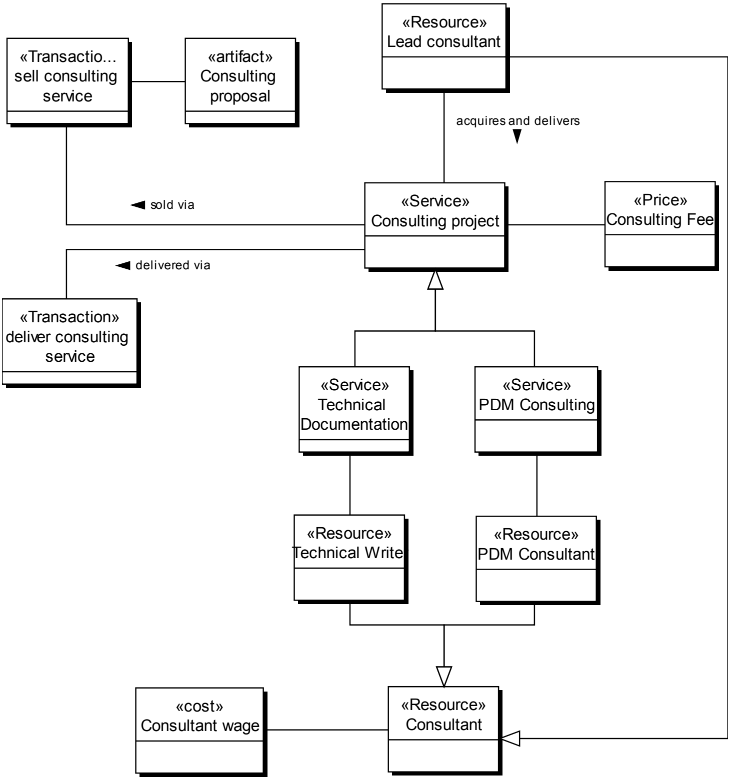

Figure 21.5.: K+K IS's services

21.4.2. Transaction details

Figure 21.6 illustrates how the transactions listed in section 21.2.2 flow between the parties in the value network, and identifies the products and artifacts exchanged within these transactions.

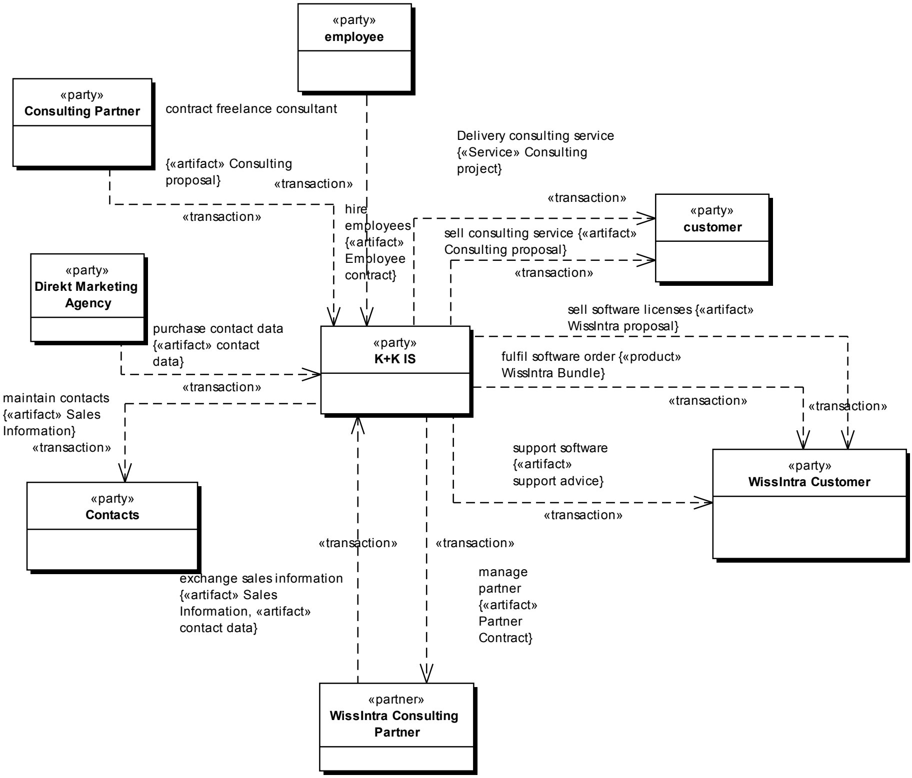

Figure 21.6.: K+K IS's transactions

21.4.3. Value dynamics

The SD-model has six modules, reflecting the separation of concerns within the business model. An overview of the value dynamics is given in Figure 21.7:

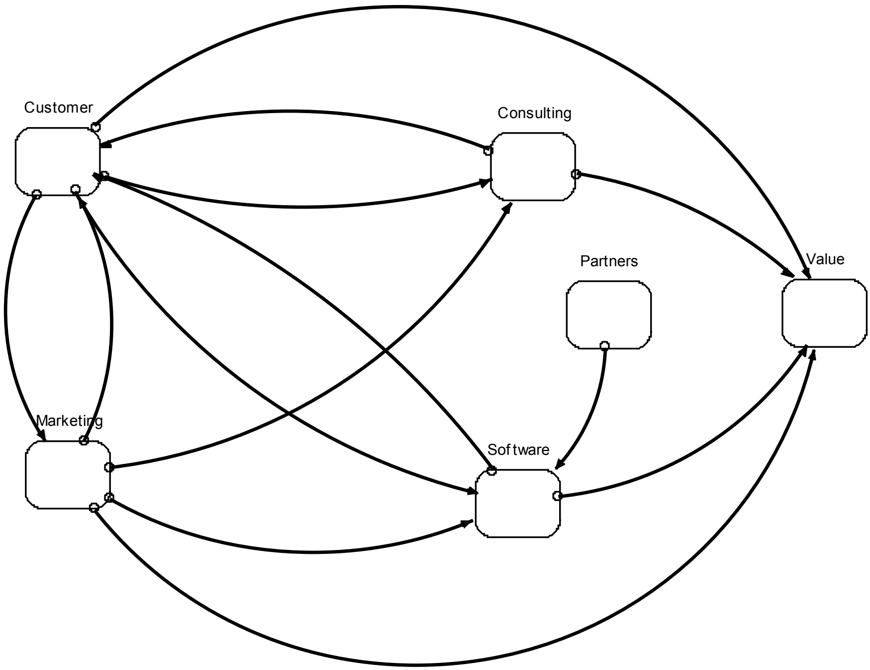

Figure 21.7.: Overview of K+K IS's value dynamics

Consulting module The consulting module contains the sales pipelines for all consulting services and keeps track of project delivery. Consultants wages have an impact on the gross margin generated, hence the relationship to the value module.

Software module The software module contains the sales pipeline for all software products. Software development itself is not explicitly modelled, software development costs are tracked via the software developer headcount.

Marketing module Marketing staff are responsible for contact maintenance, software sales and maintenance of software customers. Contacts provide both software and consulting leads, explaining the relationships to the consulting and software modules. Depending on the number of current software customers demand is created on marketing staff's time. This is reflected in the bidirectional relationships between marketing and customer modules. The marketing cost has an impact on the gross margin, hence the relationship to the value module.

Customer module The customer module keeps track of the number of new and mature customers. The number of current customers has an impact on the revenue generated per customer explaining the relationship to the value module.

Partner module K+K IS's partner network helps generate leads for software sales, explaining the connection between the partner and software module. The effort required for maintaining the partner network is not currently modelled, explaining why there is no connection between the marketing and partner modules.

Value module This module keeps track of the revenue generated and the costs incurred and calculates the gross margin generated by the consulting and software sales.

Consulting module

The consulting module contains the sales pipelines for TE and PDM services and keeps track of the lead consultants needed for project acquisition, customer maintenance and project delivery and of the consultants and free lance consultants needed for project delivery.

The sales pipelines for all services and customer types (i.e. new customers, repeat customers and the major customer) are similar—for convenience only the main stock and flow structure for acquisition of major customer PDM projects is shown in Figure 21.8:

The pipeline starts with leads for potential projects. A major assumption is that these are generated whenever an active project ends ("repeat projects"). Some of these leads turn into proposals, some of these proposals are successful leading to active projects. The projects are then delivered depending on available consulting resources.

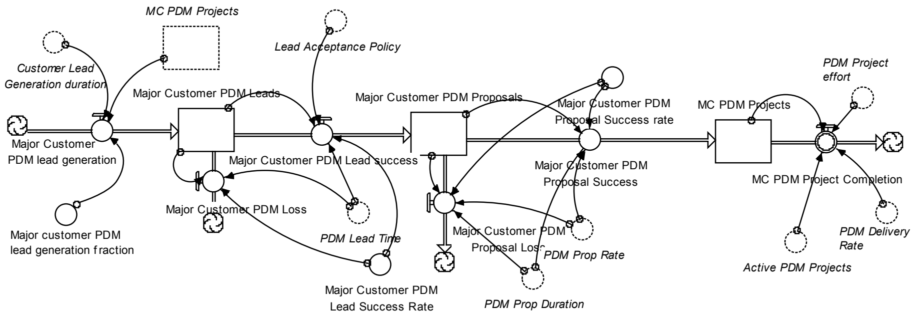

Figure 21.8.: K+K IS's consulting module

Software module

The software module contains the sales pipelines for the sale of WissIntra™ licenses and keeps track of software maintenance fees paid by the customers. The sales pipeline for new license sales is shown in Figure 21.9. It is similar in structure to the pipeline defined for the consulting services: Depending on the number of contacts and on exogenous sales success factors new leads are generated. Some of these leads are successful and turn into proposals. Successful proposals turn into licenses sales. License sales are also tracked in the software module but are not illustrated here.

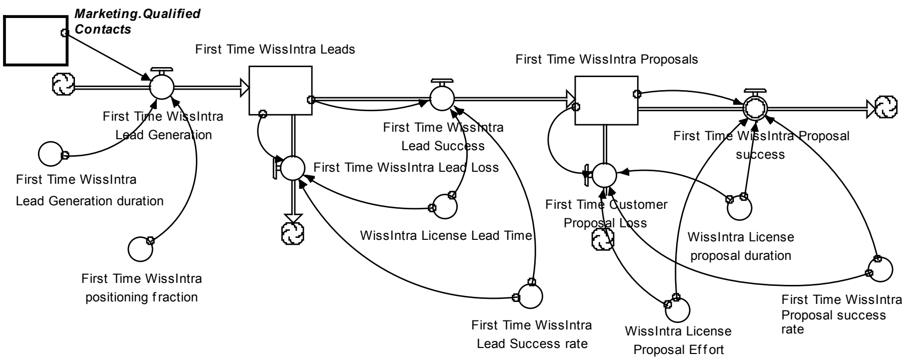

Figure 21.9.: K+K IS's software module

Marketing module

The marketing module keeps track of the business contacts that are maintained by the marketing staff, and of the effort required to do so. Contact data is regularly purchased, leading to identified contacts. These contacts must than be qualified, which takes a significant amount of marketing staff effort. Once contacts are qualified they need to be maintained to remain qualified: If the amount of effort spent on contact maintenance by the marketing staff falls below the effort required, qualified contacts are lost.

The corresponding stock and flow structure is shown in Figure 21.10.

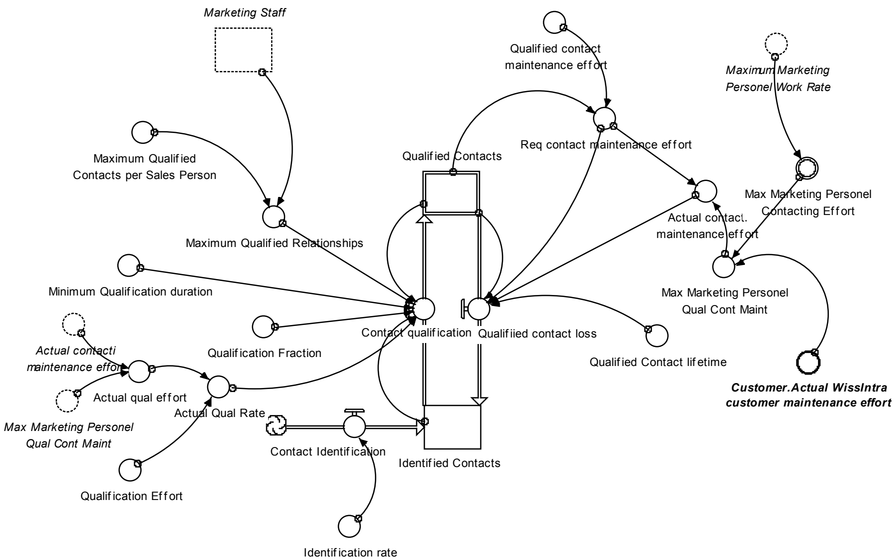

Figure 21.10.: K+K IS's marketing module

Customer module

The customer module contains two distinct customer ageing chains, one for consulting customers and one for software customers. For convenience only the ageing chain for consulting customers is discussed here, as these are identical in structure. the again chain is shown in Figure 21.11:

New customers are acquired and become mature customers after a certain amount of time. Mature customers are important in the model, as experience shows that sales figures are better for mature customers.

Marketing staff must spend effort on customer maintenance—if the effort spent falls below the effort required, customers are lost prematurely. This has a negative effect on repeat business.

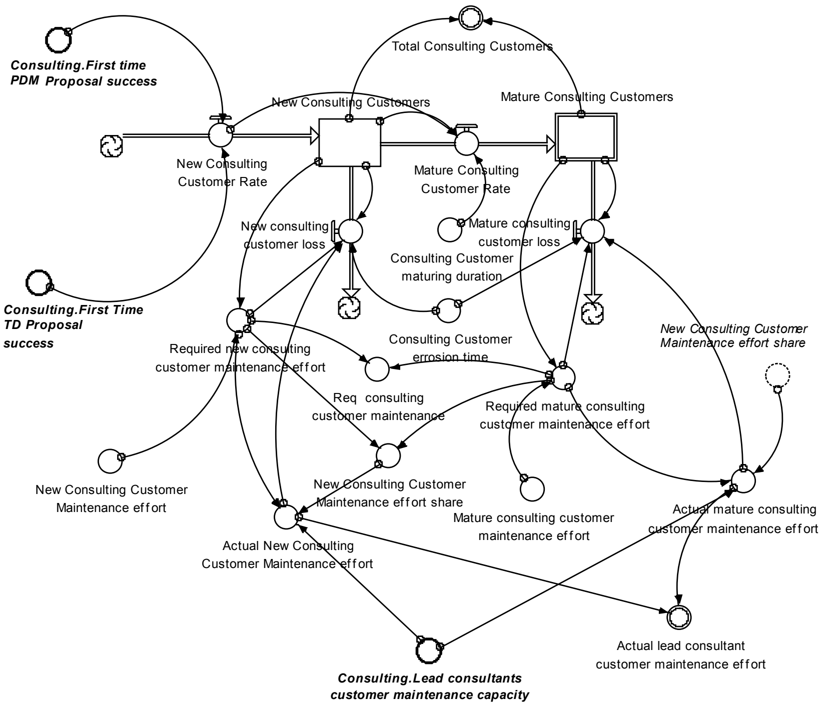

Figure 21.11.: K+K IS's customer module

Partner module

The partner module is kept very simple in this model, the major assumptions being that the rate of partners being acquired and the rate of partners lost per time period are constant. The effort needed to acquire and maintain partners is also not considered in this model. This was deemed acceptable as the effort needed to acquire and maintain partners is small considered to customer maintenance effort.

The corresponding stock and flow structure is shown in Figure 21.11.

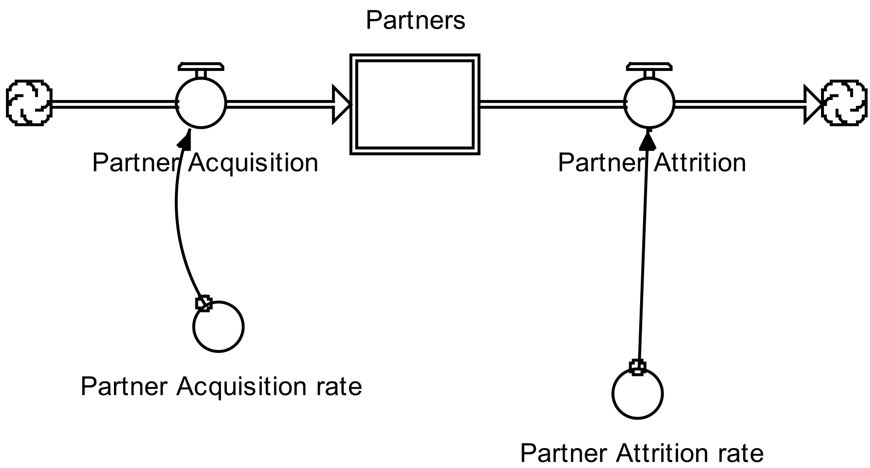

Figure 21.12.: K+K IS's partner module

Value module

The value module keeps track of the total revenue generated and costs incurred and uses these to calculate gross margins at two levels in accordance with the gross margins used by K+K IS to monitor financial success[3].

21.5. Scenarios

Using the simulation microworld many different scenarios where analysed, both pertaining to the strategic question raised in section 21.3 and to new questions that arose during the analysis.

Three major scenarios are discussed here in detail:

Scenario 1: Major customer only This is the base case reflecting the situation when K+K had only one major customer and had just extended its business model by acquisition of WissIntra™.

Scenario 2: Acquire new customers This case reflects the situation where K+K actively starts acquiring new customers, but does not increase lead consultant capacity. Financial performance in this scenario is worse, because the lead consultants have too little time to follow up on leads and for customer maintenance. Most of the leads generated by the marketing department cannot be followed up.

Scenario 3: Hire more lead consultants This case reflects the situation where K+K defines a new hiring policy for lead consultants. This hiring policy ensures that new lead consultants are employed when the capacity remaining to follow up on leads falls below the requisite amount.

[3] The total value generated by the business model was not explicitly calculated as this is not a KPI used at K+K IS.

21.5.1. Scenario 1: Major customer only

This is the base case reflecting the situation when K+K IS had only one major customer and had just extended its business model by acquisition of WissIntra™.

The financial performance in this scenario is displayed in 21.13—it remains stable over the entire period, but does not show significant growth. Over 80% of revenue come from one major customer, as displayed in 21.14.

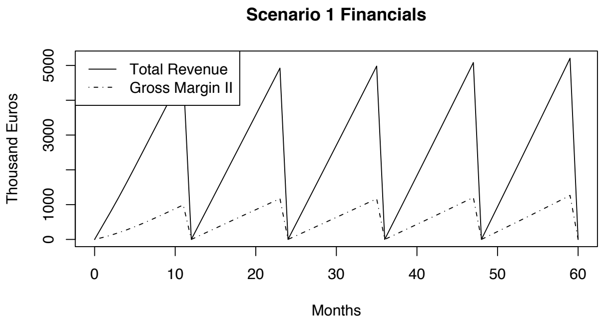

Figure 21.13.: K+K IS scenario 1: Financial performance

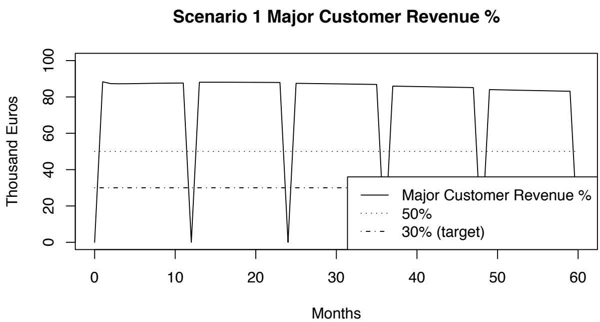

Figure 21.14.: K+K IS scenario 1: Major customer revenue share

21.5.2. Scenario 2: Acquire new customers

This case reflects the situation where K+K actively starts acquiring new customers, but does not increase lead consultant capacity. The sales factors for acquiring new customers are assumed to be identical to those for the major customer.

Financial performance in this scenario is worse, because the lead consultants have too little time to follow up on leads and for customer maintenance.

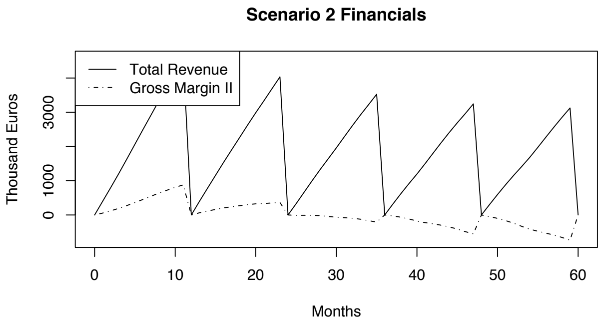

Figure 21.15.: K+K IS scenario 2: Financial performance

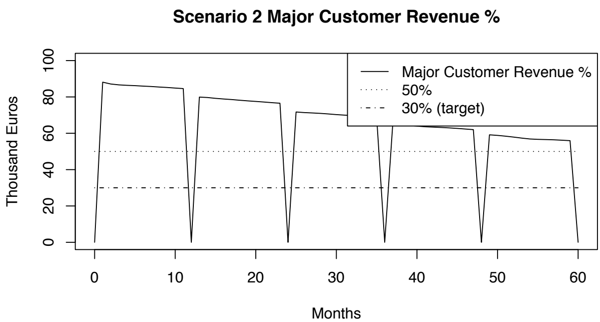

Figure 21.16.: K+K IS scenario 2: Major customer revenue share

21.5.3. Scenario 3: Hire more lead consultants

This case reflects the situation where K+K IS defines a new hiring policy for lead consultants. This hiring policy ensures that new lead consultants are employed when the capacity remaining to follow up on leads falls below the requisite amount.

Despite the fact that all exogenous sales factors remain identical to those in scenario 2, financial performance improves significantly in this scenario, as shown in Figure 21.17.

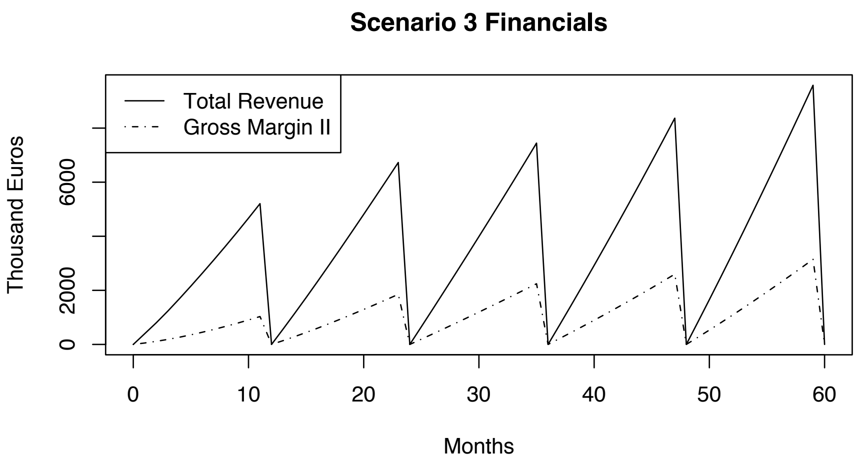

Figure 21.17.: K+K IS scenario 3: Financial performance

In this scenario the major customers revenue share is reduced to about 50% at the end of the fifth year, as displayed in Figure 21.18. The share of revenue between the three products consulting, software licenses and software maintenance is shown in Figure 21.19.

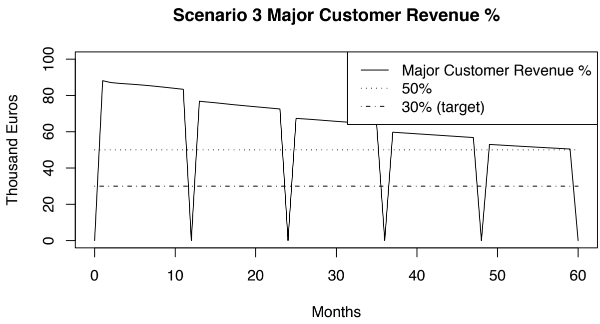

Figure 21.18.: K+K IS scenario 3: Major customer revenue share

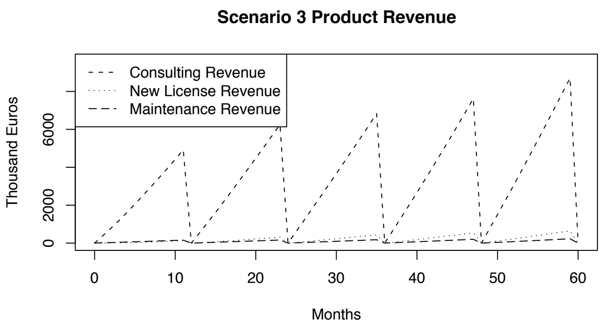

Figure 21.19.: K+K IS scenario 3: Comparison of revenue generated by products

21.6. Recommendations

- Hiring policies, especially for lead consultants and marketing staff should be made explicit and actively monitored.
- Time allocation policies of lead consultants and marketing staff should be monitored, as these resources are involved in many transactions.
- All sales success factors, in particular the lead conversion factor, should be actively monitored and compared to the assumptions of the model. This is particularly relevant for those factors pertaining to new customer acquisition.
- The assumption that contacts made in connection with WissIntra™ can be effectively leveraged within the consulting business ought to be verified over a longer time period.
- Currently no explicit sales targets are set—this area should be investigated for potential benefits.
- The 30% target set by the major customer is not reached despite the assumption that sales KPIs for new customers will be as good as those of the major customer. A strategy for increasing overall revenue (and thus further lowering the major customers revenue share) through acquisition ought to be investigated.

Part V.

Conclusions

Conclusions derived from the research.

Chapter 22.

Critical evaluation

> We shall not cease from exploration. And the end of all our exploring will be to arrive where we started and know the place for the first time.
>
> *(T.S. Eliot)*

As outlined in Chapter 2, the research presented in this dissertation followed a design research approach and the critical evaluation of the results obtained should therefore be made from this perspective.

Hevner (2007, p. 12) defines the following design research guidelines, and proposes to use them as a basis for understanding and evaluating effective design research (Hevner, 2007, p. 11). The guidelines are presented here in their order of evaluation in the following sections:

Problem relevance The objective of design research is to provide utility through the creation of new and innovative artifacts.

Research rigour Design research relies upon the application of rigorous methods in both the construction and evaluation of the design artifact.

Design as an artifact Design research must produce a viable artifact in the form of a construct, a model, a method or an instantiation.

Design as a search process The search for an effective artifact requires utilising available means to reach desired ends while satisfying laws in the problem environment.

Design evaluation The utility, quality and efficacy of a design artifact must be rigorously demonstrated via well executed evaluation methods.

Research contributions Effective design research must provide clear and verifiable contributions in the areas of the design artifact, design foundations, and/or design methodologies.

Communication of research Design research must be presented effectively both to technology-oriented as well as management-oriented audiences.

22.1. Evaluation of problem relevance

The objective of design research is to develop technology-based solutions to important and relevant business problems (Hevner, 2007, p. 12): The problem most be real and interesting, and the resulting artifacts must be useful to practitioners (Hevner, 2007, p. 14). Relevance is evaluated here both from the perspective of business practitioners and from a scientific perspective.

22.1.1. Relevance to business practitioners

The objective of this dissertation was to develop a consistent method to analyse the structure, the behaviour and the dynamics of a business model, that should enable practitioners to make their business models more transparent to all relevant stakeholders, and should also allow them to answer strategic questions pertaining to the performance of their business model.

As analysed in Chapter 14, a business model shows how a firm creates value by identifying its value network, its value logic and relevant business policies. As value creation is fundamental to business success, analysing these aspects of a business is itself of value to a firm's top management. In the concrete situations encountered within the case studies presented in Part IV, management was interested in all three of these aspects. During the conversations that arose while performing business model analysis another need became transparent: that of making a business model transparent to relevant stakeholders, both from a qualitative and from a quantitative perspective; financial stakeholders such as banks and shareholders where mentioned here in particular.

No comprehensive survey was carried out to analyse the relevance of business model analysis to business practitioners: this could be addressed in the future.

Of the artifacts created, the scenario analysis based on the SD-models proved to be most useful: in all cases many more scenarios were analysed than could be presented in the case studies. The SD-microworlds also proved to be interesting to business practitioners—one client is thinking of using the model as a basis for training their staff, though this has not yet been implemented in practice.

The UML-models were mainly useful as a basis for clarifying the constituent parts of the business model and as a basis for creating the SD models—thus they were useful to the author, but they did not seem to be relevant to the clients involved in business model analysis.

22.1.2. Relevance to science

The relevance of the business model concept to science is clear due to the many research articles on this topic—a number of these were analysed in Chapter 14. The final definition of the business model concept arrived at in Definition 14.19 unifies the structural and behavioural aspects of business models.

Only few detailed business model metamodels were found in literature: the metamodel defined in Chapter 15 is rigorously derived from Definition 14.19 and is comprehensive. This metamodel is consistent with, and a concretisation of, the BE-metamodel introduced in Chapter 9 and is compared to other business model metamodels in Chapter 15.

None of the papers surveyed provide a detailed method for business model analysis, with the exception of Braun (2003): This points to the fact that this dissertation fills a gap in literature, but does not say anything about the relevance of the gap or of the method developed in this dissertation.

22.2. Evaluation of research rigour

Design research relies upon the application of rigorous methods in both the construction and evaluation of the design artifact (Hevner, 2007, p. 12). The following points highlight the rigour of the approach taken:

- The research for this dissertation started with clear objectives, as discussed in Chapter 1. It followed an approach based on design research, as defined in Chapter 2.
- All methods and theories used in instantiating the approach and fulfilling the objectives were discussed in the foundation chapters in Part II. All terms and definitions used are based on citations from literature, or are rigorously derived from them; they are listed and explained in an extensive glossary. All cross-references in the electronic version of the dissertation are hyperlinked.

- The business model concept was analysed using literature research, resulting in a comprehensive definition of the term “business model”, given in Definition 14.19. An overview of the papers surveyed and the business model constructs discussed in these papers is given in 14.2.
- The business model metamodel was derived using noun/verb analysis, a proven technique discussed in Chapter 5.
- The business model analysis method was constructed using the method engineering approach discussed in Chapter 4. The activities in the method where based on the systems engineering method discussed in Chapter 8.
- Critical evaluation of the research was performed according to the design research guidelines defined in Hevner (2007, p. 12).

The following points highlight aspects where more rigour could have been applied:

- Only few references could be found to validate the SD metamodel introduced in Chapter 7.4.
- The approach to literature analysis defined in Chapter 14 was not critically discussed.
- The criteria for completeness of the business model definition defined in Chapter 14 are grounded in literature but could be investigated more thoroughly.
- The suitability of a systemic approach to business model analysis is inferred from the fact that such approaches are used in many of the publications referenced here, but this suitability is not critically discussed.
- The case studies themselves where performed according to this business model analysis method. Case study approaches such as those discussed in Yin (2003) and Senger and Österle (2004) were considered, but not used.

22.3. Evaluation of artifacts

Design research must produce a viable artifact in the form of a construct, a model, a method or an instantiation (Hevner, 2007, p. 12). The following artifacts were created during this research:

Constructs All constructs relevant to fully specifying a business model are clearly identified and derived from Definition 14.19 of the business model concept. This definition itself is derived from an extensive review of current literature (cf. Chapter 14).

Model The business model constructs that were identified in Definition 14.19 were related to each other in a business model metamodel in Chapter 15. A full list of the results created by the business model analysis method and the metamodels defining them can be found in Chapter 16.2.

Method A method for analysing business models based on the metamodel was developed in Chapter 16. This method was not critically compared to other such methods.

Instantiations The method was instantiated four times at four client sites, as described in the case studies in Part IV. These instantiations lead to concrete models of the business models analysed; the models conform to the business model metamodel. The models created were not compared to the results of other strategy analysis approaches.

22.4. Evaluation of search process

The search for an effective artifact requires utilising available means to reach desired ends while satisfying laws in the problem environment (Hevner, 2007, p. 12). Good design is based on iterative, heuristic search strategies (Hevner, 2007, p. 19).

The research for this dissertation followed the iterative process outlined in Chapter 2.2 and illustrated in Figure 2.3. This resulted in the following search process:

- After an initial review of literature, a first version of the business model analysis method was defined.

- The case studies were initiated and completed in sequential iterations, with a slight overlap between each iteration—the learnings of each iteration could thus be incorporated in the business model analysis method during the first step of the subsequent iteration. The concrete learnings made in each iteration are listed in section 22.4.1.

- After all case studies in Part IV were completed, the business model analysis method was finalised and Part III of the dissertation was completed.

- All case studies in Part IV were subsequently reworked to reflect the final metamodel.

This approach lead to a constant interplay between research, expansion of the business model analysis method, and on-site business model analysis. The literature evaluated in the first step was revisited and expanded each time, raising new questions posed from different perspectives. During this process the definition of business model given in Definition 14.8, the business model metamodel, and the business model analysis method changed substantially, indicating that the search process was effective.

22.4.1. Iteration learnings

transentis case study

- Experience gained creating simulation model of small PSF, in particular in identifying the life-cycle of artifacts within a transaction and modelling these using SD.
- The importance of identifying strategic questions at the beginning of analysis, which are subsequently answered using scenarios, as opposed to creating a model without a definitive purpose.
- The separation of transaction structure from transaction behaviour: transactions are supported by channels and require resources, but also have dynamic behaviour due to the effort required in performing a transaction, and due to the depletion of resources over time.

GFT case study

- Generalising the construct “firm” in the value network to the construct “party”, to allow modelling of business models that involve parties that are part of the same corporate structure.
- Introduction of the entity role metamodel to allow for the fact that an entity can have multiple roles, e.g. be both a resource and a product.
- Separation of “artifact” from “product” to allow modelling of entities important to transactions that do not have a price, such as “proposal”.
- Modelling of the customer life cycle and the differentiation of sales success factors according to the position of a customer in this life cycle.

Valtech case study

- The importance of resource allocation policies in this case study lead to the explicit separation of “assumptions” from “policies”.
- Due to the number of stakeholders involved in this case study a separate step to analyse stakeholders and create a stakeholder list was included at the beginning of the method.
- A separation of the model of the business model into a conceptual model and a detailed model was necessary to aid early analysis and to ease communication with the stakeholders.

K+K IS case study

- Originally the “transaction” construct was modelled using UML communication diagrams. This was changed to using “information flows” because their semantics match the transaction concept better.

22.4.2. Search process constraints

The search process was constrained in the following ways:

- Though the list of research articles reviewed was extensive, it was by no means complete.
- The approach to finding the articles reviewed in Chapter 14 was systematic, in that citations in a number of initial sources were systematically followed, leading to new articles; but the initial sources used were not systematically identified. As a consequence of this, approaches to the business model concept and to business model analysis could in principle exist that are completely orthogonal to those discussed here. This was not judged to be critical as almost all of the definitions discussed in Chapter 14 are based on the assumption that business models define how firms create value, making a completely orthogonal approach unlikely (cf. Table 14.2).
- The use of a model based approach was justified in Chapter 16, but not critically evaluated against other approaches. The modelling methods (SD, OOAD) and notations (UML) used were not critically evaluated and compared to other potential methods and notations.

22.5. Evaluation of design evaluation

The utility, quality and efficacy of a design artifact must be rigorously demonstrated via well executed evaluation methods (Hevner, 2007, p. 12).

The evaluation method chosen here was to instantiate the business model analysis method in four different firms and present the results in the form of a case study. These instantiations where successful, but limited in a number of ways:

- Only four iterations were carried out. The business model metamodel and the business model analysis method stabilised after the second iteration, indicating that four iterations were sufficient to validate the method as defined. Further iterations could be useful to analyse usage of the artifacts created within the firms visited.
- Instantiations of the artifacts were only performed at PSFs operating in value networks with less than ten parties and transactions running over only a few of these parties.
- All PSFs visited were small and medium enterprises (SMEs), the scalability of the artifacts to larger corporations could not be evaluated.
- The iterations and thus the case studies themselves were conducted over a fairly short time period (3-6 months), so the long term utility of the artifacts could not be observed. The effect of the recommendations made could also not be observed.
- The validation of the models themselves should was only performed over a short period of time, so the coverage of all aspects pertaining to the strategic questions raised cannot be assured.
- The performance and results of the business model analysis method was not compared against those of other strategy analysis methods.
- The instantiations were performed in isolation and not as part of a regular strategy process or a business engineering initiative. Therefore the strategic questions raised were not always at the centre of stakeholders attention. The interaction of the method and models with processes and artifacts already established at these firms could not be observed.
- The results of the individual case studies and in particular the models of the business models were not compared to each other.

- All instantiations were performed by the author of the dissertation, so no conclusions can be drawn about repeatability of the method or adequacy of method description.

(Hevner, 2007, p. 16) defines four other evaluation methods: the analytical, experimental, testing and descriptive approaches:

- The analytical approach analyses the resulting artifacts with respect to static qualities (such as complexity), dynamic qualities (such as performance), or demonstrates inherent optimal properties. It may also analyse the fit of the artifact in its designated environment[1]
- The experimental approach studies the artifact in a controlled environment, to measure qualities such as usability. Another experimental approach could be to simulate the use or behaviour of an artifact using artificial data.
- The testing approach performs functional or structural tests on the resulting artifacts.
- The descriptive approach uses informed argument (such as literature research) or constructs detailed scenarios to prove the utility of the artifacts.

Given the experience from applying the observational method the following can now be said about these approaches:

Analytical approach The concrete results delivered by performing business model analysis at the four firms could now be analysed against other, similar artifacts (such as the business planing and forecasting instruments already in place at these firms). The complexity of the resulting models could be compared to those of the business model schematics introduced in Weill and Vitale (2001)[2].

Experimental approach Experiments could be performed based on the models and simulation microworlds that are created during business model analysis, to investigate whether they are easily understood by those not taking part in business model analysis itself. Experiments regarding the extensibility of the models to answer new strategic questions and accommodate new scenarios, and the maintainability of models over a longer time period, could be performed.

[1](Hevner, 2007, p. 16) mentions the IT architecture here, which is not relevant to business model analysis. A relevant environment here is business engineering or strategic management, as discussed in Chapter 9.

[2]One of these schematics, the full service provider schematic, was remodelled in Chapter 15.

Testing approach Model testing is an integral part of business model analysis. Testing of the method could be performed by letting test subjects apply the business model analysis method to identical inputs, and to compare the results obtained.

Descriptive approach Informed argument in the form of literature research was used throughout the dissertation to motivate the utility of the artifacts defined. Scenarios showing how the artifacts could be used in practice should be created, in particular in how the business model analysis method could fit into other strategy management and business engineering approaches.

22.6. Evaluation of research contributions

Effective design research must provide clear and verifiable contributions in the areas of the design artifact, design foundations, and/or design methodologies (Hevner, 2007, p. 12).

- The definition of the business model concept given in Definition 14.19 is grounded in literature and fits well into the BE metamodel and into strategic management. The definition is fecund in the sense that a metamodel can be derived from it that leads to models that allow the aspect of value creation to be studied in isolation from other effects, such as market behaviour. The definition unifies behavioural, structural and dynamic aspects of business models.

- A generic causal model of value creation is developed in Figure 14.6. This causal model is imbedded in a generic causal model of business dynamics in Figure 14.8.

- The combination of UML (which has a very powerful metamodel, cf. Chapter 6) and SD (which has a simple metamodel, but leads to quantitative simulation models) results in models that have rich semantics, are quantitative, and can be used for simulation-based scenario analysis.

- The dynamics of product innovation and its impact on consulting fees were explored in Chapter 20. Only few articles on this topic could be found in academic literature, so this could be a fruitful area for future research.

- Two publications have resulted from this research Grasl (2008a), Grasl (2008b), Grasl (2009c)). Both publications were within the SD-community and pertain to business model analysis and the resulting case studies. So far no publications have resulted pertaining to Definition 14.19 of the business model concept or the resulting metamodel.

22.7. Evaluation of research communication

Design-science research must be presented effectively both to technology-oriented as well as management-oriented audiences (Hevner, 2007, p. 12).

- The research has been communicated at three conferences and workshops within the scientific community (Grasl (2008a), Grasl (2008b), Grasl (2008c)).
- Two workshops on business model analysis were held for the business community (Grasl (2009a), Grasl (2009b)).

Chapter 23.

Open issues and potential future research

The last chapter highlighted a number of issues that remain to be investigated. This chapter pulls these together and structures them according to the design science research framework defined in Chapter 2.1.1:

Construct issues Open issues concerning the business model concept and is placement within the context of business engineering and strategy management.

Meta-model issues Open issues concerning the business model metamodel.

Method issues Open issues concerning the business model analysis method.

Instantiation issues Open issues concerning instantiations of the business model analysis method.

23.1. Construct issues

This section highlights open issues concerning the business model concept and is placement within the context of business engineering and strategy management.

- As discussed in Chapter 10, a basic assumption of transaction cost theory is that firms involved in a transaction choose a form of coordination which minimises transaction costs. The implications of this for the configuration of business models should be analysed.
- The fit of the business model concept within the BE-map and strategic management frameworks was discussed in Chapter 14. This discussion ought to be extended.
- The relationship between transactions in the business model metamodel and processes in the BE metamodel ought to be investigated in detail.

- Müller-Stewens and Lechner (2005) discuss patterns of value chains and reconfigurations of value chains. An attempt should be made to analyse and quantify these configurations using the business model analysis approach discussed here.

- The case study in Chapter 20 discussed the effects of product innovation and standardisation on consulting fees in PSFs and derived an insight-based SD-model for this. This model should be substantiated through further research and observation in the field.

- The concept of value creation was discussed in detail in Chapter 12, and various measures for value where defined. All these measures where only partially relevant to the case studies, which focused more on revenue and operating income[1]. Measures of value creation that are useful in practice ought to be investigated further[2].

23.2. Metamodel issues

This section highlights open issues concerning the business model metamodel.

- The business model metamodel introduced in Chapter 15 was derived from a generic definition of business model, but so far has only been applied to PSFs. The metamodel should also be applied to business models from other industries and other party types such as not-for-profit organisations, to test whether it is generic enough.

- Refinement of the business model metamodel with respect to attributes of the constructs identified so far should be performed, once more experience has been gained with the metamodel.

- Generic business model reference models for PSF could be defined on the basis of the case studies in Part IV.

- The case study in Chapter 19 highlights a business model of a “firm within a firm”. where a business unit is fully responsible for a complete business model, but shares resources with other business units. The case study in Chapter 21 highlights a firm that has two almost completely separate business models (consulting and standard software) that only share a common contact database and

[1]The case studies focused on gross margins, which is a measure of operating income.
[2]In particular ROVA as defined in Equation 12.13, which relates free cash flow to the value created.

corporate infrastructure. This points to the fact that the business model metamodel and business model analysis method defined here are in principle powerful enough to model such situations. Nevertheless the extension of the metamodel to firm with multiple business models should be considered in more detail and then formalised.

- Integration of the business model metamodel into appropriate strategy and process metamodels, in particular the BE metamodel introduced in Chapter 9.
- Further validation of the SD metamodel introduced in Chapter 7.4.
- The metamodel was used to remodel the full service provider business model schematic introduced by Weill and Vitale (2001, p. 111-128) in Chapter 15. This evaluation could be extended to further schematics.

23.3. Method issues

This section highlights open issues concerning the business model analysis method.

- No comprehensive survey was carried out to analyse the relevance of business model analysis to business practitioners. This should be performed to allow concretisation of the analyses performed and to expand the list of generic strategic questions introduced in Table 16.1.
- The utility of other simulation methods (such as agent-based modelling) to perform business model analysis should be evaluated.
- The method defined in Chapter 16 concentrates on analysis and completely neglects the topic of business model design. An extension of the method to inform the business model design process should be considered.
- Reconfiguration of business models (i.e. the process of actually transforming a business model) ought to be considered, in particular in connection with dynamic capabilities of a firm[3].
- Scenarios showing how the artifacts could be used in practice should be created, in particular in how the business model analysis method could fit into other strategy management and business engineering approaches.

[3]The goal should be to answer the strategic question pertaining to change, cf. Chapter 9.2

- The use of business model analysis to inform performance management and business intelligence strategies should be investigated[4].

23.4. Instantiation issues

This section highlights open issues concerning instantiations of the business model analysis method.

- Important aspects of value based management introduced in Chapter 12 are reward and incentive systems. Can business model analysis be used to identify the right policies for such reward systems?
- All firms the business model analysis method was instantiated at were SMEs, and all instantiations were performed by the same, single performer. Scalability of the method to larger firms and larger teams of business engineers should be investigated.
- All firms the business model analysis method was instantiated at were mature firms (at least ten years old). In particular this means that the models were based on the analysis of past behaviour and enough data was available to calibrate the simulation models. When applying this approach to young firms with only a short history (such as start-ups) simulation models can still be used. In such cases the reference data cannot reflect past behaviour, but it will reflect assumptions about future behaviour. The applicability of the method to firms in start-up phase and the utility of recommendations made based on simulation analysis should be investigated further.
- An important criterion for rigorous design of methods is "repeatability", as discussed in Chapter 16. So far the method defined here has not been repeated independently and an opportunity should be sought to do so.
- The models created during business model analysis are fairly detailed, so modelling guidelines and conventions would be useful to improve instantiation results.
- A comparison of the individual studies should be performed to draw conclusions about similarities and differences between individual PSFs and their business models.

[4] The goal should be to answer the strategic question pertaining to performance measurement, cf. Chapter 9.2

- Experiments should be performed based on the models and simulation microworlds created during business model analysis, to investigate whether they are easily understood by those not taking part in business model analysis itself.
- Experiments regarding the extensibility of the models to answer new strategic questions and accommodate new scenarios and the maintainability of models over a longer time period should be performed.

Chapter 24.

Conclusion

This dissertation started with the observation that a good business model is essential to every firm, whether it is a new venture or an established player (Magretta, 2002, p. 4), because it positions the firm within its value network, shows how it transacts with customers and suppliers, and clarifies the products that are exchanged. A business model also makes explicit the underlying value logic.

Many firms operate with a conceptually very simple business model: They supply a product that meets a consumer need and sell it at a price that exceeds the cost of production. Other firms have more complex business models, such as supplying a service for free but charging for advertising instead (Grant, 2008, p. 21).

Hamel (2000, p. 63) argues that in future business model innovation will be the key to creating new wealth: Competition will not take place between products or companies, but between business models. This is echoed by Kagermann and Österle (2006, p. 17), who predict that in future business model innovation will be more important for business success than product innovation.

Unfortunately the business model concept is not used consistently, either in research or in business practice (Magretta (2002, p. 4), Hedman and Kalling (2003, p.49)); the quantitative evaluation of business models is difficult, because they are mostly only developed informally and are frequently documented only in prose (Heinrich and Winter, 2004, p. 1); and the way a business model will develop over time is difficult to predict because of complex feedback dynamics (Sterman, 2000, p. 22), (Warren, 2002, p. 20).

The objective of this dissertation was therefore to rigorously develop a method to analyse all relevant aspects of a business model, that should:

- Be based upon a definition of the business model concept that is derived from rigorous analysis of relevant academic and business literature.
- Enable practitioners to make their business models more transparent to all relevant stakeholders, in both a qualitative and quantitative way.

- Allow practitioners to answer strategic questions relevant to the performance of their business.
- Define a model-based approach to business model analysis based on method engineering principles.
- Validate this approach by analysing the business model of four different professional service firms

Academic and business literature was analysed in Chapter 14, leading to Definition 14.19 of the business model concept.

A detailed business model metamodel was derived from this definition in Chapter 15 and applied to the full service provider schematic (Weill and Vitale, 2001, p. 111) as an illustration. This metamodel shows that business models have rich structure, behaviour and dynamics.

In order to analyse all aspects of a business model as defined in the business model metamodel, Chapter 16 developed a corresponding method for business model analysis. A method reference may be found in Chapter 16.2. The approach uses UML for modelling the structure and behaviour of business models and SD for modelling the dynamics of the business model and simulating its behaviour under varying conditions. A UML-profile for this metamodel is defined in Appendix A.

The method was subsequently used at four PSFs to raise strategic questions concerning the performance of their respective business models. These questions were then answered using scenario analysis based on the substantial models and dedicated simulation microworlds created during the analysis. These case studies are described in detail in Part IV. Detailed models and microworlds were created during each of these instantiations.

The research was critically evaluated in Chapter 22. Resulting open issues and potentials for future research were addressed in Chapter 23.

Part VI.

Appendix

Appendix A.

UML Profile for Business Models

This appendix follows OMG (2008c, p. 25) in defining an UML profile[1] for the business model metamodel. The major constructs of the business model metamodel are shown in Figure A.1 .

Every construct of the metamodel defined in Chapter 15 is assigned a stereotype, which by convention carries the same name as the construct itself. For each stereotype, the UML metaclasses that it can extend are listed. In principle UML offers the possibility of assigning graphical icons to each stereotype, thus allowing the appearance of diagrams to be customised. No such icons where assigned for this version of the profile.

The metaclasses "class", "attribute", "association" and "information flow" are the only pure UML elements needed in the UML profile. All these elements are introduced in Chapter 6. Next to these metaclasses, all constructs of the SD metamodel defined in Chapter 7.4 are used as metaclasses. Strictly speaking, the SD metaclasses are not real metaclasses but are themselves stereotypes of metaclasses. From a UML modelling perspective this means that elements that are mapped to a SD-metaclass have two stereotypes: the stereotype from the business model metamodel and the stereotype from the SD metamodel[2].

Some constructs (such as the construct "core construct" defined in Chapter 15.1.1) are abstract and cannot be instantiated within a user model. Abstract constructs are explicitly marked as such in the following tables.

For convenience only the parent constructs of the business model metamodel are listed: All child constructs are mapped onto the same metaclass as their parents. This leaves only the core constructs and value accounting types, which are listed in Table A.1 and Table A.2 respectively.

Some of the stereotypes can extend more than one metaclass: Channels are represented by classes when modelling structural properties, such as channel costs and

[1] UML profiles are introduced in Chapter 6.4.

[2] This had no practical impact on the models created during method instantiation, since all model elements carrying SD-stereotypes were modelled using a dedicated SD-tool.

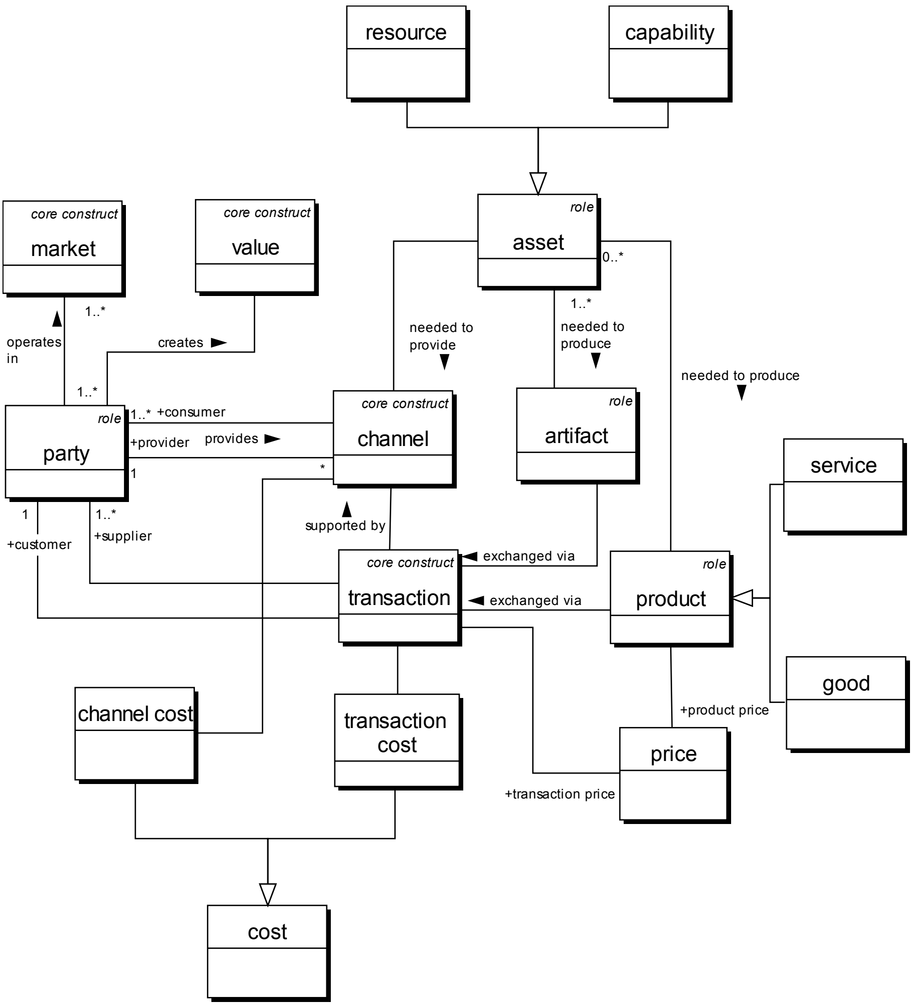

Figure A.1.: Major constructs of the business model metamodel the resources needed to support a channel, and by flows when modelling behavioural properties, such as products exchanged and parties involved. Transactions are represented by classes when modelling structural properties, such as transaction costs, and by flows when modelling behavioural properties, such as products exchanged and parties involved. Due to the usage of two different modelling notations, the roles that represent an entity are mapped onto both classes and stocks.

Stereotype	**Meta-Class**	**Abstract**
business policy	converter	no
business assumption	constant	no
business assumption	initial value	no
channel	association	no
	class	no
	flow	no
core construct	class	yes
	stock	yes
role	class	no
	stock	no
market	class	no
property	attribute	no
transaction	class	no
	information flow	no
value	stock	no

Table A.1.: Stereotypes of the core constructs

Stereotype	**Meta-Class**	**Abstract**
cost	class	no
	constant	no
	stock	no
price	class	no
	constant	no
	stock	no

Table A.2.: Stereotypes of the value accounting types

Appendix B.

Curriculum Vitae Oliver Grasl

Oliver Grasl has been managing partner of transentis management consulting since 1997. transentis focuses on improving value creation in complex systems through efficient and effective designs that align strategies, organisations and IT-landscapes.

After reading mathematics and theoretical physics at Cambridge University (Bachelor of Arts) and the University of Innsbruck (Mag. rer. nat), and a brief foray into software development, Oliver specialised in Business Engineering at the University of St. Gallen (Executive MBA in Business Engineering).

His current personal focus is on value creation strategies. Oliver regularly speaks at conferences and publishes papers in academic and trade journals. He is coauthor of the book "Prozessorientiertes Projektmanagement" (Grasl et al., 2004).

- ***2003-2005, University of St. Gallen, Switzerland.*** Executive Master of Business Administration in Business Engineering. Diploma thesis: "The architecture of innovative organisations"

- ***1992-1994, Leopold Franzens University of Innsbruck, Austria.*** Magister der Naturwissenschaften, Mathematik. Diploma thesis: "Five-graduated Lie Algebras".

- ***1989-1992, Cambridge University, England.*** Bachelor of Arts in mathematics and theoretical physics.

Appendix C.

Acknowledgements

All quotations are referenced directly in the main text apart from the following:

- The quotation by Gordon MacKenzie in the preface is taken from his book *Orbiting the giant hairball* (MacKenzie, 1996, p. 224).
- The quotation by T.S. Eliot in Chapter 22 is from his poem *Little Gidding*, which is the fourth poem of his *Four Quartets* (Eliot, 1969, p. 197).

Glossary

agent based modelling In an agent-based simulation model, the individual members of a population, such as firms in an economy or people in a social group, are represented explicitly rather than as a single aggregate entity. Important heterogeneities in agent attributes and decision rules can then be represented (Sterman, 2000, p. 896). 37, 38

artifact Something created by humans for a practical purpose (Merriam-Webster, 2009). 4–8, 10, 11, 14, 26, 79, 96, 97, 102, 103, 108, 129, 240, 254–259, 261–263, 267

asset A resource (e.g. physical property, intangible right) or capability that has economic value. Important examples are plant, equipment, land, patents, copyrights, and financial instruments such as money or bonds (Samuelson and Nordhaus, 1995, p. 744). 68, 69, 75, 103–106, 108, 110, 113, 119, 125, 126

association An association describes a set of tuples whose values refer to typed instances (OMG, 2005b, p. 36). 31, 33

beta Beta represents a stock's incremental risk to a diversified investor, where risk is defined by how much a companies stock varies with the average of the entire stock market (Koller et al., 2005, p. 294). It is thus a measure of a stocks volatility compared to the market average. 75

business A business is a party that creates goods or services beyond its own need and thus provides them to other parties. Businesses are characterised by the fact that they depend on a combination of assets (such as resources, capabilities), they must be economically efficient (i.e. the revenues are greater than the costs) and they need to be in financial equilibrium (Schierenbeck and Wöhle, 2008, p. 30). 91, 101, 103, 113

business assumption The assumptions a firm makes about the value it can create by implementing the business model under consideration (Magretta, 2003, p. 44). 95, 106 *business engineering* Business engineering is a holistic approach to the process of transforming enterprises: it deals both with hard facts (such as business strategy, business processes, information systems) and soft facts (resistance to change, employee motivation, politics, and power)(Österle and Winter, 2003, p. 12). 19, 23, 24, 57, 60, 62, 101, 263, 265, 267

business idea An organisations business idea defines the value created by the organisation, the nature of the competitive advantage exploited, the distinctive resources and capabilities, owned by the organisation, which allow it to create and appropriate value, and the reinforcing feedback loop, which in turns the idea into a self-sustaining engine for ongoing survival and growth (van der Heijden, 2005, p. 74). 89–91

business intelligence A set of techniques and processes that use data to understand and analyse business performance (Davenport and Harris, 2007, p. 7). 148

business model A party's business model shows how the party creates value for all the other parties within its value network by defining its value logic and by identifying the transactions through which goods and services are exchanged between these parties. xvii, 2, 3, 10, 11, 13–15, 25, 36, 41, 53, 58, 62–64, 71, 76, 83–89, 91–96, 99–103, 108, 111, 123–130, 132–137, 139, 142, 144, 146, 148–150, 153, 155, 234, 255–261, 264–268, 270, 271, 273

business model analysis A multi-method approach to analysing business models based on OOAD and system dynamics. ii, xvii, 10–13, 16, 22, 53, 56, 79, 130–132, 134–139, 141, 142, 145–151, 153–155, 178, 198, 237, 255–269

business operations Business operations are defined to be the collection of all activities and organisational structures needed to operate a firm. Both the business process and applications and technology layers of the business engineering map are part of business operations. 98, 125, 129, 130

business policy A rule that governs the behaviour of business in general and a firm's business model in particular. 96, 106, 125, 135, 255

capability Capabilities refer to a firm's capacity to deploy resources, usually in combination, using organisational processes, to effect a desired end. They are information-based, tangible or intangible processes that are firm-specific and are developed over time through complex interactions among the firm's resources (Amit and Schoemaker, 1993, p. 35). 91, 95, 96, 102, 103, 110, 113, 125, 129 *capitalisation* The sum of all long-term sources of financing to the firm, or equivalently: total assets less current liabilities (Higgins, 2007, p. 388). 86

case study A case study is an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident (Yin, 2003, p. 13). xvii, 11, 25, 79

causal loop diagram Causal loop diagrams show the relevant parts of a system using textual identifiers, the links between the parts are drawn using arrows pointing in the direction of influence. Small $+$ or $-$ signs are used to show whether the influence is positive or negative (also referred to as positive or negative link polarity). Causal loop diagrams are also referred to as influence diagrams. 37, 38, 40–42, 44, 46, 53, 90

channel A channel is a conduit by which a firm offers its products (Weill and Vitale, 2001, p. 61). These products are exchanged via transactions. 96, 102, 103, 106, 125, 126, 128, 129

class A class describes a set of objects that share the same specifications of features, constraints, and semantics (OMG, 2005b, p. 45). A class is a type that has objects as its instances (OMG, 2005a, p. 93). 30, 32, 33

commodity A product whose wide availability typically leads to smaller profit margins and diminishes the importance of factors (such as the brand name) other than price (Merriam-Webster, 2009). 104

construct In the context of design science, constructs are concepts from the vocabulary of a particular domain. They constitute a conceptualisation used to describe problems within this domain and to specify solutions (March and Smith, 1995, p. 256-258). 5, 10, 19, 44, 106, 258, 273

consumer A party that receives artifacts from a transaction. 84, 106, 270, *see* artifact

core competency A core competency is a complex set of resources and capabilities that links different businesses in a diversified firm through managerial and technical know-how, experience and wisdom (Barney, 2001, p. 414). 91

customer A party buying products from another party. xvii, 84, 96, 102, 106, 125, 128, 270 *design research* Design science is a research methodology used to produce and apply knowledge of tasks and situations in order to create effective and innovative artifacts (March and Smith, 1995, p. 253) and thus seeks to extend the boundaries of human and organisational capabilities (Hevner et al., 2004, p. 75). 4–8, 18, 19, 134, 254–257, 263

discrete event modelling A simulation technique where the current state of model elements is only examined and updated when an event relevant to the simulation occurs (Pidd, 2004, p. 17). 37

economic agent Used equivalently to party here. 104, 113, 114, *see* party

economic profit In the economic profit model, the value of a firm equals the amount of capital invested, plus a premium equal to the present value of the value created each year (Koller et al., 2005, p. 63). 71, 78

element An element is a constituent of a model (OMG, 2005a, p. 91). Element is an abstract metaclass with no superclass. It is used as the common superclass for all metaclasses in the UML metamodel (OMG, 2005a, p. 44). 33, *see* metaclass & metamodel

entity An entity is an abstraction of anything that has an identity. 19, 105, 108, 113, 131

factor market A firm's factor markets are the markets where it buys the resources needed to produce goods and services (the factors of production). 79, 96

feedback system A feedback system is a system that has a closed loop structure that bring results from past action of the system back to control future action—so feedback systems are influenced by their own past behaviour (Forrester, 1968, p. 1-5). 38, 41

firm A firm is a business that is privately owned, autonomous and seeks to maximise profits (Schierenbeck and Wöhle, 2008, p. 31). xvii, 10, 11, 13, 14, 58, 78, 79, 81, 83, 85, 86, 90, 91, 106, 112, 113, 127, 128, 132, 136, 139, 151, 154, 260–262, 266–268

flow Flows represent the rate at which the stocks within a system are changing at a particular instant. 37, 41, 42, 45, 47, 50 *focal firm* In the context of business model analysis the focal firm is the firm whose business model is being analysed. The term is used here following Zott and Amit (2007). 72, 76, 88, 103, 129

force field analysis A technique used for analysing a stakeholders importance and attitude with respect to a change that is to be implemented within an organisation (Grasl et al., 2004). 141, 142, 150

free cash flow Total cash available for distribution to owners and creditors after funding all worthwhile investment activities (Higgins, 2007, p. 22). 71, 74

good A good is a material product. 94, 96, 103, 113, 125

graphical function A graphical function (also referred to as a table function) defines how two variables depend on each other by explicitly defining each pair of points defining the relationship using a lookup table. Pairs of points lying in between the explicitly defined ones are interpolated (Sterman, 2000, p. 552). 49, 51

influence diagram An alternative name for causal loop diagrams. 38

information Information is a non-material product that may be exchanged many times (Picot et al., 2001, p. 61). It is the knowledge increment brought about by a transaction; i.e. it is the difference in conceptions interpreted from a received message and the knowledge before the transaction (Eriksson and Penker (2000, p. 258) referencing Falkenberg et al. (1996)). 87, 107

information flow An information flow specifies that one or more information items circulate from its sources to its targets. Information flows require some kind of channel for transmitting information items from the source to the destination. An information channel is represented in various ways depending on the nature of its sources and targets. It may be represented by connectors, links, associations, or even dependencies (OMG, 2005b, p. 590). 31, 282

information management Information management is a management discipline concerned with solving business challenges using information technology, and with conceiving, realising and operating the information and communication infrastructure of the business (Alpar et al., 2002, p. 56). 4

instance specification An instance specification is a model element that represents an instance in a modelled system (OMG, 2005b, p. 78). 31

instantiation An instantiation is a realisation of an artifact in its environment. Instantiations operationalise constructs, models and methods. It is important to note that instantiations may precede the complete articulation of their underlying constructs, models and methods—an instantiation may be created out of necessity, using intuition and experience. Only as it is studied and used are we able to formalise the constructs, models and methods on which it is based. (March and Smith, 1995, p. 256-258). 5, 7, 10, 110, 111, 113, 133, *see* artifact

knowledge provider A professional service firm specialised in providing goods and services in which knowledge is an important factor of production (Rode, 2001, p. 14-16). 81, 91

M0 The UML is defined using a four-layer metamodel hierarchy. Level M0 represents the system under study, i.e. the part of reality that is to be modelled (OMG (2005a, p. 16), Seidewitz (2003, p. 30)). 28, 101, *see* metamodel, M1, M2 & M3

M1 The UML is defined using a four-layer metamodel hierarchy. Level M1 represents the model created by the user (OMG (2005a, p. 16), Seidewitz (2003, p. 30)). 28, 30, 31, 34, 36, 101, 111, *see* metamodel, M0, M2 & M3

M2 The UML is defined using a four-layer metamodel hierarchy. Level M2 contains the metamodels used to define the language the model is created in, e.g. UML (OMG (2005a, p. 16), Seidewitz (2003, p. 30)). 28, 30, 31, 36, 101, 111, 125, 128, *see* metamodel, M1, M0 & M3

M3 The UML is defined using a four-layer metamodel hierarchy. Level M3 contains the meta-metamodels used to define the language the model is created in. In this case the metamodel is referred to as MOF (Meta-Object-Facility), which is again defined in UML (OMG (2005a, p. 16), Seidewitz (2003, p. 30)). 28, 31, *see* metamodel, M1, M2 & M0

management science Management science (also known as operations research) is the discipline of applying advanced analytical methods to help make better decisions. By using techniques such as mathematical modelling to analyse complex situations, management science gives executives the power to make more effective decisions and build more productive systems based on more complete data, consideration of all available options, careful predictions of outcomes and estimates of risk and the latest decision tools and techniques (INFORMS, 2008). 4

market An arrangement whereby buyers and sellers interact to determine the prices and quantities of a commodity. Some markets (such as the stock market or flea market) take place in physical locations; other markets are conducted over the telephone or are organised by computers (Samuelson and Nordhaus, 1995, p. 756). 104, 106, 125

metaclass A metaclass is a class at the M2 level of the UML metamodel hierarchy. 27, 28, 33–35, 273, *see* metamodel

metamodel A metamodel is itself a model, that is used to describe another model using a modelling language. The term "meta" is therefore relative—depending on the perspective a model is either a model or a metamodel. It is important to note here that a metamodel is not an aggregated or less detailed view of another model: a metamodel is a model at a different level of abstraction that makes statements about the structure of another model, without making statements about its content. The elements of metamodels are referred to as metaclasses (Hitz et al., 2005, p. 300). xvii, 3, 10, 13–15, 19–22, 24–28, 30–34, 36, 44, 45, 57, 58, 62, 64, 88, 89, 99, 101, 102, 104–106, 108, 110, 111, 113, 116, 117, 123–130, 132, 133, 135, 136, 139, 141–144, 146, 150, 153, 155, 256–259, 261, 263–267, 271, 273, *see* metaclass

method A method is a set of steps that need to be performed to reach a specific goal (Stahlknecht and Hasenkamp, 2004, p. 212). Within the context of design science methods are based on a set of underlying constructs and a model of the solution space (March and Smith, 1995, p. 256-258). xvii, 5, 10, 14, 18, 19, 22, 23, 37, 38, 79, 110, 111, 113, 130–132, 134, 147, 257, 258, 261

method engineering Method engineering was originally conceived as the engineering discipline to design, construct and adapt methods, techniques and tools for the development of information systems. Meanwhile the method engineering approach has been extended to the engineering of enterprises as a whole, in order to ensure a repeatable, scalable, disciplined engineering process and facilitate increased division of labour, as opposed to individualistic creation (Winter, 2003b, p. 88). 2, 57, 131, 133, 257, 271 *method engineering metamodel* A metamodel that defines the structure of a method. This dissertation uses the metamodel introduced by Gutzwiller (1994). 22, 131, 133, 147

methodology A body of methods, rules and postulates employed by a discipline; a particular procedure or set of procedures (Merriam-Webster, 2009). 4, 22, 23

microworld A term coined by Papert (1993) and used synonymously with the term virtual world in this document. 42, 136, 155, 173, 178, 188, 247, 262, 269, 271, *see* virtual world

model A model is a set of propositions or statements expressing relationships among constructs (March and Smith, 1995, p. 256-258). It is an external and explicit representation of a part of reality as seen by the people who wish to use that model to understand, to change, to manage and to control that part of reality (Pidd, 2003, p. 12). 5, 13, 36, 44, 50, 52, 53, 137, 150, 271

named element A named element represents elements with names (OMG, 2005a, p. 91). 33, *see* element

network economy A network economy is an economy characterised by network effects: every new member of the network increases the value of the network, leading to positive feedback effects (Sterman, 2000, p. 370), (Shapiro and Varian, 1999, p. 174). 107

noun/verb analysis Noun/verb analysis is a very simple way of analysing text to try and find classes, attributes and responsibilities. In essence, nouns and noun phrases in the text indicate classes or attributes of a class, and verbs and verb phrases indicate responsibilities or operations of a class (Arlow and Neustadt, 2005, p. 164). 24, 25, 102

object An object is the instance of a class. 32

Object Constraint Language The Object Constraint Language (OCL) is a text language for specifying constraints and queries and writing expressions for navigating within a UML model. OCL is not intended for writing actions or executable code (Rumbaugh et al., 2005, p. 490). 36

object-oriented analysis and design Object-oriented analysis and design is an approach to modelling information systems as groups of interacting objects, that has been used in software engineering for many years. Each object represents some entity of interest in the system being modelled, and is characterised by its class, its state, and its behaviour. Various models can be created to show the static structure, dynamic behaviour, and run-time deployment of these collaborating objects . 133

ontological instantiation Instantiations of constructs that exist in the same layer of the metamodel hierarchy, i.e. two constructs at the same level in the hierarchy, one of which is an instance of the other at a particular point in time, are referred to as ontological instantiations (Hitz et al., 2005, p. 306). 30, *see* metamodel

open system An open system is a system that is characterised by outputs that respond to inputs, but where outputs are isolated from and have no influence over the inputs (Forrester, 1968, p. 1-5). 38

opportunity cost A firm's opportunity cost is best defined using a thought experiment: The firm is interested in acquiring a certain quantity of resources from the supplier. The thought experiment this time consists in taking this quantity of resources away from the supplier and giving the supplier money in return. The amount of money that leads the supplier to gauge the new situation (money minus resources) as equivalent to the original status quo defines the supplier's opportunity cost (Brandenburger and Stuart, 1996, p. 9). 72, 73

party A party is any legal entity taking part in the economic process (Schierenbeck and Wöhle, 2008, p. 29). 93, 94, 96, 97, 102–106, 108, 115, 118, 125–129, 146, 150

principle of decomposition Divide a problem into parts on solve each separately. Beware of general purpose models that try to incorporate everything (Pidd, 2003, p. 90). 101

principle of parsimony Be parsimonious, start small and add. Models should be developed gradually, starting with simple assumptions and only adding complications as they become necessary (Pidd, 2003, p. 86). 101, 110, 111

private household A private household is an economic agent that does not create goods or services or only creates them for its own use (Schierenbeck and Wöhle, 2008, p. 29). 103, 114 *product* A product is any good or service produced by a business. Businesses are characterised by the fact that they produce goods or service beyond their own need and can therefore offer them to other economic agents via a market process (Schierenbeck and Wöhle, 2008, p.30). xvii, 84, 85, 87, 94, 96, 102–104, 106, 108, 109, 125–127, 270

product market Markets where a firm's products are sold. 79

professional service firm A firm where professional skills form the basis of its offering to customers (Young, 1961, p. 1). 2, 11, 53, 79, 133, 271

profile The UML has an in-built extension mechanism know as UML profiles. A profile is a coherent set of extensions applicable to a given domain or purpose, the UML language mechanisms used are stereotypes, tagged values and constraints. 15, 27, 28, 271, 273

profit Equivalent to earnings. The excess of revenues over all related expenses for a given period (Higgins, 2007, p. 390). 66, 78, 79, 86, 113, 129, 147

public authority A public authority is similar to a public enterprise but is not incorporated (Schierenbeck and Wöhle, 2008, p. 31). 103, 114

public enterprise A public enterprise is a business that is owned by the public, is not autonomous and follows a planned economy (i.e. the production level is not determined by the market but determined by the government) (Schierenbeck and Wöhle, 2008, p. 31). 113, 114

reference model A reference model is a model or model component of a particular kind of system (business, IT-System) that can be reused in a concrete modelling context (Fettke and Loos, 2005, p. 19). 146

resource Resources are stocks of available factors that are owned or controlled by the firm. They are converted in to final products by using a wide range of other firm assets and bonding mechanisms such as technology, management information systems, and more (Amit and Schoemaker, 1993, p. 35). Barney (2001, p. 156) further differentiates these resources into financial resources, physical resources, human resources and organisational resources. 79, 91, 95, 102–104, 110, 113, 129

return on value added A measure of the value a firm creates that compares the firm's free cash flow to the firm's total value added. 78

revenue The inflow of resources to a business for a period from sale of goods, of information, or for provision of services (Higgins, 2007, p. 396). 86, 129

role A role represents an entity in a particular context. The primary justification of a role is that it controls complexity by partitioning knowledge of an entity into separate domains, and allows this knowledge to change over time (Marshall, 2000, p. 103).. 19, 105, 108, 113, 128, 131, *see* entity

run-time semantics The run-time semantics of a modelling language define a mapping between the modelling constructs available in the modelling language and an execution environment, also referred to as the "run-time environment" (OMG, 2005b, p. 8). Examples for execution environments are computer programmes being executed in some operating system, simulation environments and the real world. 33

scenario Scenarios are tool for systematically looking into the future. They describe a possible future development of the system or situation under consideration (Weber et al., 2005, p. 19). 139, 150

service A service is a non-material product that may only be exchanged once between actors within a transaction. 79, 84, 87, 94, 96, 103, 109, 113, 125, 270

simulation model A model that may be used as a basis for experimentation, often in a "trial and error" way to demonstrate the effect of various policies (Pidd, 2004, p. 8). 37

socioeconomic system A system consisting of humans, organisations and technologies. 4

stakeholder Anyone who has a stake in an enterprise or is involved in or is affected by a course of action (Merriam-Webster, 2009) . In the context of business models all entities that are affected by the value created by a firm: customers (satisfaction gained), employees (wages and salaries), investors (interest), government(taxes), shareholders (profit) and suppliers (Grant, 2008, p. 35). xvii, 19, 61, 71, 85, 91, 111, 112, 131, 134, 135, 138, 151

Standard & Poor's Standard & Poor's is a company offering indexing services for the world's financial markets. The S&P 500 Index is widely regarded as the best single gauge of the U.S. equities market. Similar indexes exist for other markets, e.g. the S&P Europe 350 and the S&P Global 1200 (Standard and Poor's, 2009). 75

stereotype A stereotype defines how an existing metaclass may be extended, and enables the use of platform or domain specific terminology or notation in place of or in addition to the ones used for the extended metaclass. Stereotype is a kind of class that extends classes through extensions. The name of the stereotype is shown within a pair of guillemets («. . . ») above or before the name of the model element. If multiple stereotypes are applied, the names of the applied stereotypes are shown as a comma separated list with a pair of guillemets. When the extended model element has a keyword, then the stereotype name will be displayed close to the keyword, within separate guillemets (example: «company» and «person») (OMG, 2005a, p. 192). 34–36, 273, *see* metaclass & metamodel

stock Stocks represent the state of a system at any given instant in time. 37, 41, 42, 45, 47, 50

stock and flow diagram A graphical notation for visualising the integral equations that govern a systems behaviour. 37, 42, 44, 46, 53, 91

strategy The plans, policies and principles by which individuals or organisations achieve their objectives (Grant, 2008, p. 17). 60, 123, 127

strategy management The management process that is concerned with how a firm develops and executes strategies. 60, 62, 89, 136, 263, 265, 267

superclass A is a superclass of B if there is a generalisation hierarchy between A and B. 33

supplier A party that provides artifacts to a transaction. xvii, 84, 106, 125, 127, 128, 270, *see* artifact

system A system is a grouping of interconnected parts (Sherwood (2002, p. 3), Haberfellner et al. (2002, p. 5)). 13, 37–39, 41, 42, 54, 115, 139

system dynamics System Dynamics is a method devoted to the study of systems, and is thus a tool within the systems thinking tool kit. It uses simple graphical notations to model systems: causal loop diagrams and stock and flow diagrams. 19, 42, 45, 53, 132, 133, 150

systems engineering Systems engineering is a purposeful and goal-oriented method for engineering complex systems, based on the system thinking paradigm and a defined problem solving cycle (Haberfellner et al., 2002, p. XVIII). 139

systems thinking The term systems thinking is used in a very broad fashion to mean either of following: A holistic perspective on reality that sharpens awareness of wholes and of how the parts within those wholes interrelate, a set of tools (such as causal loop diagrams, stock and flow diagrams and simulation models), a specific vocabulary that expresses understanding of systems, such as "reenforcing and balancing feedback loops", "stocks" and "flows". 37, 53, 54

table function A table function (also referred to as a graphical function) defines how two variables depend on each other by explicitly defining each pair of points defining the relationship using a lookup table. Pairs of points lying in between the explicitly defined ones are interpolated (Sterman, 2000, p. 552). 49

technique A technique is a particular approach to achieving an aim or creating a particular result. 19, 132, 141

total value added The revenue generated by a firm through all its transactions less the cost incurred in supporting the transactions that generate that revenue. 76

transaction Firms interact via boundary spanning transactions (Zott and Amit, 2007, p. 3), which are supported or enabled by channels. A transaction takes place when a product is exchanged via a separable interface (Richter and Furubotn, 2003, p.55). 14, 63, 76, 93, 94, 96, 103, 104, 106, 125, 126, 128, 129

transaction model The transaction model identifies the transactions that are supported or enabled via the channels of a business models value network, and the products that are exchanged during these transactions. 104, 106, 129, *see* value network, business model, channel & transaction

type A type is a named element that is used as the type for a typed element (OMG, 2005a, p. 92). 32, 33, 101

typed element A typed element is a kind of named element that represents elements with types (OMG, 2005a, p. 92). 32, 33, *see* named element & element

UML profile A UML profile is a coherent set of extensions applicable to a given domain or purpose, the UML language mechanisms used are stereotypes, tagged values and constraints (Rumbaugh et al., 2005, p. 115). 34, 36, 101

Unified Modelling Language The Unified Modelling Language (UML) is a visual language for specifying, constructing, and documenting the artifacts of systems. It is a general purpose modelling language that can be used with all major object and component methods, and that can be applied to all application domains (e.g., health, finance, telecom, aerospace) and implementation platforms (e.g., J2EE, .NET). 26

value A measure of the benefit a firm creates for its stakeholders. Concrete measures for value generated by a firm used in this document are the free cash flow discounted by the weighted average cost of capital and the firm's growth rate, the total value added (TVA) and the return on value added (ROVA). 71–73, 76, 85, 96, 102, 112, 129

value added The value added a firm creates is calculated by subtracting all external costs from the net sales. The value added does not consider the operating expenses a firm has—so two firms may create equal value added, but one may be profitable due to superior organisation, while the other makes a loss. It also does not take into account the fact that a firm needs to invest some of the value created back into the firm to ensure that value generation can be continued in the future—therefore it does not show all aspects of a firm's performance (Müller-Stewens and Lechner, 2005, p. 370). 73, 85

value based management Value based management is an approach to management that argues that the contributions of individuals and groups toward the creation of value should be measured using appropriate performance measures and that rewards should be structured accordingly (Martin and Petty, 2000, p. 5). 71

value chain Every firm is a collection of activities that are performed to design, produce , market, deliver and support its product. All these activities can be represented using a value chain (Porter, 1985, p. 36). 86

value logic A firm's value logic shows how resources and capabilities are used to create products, attract customers and drive value creation in a self sustaining feedback loop. 71, 96, 102, 104, 135, 255, 270

value network The value network of an economic agent is the collection of all economic agents connected to it via channels within a particular business model (Müller-Stewens and Lechner (2005, p. 377), Stabell and Fjeldstad (1998), Bovet and Martha (2000)). xvii, 84, 93, 94, 96, 102, 104, 106, 129, 135, 255, 270 *view* a view is a projection of a model, which is seen from one perspective or vantage point and omits entities that are not relevant to this perspective (Rumbaugh et al., 2005, p. 678). It is a representation of a whole system from the perspective of a related set of concerns (The Open Group, 2007, p. 297). 102, 115

virtual world Virtual worlds are formal models, simulations, or microworlds in which decision makers can refresh decision making skills, conduct experiments, and play (Sterman, 2000, p. 34). 136, *see* microworld

weighted average cost of capital The weighted average cost of capital (WACC) is the rate of return that investors expect to earn from investing in a company and therefore the appropriate discount rate for free cash flow. Viewed form a firms perspective it is an opportunity cost that arises to the firm's shareholders because the firm is using its capital to fund its operations and not investing it elsewhere (Martin and Petty, 2000, p. 64). The WACC is calculated from the cost of the firm's debt and the cost of its equity. Debts costs arise due to the interest a firm has to pay to its creditors, equity costs are opportunity costs that arise to the firm because it is using its own equity to finance its operations and not investing it elsewhere. 74

willingness-to-pay The willingness-to-pay is best defined using a thought experiment, in which a buyer is interested in acquiring a certain quantity of product from the firm. Imagine that the buyer is first simply given this quantity of product free of charge. The buyer must find this situation preferable—typically, in fact, strictly preferable—to the original status quo. Now start taking money away from the buyer. If only a little money is taken away, the buyer will still gauge the new situation as better than the original status quo. But as more and more money is taken away, there will come a point at which the buyer gauges the new situation as equivalent to the original status quo. The amount of money at which equivalence arises is the buyer's willingness-to-pay for the quantity of product in question (Brandenburger and Stuart, 1996, p. 8). 72, 73, 85, 134, 147

Acronyms

BE business engineering. 13, 38, 56–58, 98, 100, 256, 263, 265, 267

BMM business motivation model. 58

BNF Backus Naur Form. 44

BPDM business process definition metamodel. 58, 60

CAPM capital-asset pricing-model. 75

CEO chief executive officer. 134

CLD causal loop diagram. 91, 122

CWM common warehouse metamodel. 32

EMBA Executive Master of Business Administration. i

EVA economic value added. 71

FCF free cash flow. 74, 76, 78

HSG University of St. Gallen. i

IT information technology. 11

IWI Institute of Information Management. i, 84

KPI key performance indicator. 198, 247, 252

MBVF market-based-view of the firm. 14, 65, 124

MD managing director. 134

ME method engineering. 13, 18–20

MOF meta-object-facility. 31, 32

OCL Object Constraint Language. 35, 36, 45, 106

OMG Object Management Group. 21, 26, 31, 36, 58, 83

OOAD object-oriented analysis and design. 3, 13, 23–25, 56, 143, 149, 150, 260

OpenUP Open Unified Process. 22, 23

PDM product data management. 233, 239, 242

PSF professional service firm. 11, 14, 15, 25, 61, 79, 137, 259, 261, 266, 268, 271

RBVF resource-based-view of the firm. 14, 65, 66, 68, 91, 125

ROVA return on value added. 78, 112, 266

RUP Rational Unified Process. 22, 23

S&P Standard & Poor's. 75

SCP structure conduct performance. 66

SD system dynamics. 3, 13, 34, 37, 38, 42, 44, 54, 56, 81, 101, 117, 149, 150, 155, 156, 180, 241, 255–257, 259, 260, 263, 266, 267, 271, 273

SE systems engineering. 13, 54, 56

SM strategic management. 13

SME small and medium enterprise. 261, 268

SPEM Software Process Engineering Metamodel. 22

TCT transaction cost theory. 14, 63

TE technical editing. 233, 239, 242

TOGAF The Open Group Architecture Framework. 22, 23

TVA total value added. 76–78, 112

UML Unified Modelling Language. 3, 13, 15, 19, 23, 25–28, 30, 31, 33, 34, 36, 44, 56, 83, 101, 115, 117, 132, 143, 155, 256, 260, 263, 271, 273

UP Unified Process. 23, 24

VBM value based management. 14

WACC weighted average cost of capital. 74, 75

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