Business Modelling & Solutions
Fourth edition

Bo Sundgren
Christofer Tolis
Gösta Steneskog

Manuscript in preparation. January 13, 2005
Please do not copy or quote without the permission of the authors
Please note that this is work in progress. Both content and form have yet to be finalised.

Please send comments and suggestions regarding this manuscript to any of the authors below:

Bo Sundgren, bo.sundgren@hhs.se
Christofer Tolis, christofer.tolis@hhs.se
Gösta Steneskog, gosta.steneskog@procman.se

Postal address:
Department of Information Management
Stockholm School of Economics
Box 6501
SE-113 83 Stockholm
Sweden

© The authors 2002, 2003, 2004, 2005
Preface

There are a number of occasions that requires a good understanding of a business. Whether you work as consultant, project leader, or manager, there are often reasons for looking into specific businesses, or parts thereof. The need for understanding may be the prerequisite for improving the business, e.g. by taking advantage of a new idea or a new technical solution.

The aim of this book is twofold. First, it attempts to give you insight into different business solutions, reflecting the development of important ideas regarding strategies, operations, and information. Second, the book aims to give you tools for business exploration in the form of a set of modelling perspectives. These tools represent a practical means to explore both current and future solutions, and therefore a way to continually learn about different businesses.

This book is written for everybody with an interest in understanding and changing businesses. In particular, this means you who professionally do consultancy work with IT, lead development projects, or manage some business area or function. Moreover, the book is also intended for you who study these issues as a graduate student. We hope that you will find our attempts rewarding.

We wish to thank our colleagues at the department of Information Management, former students, and others that have provided valuable feedback on the first edition of this book. Please let us know of any further suggestions for improvements that you come to think of.

Stockholm, January 2005

Bo, Christofer & Gösta
Table of Contents

INTRODUCTION.................................................................................................................. 1
   Business Modelling for Exploring Business Problems & Solutions .................. 3
PART I: BUSINESS SOLUTIONS.................................................................................. 13
   Strategy Solutions: Customer Satisfaction in Context............................... 14
   Operations Solutions: Value Creation and Marketing ......................... 28
   Information Solutions: Information Systems in Context ....................... 55
PART II: BUSINESS MODELLING ........................................................................... 83
   Value Modelling: Exploring Strategy Solutions ..................................... 85
   Concept Modelling: Exploring Information Solutions ....................... 126
INTEGRATION ........................................................................................................... 139
   Multiple Perspectives in Business Exploration .................................... 141
   References .......................................................................................................... 159
INTRODUCTION
How can we understand and change a business that we come in contact with? In this chapter, the core idea of the book – exploring business solutions by engaging in business modelling – is presented in two steps. First, the view of businesses as interrelated sets of business solutions is explained. Second, the activities of business modelling are presented as a tool for grasping and influencing the business. The chapter ends with an outlook on the remaining chapters of the book.

Grasping and influencing businesses

A complex world requires flexible tools. New technology and new ideas lead to ever-changing business situations. Recognising that yesterday’s solutions often are today’s problems, business problems and solutions not only affect people within the business, but also customers, suppliers and other stakeholders. Creating business opportunities and competitive advantages requires a balance between constructively identifying possibilities and critically examining difficulties.

In this book, we will explore business problems and solutions by engaging in activities of business modelling. To introduce you to these issues, we will spend the first chapter on outlining the quest ahead.

When reading about a company in the newspaper, you get a certain idea of it. Talking to the receptionist over the phone, you get another understanding for it. Wandering through its office, you get yet another impression of it. As each of these views highlights certain issues and downplays others, a key challenge is to be able to use them all, switching between them when appropriate, and search for linkages and missing pieces.

Underlying our book is the belief that there is much to be gained from considering multiple perspectives. We emphasise the ability to shift attention between different perspectives during business exploration. Called double or multiple comparison, it has been encouraged because “the combination of information of different sorts or from different sources results in something more than addition. … A momentary gleam of enlightenment” (Bateson, 1979, p. 91). However, as illustrated in Figure 1, handling multiple perspectives can be easier said than done, and requires both an open mind and conscious training.
Our focus on multiple perspectives stem from another belief, namely that our view of a particular business is influenced both by the way it is and the way we look at it\(^1\). Without going into philosophical details, there are quite different viewpoints on the relationship between the objective and the subjective (cf. Burrell & Morgan, 1979). In this book, we will combine the “objective” state of affairs in the business, the topic of our exploration, and emphasising the “subjective” perspectives of an observer, using different tools for exploration (cf. Figure 2). This will be evident in the following, where we first take a brief look at different business solutions before we introduce some basic issues of business modelling.

\[ \text{Figure 2. Topics of exploration and tools for exploration – an overview.} \]

The topic of exploration: business solutions

We focus on businesses as the topic of our exploration. But what is it, this “business” that we try to grasp and influence? We will settle for a rather vague answer at this stage, as this is a main question throughout the book. Indeed, the chapters ahead try to provide various bits and pieces for elaborating the answer as we go.

\[^1\] This view parallels Langefors’ (1966/73) so called infological equation, \( I = i(D, S, t) \), expressing that information (I) is the result of an interpretation (i) of “objective” data (D), using our “subjective” conceptual structure (S), during a specific time period (t).
Broadly speaking, by “business” we mean a purposeful activity using and producing information and other resources. An example is the development and sales of home furniture in order to become a market leader. The concept of business is thus closely related to the concepts of organisation, company, firm, and enterprise. We prefer the term business for two main reasons. First, we do not wish to delimit ourselves to a certain scope. A business might be very small (e.g. a single person working as a consultant), or very large (e.g. a multinational company), or anywhere in between.

Second, and this is worth emphasising, we do not wish to delimit ourselves to commercial activities. Although most businesses have as an important purpose to earn money for its owners, many have also other types of purposes that considered more relevant, e.g. to produce services for its members or to promote some kind of idea. Economical and other restrictions notwithstanding, the role of money might differ in different businesses:

In some cases, the business is a means to an end – money, in other cases, money is a means to an end – the business.

Three areas of business solutions

A business can be seen as a network of different solutions. Solutions are state of affairs in the business, and might just as well be considered problems. Examples include the corporate vision, the way a customer complaint is handled, and the Internet web server just installed in the basement. A business solution can thus be any result of human effort, not necessarily deliberate. Hence, solutions also cover situations that have evolved without any conscious master plan.

Figure 3. Three areas of business solutions as topics of exploration.

As there are an endless stream of new ideas and solutions in a business, we will use a broad division into three main areas that can be traced back to our definition earlier: strategies, operations, and information. As outlined below, there are different issues in focus in each of the three areas of business solutions (cf. Figure 3):

- Strategy solutions: Purpose, mission, vision, objectives, goals, strategies, and raison d’être of the business. This is the subject of chapter 2.
- Operations solutions: Actors’ behaviour, tasks, transformations, routines, procedures, and processes in the business. This is the subject of chapter 3.
• Information solutions: Information content, information systems, information technology, and other resources in the business. This is the subject of chapter 4.

Different business solutions

Different businesses have different types of solutions. Figure 4 illustrates a privately owned company that strives for profit by providing added value to its customers. As an example, during the last few decades, a company called Volvo has been a combined person car and truck producer, a would-be oil producer (the Norwegian vision), a food producer, a would-be drug producer (the Dr. El Sayed vision), and a pure truck producer (after selling off its person cars to Ford). Throughout this period, a persistent goal of Volvo has been to earn money for its owners.

![Figure 4. Examples of business solutions of a commercial company.](image)

Figure 5 shows a public institution, e.g. the health system of a country, aiming at providing services demanded by the citizens of a society. For example, the goal of the Health Organisation of a country is to care for and cure those of its citizens who have medical needs. The fulfilment of this goal requires good economy with scarce resources. One possibility to achieve this – not undisputed, though – is to outsource the production of certain types of services to companies with an interest to earn money for its owners.

![Figure 5. Examples of business solutions of a national health system.](image)

Finally, Figure 6 shows a non-profit organisation, e.g. a church or a co-operative, wanting to promote some idea or interest of its members. Note that “good economy” also plays a role for this type of organisation. Rather than being a goal in itself, as for a commercial company, it is more of a restriction or a means to other ends.
It is always difficult to make a brief and yet meaningful description of a complex business. The examples above show how this can be done in terms of the three areas of solutions introduced. Although all businesses have strategy solutions of some kind, the specific values pursued can differ to a large degree when examined in detail. The same applies to operations and information solutions. One question is therefore how the business can be explored in further detail.

In a general sense, a person’s knowledge and experience provides her with a most useful tool when exploring a business. Being aware of current business ideas and best practices gives an advantage when trying to get a grip on a specific business. Indeed, this awareness is what we aim for when we in later chapters will look more closely on different business solutions. However, the value of what you learn increases if you also learn how to learn, so that you acquire tools and techniques that enables you to better grasp and influence a business in the future. As business solutions more or less rapidly change over time, you need to be able to focus on some core perspectives, enabling you to explore new and unique situations and put existing solutions into perspective. We believe that business modelling is a useful tool for achieving this.

The tool for exploration: business modelling

Business modelling is the use of business models to grasp and influence businesses. Drawing on theories of signs (Peirce, 1893-1910/1985), a business model is something that is seen as referring to some part or aspect of a business or its environment. With such a broad definition of business models, we acknowledge that there are many forms of models that can be useful for exploring a business.

Take the balance sheet in an annual report as an example. Provided that you know how to interpret it, the figures give you certain insights into the business in question. Hence, it can be seen as a specific type of business model. Another example is the organisational chart that the president of the company is showing to the members of the board. Here, they can understand the new structure of the organisation following the latest reorganisation. As a business model, the organisational chart tells the informed viewer about some details of the business, while leaving out other.

It is this second type of models that we will focus on in this book, namely business models in graphical form. The main reason for this is that graphical models have the possibility of both being easily accessible and still

---

2 However, we are not focusing on models of our own exploration. These type of models are often labelled methods and have a strong normative focus, prescribing rather than describing what is supposed to be done.
precise. This is important as models often are used in communication between different groups of people and might fill multiple purposes. That a model is easy to understand is crucial when communicating between people in order to facilitate comprehension and acceptance; that it is precise is needed to reduce the risk of misunderstanding, for example when developing information systems.

In order to help you understand the activities of business modelling, we will make use of an analogy with an artist. As you will see, there are deeper reasons than the common graphical form that has led us to this comparison. One is to emphasise that business modelling is indeed an art in many ways.

**The art of business modelling**

When a landscape-painter is creating a new painting it could be looked upon as a sort of modelling. First, he collects his impressions of the landscape by viewing it and strolling around in it, in order to create his own picture of it, his own impression, his own notion or – if you want – his own mental model of it. This mental model is an extraction of the important elements and sentiments of the landscape.

His next step is to express his mental model on canvas, using his preferred technique and the rules of the school or “ism” he believes in. He is working in trial-and-error mode. He paints, steps back, evaluates, make changes, etc. until he is satisfied and feels there is a harmony between his mental model (his inner picture) and the painting. He takes another look at the landscape, finds out some new details, returns to the painting and the work continuous. Both his mental model and his painting are revised, being influenced by each other and the landscape itself (cf. Figure 7). The work is in a way never finished but at a certain point in time he feels that “it is good enough” and that it is time to show the painting to the public.

![Figure 7. An artist working on his painting.](image)

Business Modelling is a similar activity. The Business Modeller collects her impressions of the business landscape she is trying to understand, walks around in it, looks at figures, reads documents, listens to other people’s opinions, etc, in order to create her own mental model of the business solutions that she experiences.

Next, she expresses her mental model using her preferred technique (tables, text, graphs, etc) and the type of focus she selects (strategy, operations, concept, etc). Different modelling “schools” are usually more rigid than those of the painter’s and is forcing the modeller to create a more systematic model – she is forced to cover the aspects of the business land-
scape the selected type of model is aimed to cover. This means that she might have to go back and collect information about the business that the model requires, if she didn’t collect it the first time. The model influences what information the modeller needs to collect and also the modeller’s mental model of the business. Hence, there is interplay between the business landscape, the modeller’s mental model and the “painted” business model.

**Outcomes of business modelling**

An important difference between painting and business modelling is that the latter is normally done as group work. A number of people with their individual and different mental models of the business create the business model in a workshop usually led by a facilitator. This improves the two main outcomes of a modelling session: matured mental models and the documented business models.

The mental model is really the key outcome – it is the base from which the participants of the modelling session are acting in the future when dealing with the business. The participants all leave the workshop with updated mental models as a result of their interactions with the emerging business model and with each other. The participants are familiar with the details of the business model, as they have had the opportunity to raise objections until they eventually reached an agreement on how to describe the business. Also comments and reactions that did not became a part of the model are still remembered by the participants when they look at the business model. As the participants gain a deep understanding of the business, they should be selected for participation not only for what they might contribute, but also for what they might learn.

The other outcome is the documented business models. With several participants in the modelling session, the models benefit from a much richer input than if they are developed by only a single person. An important advantage of business models is that they are stable over time compared to the participants’ mental models. As human beings, the participants forget things and loose details – the documented models don’t.

Furthermore, the business models may be used as tools for communication with other people. Compared to the artist’s showing his painting on an exhibition, business models often have to be transferred in more controlled ways – by presentations, lectures and workshops – in order to communicate its messages to people who were not involved in the creation of the model. Actually, it might be quite difficult to convince non-participants that the presented model is appropriate. Their mental models may differ too much from the business model: they either do not understand it and/or do not accept it. Although it is usually looked upon as their own fault (referred to as the Not-Invented-Here syndrome) they in fact have not had the chance to go through the process of matching their mental models with the presented business model. In our experience, the effort to transfer completed business models to non-participants is systematically underestimated.

**The science of business modelling**

Having compared business modelling with the work of an artist, it is now time to present some of the more organised sides of it. By talking of “science”, we want to emphasise the long history of systematic thought that has gone into the disciplines that today’s researcher in the field draw from.
The history includes work done by philosophers, linguists, logicians, and others.

One of the more influential persons in this respect is the American philosopher Charles Sanders Peirce, who lived between 1839 and 1914. In his research, he stated that “a sign … is something which stands to somebody for something in some respect or capacity” (Peirce, 1893-1910/85, p. 5). As noted earlier, this is a defining characteristic of business models as used in this book. Comparing with the description of the artist in Figure 7, we recognise Peirce’s basic elements also there. His ideas reappeared in the graphical form of a triangle by Ogden & Richards (1949), which we have adapted to the current context of business modelling in Figure 8. The dashed line, between the documented model and what it stands for, is a reminder that this relationship is dependent on someone’s mental model.

![Figure 8. A model of models (adapted from Ogden & Richards, 1949).](image)

In order to deepen our understanding of models, we may consider them in different ways. If we use Figure 8 as a starting point, we can choose to focus on each of the three corners of the triangle in order to shed further light on business models.

Starting with “Business in the real world”, we can adapt a pragmatic perspective and ask ourselves about the use of business models in the real world. Within the scope of exploring businesses, we have already seen some examples of what models may be used for. We may use models to describe things that we are interested in or to prescribe other things that we would like to see. We may create models in order to prepare a decision or an action, alone or together with others. We may use models for carrying out and co-ordinating an operation. We may use models for communication over shorter or longer distances in room and time. Depending on if we see the world as driven by consensus or conflict, we might use models to create a shared frame of reference or to strengthen the position of certain interests (cf. Tolis, 1999). In any case, the models enable us to explore differences among us.

Moving on to “Documented business model”, we change to a syntactic perspective and ask ourselves about the form and appearance of business models. Texts, tables, and graphs are common examples of model representations. The representations occur on different media, such as paper, computer screens, compact disks, etc. As already mentioned, we mainly focus on graphical models in this book, i.e. business models that exist in graphical form, consisting of different symbols used to stand for various elements or aspects of a real-world business. The symbols can be more or less standardised, at least in particular communities: all the way from the convention of using an arrow to stand for a flow of something to completely novel ways of expression. As a tribute to human creativity, there is an endless number of graphical “dialects” available for business modelling.
One recurring challenge is therefore to be able to “see beyond” the particular symbols used, in order to understand their meaning, as in the following.

The final focus on “Mental model of business” leads us to a semantic perspective where we ask ourselves about the meaning of business models. It is the interpretation of documented business models that is the key to understanding what is being symbolised. Depending on how we look at a business, different things become important to include in the model. As it is impossible to even imagine a “complete” model, in the sense of one capturing everything about a business, there are always need for selections and combinations. In this book, we will focus on three major perspectives that affects what is included in a model and hence its meaning (cf. Figure 9). Each perspective includes a number of particular model types or “languages”, each capable of appearing in different forms or “dialects” as described above. Shown below are the modelling perspectives that are used as tools for exploration.

### TOPICS OF EXPLORATION

<table>
<thead>
<tr>
<th>Business solutions</th>
<th>Value modelling</th>
<th>Process modelling</th>
<th>Concept modelling</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CHAPTER 5</td>
<td>CHAPTER 6</td>
<td>CHAPTER 7</td>
</tr>
</tbody>
</table>

![Figure 9. Three ways of business modelling as tools for exploration.](image)

- Value modelling, focusing on strategy solutions: for example, factor models for exploring influences between different variables in the business. Sometimes called “why” models. This is the subject of chapter 5.
- Process modelling, focusing on operations solutions: for example, process graphs for exploring different flows in the business. Sometimes called “how” models. This is the subject of chapter 6.
- Concept modelling, focusing on information solutions: for example, object graphs for exploring the structure of the content of the business. Sometimes called “what” models. This is the subject of chapter 7.

### The quest ahead

In this initial chapter, we have described the core idea of the book: to explore different types of business solutions by using different ways of business modelling (cf. Figure 10).

---

3 The question words used here (cf. Zachman, 1987; Sowa & Zachman, 1992) are useful as reminders but they are not conclusive of the perspectives. The same perspective can be derived at using a number of different question words. For example, when exploring the values that motivate a business, one can ask either of the questions “Why is this done?”; “How come that this is done?”, and “What is the reason for doing this?”.
An analysis of a business can be used for a number of different purposes. However, clarifying the purpose of the analysis in advance is normally very helpful. It helps to make sure that all relevant aspects are covered. Depending on the timing of other ongoing change projects, the focus of the analysis might become quite different:

- **Business overview**: no specific issue of concern. The analysis is used as basis for making priorities, finding the most important areas for improvement, and outlining the changes required.
- **Business change**: focus on a specific change project, investment, etc. The analysis is used to explore the foundations and underlying assumptions, and to specify the change.
- **Business evaluation**: assessing the situation after a change project. The analysis is used to examine what has worked, and what remains to be done in the future.

The following chapters are divided into three main parts, focusing on business solutions, business modelling, and on integration, respectively. We have written the chapters rather self-contained, encouraging a non-linear order of reading if that is more appropriate in a given context. For example, if you are most interested in operations solutions, you can easily skip directly to its “sibling” chapter on process modelling, before moving on to another area like strategy solutions or information solutions. However, we believe that the concluding integration becomes more valuable after all the different solutions and modelling chapters have been covered.

As the exploration of business is a multidisciplinary endeavour by nature, we encourage you to make linkages to other theories and experiences. Due to the scope of this book, our aim is not to give a complete coverage. Rather, we want you to understand a selection of important issues of each type of business solution. By our references, we hope to point the way to other sources if you want to go into further details. The same goes for the chapters on business modelling, where we have chosen to focus on a range of modelling perspectives providing valuable views of the business.
PART I: BUSINESS SOLUTIONS

Briefly stated, this book aims to help you in making sense of a business and finding ways to improve it. In order to do this, the book deals with both business solutions, i.e. recurring conditions that you might come across in many businesses, and business modelling, i.e. ways of exploring specific details of a particular business.

In this book, three particular types of business solutions are discussed in the following chapters: strategies, operations, and information (cf. Table 1). A business solution has come about as a result of some human activity and can be of many kinds, for example an environment policy, a sales procedure, and a computer system. However, even if the solution originally was considered desirable, it might at present just as well be seen as problematical, at least by some people. Therefore, as important as understanding the benefits of current solutions is the ability to also see limitations and potential problems, and being able to devise new and improved solutions.

<table>
<thead>
<tr>
<th>TYPE OF SOLUTION</th>
<th>EXAMPLES OF COMPONENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategy solutions</td>
<td>Strategies, Goals, Missions, Visions</td>
</tr>
<tr>
<td>Operations solutions</td>
<td>Activities, Functions, Products, Services</td>
</tr>
<tr>
<td>Information solutions</td>
<td>Information systems, IT, infrastructure</td>
</tr>
</tbody>
</table>

Table 1. Three types of business solutions presented in the following chapters.

The following three chapters focus on the main points of each type of business solution in order to present important possibilities and challenges. As there are numerous books that expand on many details of strategies, operations, and information, the purpose here is rather to provide an overview and a basis for further exploration.
Strategy Solutions: 
Customer Satisfaction in Context

Christofer Tolis

The goal of customer satisfaction is salient in the strategies of many businesses. But how does this relate to benefits for other stakeholders and the overall issue of business direction? Under the heading of strategy solutions, this chapter focuses on the issue of business direction. It presents examples of both specific strategies for individual businesses and generic strategies for business units and portfolios. Additionally, it examines transitory strategies relating to improvement efforts, thereby illustrating the tension between the business’ actual present and potential futures. From the examples, core elements of strategy solutions are identified and discussed.

Key ideas in strategy solutions

Strategies are abundant in today’s businesses. Despite that the word “strategy”, strictly speaking, has more to do with a way to reach established goals, it normally covers also the goals themselves. In a business context, this includes a number of more or less similar things, such as missions, visions, objectives, goals, corporate identities, electronic business models, etc. Despite several attempts to differentiate, they all relate to the present and future direction of the business and are therefore grouped under the wider heading of strategy solutions. Like other types of business solutions, strategy solutions are the result of human activity, whether they appear as documents or as ideas in someone’s mind. Behind the strategy solutions of a business might lie work not only by the people in the business but also of external consultants specialising in strategy issues.

Benefits and strategy solutions

Why is a particular business the way it is? Why does it behave the way it does? An important aspect of understanding a business lies in getting a grip on the benefits that the business creates. Exploring business offers is a fundamentally strategic activity as it deals with the basic reasons for the existence of the business. It leads to an appreciation of the benefits and drawbacks associated with the business and forms the basis for challenging market offers, unique selling points, sources of revenues, and other strategy solutions.

The concept of benefits can be somewhat elusive and perhaps not as easy to pinpoint as other aspects of the business, such as the resources being handled and the activities being performed. However, without an understanding of the underlying values of the business, the other issues lose much of their meaning. For example, knowing what products a business
produces, or how it produces them, become more meaningful and useful if one also knows the values that underlies and follows from this.

Stakeholder benefits

What benefits a particular business creates depends on whom you ask. There are a number of different stakeholders that are affected by the business in one way or another. For example, customers use the products and services that the business offers. Suppliers get paid for the merchandise that the business uses. Employees get salary and other advantages from working in the business. Owners get profits from the business. The state gets tax revenue from the business. Other stakeholders have other relationships with the business and hence experience different benefits.

<table>
<thead>
<tr>
<th>STAKEHOLDER</th>
<th>BUSINESS RELATIONSHIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer</td>
<td>Use of products and services, normally in exchange for payment</td>
</tr>
<tr>
<td>Visitor</td>
<td>Use of premises</td>
</tr>
<tr>
<td>Client</td>
<td>Recipient of treatment</td>
</tr>
<tr>
<td>Patient</td>
<td>Recipient of medical treatment</td>
</tr>
<tr>
<td>Traveller</td>
<td>Use of transportation services</td>
</tr>
<tr>
<td>Viewer</td>
<td>Use of visual media</td>
</tr>
<tr>
<td>Reader</td>
<td>Use of textual media</td>
</tr>
</tbody>
</table>

Table 2. Example of different stakeholders and their relationship to the business.

Customer satisfaction has been the battle cry of the quality and reengineering movements. With the arrival of customer relationship management (CRM), the whole life-cycle of customer relations have come into focus, and not only the individual transaction. Partly as a result of the development of IT systems, the idea of more focused customer relations have grown stronger. With one-to-one marketing, the possibilities of handling each customer as an individual are explored. The increased use of personal electronic devices, like credit and membership cards, has led to a dramatic rise in the amount of personal data that the business can acquire. Much of what a person does throughout the day leaves personal trails that hold a lot of clues about the specific person. Of course, all the possibilities of getting information do not come without problems. One needs not to go as far as to George Orwell’s classic novel “1984” to find reasons for scepticism.

The benefits may not always outweigh the drawbacks, i.e. some stakeholders might feel that the business is more of a liability than an asset. Not only literary, as might be the case for the owners of a company threatening to go bankrupt, but also more figuratively, e.g. the neighbours feeling threatened by a nearby nuclear plant. In this case, the benefits that that particular business produces for this group of stakeholders are exceeded by the drawbacks.

However, stakeholders’ different benefits might not only be a source of conflict. What is considered as goal for one group might be means for another. Seen in this light, compromise might not always the best solution, given that it is possible to find common ground and ways to explore the differences. In doing this, one has to see to different types of benefits, not only monetary, but also quantitative and qualitative non-financial benefits. This has been done extensively in the realms of intellectual capital and balanced scorecards.
**Interlinked benefits**

As each group of stakeholders has different expectations of the business, they also experience different benefits. Taken together, strategy solutions form an often complex and confusing whole. There is no guarantee that this whole is not partly contradictory or conflictual. On the contrary, one only need to open a newspaper or look at a news report on TV to realise that consensus between different stakeholders are more exception than rule. Being aware of supporting as well as contradicting benefits is a key ingredient in the analysis and design of strategy solutions. Benefits might often reinforce each other and create loops of that will enhance positive or negative trends, thereby creating virtuous or vicious circles (cf. Senge, 1990). For the different stakeholders, what direction that the business is pursuing can be crucial for their relationship with the business. In short, a business’ strategy solutions greatly influence its future – it can quite literally be a question of prosperity or extinction.

Strategy solutions give rise to a number of practical as well as theoretical issues. There is an unavoidable ethical dimension in the exploration and development of strategy solutions. Establishing and prioritising among different goals is always a political activity, affecting the power of the stakeholders involved. It is therefore a key issue for all parts of a business, e.g. marketing, production, human resources, accounting, etc. This is especially true in the light of information technology as the benefits supported and created by IT can affect the whole business and its surroundings, i.e. all its stakeholders.

To give an overview of the landscape, three types of strategy solutions will be discussed in the following: specific strategies of particular businesses, generic strategies for ranges of businesses, and transitory strategies linked to efforts of improving the business.

**Specific strategy solutions**

Over the years, there has been a shifting emphasis on explicit and analytically derived strategies vs. implicit and evolved strategies (cf. Bengtsson & Skärvad, 1988). In most businesses, there are ongoing mutual influences between the two forms of strategies, each both affecting and being affected by the other.

<table>
<thead>
<tr>
<th>EXPLICIT STRATEGIES</th>
<th>IMPLICIT STRATEGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Designed</td>
<td>Evolved</td>
</tr>
<tr>
<td>Articulated</td>
<td>Tacit</td>
</tr>
<tr>
<td>Espoused</td>
<td>In use</td>
</tr>
</tbody>
</table>

*Table 3. Different characteristics of explicit vs. implicit strategies.*

The two forms mirrors the distinction made by Argyris & Schön (1974) between espoused theories and theories-in-use. Whereas espoused theories cover what people say when asked about their behaviour, theories-in-use cover the guiding principles that can be deduced from their actual behaviour. Needless to say, there can be a smaller or larger gap between what is espoused and what is in use. In terms of strategies, this means that although the explicit strategy states that the customer is king, the salespeople may well behave as if she was merely a nuisance.

Explicit strategy solutions might be more or less elaborated, e.g. depending on its intended use. When trying to reach potential customers and other external stakeholders, often brief and condensed versions are being used,
functioning as easy-to-remember slogans, such as “connecting people” (Nokia) and “building the information society” (TietoEnator). Frequently coupled with the slogans, graphical logotypes emphasise the identity of the business. The slogans and logotypes are often combined with a more elaborated description of the mission of the business. In the following, we will take a closer look on specific strategy solutions from four businesses chosen from different industries.

**H&M: FASHION AND QUALITY AT THE BEST PRICE**

Our business concept is to give the customer unbeatable value by offering fashion and quality at the best price. To be sure we can offer the latest fashions we have a design and buying department that creates our clothing collections.

We ensure the best price by:
- having few middlemen
- buying large volumes
- having extensive experience of the clothing industry
- having a great knowledge of which goods should be bought from which markets
- having efficient distribution systems
- being cost-conscious at every stage

We put a lot of energy into ensuring and improving the quality of the goods. We also have the resources to carry out careful testing and quality controls regularly. In addition to good quality products, our quality concept also requires the garments to be manufactured without the use of environmentally hazardous chemicals or harmful substances and to be produced under good working conditions.

*Table 4. Example of strategy solutions: H&M’s slogan and philosophy (www.hm.com/uk/hm/facts_history/ourphilo.jsp, January 2003).*

The first example is from the Swedish clothing company Hennes & Mauritz (cf. www.hm.com). As shown in Table 4, H&M uses the slogan “Fashion and quality at the best price” to summarise the benefits it brings to its customers. In describing its philosophy, H&M expands on its slogan by detailing the three components of its slogan and business concept: Latest fashion, best price, and (high) quality. For each of these components, the philosophy describes some of the bases for being able to offer the intended benefits, e.g. the quality is supported by resources for testing and control.

**THE RED CROSS: THE POWER OF HUMANITY**

The RC/EU Office represents and promotes the interests of its members as well as the policies and values of the Red Cross and Red Crescent Movement to the EU institutions. It aims to have its members recognised by the EU and its institutions as being a primary partner and interlocutor in service delivery and in the development of EU policies in the humanitarian and social fields.

*Table 5. Example of strategy solutions: the Red Cross EU office’s slogan and vision statement (www.redcross-eu.net/sw5.asp, January 2003).*

Next example is from the non-profit sector. On the European level, the Red Cross EU office is a consortium of the National Red Cross Societies of the EU Member States and the International Federation of Red Cross and Red Crescent Societies (cf. www.redcross-eu.net). Calling the consortium for a “business” follows from our wide use of the term, rather than implying a commercial focus. Table 5 shows the vision statement of the EU office that clearly reflects the interests of the different members of the consortium. The explicit aim of the Red Cross EU office is closely linked to elevating the “the power of humanity”, as expressed by the slogan.
The corporate strategy of Danzas rests on four pillars:

1) Developing our Solutions business

At the very center of the strategy is expansion of business in integrated logistics solutions. For manufacturers and sellers of consumer and industrial goods, Danzas develops and continuously optimizes customized solutions along the supply chain. The key activities of warehousing and distribution are supplemented by a broad range of value-added services that is steadily being expanded to enable customers to concentrate entirely on their core businesses.

2) Growing our Intercontinental business

The second strategic thrust is expansion of Danzas’s intercontinental business, which includes worldwide air and ocean freight as well as project forwarding, i.e. the coordination and execution of logistics operations for major infrastructure and industrial projects. Danzas is present everywhere to link the different continents for its customers and enable them to open up new markets. Many years of cooperation with first-class airlines and shipping companies forms the basis for the good service Danzas is able to offer its customers. Declared goal in this field is to strengthen that basis even more by adding new air and sea routes.

3) Shaping our Eurocargo business

The third pillar is optimization of European overland transport. Freight is moved by rail, road, or a combination of both. Successful operations here are built on a far-reaching network of offices all over Europe – a network that is being ever more closely meshed. With few exceptions, Danzas purchases haulage services flexibly on the market rather than operating a fleet of its own.

4) Creating a market-oriented organization

The final thrust is the creation of a consistently market-oriented organization structure, because the essential ingredient of long-term success is optimal fulfillment of the real needs of individual customers and the market. The above corporate strategy was announced by Danzas following its transformation from conventional freight forwarder to provider of IT-supported logistics solutions. It signalized the start of the next stage in the market- and customer-focused reorientation aimed at increasing the group’s corporate value. For Danzas, the goal has always been and will continue to be to selectively strengthen its leading position in the marketplace and further increase its profitability.


As indicated by their slogan “Logistics. Worldwide”, Danzas is providing transportation services around the globe (cf. www.danzas.com). Their corporate strategy, shown in Table 6, contains four paths that the business follows in order to improve. Each path is presented in terms of intended benefits and/or facilitating conditions. For example, the second path of growing intercontinental business aims at enabling customers to open up new markets and is facilitated by cooperation with first-class airlines and shipping companies.
It is our mission to improve the lives of customers and communities where we all live, work and play. We will continue to develop and build products in local markets around the world to create value for all of our customers. Our established directions for the 21st century provide a balance of fun for the customer and responsibility for society and the environment. This is demonstrated through advanced technologies such as a humanoid robot and gas-turbine airplane engine. A more familiar example, the S2000 sports car, is a Low-Emission Vehicle that will safely transport you down the highway with 240 horses of driving excitement.


The final example comes from the Japanese company Honda, originally a motorcycle manufacturer now producing a wide range of products (cf. www.honda.com). Table 7 shows Honda’s strategic vision describing the aims of the business and the benefits it seeks to provide. In addition to its customers, Honda also includes communities and the society in its vision, illustrating an aim for balancing benefits, e.g. between fun and responsibility. The strategic vision also includes two concrete examples of products that demonstrates this balance.

Generic strategy solutions

Having seen some specific examples of actual strategy solutions in the previous section, we will now turn to a number of commonly used generic frameworks that brings together considerations that are supposed to be important for many different businesses. Even if not all of a generic framework is observable in a specific strategy solution, they have often contributed underlying issues and trade-offs. Because of their use as templates and checklists, an awareness of different generic frameworks is a valuable ingredient in understanding the overall landscape of strategy solutions.

Generic frameworks have different focus depending on their background and intended application. In order to give an overview of the differences, we will concentrate on two main dimensions: strategy level and strategy emphasis.

- **Portfolio vs. unit level.** In most cases, especially in larger businesses, there are possibilities of focusing both of the business as a collection of parts (the portfolio level) or as a single whole (the unit level). Different strategy solutions have different focus in this dimension, either focusing on the business portfolio or the business unit.

- **Eternal vs. internal emphasis.** As the basis for strategy can be seen as the interaction between external and internal, this dimension is about emphasis rather than delimitation. Hence, a strategy solution with a strong external emphasis might also have, less salient, internal components, and vice versa.
In the following, some classical frameworks for strategy solutions are presented. The focus is on the content of these frameworks rather than their development or evolution. Except where otherwise is noted, the description of individual frameworks in the reminder of the section is based on general overviews such as Bengtsson & Skärvad (1988) and Fleisher & Bensoussan (2003).

**Business portfolio strategies**

On the level of business portfolios, strategy solutions deal with the balance and potential synergies between different business units, often under the heading of corporate strategy. This level emphasises the heterogeneity of the business by treating it as a collection of more or less independent units that together form a portfolio. Although the units often are conceived as different production units, they might as well be seen as different offerings by the business. Strategy solutions on this level focus on the balance between different units depending on their characteristics. To illustrate, three generic frameworks for business portfolios will be outlined below, each with a different emphasis along the line from external environment to internal state of affairs.

Emphasising the external environment, the market position is the focus of the BCG (Boston Consulting Group) matrix. Different markets that the business is operating on are characterised in terms of their growth and the current market share for the business. Figure 12 illustrates the market position of three business units (the circles A-C). The size of each circle corresponds to the sales of each business unit. In the example, two of the business units have low market share – one in a market with low growth (C), and the other in a market with high growth (A). The third business unit (C) has high share of a low-growth market.

Taking a step towards further emphasising also internal aspects, the GE matrix (after the company General Electric; it is also known as the
McKinsey matrix) matrix looks at the relationship between business strengths and the attractiveness of different markets (cf. Figure 13). Compared to the BCG matrix above, business strength is determined by more than market share. Other components of this dimension may include internal elements such as positioning, competitive advantages, brand strengths, human resources, R&D capacity, quality, marketing (Fleisher & Bensoussan, 2003, p.50). Similarly, the industry attractiveness is determined by a number of conditions such as competitive structure, financial, societal, and political issues (ibid. p.50).

![Business Strength vs Industry Attractiveness Matrix](image)

*Figure 13. General Electric / McKinsey matrix outlining the relationship between business strength and different industries.*

With an internal emphasis, the investigation of possible ways to grow is the focus of Igor Ansoff’s growth vectors analysis. He uses the product/market combination as a prime indicator for the focus of each business. As shown in Figure 14, four main strategies are discerned by looking into the choices of developing new products and/or new markets. The alternatives range from market penetration, making the best use of existing products and markets, to diversification, where new products are introduced into new markets.

![Ansoff’s Growth Vectors](image)

*Figure 14. Ansoff’s growth vectors resulting from different product and market decisions.*

**Business unit strategies**

On the level of business units, strategy solutions deal with the advantages sought and the resources required, often under the heading of competitive strategy. This level emphasises the homogeneity of the business by treating it as an undivided unit. Strategy solutions on this level focus on the individual characteristics of the business in relationship with its environment. To illustrate, three generic frameworks for business units will be outlined below, each with a different emphasis along the line from external environment to internal state of affairs.
The work of Michael Porter (1980), dealing with industry analysis, has a strong external emphasis. He distinguishes between five forces that affect the competitive situation in an industry (cf. Figure 15): threat of new entrants, bargaining power of suppliers, intensity of rivalry, bargaining power of buyers, and threat of substitutes. Each of the five competitive forces is influenced by a number of determinants. For example, the intensity of rivalry among industry competitors is influenced by things like industry growth, informational complexity, and exit barriers.

Balancing external and internal emphasis, the SWOT analysis focuses on business strengths, weaknesses, opportunities, and threats. Whereas strengths and weaknesses refer to the business’ internal capabilities, opportunities and threats refer to its external environment (cf. Figure 16). Based on an initial account of each of the four types of conditions, matches can be sought among them, for example looking for internal strengths to counter external threats or take advantage of external opportunities. The analysis can also be extended to cover not only the current situation, but also address the future foreseen.

The components of an electronic business model, as articulated in the area of electronic commerce and Internet business (cf. Timmers, 1998; Afuah & Tucci, 2001/03), have a stronger internal emphasis. A business model in this particular sense is a strategic blueprint how one or more businesses make money. The business model may comprise a number of elements that influence the possibilities of the business to gain competitive advantage and make money in the long run. As shown in Figure 17, this might include the profit site of the business, i.e. its place within the industry’s

---

4 This narrow use of the term business model is in contrast to the wider meaning used in this book and elsewhere: that a business model is any model of a business, not necessarily one with a strategic focus.
value network, the value it provides to its customers, and its sources of revenue.

![Figure 17. Content of electronic business models (adapted from Afuah & Tucci, 2001/03, p.52).](image)

Transitory strategy solutions

So far, we have discussed strategy solutions – both specific and generic ones – that concern the business itself. This is well in line with the chapter’s purpose of examining this particular type of business solutions. However, the understanding of strategy solutions can be further deepened by also looking at efforts of improving the business. Improvement work is transient compared to the ongoing business and is many times formalised into an improvement project that is delimited in time and resources. Senge (1990/94, pp. 150-155) talks about the benefit of a “creative tension” between the current reality and the vision for the future. It is this tension that drives the improvement efforts, circling around questions such as: What is good and bad today? What is desired for tomorrow? What is needed to go from today to tomorrow? Table 8 summarises some of the differences involved.

<table>
<thead>
<tr>
<th>THE BUSINESS</th>
<th>IMPROVEMENT WORK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ongoing</td>
<td>Transitory</td>
</tr>
<tr>
<td>Going concern</td>
<td>Development work</td>
</tr>
<tr>
<td>Working for today</td>
<td>Working for tomorrow</td>
</tr>
<tr>
<td>Business activities</td>
<td>Change activities</td>
</tr>
<tr>
<td>External primary client</td>
<td>Internal primary client</td>
</tr>
<tr>
<td>Helping the customer</td>
<td>Helping the business</td>
</tr>
</tbody>
</table>

*Table 8. Different characteristics of the ongoing business vs. transitory improvement work (cf. Tolis, 1999).*

The key insight here is that each improvement effort carries with it an own set of strategies, goals, objectives, etc. This transitory strategy solution is something else than the strategic solutions of the business itself. Although the overall aim of improvement work is somehow to advance the business, this can be done in many different ways. Systems, operations, and strategy development are but three examples of efforts directed at improving the
business. Table 9 provides an illustration of an improvement project running into problems.

**The IS development project**

Suppose that you are called in to help out a large project that has run into problems. The project deals with developing an information system that should have certain capabilities, and it should be ready by a certain date. A budget has been allocated to the project, specifying the cost of developing the system together with its proposed benefits. Lately, the meetings of the staff working with the project have revealed the uncomfortable insight that the intended system will not be ready in time within the cost limits set.

Faced with this problematic situation, the responsible project leader asks you for advice on her options. One alternative is to ask for more time, another is to ask for more money, a third is to cut down on the system itself in order to meet the constraints. Being familiar with project work, you realise that there are potential problems with all courses of action.

Regarding deadlines, if the project is reasonably complex, experience shows that one delay is often followed by another, and so on. The remaining work is almost always underestimated. Increasing the budget by adding more resources may not solve the problem either. In addition to the increased cost, more resources will require more co-ordination, and the marginal effect of adding more resources, even a lot of resources, may be quite small, sometimes even negative. Neither the third alternative of delimiting the developed system itself is without problems. It runs the risk of some important functionality being missed, thus limiting the usefulness of the end result.

Table 9. Example of improvement project.

Taking a closer look at the project, there is a web of potential trade-offs that needs to be sorted out. What benefits are created for whom? What is it that makes the project, and its results, valuable? Is it possible to link the different benefits together and making the relationships explicit? In situations of crisis, where an improvement project threatens to run out of time and money, it is particularly important to consider its strategy solution and relate it to those of the business itself (cf. Figure 18).

![Figure 18. Strategy solutions of the business and of a transitory improvement project.](image)

One starting point is to question the stated content and functionality of the planned result, in this case the intended information system, taking advantage of the relationships identified. In order to reconsider the goals and added values of the project, different wishes can be weighed against time and price tags. Many buyers and future users of information systems under development will give priority to time and budget and be willing to
give up some functionality or accept less technically elegant solutions – if they only are confronted with such questions. Sticking stubbornly to the originally developed requirement specification is more typically a characteristic of the developers than of the users – maybe due to professional pride or difficulties to shift between different perspectives in their analysis.

In order to facilitate making priorities, it might be useful to speak about “desirables” rather than “requirements” when talking about the future results of a project. Having elaborated the benefits of the project and its results, and related it all to the strategy solutions of the business, the proposed results may instead be stated in categories like:

- necessary in the first version of the system
- desirable in the first version of the system
- necessary in later versions of the system
- maybe later
- maybe not so important

Core elements of strategy solutions

Having seen examples of a number of different strategy solutions in the previous sections, we are now in a position to look for common core elements. On the surface, there are of course a large number of differences. The specific solutions come from businesses operating in widely diverse contexts, including different industries, different offerings, different capabilities, etc. The generic frameworks similarly differ in many respects, not only in their different focus in terms of business portfolio vs. business unit and external vs. internal emphasis. Although not concerning the business itself, also the transitory strategic solutions depend on the particular circumstances of the improvement effort at hand.

However, although the actual content of strategy solutions might be largely different, some common elements can be extracted. These core elements can be seen as the building blocks for strategy solutions, whether specific for particular businesses or in the form of more generic frameworks. On a fundamental level, strategy solutions describe the direction of the business in terms of actual or desired values and their influences on each other. Hence, the core elements are of two types that will be closer discussed in the following.

Factor values

The first type of core element of strategy solutions is factor values that can vary over time. Actual or desired values in a business all have in common their dependency on underlying factors. This is particularly evident among the generic frameworks, as they tend to focus on the factors rather than specific values. For example, whereas Danzas talks about the desired value of a “leading position in the marketplace”, the generic BCG matrix includes the corresponding factor “market share” and its range of values from “low” to “high” (cf. Table 10).
The generic frameworks typically include a number of specific factors, or sometimes groups of factors. The SWOT matrix is an exception, and instead focuses on certain factors depending on their current values. For example, it is only if a factor has a different value from what is desired that it is included as a weakness in the matrix.

**Means/ends relationships**

The second type of core element of strategy solutions is relationships between the factor values that are linked as means and ends. Although a strategy solution in theory might contain only a single factor value, the desired goal of the business, in reality it always contain several. Hence, there are always explicit or implicit relationships between the factor values. The relationships are directed in that they indicate how a factor (means) influences another factor (ends), as shown in Table 11.

<table>
<thead>
<tr>
<th>MEANS/ENDS RELATIONSHIPS</th>
<th>SOURCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;to be sure &lt;end&gt; we have &lt;means&gt;&quot;;</td>
<td>H&amp;M</td>
</tr>
<tr>
<td>&quot;we ensure &lt;end&gt; by &lt;means&gt;&quot;;</td>
<td>RC/EU</td>
</tr>
<tr>
<td>&quot;&lt;means&gt;. It aims to &lt;end&gt;&quot; (implicit means/ends relationship between two sentences)</td>
<td>RC/EU</td>
</tr>
<tr>
<td>&quot;&lt;means&gt; to enable &lt;end&gt;&quot;;</td>
<td>Danzas</td>
</tr>
<tr>
<td>&quot;&lt;means&gt; forms the basis for &lt;end&gt;&quot;;</td>
<td></td>
</tr>
<tr>
<td>&quot;strengthen &lt;end&gt; by &lt;means&gt;&quot;;</td>
<td></td>
</tr>
<tr>
<td>&quot;successful &lt;end&gt; are built on &lt;means&gt;&quot;;</td>
<td></td>
</tr>
<tr>
<td>&quot;because the essential ingredient of &lt;end&gt; is &lt;means&gt;&quot;;</td>
<td></td>
</tr>
<tr>
<td>&quot;&lt;means&gt; aimed at &lt;end&gt;&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;&lt;means&gt; to &lt;end&gt;&quot;;</td>
<td>Honda</td>
</tr>
<tr>
<td>&quot;&lt;end&gt; is demonstrated through &lt;means&gt;&quot;</td>
<td></td>
</tr>
</tbody>
</table>

Table 11. Examples of means/ends relationships in strategy solutions.

That the word “strategies” is used both for ways to reach established goals and for the goals themselves, as mentioned initially, is not surprising given the close link between means and ends. What is considered an end in one context might very well be seen as a means in the next as it really is a question of the relationships with other factors. For example, high profit may one moment be considered an end to low costs and other means in the business, and the next moment considered a means for investments and other ends. Hence, means and ends are closely linked in their development: if you explore one, the other is often likely to be affected.
Conclusions

This chapter has discussed strategy solutions, a heading covering all things dealing with the direction of a business, e.g. strategies, goals, objectives, etc. The importance of identifying benefits for different stakeholders has been stressed, as well as the ethical and political dimensions of strategy solutions. Following this, three kinds of solutions were presented:

- Specific strategy solutions in the form of brief slogans as well as more elaborated direction statements for individual businesses.
- Generic strategy solutions in the form of strategy frameworks for business units and portfolios.
- Transitory strategy solutions for improvement efforts, in contrast to the previous solutions for the ongoing business.

Following the different examples, the chapter ended up with two core elements of strategy solutions: factor values and means/ends relationships. Hence, a key insight into analysing and designing strategy solutions lies in exploring the means and ends of a business. This facilitates understanding and strategic decisions about what benefits that are created for whom. By being aware of different examples of strategy solutions, such as the ones in this chapter, one becomes better prepared for what might be found in an actual business.

However, useful as this might be, there is still a need to be able to explore also the particularities experienced. While there might be many similarities with the examples, there will most certainly be a number of significant differences affecting important factor values and their relationships. To support an exploration of strategy solutions, different tools can be used to identify crucial interdependencies between means and ends and finding points of leverage. This will be further discussed in chapter 5, dealing with the topic of value modelling. Additional modes of analysis will be presented in later chapters, focusing on processes and concepts, highly useful also in the exploration of strategy solutions. But before all that, the next chapter will go into the area of business operations, another type of business solutions.
To understand how an enterprise is creating value for and with its customers is a key factor in order to understand its raison d’être. In this chapter we study the dynamic and important side of the ongoing value-creating operations of enterprises. Due to the large variations in types of business and how work is done, one simple model is not sufficient. There are differences from organisation to organisation depending on a number of characteristics. Here we discuss how these differences can be classified and identified and what the relevant solutions may look like.

Introduction

The traditional way to view and organise an enterprise is the functional organisation by structuring responsibility and resources in functional units such as Sales, Manufacturing and Delivery. Our main approach here is different. We focus upon the tasks to be done. Business tasks are defined as the transformation of input to output and thereby creating value for the customer. These ongoing more or less repetitive sets of activities are usually called operations. Here, we focus upon how to analyse and understand these ongoing tasks and how to coordinate them to create value not only for but also with the customer.

The term operations are used for (Slack et. al. 2001):

- operations as a function, meaning the part of the organisation which produces the products and services for the organisation’s external customers
- operations as an activity, meaning any transformation of input resources in order to produce products and services, for either internal or external customers.

We will use the word in the latter sense

The value creation task

How value has been created in business has been changing over time and so have the ways to understand and describe it. For each step in this evolution new ways have been added while much of the old also remains. The methods and models for industrial production are not replaced by the ones for the service society, they co-exist.
The Clog Factory

We will start our business safari in the industrial end by analysing a relatively traditional small industrial undertaking – The Clog Factory. They manufacture high-quality clogs, are located in a rural area in south Sweden, and have around 20 employees.

How do they create value for their customers? They do it by a traditional and typical industrial production process. Input is wood and leather output is well-packaged clogs.

Transformation is the central issue of value creation: input is transformed to output, wood and leather into clogs. The value of output (as valued by the customers) should be larger than the cost of material input and of the use of the transforming resources such as the building, the equipment and the workers.

The production task is to add value/transform input to output by executing activities. Organised and structured resources such as people, equipment and information constitute the base for performing these activities.

The Task Unit Framework (cf. Figure 19) is our tool for modelling these task units i.e. a clog production task.

- On top we have the input and output: the material, the elements that are consumed when transformed from input via being work-in-progress to output – wooden block and leather sheets – mutilated in the factory – clogs out.

- At the bottom are the organised task resources – what we need to perform the transformation process. There are three different types of resource elements: equipment, information and people. They are used to perform the activities but are not used up themselves.

- When we have both the task resources and the necessary input we might start the transformation activities. The execution of these activities is directly related to the successive change of the work-in-progress (of wood and leather). The activities and the transformation of input are two sides of the same coin – the transformation process.
This framework may be used to model a whole enterprise, a company, a part of a company or an elementary task.

**The task unit framework**

Here is a more generic version of the Task Unit Framework (cf. Figure 20).

![Generic Task Unit Framework](image)

*Figure 20. Generic Task Unit Framework.*

We use the triangle to represent task units i.e. business entities adding value to input by transforming it to output.

Sometimes you may represent a whole company as a task unit (Wood Supplier); sometimes you have to break it down in sub-tasks (Clog Production, Clog Marketing) in order to better understand the business.

**The value creation chain**

The Clog Production Task does not operate in a vacuum (cf. Figure 21). Upstream there are suppliers who create input for the Clog Factory and downstream there are customers and also customers’ customers etc. Value is created step-by-step in a number of task units in a number of different organisations before the results reach its final destination: the end-user, the consumer.

The Production Unit of the Clog Factory is only one – but important – link in this chain of task units – the Value Creation Chain. Each task unit does its work in the chain to add value for the final end-user. Here we have a model of this chain from the Clog Factory’s point of view – from the Clog Factory’s perspective and the Factory is broken down into three subunits: Management, Sales and Production.
During the 1980’s the Value Chain concept was established as a main way to understand and describe how value was created and distributed. The Value Chain concept became a dominant theme, was described by Porter (1985) and is still useful for industries producing physical products but is also relevant to apply for new types of value creation.

Also, our map may have more nodes – there are task units upstream on the left (supplier’s supplier) and a number of transportation units operating between many nodes in the Value Chain.

**The Bookstore**

Let us take another example: a traditional Bookstore and their way of value creation (cf. Figure 22).

The content of the book is created by the author, edited, printed and published by the publishing company. Now we have the physical product. The
distribution is taken care of by distributors all over the world and distributed to the bookshops. The bookshops sell the books to the customers. This value chain is similar to the clog one but the bookshop – the task unit in focus – is in another place in the chain. As we take another perspective we get another picture – a picture similar to what a shoe retail shop would get in the clog case. (There are also other bookshops around – competitors. They are not part of the bookshops value chain, but important for the understanding of the bookshop’s business.)

The value chain is the backbone of business. To understand a business enterprise, the understanding of the value chain is mandatory.

Order fulfilment

Customer order fulfilment is another important view of a business organisation as the flow of material and products along the value creation chain is driven by orders in each of the participating units.

In the industrial environment there is a focus on these interactions between the company and its direct customers. So, we narrow our view for a while and study the interactions between one unit and its customers: What do the processes for order fulfilment look like?

![Figure 23. The Exchanges during a Business Transaction Process.](image)

To understand this we have to consider (cf. Figure 23):

- How the order is received and how products are created and provided.
- How the customer integrates, uses and/or consumes what is delivered in order to achieve value (profit) and experiences (pleasure) out of it.

**The Clog Factory order fulfilment**

The order fulfilment is shown in a simple process model (cf. Figure 24). (Details of process modelling are described in chapter 6).

The customer order arrives and is taken care of by Sales in a planning process. If the corresponding clogs are in stock the process is simple: just pick and pack and deliver (lane 2).
Figure 24. Clog Factory Order Fulfilment.

Sometimes they don’t have the right clogs in stock so they have to be produced and an internal manufacturing order is issued to trigger a manufacturing process in order to provide the clogs for order fulfilment (lane 3).

Things could be worse than that – there may be a stock shortage for the some necessary material that has to be purchased. Leather is here a key issue due to its relatively high cost. Nails, glue and paint are cheaper to stock (lane 5).

The Clog Factory produces the wood bottoms themselves and if they need more bottoms of some size or fashion an internal production order starts that process (lane 4).

The Clog Factory is mixing two common manufacturing strategies:

- Build to order. The manufacturing process is started by an incoming order
- Build/provide to plan – for manufacturing of the bottoms and for purchasing of leather etc. These processes are normally run according to plans built on forecasts and more seldom started by an incoming customer order.

The build to order strategy gives long lead-times and not-so-good delivery service but also low stocking costs.

Build to plan results in short order lead-times but high stocking costs as it may lead to a surplus of material and processed items in stock.

So, in order to be good in fulfilling customer orders it is not enough to be able to efficiently and effectively pick and pack or manufacture clogs or manufacture bottoms, it is also necessary to control the quality and the inflow of necessary material to get it “just-in-time”. This is a delicate balance because if it is coming too late the production line will get stuck – which costs a lot of money, if it is coming too early the stocking costs are rising.

These problems force the companies to understand and to try to control the value creation chain upstream and cooperate efficiently with its suppliers.
As demonstrated in the “Lovers Beer Case” (Senge, 1990), there is also a need to have control of the value chain downstream in order to get early warnings when the demand is falling or rising to be able to foresee the coming the orders and plan production and purchasing accordingly. If the end-user demand suddenly is rising e.g. clogs become high fashion for some reason, the retailers will raise their orders to the wholesalers, they raise their orders to the Clog Factory and they have to order from their suppliers. If e.g. there is a shortage of the special nail used for the clog manufacturing the whole chain will have to wait.

One way to avoid such shortage problems all units in the chain would be to increase the stocks to have a buffer against the variations in demand. But stocking is expensive and today every unit is trying to minimise their stocks. In chains with this traditional step-by-step structure the delicate balance of how to have the right stocking levels vs. order service is a major problem. This is a difficult and important issue for all units operating in such an environment.

An emerging solution to this is to have a shared information system in order to be well informed about the stock situation in the whole chain as well as the variations in demands down to the retail level. Large chains as Procter & Gamble, IKEA and Benetton have developed IT systems to be able to track what happens down-stream (“what models sell where?”) and the car industry uses IT systems to control what happens upstream (“what is the status of production and delivery from our suppliers?”) With Internet the possibilities to build such information networks have risen substantially.

**Business transactions**

Understanding the overall value-creation chain and one’s own order fulfilment process is fine but not enough. They are both driven by the incoming orders. Where do these orders come from? We have to look at the entire business transaction consisting of offerings, orders, fulfilment and payment. This is sometimes called the marketing process where order fulfilment is a part. But the word marketing is more often used as the activities leading to an order and we will to use the term in that slightly limited way.

To run a business three main tasks are needed.

- Develop offerings (new products and services)
- Market these offerings (of existing products and services) and create orders
- Fulfil these orders and provide products and services to the customers.

Marketing and order fulfilment are the core of the on-going business. Development of new offerings and the development/change of the business are issues not specifically covered here.

**The business transaction framework**

A complete business transaction could be modelled using the following framework in Figure 25.
Figure 25. The Exchanges during a Business Transaction Process.

It is interplay between a producer/provider and a customer and how the different objects go back and forth.

Another way to model the same interplay is the following simplified process model (based on a model in Grönroos, 2002)

Figure 26. The Clog Factory Business Transaction Process.

The Clog Factory business transaction

Clog Marketing gives an offering to the Wholesaler, which accepts it and returns an order. The order is taken care of by the Clog Manufacturing and the clogs are delivered. Finally, the Wholesaler pays for the delivery. This is a classical business exchange transaction in its simplest form (cf. Figure 26).

In our model of the Business Landscape we could extend the Value Creation Chain by adding the Business Transaction. Offerings and goods are going forward and orders and payment the other way (cf. Figure 27).

So what? There seems to be no major difference between the pictures of the Value Chain and the chain of exchanges except the two-way arrows. No, not in this case but still it is needed to understand the structure behind the “Lover’s Beer Problem” and the issue of variations in demand. In this and many other cases – shared information between all units improves the situation. But it does not stop here. The emergence of IT and Internet had tremendously improved the possibilities to create powerful information systems, and raises possibilities to radically restructure the business transaction chains more independently from the value chains.
The Internet Bookshop business transaction

Let us analyse the business transaction chain in our second example – the traditional bookshop (cf. Figure 28). Here we find something very similar to the Clog Factory case. However, information technology and especially Internet is providing new possibilities not only to improve existing chains but also to build new ones to meet the same customer needs. We use an Internet Bookshop as an example. Here the business transactions and the physical value creation chain do no coincide.

Let us trace order fulfilment for the Internet Bookshop (cf. Figure 28).

1. The customer is ordering books on the bookshop’s Internet site.
2. Order Management processes the order automatically or manually and transmits it to the relevant publishers.
3. Each publisher picks the books from his stock
4. A transportation company takes them to the cross-docking centre.
5. This centre is a separate company performing cross docking for all types of virtual stores. They unpack the deliveries from the publishers and match the deliveries with the customer orders. When an order is complete (our student’s two books have arrived) it is packaged including the invoice. The Factoring Company is informed.
6. The package is delivered to the customer using another transportation company.
7. The customer pays to the Factoring Company.

Here, the different tasks in the order fulfilment process are clearly separated, well defined and performed by a number of different task units in different companies. Each task unit is specialised and i.e. transportation and cross-docking may perform their tasks in other order fulfilment processes belonging to other Internet-based enterprises.

The tasks are performed in a network of task units. In order to build such a network one has to identify the tasks to be performed, identify (and maybe build) the task units to perform these tasks, and finally organise the network. This whole set-up is designed, contracted and monitored by the “star” unit – in this case the Internet Bookshop.

The organisation of the network i.e. the distribution or the responsibilities for the different tasks is possible to do in a number of ways. What company/network node should perform what task? The Internet Bookshop has e.g. to decide if the need to own the cross-docking task unit in order to secure the quality of the delivery or if this is done better by a separate company specialised on cross docking. Transportation is another task that could be considered in the same way but here separate transportation companies did already exist to fulfil that task. (However one of the problems in e-Business proved to be in the delivery area. The transportation companies were good at container delivery but not at “small packages to consumer” delivery. This has shown to be to a different task and requires different set-ups i.e. new types of task units.)

Also the other parts of the exchange, i.e. offering, billing and payment are split up in different tasks handled by different task units in different companies. A model of the complete business transaction would look like in Figure 29.
Our previous industrial example with offerings, orders, products, payments in a step-by-step mode between the producer and customer is still valid in many cases but in other we find this separation between the business transaction chain form the value chain and the flow of products. From a customer point of view it looks the same. The Internet Bookshop is a virtual organisation and for the customer it looks like one unit but behind the curtain the Bookshop has organised a well-controlled system of tasks performed by a number of different companies. They constitute a value-creating network that work together to produce value to the customer and fulfil the business transaction. We are still able to identify the flow of books as a value chain of steps but the business transaction chain is not a straight chain any more but a network.

Three tracks to follow

To understand a business we may follow these three partly overlapping tracks in order to understand how value is created for the customer:

- The order fulfilment track by following how a customer order is transformed into the required deliverable. This view focuses usually on one company’s processes. However, in order to combine high short delivery times with low stock levels the view has to be widened to cover more of the other units and companies upstream in the value chain.
• The value chain or product track by following the finally delivered product (clogs, books) upstream to its sources (wood, author’s idea) and downstream to the customer. Here we get a wide view over the whole value chain usually covering a number of companies. This logistics chain approach still holds in these cases.

• The business transaction track by following the complete process covering offering, order, delivery and payment (cf. Figure 30).

The value creation chain looks like a relay where we may look at each actor at a time, and also study the change-overs. The traditional business transaction process is something done in interplay between two nodes: customer and producer. This process has to be understood from both the customer’s as well as the producer’s perspective.

**Business Transaction Process**

![Business Transaction Process Diagram](image)

*Figure 30. Business Transaction Process as an interaction between provider and customer.*

It is one process viewed from two different perspectives.

**The business landscape**

All these three processes: order fulfilment, value creation chain and business transaction chain may be modelled on a network of task units or nodes participating in these processes. This map of the overall business network is a useful background to create models in order to describe and understand the on-going business. Also other stakeholders such as those units participating in the development of the business may be added, as well as other influential business actors such as competitors and potential customers. Finally, important social, political and technological facts and infrastructures may be added when trying to understand what may happen in the future.

This landscape is also named the ecosystem of the enterprise.

Basically, the entities in the Business Network in the map should be considered to be task units – but not elementary ones. In practice such a precision would lead to incomprehensible maps, so more peripheral tasks are represented by legal entities such as companies or parts thereof. These parts are relatively independent actors with their own objectives, own management and some power. We call them management nodes and they usually consist of two or more task units.

Our two basic frameworks for analysing and understanding operations are then the Task Unit and the Business Network (in a Business Landscape) and there we study the Value Chain, Business Transaction and Order Fulfilment-
The Internet Bookshop business network and landscape

In this Business Landscape for the Virtual Bookshop in Figure 31 you also find the Business Network and essential factors in the different environments the institutional, the technological and the social – factors that influence or may influence the business although they not participate in the ongoing business operations.

![Business Landscape for Internet Virtual Bookshop](image)

**Figure 31. Business Landscape for Internet Virtual Bookshop.**

However, the primary objective for this map is to show all relevant task units for the value creation chain, the order fulfilment and the business transactions. For order fulfilment it is relevant to break down some of the overall task in subtasks while in other cases other units are represented by their formal organisation (Publisher B) company or parts thereof (management nodes – Cross-Docking Centre).

The map is made from the perspective of the unit in focus (the Virtual Bookshop). This unit is often called core unit or star unit.

Each task unit may be further broken down in separate tasks and corresponding units when necessary. Companies and management nodes are looked upon as task units although they in reality contain a number of elementary task units.

The different task units have more or less tight relationships to the core unit. We have the task units of the company in focus as the innermost group (usually with a hierarchical relationship). In the Alliance we have the partners to the company the units that are closely related to the business of the core unit and participate in the development of it (contractual and social relationship). The Value Network embraces all units necessary for the creation of the products and services to the customer market (market relationship). Finally, the Constellation covers also the customers – i.e. all units that have to participate in order to keep the business running (market relationship). If any of the groups does not participate the show will stop. It is necessary to have a win-win-win business situation for all units in the Constellation in order to have an ongoing business running.
Within the Business Network there is co-production to create value for the customer; within the Constellation there is co-production to create value together with the customer and for the customer and all other nodes.

The Internet Bookshop built its Constellation very consciously and had two major issues in creating win-win for all parties:

- Why should the publishers endanger their business with the traditional bookshops by making special arrangements with an Internet Bookshop? They had long discussions with the publishers before they could convince them.

- For what group of customers would it be attractive to use an Internet Bookshop instead of a traditional one? They identified two primary groups
  - Students – they know exactly what books they had to have for their classes, they were already on the net and they were attracted by low prices.
  - Business Professionals – they often had access to the net and they estimated how easy it was to order the wanted literature without having to leave their desk.

(The map could also be used to ask questions such as what will the competitors such as the University Bookshops, do?)

**The Clog Factory business network**

In Figure 32 below we have tried to present all relevant nodes/task units and their relationship to the Clog Manufacturing Company.

![Figure 32. Business Landscape for Clog Factory.](image)

The centre is the company in focus – now divided into three task units/nodes: Marketing, Clogs Operations and Soft Shoe Operations. (Clogs are not the only products of the company). As the company has a very close connection to the US Agent (partly owned) it is located in the
inner circle. The relationship in this inner circle is hierarchical i.e. more or less ruled by top management (=Marketing = owners).

In the next circle of relationships – the Alliance – we find the Partners who do have more than pure a market relationship type (more than short/long term economic win-win) with the company and also take part in the development of the company and vice versa. The alliance is quite small: the bank, the wood supplier and the local equipment service company. There is interdependency between the company and its partners having them to maintain these long-term relationships. The relationships are both of market type, also of a more social type built on personal relations and shared visions and on efficiency by reuse of well-known routines and established communications.

Next circle is the value network that consists of all the task units necessary for creating value to the customers i.e. get the clogs to them. The relations to the task units outside the Alliance is more of a true capitalistic market type (short/long term economic win-win) i.e. if the Clog Factory could find another supplier with a better offering they would consider a switch. But it is reciprocal so if e.g. the nail manufacturer could decide to stop producing these small amounts of special nails in order to reduce their assortment, they might do it.

The value network includes also the wholesalers and agents – market relationships. The relationships to the US Agent is closer than that at least they belong to the Alliance but we have chosen to put the in the innermost Company circle.

Outside the value network we have what is conceived as customers: the retailers and end-customers. They are part of the total Business Constellation i.e. all the actors needed in order to make business. If any group in the Constellation is not willing to participate, this will stop the whole show. The business concept must provide win-win solutions for all nodes.

The step from focusing on the Value Network and its creation of value for the customer to focus upon the whole Business Constellation and the creation of value for all units is important. We will develop that aspect further in under “Value Creation by Services” below.

The map of the total Business Landscape also includes companies, actors, nodes, and infrastructures that may have an impact on the business in focus – i.e. competitors, potential customers etc. more important for the possible future development than for understanding the ongoing operations.

**Business relationships**

Short-term profit is not the only reason for making business. Our analysis of e.g. the Clog Factory describes and inner circle – an Alliance – where the units have much closer relationships.

One of the surprises for many eBusiness initiatives has been that business is not only a question of business transactions for short-term profit but also a question of the development of long-term relations between the actors, between the task units/management nodes. Phrases such as “your competitor is one click away” and “the Eldorado of price comparisons” imply a market of actors driven only by short-term profit. However there are many reasons for maintaining long-term relationships: long-term profit, shared knowledge of each other business (products and routines) leading to very effective handling of business transactions; shared long-term development; and personal relations including feelings of trust and security.
Business relationships have a number of ingredients such as power, profit and personal feelings. Ouchi, 1991 classifies the different types of networks of relationships in markets (profit relationships), bureaucracies (power relations), and clans (personal relations and feeling).

The relationships between the task units within a company are mainly of the hierarchical bureaucratically type i.e. one unit (top management) has power over the other ones.

Between the Internet Bookshop and its customers we have a pure market relationship i.e. they keep on doing business as long as the win-win situation persists. The customer may leave if he finds a better book provider (lower prices and/or more pleasant and convenient service) and the Internet Bookshop would break the relationship if the customer does not pay.

Other bonds may be of a more personal and social character – the students are maybe loyal to the University Bookshop at their University.

These are the three main ingredients in a relationship – power, profit and personal relations – usually one of them is dominating.

Relationship marketing – to develop these relations as a part of the execution of business transactions but also activities outside these transactions – have always been done by companies especially in B2B (business-to-business i.e. between companies) relationships. The business transactions are of course very important – that is where the value is exchanged – but good business relationships are getting more and more important. Good relationships give e.g. a more stable environment, lower transactions costs and improved services. The awareness of the importance of consciously building and maintaining these relationships has increased.

When the eBusiness and IT industry understood this fact their first reaction was to solve it by CRM (customer relationship management) systems. However, to manage relationships is a subtle task where human beings may be supported by a CRM system but can hardly be replaced by it.

So, the model of the Business Landscape is also used to analyse the relationship both between dyads of units as well as by groups of units in the above-mentioned way: Core Unit, Company, Alliance, Business/Value Network, and Constellation.

Value creation by services

Until now we have had a traditional industrial production view of value creation with the value creation chain as the backbone, a flow of objects and products step by step to the end customer from alder trees to clogs at end-user feet. This manufacturing view is implicitly the thinking behind many theories and models for understanding business operations.

However, during the 1980’s these theories and models did not fit very well in a number of cases and the concepts of services and relationships began to appear. During the last 20 years this thinking has resulted in a number of new concepts and models but “The distinction between services and products is both difficult to define and not particularly useful.” (Slack, 2001) In the literature there is no common agreement upon the definition of services although all agree when we are talking about a tremendous growth in the service industry.

To define product business is easier: it is the passing of an object/a product from provider to customer for money and at the same time passing the ownership.
To define services as something else as just not-product business seems to be very difficult. Also, it is less meaningful to look for a clear-cut distinction between products and services, as many offerings today are a combination of products sold/delivered and services provided. Still, traditional industrial product business is as important as brand-new service business and we have to understand and be able to manage both of them often in combination.

One new approach is to widen the view and also cover the customer’s task in order to see what could be done to support his value creation. (Normann, 2001). Our approach is to ask the question: “What is the provider able to do in order to contribute to the profit and the pleasure of the customer’s task in cooperation with the customer”. By creating economic value and positive experiences (“profit and pleasure”) for and with the customer, the provider achieves his implied objectives of doing more business with the customer, getting more customers via word-of-mouth and be able to get fair payment for his contributions.

The Hotel business

Let us take a traditional hotel service for a typical businessman as an example of value creation and look at order fulfilment.

What is value-adding transformation task? It is the customer’s task to survive in a foreign city from one day to another, to leave the business on the afternoon the first day and be ready for fight next morning.

What is the object of transformation? The businessman himself: input – hungry, dirty, tired and output – clean, alert and ready for a new day.

The activities or subtasks to perform this conversion are: sleeping, washing, relaxing, eating, maybe working a little, etc. To what degree and in what order the different activities are performed varies from guest to guest but most of them are probably performed by most guests.

Who are the participants? In contrast to the traditional industrial production – primarily the guest, the customer!

But what does the hotel provide? Primarily equipment: room, bed, bathroom, TV, telephone, Internet connection, desk, chairs – transforming resources to be used by the participant – the guest.

They also have resources in place to ad hoc perform the room-service when the customer wants to eat something. Here the hotel provides people (participants) both in direct interaction with the customer (front-office activities) and behind the scenes in the kitchen (back-office activities).

So, the hotel supports the customer to get profit and pleasure mainly by providing a room full of resources (enabling services) but also people and the resources they need for tasks in front and back-office (relieving services).

This situation raises the question: Who is responsible for the successful outcome of the customer’s stay, the transformation? Well, the guest is certainly responsible to his company to arrive next morning alert and fresh. He has sub-contracted the hotel, done some “outsourcing” but is still responsible for the overall outcome.

The hotel is responsible to the guest for providing the necessary resources and the execution of the relevant tasks enabling him to achieve his overnight objectives.
<table>
<thead>
<tr>
<th>TASK FRAMEWORK</th>
<th>HOTEL EXAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Object/material</td>
<td>Customer in many dimensions (physical, …)</td>
</tr>
<tr>
<td>Responsibility</td>
<td>Customer – overall, hotel – for resources and sub-tasks</td>
</tr>
<tr>
<td>Activities &amp; participation</td>
<td>Customer – 95%, hotel personnel front and back office – 5%?</td>
</tr>
<tr>
<td>Equipment and info</td>
<td>Customer – 5% (PC, toothbrush), hotel – 95% (room, bed, sheets, alarm-clock, bathroom, hairdryer, ………</td>
</tr>
</tbody>
</table>

*Table 13. Division of responsibility between customer/guest and hotel.*

This covers the main value creation task. If we put that in perspective of the whole business transaction process it will look like this

<table>
<thead>
<tr>
<th>Customer activities</th>
<th>Search market</th>
<th>Evaluate and buy</th>
<th>Receive &amp; integrate</th>
<th>Perform main task</th>
<th>Dis-integrate</th>
<th>Pay</th>
</tr>
</thead>
<tbody>
<tr>
<td>The same in hotel words</td>
<td>Search for accommodation</td>
<td>Order room</td>
<td>Check-in</td>
<td><strong>Live there</strong></td>
<td>Check-out</td>
<td>Pay</td>
</tr>
<tr>
<td>Provider activities/processes</td>
<td>Market services</td>
<td>Sell/reserve room</td>
<td>Give access to clean room</td>
<td><strong>Support when needed</strong></td>
<td>Get access to the room Clean the room</td>
<td>Receive payment</td>
</tr>
</tbody>
</table>

*Table 14. Division of process activities between customer/guest and hotel.*

One distinction between product and non-product business is the transfer of ownership. Therefore, we have a new column, a new step in the process – the disintegration i.e. the return of the provider’s equipment (don’t forget to return the cosy bathrobe!) and of staff (e.g. in consultancy services).

One distinction between product and non-product business is the transfer of ownership. Therefore, we have a new column, a new step in the process – the disintegration i.e. the return of the provider’s equipment (don’t forget to return the cosy bathrobe!) and of staff (e.g. in consultancy services).

<table>
<thead>
<tr>
<th>Hotel Services - Value Creation Processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer</td>
</tr>
<tr>
<td>Tired Guest</td>
</tr>
<tr>
<td>Stay overnight (Use room)</td>
</tr>
<tr>
<td>Alert Guest</td>
</tr>
<tr>
<td>Provider Order Fulfillment</td>
</tr>
<tr>
<td>Clean Room</td>
</tr>
<tr>
<td>Provider Maintenance</td>
</tr>
<tr>
<td>Clean</td>
</tr>
</tbody>
</table>

*Figure 33. Room and Guest Value Creation Processes.*

The important process is how the customer/guest is creating value for himself. The room process is a supply process but a supply to let, not to buy (cf. Figure 33).

As the customer will evaluate his use of the services not only from the main value creation task (main task) but from his experiences (pleasure) of the whole transaction process the provider has to perform well in all its
subtasks in order to achieve more business, good market image and keep fair prices.

The main dimensions to consider when analysing how to support the customer’s value creation task are

- Object: what is the object transformed? Who owns the object?
- Transforming resources:
  - Activities: what is the balance between customer and provider participants?
  - Equipment and information: who provides what? During what time?
- Task responsibility: what are the formal and informal contracts between customer and service provider? Who is responsible to whom and for what?

By focusing upon the customer’s value-creating process and how the provider is able to contribute to the execution of that task we circumvent the need to participate in the product-service debate. To provide a product is only one way to support/enable a customer’s value-creating process.

**Analysis approach**

So, our main approach is as follows:

First, we focus upon the customer’s value-creating task and process and then we classify the different ways the producer/provider may contribute to the customer’s profit and pleasure.

Second, although we focus upon the customer’s value-creating tasks we also look at the total business transaction process, the steps leading to the main task and the steps thereafter.

Third, we look at the value creation chain upstream and downstream from the core task. To be able to cooperate and to contribute to the customer’s value-creating process the provider has to take the following steps or tasks:

- produce the resources to be used in the customer’s process
- mobilize and deliver these resources and have them integrated into the customer’s task unit.
- take responsibility for at least the performance of his own(ed) resources during the execution of the customer’s task but also focus upon the customer’s profit and pleasure – as this is what is leading to more business.
- when the task is finished, retrieve and refresh his resources to be available for next customer.

Fourth, we look upon the business transaction from both customer’s and the provider’s perspectives. We study both how well it works as well as its impact on the relations especially in person-to-person situations.

“Advice to a hotel owner”:

- Build a warehouse of resources – a hotel – and get and organize resources for support customers through the business transaction process: reservation, checking in, room service and kitchen, checking out and payment.
- Integrate these resources into a customer’s task unit – check him in. Contribute to the success of his value creating task – make staying
rewarding and nice – customer profit and pleasure. Every front office personal contact with the customer should be pleasant (hopefully for both parties).

- Retrieve and refresh your resources – after check-out, clean the room

Focus upon the objectives e.g.

- get monetary compensation – make profit
- build a set of frequently recurrent price-insensitive customers
- get an excellent image on the market = getting more guests
- create a motivating atmosphere for your staff (profit and pleasure for them, too)

The task unit framework

The main task is to transform input to output to create value. The value of output (in customer terms) should be larger than the cost of material input and of the use of the transforming resources.

The focus is upon this main transformation task where value is created and added to/built into objects out. Activities are needed to achieve this transformation. Organised and structured resources such as people, equipment and information are the necessary bases for the execution of these activities. We use the Task Unit Framework to model: transformed material/objects, transforming activities and transforming resources organised and structured to perform the task.

Figure 34 shows the basic Task Unit Framework.

The triangle represents the whole task unit i.e. the business entity adding value to input by transforming it to output.

Sometimes these Task Units coincide with the formal organisation, sometimes they don’t. Often the resources needed for a task are collected from different organisational units i.e. the clog manufacturing task needs resources from the common pool of workers in times or high demand. Then the responsibility for the execution of the task is up to the formal
organisation but all the resources are not owned by them. Out-sourcing or out-tasking is another case. Then a whole sub-task (or even the whole task) is delegated to an outside organisation.

In order to understand a business one has first to identify the tasks that have to be done, then one is able to explore each task. A task may be broken down in sub-tasks i.e. a task unit into sub-task units.

A useful concept in this understanding of a business organisation is the management node: a node in the Business Network responsible for one or usually more tasks that have to be recognised in order to understand the operations.

**Similar frameworks**

*Work system model*

![Figure 35. Work System Framework.](image)

Our task unit framework is similar to the Work System Framework by Steven Alter, 2001 (cf. Figure 35) and the Management Node by Peter Keen, 2001.

Alters Works System Framework “is a system in which human participants and/or machines perform a business process using information, technology and other resources to produce products and/or services for internal or external customers.”

The main difference between the Task Unit Framework and the Work System Framework is that the latter is more stand-alone while we use our in the context of a Business Landscape Framework. The Customer element is in our case another task unit in the network and the products and services are the links between different task units.

However, to compare the two models gives an insight in both.
<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>WORK SYSTEM</th>
<th>TASK UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customers</td>
<td>Those who receive benefits from what is produced by the work system</td>
<td>Same definition but the element is a separate task unit in the Business Network.</td>
</tr>
<tr>
<td>Products &amp; Services</td>
<td>What the work system exists to produce.</td>
<td>The task unit produces only deliverables. Services are defined in the Business Network Model as support to customer tasks. The Task Unit Framework also gives more focus to material not only as output but also as input and work-in-progress.</td>
</tr>
<tr>
<td>Business Processes</td>
<td>The set of work steps or activities that are performed. They may be precisely predefined or relatively unstructured.</td>
<td>Same concept but we prefer to use the term activities to avoid the common fallacy to look upon business processes as something always well structured.</td>
</tr>
<tr>
<td>Participants</td>
<td>The people who perform the work in the business processes.</td>
<td>The same.</td>
</tr>
<tr>
<td>Information</td>
<td>The information used by the participants to perform their work. Much information is not computerized and is not part of a formal information system.</td>
<td>For us information is primarily what the participants do have in their heads and is controlling the activities. In order to build that information they have access to data; computerized and documented.</td>
</tr>
<tr>
<td>Technology</td>
<td>The hardware, software and other tools and equipment used by the participants to perform their work.</td>
<td>Same concept but we use the term equipment for all &quot;hard&quot; physical resources.</td>
</tr>
<tr>
<td>Context</td>
<td>The organisational, cultural, competitive, and regulatory environment within which the work system exists.</td>
<td>Same concept and may appear both on the task unit and the business network level.</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>The shared human, informational, and technical resources that the work system relies on even though these resources exist and are managed outside of it.</td>
<td>This is divided into supporting task units and in the environment in the business network model.</td>
</tr>
</tbody>
</table>

*Table 15. Comparison between Task Unit and Work Systems Frameworks.*

**Management nodes**

Peter Keen in “the eProcess Edge” (Keen & McDonald, 2000) has a network view and models business in terms of a network of management nodes. “A management node can be loosely defined as an organisational unit of control or influence.” For us, the task unit is that management node and the elements of the business network are task units. These units may belong to different companies.

Sometimes “actor” is used in the same sense. We prefer task unit or node because the participants are the true actors in the network and the tasks.

The Task Unit Framework has emerged by putting the Work System Framework in a Business Network environment.

**Operations management**

However, there have also been influences from the Operations Management field (Slack et. al. 2001). Our focus on transformation and the terms...
for the three levels of the task unit are similar to what is used in the field of Operations Management. Business activities may be viewed as transforming input to output and thereby creating value and are often called “operations”. In that sense the Task Unit is a framework for operations. Another meaning of “operations” is the specific task unit (or network of task units) for the creation of output to be delivered to the organisation’s external customers.

Slack et al. (2001) differentiates between:

- operations as a function, meaning the part of the organisation which produces the products and services for the organisation’s external customers (i.e. task unit)
- operations as an activity, meaning any transformation of input resources in order to produce products and services, for either internal or external customers (i.e. process).

While they focus on operations as a function = customer order fulfilment, we will use the term in its more general sense = the activities in a task unit.

**Business process management**

The process management thinking is another base in our work as this is focussing upon the transformation process that is the core or the task (Davenport, 1993). Process modelling is the primary tool when analysing value creation in more detail. The Business Landscape, the Business Transaction and the Task Unit put these value-creating processes in their proper business context (see chapter 6).

**Important characteristics of task units**

**Size**

There are two measurements of task unit size: revenue and number of participants. With increasing revenue the importance of the task unit is normally increasing. An increasing number of participants increase the demands on organisation and coordination.

**Transformed object**

The transformation process is very different depending on the type of object the unit is working with and produces as output. It is necessary to distinguish between

- physical objects: primarily equipment and material (clogs) but also data in physical form (books, bills) and physical aspects of people (haircut)
- data especially in electronic form
- mental objects: person’s knowledge, skill, attitudes

The processes of changing, moving and creation/copying are very different between these different types of objects and hence the transformation processes and their technology are very different. Many units have a mix of different types of objects as input and also as output. To identify the type of main object processed by the unit is of vital importance for understanding the task.
Stability in process and base

Every task unit is changing over time due to erosion, spontaneous learning and/or conscious development efforts. Here we focus upon the ongoing operations and leave these changes out of account and focus upon the changes/transformations that are a planned conscious part of the way the unit operates.

Factory type operations

For factory-type operations the objectives are to have a pre-defined, rigid activity structure for repetitive work in order to secure efficiency, quality of output and to reduce dependence of individual skills. There are three versions.

Continuous processes: the output is a flow with high volumes of objects with almost no variety e.g. electric utility. The process is ever the same using a fixed base.

Mass production: the output is a number of objects with high volumes with varieties within pre-defined limits, e.g. car manufacturing and ATM services. The process is always the same using a fixed base of transforming resources.

Batch production could be treated as a sequence of mass production of different but usually very similar products using (almost) the same base of transforming resources. Clog manufacturing is a typical case. The clogs are very similar and have the same production process but the differences in style and size require a production in separate batches for each size and style. Slightly different processes are run using to a large degree the same parts of a fixed task base. To switch from one batch to another a more or less time-consuming and costly set-up process is needed. Some resources may not be always allocated to the unit but may have to be leased from other internal or external resource pools when needed.

For these types of operations it is usually very efficient to be able to work with clearly pre-defined processes in order to optimise the workflow and secure the quality.

Workshop type operations

Car repair is an example. Each execution of the repair task is unique but usually very similar to many previous ones.

The process – activity structure and the transformation are not rigidly defined and require creativity and craftsmanship to execute. The necessary transforming resources are still pre-defined and at hand but used differently from execution to execution depending on the customer’s/the car’s needs. These workshop/jobbing processes are characterised by lower volumes and a high variation in output.

The car repair workshop has a given base of facilities and tools, manuals and skilled mechanics. Each incoming car is more or less unique and requires a more or less creative process to be fixed. The individual task varies from being pure routine to “never-seen-before”. So, the structure of the process varies from object to object using the given resources in the base. Hotel services could be classified in this category although they tend to be very repetitive from the provider’s perspective due to the freedom of the guest to structure and execute the task.

The proper design of these processes requires a balance between to have process structure as a back-bone and creative resources to fulfil the task. Many attempts have been done to treat workshop-type operations to become factory-type operations sometimes with disastrous results.
Ad hoc type operations – projects

For this type of operations not even the task resource base is pre-defined but is put together successively as the task is understood, and activities are successively defined and results identified. In some cases the process may be well known and well structured, e.g. for I/S development project. In other cases e.g. in professional services the structure and the needed resources are successively identified as the initial problem analysis proceeds.

Operations and the Internet

The basic quality of the Internet is to provide possibilities to more easily connect all task units and companies in the Business Constellation in one huge information web. This and other IT networks are increasingly used for a number of different purposes. First, to control the value chain. There are PC vendors (in cooperation with logistic providers) that give their customers opportunity to track not only where their delivery is, but also what is in stock and what is in production, i.e. to “see” along the whole value chain to be able to predict when their PC is going to arrive.

Second, to support the business transaction in all different steps: searching/marketing, ordering/confirming, tracking (see above), invoicing/paying.

By this, Internet has provided companies with possibilities to co-operate and there is a growing tendency to do so – to run a collaborative commerce and in consciously control more of the company’s ecosystem.

Third, when the product, the objects passed from provider to customer is possible to convert to digitised data the whole business may change. If the Internet Bookshop is using the two previous opportunities, the eBook is an example of this third. However, the eBook is not fully competitive to the paper book when it comes to customer profit and pleasure so the Business Constellation for success is not at hand – yet. It simplifies tremendously the mass-production and distribution of the content of the book but makes it more difficult for the reader to “get the message”.

The music industry is seeing this as a threat to the current order. Hence, their fight against Napster and shows how these new opportunities create a deadly threat to the existing companies.

There has also been a lot of fuss about innovative ways to build new business constellations (e.g. Bookshops, Marketplaces, Auctions etc.) but in many cases they have failed because some actors in the Business Constellation did not participate as expected. They did not find any advantages of joining the constellation. It will probably take more time to develop these new constellations than expected.

However, Internet is also used to improve the cooperation within existing constellations both with a narrow unit-to-unit (B2B) focus and initiatives to coordinate existing value networks. This development started more slowly than the spectacular ones and the B2C-solutions, but is more enduring and seems to have more impact in the long run.

In all cases it is useful to use these frameworks and to identify the relevant tasks and task units in order to design the optimal solution. In the Internet Bookshop case this was done very consciously and the tasks were distributed carefully. When trying to improve an existing business network it is more difficult to realise this optimal task distribution because the transforming resources are already organised according to some functional
structure. To change that may be politically difficult it will take time to re-allocate the resources e.g. adapting the information systems to the new structure.

**Analysing and modelling business operations.**

The Task Unit, the Business Transaction and the Business Landscape are frameworks, the instruments to be used to create models and to get an overall understanding of the business for the company or task unit /core unit being the focus of the study. For us the term perspective implies a viewpoint, a position from which we look upon the business i.e. most cases the analysis is done from the perspective of the core unit. The task unit, business transaction and business landscape are different views from that perspective and we use the different frameworks to create the relevant models.

To increase our understanding, sometimes we may use two or more perspectives. For example, the business transaction is analysed from both the provider’s and the customer’s perspective.

In many cases we have to go deeper in order to understand the ongoing operations to the degree that is necessary for our study and there are many tools for that. We have found three tools to be very useful: process modelling, concept modelling and value modelling.

**Process modelling**

This is the primary tool for analysing ongoing value-creating operations and its importance and use has grown considerably during the last 10 years. It is used to analyse and describe the transformation processes, the customer order fulfilment process, the value creation chain as a process and also the business transaction process. This will be described more in detail in chapter 6.

Process modelling may here be used for different purposes, requiring an increasingly detailed description

- to get an overview and overall understanding of the process
- to have a base for measuring and controlling the performance of a process
- to describe the process for development purposes (“is” as well as “to be”) including the creation of IT-systems supporting the process
- to describe the process in detail to be a manual for the participants

**Value modelling**

In order to keep a profitable business running it is necessary that all units, actors, companies in the business constellation want to participate for profit and pleasure. Value modelling is used to get a grip on that. For more peripheral units a very simple evaluation may be sufficient and for other e.g. the core unit a more careful analysis may be necessary (see chapter 5)

Also when digging deeper into a task, its sub-tasks and the corresponding transformation processes goal modelling is often a necessary complement.
**Concept modelling**

As the purpose of models is to create understanding and communication among people it is vital that the different terms for objects, tasks, processes etc. are understood in the same way. Especially for what you deliver – the transformed objects out from the task – you have to agree upon what they consist of and what terms to use for them. To discuss a task unit when different people have different understanding of what the output is will lead to either endless debates or a superfluous agreement covering non-agreement (see chapter 7).

**Organisational modelling**

The common organisation chart could be defined as a model, a picture of responsibilities (which management nodes/formal units are responsible for the performance of which tasks) and resources (which management nodes control which resources). As this is a well-known model we do not describe the framework.
Large-scale information systems that aim to support a multitude of business activities are put forward by system vendors and consultants as answers to current business problems. The implementation of these systems have potentially vast implications on organisational characteristics, such as degree and nature of centralisation/decentralisation, business-relevant values, such as userfriendliness and flexibility, as well as features of the organisation’s technical infrastructure, such as client-server architecture based upon standardised interfaces and components, the role of the Internet, intranets, and extranets, etc. Conversely, business values, organisation, and technology can and should influence how the information systems are implemented. In this chapter, these ideas and concepts are put into the larger context of information solutions.

The information area of business solutions

Human beings have always used information and information systems for different purposes. For example, consider the use of smoke signals, maps, navigation methods, messengers, horoscopes, papyrus rolls, telephones, ... Information and information systems may be used by individual persons, e.g. the notes made in a personal calendar or telephone book; we talk then about “personal information” and “personal information systems”. However, it is more common for information and information systems to be shared by some kind of collective, e.g. a group of people, a company, an organisation, a society, or even the whole world community (e.g. the Internet); we talk then about “shared information” and “shared information systems”.

Information and information systems may be used for a wide range of purposes. Since the human being is by nature a social creature, curiosity and a strong desire to belong to a group may have been some of the first driving forces to stimulate communication and information sharing. Furthermore, the human being is also, at least sometimes, a rational creature and will

---

5 Strictly speaking all information and information usage is personal. As will be discussed below, information exists only in the minds of people. All communication and information sharing is based upon data representations of information, e.g. printed representations, electronic representations, voice signals. An important issue in connection with information shared by a collective is therefore how to ensure that all members of the collective interpret stored and communicated data representations in more or less the same way, the way intended by the original creator of the information (or rather the data representations of the information).
soon have discovered that collection and processing of information may be very helpful in planning, executing, and evaluating different kinds of actions, especially goal-oriented actions involving large groups of people, e.g. war efforts.

So far we have assumed that the reader has some kind of intuitive understanding of the meaning of “information” and “information system”. For the purposes of this book it is necessary to define the two concepts more precisely.

As we have discussed in the introduction to this book, it may be a good idea to look upon a phenomenon from different angles or perspectives, especially if we need to develop a deeper understanding of the phenomenon. We may apply this idea on the concepts of “information” and “information system” and choose the following three perspectives that were also mentioned in the introductory chapter:

- a semantic perspective: what is it?
- a syntactic perspective: how does it appear in the real world?
- a pragmatic perspective: what is it used for?

See Figure 36.

![Figure 36. Semantics, syntactics, and pragmatics of information and information systems.](image)

**Pragmatic aspects of information and information systems**

We have already seen some examples of what information and information systems may be used for. We may look for information in order to satisfy our curiosity. We may collect information in order to prepare a decision or an action, alone or together with others. We may use information for carrying out and co-ordinating an operation. We may collect and analyse information in order to evaluate the performance of an operation, while it is still going on, or the results of the operation, afterwards. We may use information in order to communicate facts or experiences over shorter or longer distances in room and time. When we store information, we make it available at later times. When we transmit information, we make it available in other places. By storing and communicating information, we also make it available to other people, i.e. we enable people to share information.

An information system is used for the functions associated with information: obtaining, processing, storing, and communicating information.

**Syntactic aspects of information and information systems**

Let us now turn to the syntactic approach. How is information obtained, processed, stored, and communicated? Strictly speaking, information only
exists in human minds, but as human beings we use different tools in the material world outside our minds in order to obtain, store, process, and communicate information. We cannot “see” information, or touch upon it; we can only see its material shadow, its data representation. Texts, tables, and graphs are common examples of data representations. They occur on different media: paper, screen, CD, etc.6

How do we obtain information? The most direct way is by observing or perceiving reality through our senses. Figure 37 illustrates this process. The impressions obtained are conceptualised into information by the human mind on the basis of the concepts and accumulated information that this mind already contains, the so-called frame of reference.

![Figure 37. Obtaining information through direct observation.](image)

The information thus obtained will update the memory and the frame of reference of the human mind. It may also be stored as data outside the human mind, and these data may again may be reinterpreted into information by the same person, who stored it, or by other persons.

Thus interpretation of data is another way of obtaining information, an indirect way. Figure 38 illustrates this process. Data represent information by means of some kind of symbols. When these symbols are perceived by a human mind, with a certain frame of reference, the data may be interpreted into information.

Frame of reference, metainformation, and metadata

A person, who interprets data, must have a frame of reference with some compatible background information that enables him or her to interpret the data “correctly”. Such background information is called metainformation, and, like other information, metainformation may be stored outside the human mind as data, so-called metadata.

---

6 This means that information belongs to the mental, invisible, conceptual world, whereas data are the external representations of information in the physical world outside the human mind. It can be assumed that data representations are hardly ever perfect in the sense that they exactly correspond to the information that they represent. Furthermore, different persons are most likely to interpret the same data in different ways, that is, when reading the data, they will get different information conceptualisations in their respective minds. However, there is no exact way to determine how differently different persons interpret “the same” information. According to Langelofs’ infological equation (...) this is due to the fact that different people have different background knowledge or frames of reference.
Different persons have different frames of reference, and even the same person will have access to different metainformation at different points of time. Thus different people will interpret the same data in different ways. Metainformation, stored as sharable metadata, may help to decrease these differences and to increase the so-called intersubjectivity of data.

Even direct perceptions are subject to errors. Our senses are not perfect. Moreover, direct observations, too, depend on the observer’s frame of reference with the concepts and understandings that it contains.

**Information, knowledge, and wisdom**

A human being uses the brain not only to store information but also to reflect on it. These reflections and analyses may lead to new information, often more general knowledge or insights. Scientific laws and theories are examples of such generalisations. Rules of thumb, as well as prejudice, are other examples, based on experience rather than systematic thinking. When general information has been reflected upon for a very long time, and by many people, it may reach the status of “wisdom”, sometimes codified in books like the Bible.

Figure 39 illustrates how the human mind processes information into knowledge and wisdom.
Similarly as information materialises through its data representations, an information system materialises through a data processing system, e.g. a computerised system for collecting, processing, storing, and disseminating data. Figure 41 illustrates how the information processing capabilities of human minds are enhanced by computer-supported information systems.

The distinction between information and data

The conceptual distinction between “information” and “data”, as well as the between “information (processing) system” and “data processing system”, should now be clear to everyone. However, it is not always easy to
maintain the distinction consistently in everyday language. For example, when we say that “this book contains a lot of information”, we probably mean that a reader of the book will get a lot of information by interpreting the text, the data, that the book actually contains.

Furthermore, especially in social sciences, the term “data” often means both “data” and “information” at the same time. For example, if a social scientist says that she has collected a lot of data about elderly women, she does not only mean that a lot of data representations, data values, have been collected and stored, but she also implies that these data represent or contain a lot of (factual) information.

We have to live with this fuzziness of ordinary language, but we should be ready to explain exactly what we mean, if someone is in doubt – and if someone is in doubt, he or she should always ask for clarification.

**Semantic aspects of information and information systems**

Figure 40 and Figure 41 can also be used for gaining some insights into the semantics of information and information systems: What is information? What is an information system?

In Figure 42 Ogden-Richards’ triangle is used to illustrate the meaning of information, the information is represented by data and refers to a real-world situation. Note that the line between data and the real world is dotted, since all data representations (which are also in the real, physical world, by the way) have to pass the mind of some person during a process of interpretation. Nevertheless, there seem to be processes where data representations of physical phenomena are automatically created by means of technical tools, e.g. thermometers, without having to pass a human mind. However, the thermometer was invented and designed by means of a human mind, and in that sense all temperature measurements through thermometers have implicitly passed a human mind; cf. Langefors (...).

![Figure 42. Information, data, and reality.](image)

Data have a similar relationship to information as the picture of a person on a photo or a TV screen has to the person represented by the photo. However, there is an important difference. Whereas the person (like the photo representation) exists in the physical world, information is something abstract that only exists in the mental world of a person.7

There are different types of information, e.g. facts and knowledge. Facts are typically structured in a uniform way and inform about states and

---

7 We postulate here that there is a “real world” that would exist, even if there were no human beings. However, we do not necessarily assume that there is only one, objective way of perceiving the real world. On the contrary, all human perceptions of the real world are dependent on the frames of references of the perceivers.
changes in a piece of reality, the so-called object system or universe of discourse. Factual information may be conceived as sets of so-called e-messages (Langefors (...) and Sundgren (...)). Knowledge is more general information like laws, rules, logical and mathematical formulae.

One may also distinguish between more or less structured information. Relational databases are used for storing highly structured, factual information. Free-text databases are used for storing less structured information. Laws, rules, and formulae are often more or less hidden in software, but they may also be more explicitly stored in a rule base, part of a knowledge base, known from the discipline of artificial intelligence and expert systems (knowledge-based systems).

Langefors (...) summarises the relationship between data and information by means of the infological equation

\[ I = i(D, S, t) \]

where

- \( I \) is the information contents obtained by a human being
- \( i \) is the process of interpretation and creation of meaning
- \( D \) is the received data
- \( S \) is the frame of reference, or accumulated knowledge, used by the interpreter
- \( t \) is the time used for interpretation

Thus information is the meaning or contents of data, as interpreted by a human being with a certain frame of reference.

Information is highly dependent on the existence of concepts. Like information, concepts are formed by, and can only exist in, human minds. Consider a small piece of factual information like “that dog is black”. The forming and understanding of this information assumes the existence and understanding of the concepts of “dog” and “black”, and the information itself is a mental association between these two concepts and the mental reflection of an individual object, a particular black dog, in the real world that the human mind is perceiving.

How does the human mind form concepts? A classification process based on (a) similarities, and (b) differences, seems to be fundamental for the mental process of concept formation. A little child learns step by step that real world objects that look and sound and behave in certain similar ways are “dogs”. Although all dogs are similar in certain ways, they are also different from each other. The little child may see some black dogs and some white dogs and form the concepts of “black” and “white” and maybe even the concept of “colour”, a class of concepts “of the same kind”.

The mental processes of classification and conceptualisation assume that the human being can mentally distance herself from the reality that she is part of, and that there is a certain variation in this reality. To realise this, you can imagine yourself having spent your whole life in the middle of a forest of identical trees. In this situation you would probably not be able to form the concept of a tree, because there is nothing but trees in your reality. Nor would you be able to form the concept of a forest, because you

---

8 Although classifications are usually assumed to be hierarchical, different classifications may very well overlap each other in a non-hierarchical way. In the example of the black dog, there is an overlap between a dog/non-dog classification and a black/non-black classification.
cannot distance yourself enough, neither physically, nor mentally, from the trees that you are completely surrounded by. You cannot see the forest for trees, as the proverb says.

Let us now make a giant mental jump and assume that you are a consultant with the task to suggest improvements in a business. On the one hand you need to understand how this business is conceptualised by the people working in it. On the other hand, as a creative outsider, you may find it rewarding to look at the business from other perspectives, conceptualising it in other ways, based on other similarities and differences than those seen by people who are in the middle of (some part of) the business.

We may conclude that concepts as well as information based on concepts are fundamental for understanding and improving a business.

**Information and data (processing) systems**

The term “information system” is most often used with the same meaning as “information processing system”, i.e. a system of information processes. Furthermore, an information system is often supposed to be computer-supported, i.e. supported by a computerised data processing system.

However, sometimes it may be useful to think of an information system in a more literal and abstract sense as a system of information, e.g. the information that is of importance for the business of an organisation. Knowing this information, and understanding the concepts underlying it\(^9\), is fundamental for understanding the business, and this understanding is in turn fundamental for designing good information processes and information processing systems for the business. The same abstract system of concepts and information, needed by the business, can be realised by many alternative information processing systems, and each information processing system may in turn be implemented by many alternative technical solutions, i.e. by many alternative data processing systems.

We may see (i) a system of concepts and information; (ii) an information processing system; and (iii) a data processing system as three aspects of an information system. By doing this, we may subdivide complex problems of describing, understanding, and designing information systems into more tractable subproblems.

Figure 43 illustrates the conceptual distinctions just made. The upper left part of the figure shows a real-world problem: what is the size of the shaded area, \(A\)? Even if we do not know, or bother about for the moment, how to compute \(A\), we may indicate that the information wanted can probably be derived from three other pieces of information, as shown in the upper right part of the figure: information about the function \(f(x)\) and information about two points: \(x_0\) and \(x_1\). Then, as shown in the bottom left part of the figure, we may start thinking about how to make the computation, in principle; we conceptualise different algorithms, or information processes, that could possibly be used. Finally, as shown in the bottom right part of the figure, we implement one algorithm, e.g. by writing a program in a programming language, or by using a piece of software that already exists.

\(^9\) Actually there is a system of concepts that is even more fundamental for the understanding of a business than the system of information that is expressed in terms of these concepts.
Figure 43. A real-world problem (upper left) and its solution in terms of an information system in the proper sense (upper right), an information processing system (bottom left), and a data processing system (bottom right).

Figure 44 shows how an implemented information system may be thought of as an information system proper\(^{10}\) (upper part) with an embedded data processing system (bottom part). In general, the data processing system may consist of computerised processes, other mechanised or automated processes, and manual processes. The data processes may interact with one another as well as with mental information processes; refer back to Figure 41.

---

\(^{10}\) By information system proper we mean an information system in the literal, abstract sense, that is a system of related sets or pieces of information.
Different roles of information in businesses

We will now use the three perspectives of this book for analysing different roles that information will have in an organisation for conducting some kind of business. Thus we shall study

- information about goals and their fulfilment
- information for processes and their control
- information about concepts and information

Information about goals and their fulfilment

The focus of this book is on “the business” of a company (an enterprise) or another type of organisation. What we call “business” here, need not necessarily be of commercial nature. It is true that most companies have as an important goal to earn money for its owners, but for other types of organisations other types of goals are of higher magnitude, e.g. to produce services for its members, or to promote some kind of idea.

For some organisations the business is a means to an end – money; for other organisations money is a means to an end – the business.

However, all kinds of organisations have some kind of “business”, and they usually work under economical restrictions that have to be taken into account, whatever the business is. Furthermore, even commercial organisations have to take many other kinds of goals and restrictions than purely economical ones into account. All stakeholders in the business: owners, personnel, customers, suppliers, etc, have to be kept reasonably satisfied most of the time. Thus those who are responsible for the business must have a good understanding of the stakeholders and their reasons for being stakeholders. This is one category of information of great importance for a business: information about stakeholders and goals and about the fulfilment of these goals. These kinds of information and ways of analysing and measuring them were discussed in chapter 2 and will be further dealt with in chapter 5.

Information for processes and their control

In chapter 3 we discussed the processes of a business. Most business processes, if not all, have some information contents, i.e. they are associated with information processes. For example, consider an order management process. First of all, the process is triggered by some kind of communication between a customer and the company. When the order process has been initiated, the customer, maybe after having asked some questions and received answers to them, provides some input parameters to the order process by telling what and how much he or she wants to buy, and where it should be delivered. In addition to the ordered goods, the company sends a delivery note with information about what has been delivered and what possibly remains to be delivered later. It also sends an invoice with information about how much, when, and where the customer should pay. The customer may make a complaint, if the delivery is not satisfactory. The payment would hardly involve any physical transfer of money but rather consist of an update of two bank accounts, one belonging to the customer and the other one belonging to the company. Even the delivered goods themselves may have some information contents, e.g. a manual accompanying some electronic device, or it may entirely be an information product like a book, a piece of software, or a password to an Internet-based information service.
Whatever the ordered product is, the processing of an order is a very basic and operational process. Most of the information processed in connection with an order process is specific, factual information about the customer, the ordered goods, etc.

However, there is also more general information used in basic business processes like order management. Persons managing orders will follow certain instructions, rule-oriented information about what to do and how to do it. If computer-support is used, the computerised subprocesses will follow the rules built into some software.

Before a company starts doing business, the business processes are typically planned in some way, i.e. the processes are designed, constructed, tested, and implemented. When a business process is going on, it is continuously monitored, by the operating staff itself and/or by some manager, in both cases possibly with the support of computers. From time to time the business process may be more thoroughly evaluated, and, as a result of the evaluation possibly modified or redesigned.

All processes in a business need to be monitored and evaluated as a basis for control, learning, and improvements. Instructions and check-lists are used for controlling and monitoring processes. Feed-back information from the processes should alert operators and managers on different levels, when something exceptional or unexpected happens. Customer satisfaction should be investigated in order to improve products and services. Etc.

Note that the planning, design, construction, testing, implementation, monitoring, and evaluation of processes are themselves processes, and as such have information needs and are associated with (or rather consist of, more or less entirely) information processes, and themselves need to be planned, designed, constructed, tested, implemented, monitored, and evaluated.

On higher managerial levels the whole business and its various business processes will have to be monitored and evaluated. Sometimes restructurings and other major changes may have to be considered. Such decisions will again require a lot of information, and typically quite a lot of the information needed is of a rather general and analytical nature and concerns the environment of the business as much as the business itself. For example, a decision about an investment in a new plant or a new product requires information about existing markets and their expected developments, information about competitors, etc. Some of the information needed for these high-level processes maybe compiled in a rather formalised and systematic way by means of basic, lower-level processes, as for example when accountants are compiling different reports from the accounting system. Other parts of the information for high-level processes may have to be compiled in a rather unique way for each new purpose, and large parts of this information may be of a rather informal and subjective nature.

In a growing number of businesses, information is not only used as an instrument, a means to an end; information is what the business is all about, an end in itself. The business obtains information from information providers, analyses and transforms it, and disseminates the results to its customers.

Even in more traditional businesses, the information contents of products and services are growing. For example, economical transactions are often performed entirely by means of information; when “money” is “moved” from one person or company to another, what actually takes place is that two database accounts are updated.
Basic business processes are often assumed to be well-defined, repetitive, and formalisable routines that are obvious candidates for being automated. Managerial processes, on the other hand, are assumed to be more unique and require more judgement and creativity. Nowadays, this distinction is not necessarily so clear. Many basic business processes contain a considerable amount of non-routine decision-making and acts of creativity. Examples are the daily preparation of a newspaper, printed or web-based, an IT consultant’s design and construction of computer-based information systems, and the daily laboratory work of a scientist.

On the other hand, managerial work, and even highly creative research work, will also contain many subprocesses, often information processes, of a quite routine nature, e.g. accountants preparing reports as a basis for top management decisions, or the scientist collecting and preparing data through interviews or experiments.

Businesses are becoming more and more aware of the importance and value of their knowledge capital, e.g. knowledge about customers and knowledge about “how to do” different things in their business. One problem is that this knowledge is often available only in the heads of individual persons working in the business, and even these persons may not be aware of the knowledge they actually possess and use; the knowledge is personal and implicit, so-called tacit knowledge.

A growing number of businesses are becoming aware of this situation, and they see both risks and opportunities. One risk is that people with valuable tacit knowledge may leave the organisation and take their knowledge with them. On the other hand, there are numerous opportunities to rationalise and improve the quality and competitiveness of the business by making the tacit knowledge explicit and generally available within the organisation. For example, big consultancy firms systematically document their knowledge and make it available to all its consultants. Furthermore, they expect the consultants to solve large parts of new tasks by retrieving existing methods and information from the firm’s common knowledge base.

There is an interesting potential conflict of interest in connection with tacit knowledge. Many stakeholders in the business, e.g. owners, managers, and (in certain cases\textsuperscript{11}) also the customers, would like the tacit knowledge to be documented. However, the “owners” of the tacit knowledge do not necessarily share this interest. To be in possession of an information monopoly may be valuable, both economically and, maybe even more importantly, psychologically. Knowledge monopolists usually do not admit that they want to keep their monopoly. Instead they point to the complexity of the knowledge (which makes it difficult to document it), the time and cost of documenting, and the potential security risks of making it more explicitly known how important business processes are carried out.

In summary, information will appear in connection with processes in many different ways:

1. general information in the form of instructions and software telling how the process should be executed and monitored (in general)
2. specific information in the form of parameters telling how the process should be executed in a specific case (e.g. information about the customer and the products ordered in an ordering process)

\textsuperscript{11} For example, advanced users of official statistics have an interest to know, how the statistics have been designed and produced, in order to be able to judge for themselves the quality of the statistics and their usefulness for different purposes.
3. information triggering (an execution of) the process to start or stop (or switch into some other mode, e.g. error handling)
4. feed-back information from the process that can be used for monitoring, quality control, and evaluations
5. information as (part of) the products and services produced by the process
6. information as a resource that is transformed into an information product
7. information informing about the other information that appears in different roles in connection with the process, so-called metainformation
8. information about metainformation, meta-metainformation, etc.

Information about concepts and information

Since we need so much information for the business processes, it should not be surprising that we also need information about the information itself. This information will also provide valuable insights into concepts of fundamental importance for the business.

Business concepts and business information

There is an interesting mutual relationship between concepts and information. On the one hand, since information is built up from references to concepts, the information used by an organisation reveals concepts that are important for the business. For example, if people in the organisation talk a lot about customers, products, services, value-added, profitability, risks, etc, these are probably important business concepts. Two questions arise: Are the concepts well defined and well understood? Not necessarily. Do different people, and different departments, in the organisation interpret the concepts in the same way? Probably not.

Thus, for someone who wants to analyse a business for some purpose or other, e.g. a manager or a consultant, the information used by the business, and the underlying concepts, may be a key to understanding the business. This approach is particularly useful in situations where those who work in the business are not themselves aware of (or do not agree upon) what the business is actually all about, and what is important for the business.

On the other hand, since information and information systems should reflect the concepts and “the reality” represented by the information, a careful analysis of the business concepts and their relations to each other may be a useful starting-point for the design of information systems. For example, consider the business concept “customer” and its representation in a customer database. In “the real world” of the business the life history of a customer could be schematically described in the following way. First the customer is born. From the point of view of the business this may mean that the customer makes a first purchase from, or at least makes a first contact. Then the customer has a number of interactions with the business, asking questions, buying, paying, complaining, etc. The customer may also change status, for example by changing address, telephone number, etc. Finally the customer may die, either literally or at least from the point of view of the business, e.g. by being inactive for a certain period. The life history of the customer should be properly represented by database records and transactions. By checking this, we ensure the quality of the information system in the sense of completeness and correctness.
A good understanding of the basic concepts of a business can also help an organisation to provide flexibility to its processes and information systems, thereby preparing itself for future changes. Even in a dynamically changing business, it is usually possible to identify a number of fundamental concepts, functions, and processes, which together define a certain natural, inherent logic in the business as such, and which remains relevant throughout most changes. Should even this “hard core” change, for example because the company changes its direction completely, most people involved will probably accept it as quite natural that the information systems will have to be drastically changed as well. What a user finds difficult to accept is when a seemingly minor and unimportant change in assumptions or requirements lead to time-consuming and costly reconstructions of information systems.

Figure 45 illustrates how one can start analysing the existing or planned information systems of a company. The company in the example is assumed to sell different products, some of which are at least partly manufactured by the company itself. Certain types of components are purchased from other companies and assembled into final products by our company.

The figure indicates, by means of so-called conceptual models, some important concepts in a number of basic business functions: Purchase, Store, Personnel, Sales, Accounting, and Delivery. Some or all of these functions could be supported by an Enterprise System (cf. Davenport, 2000). However, this would require co-ordination of concepts.

A practical consequence of such integration of concepts and systems is that we would have to find answers to questions like:

- Is the *Customer* concept the same in Sales, Accounting, and Delivery? If so, are they identified in the same way, e.g. by the same number?
- How are the concepts of *Order*, *Invoice*, and *Delivery* related to each other? For example, can there be several, separate deliveries (and invoices) for one and the same order?
- Is the *Item* concept the same in Purchase, Sales, and Delivery?
- How are the concepts of *Item* (in Purchase), *Component* (in Store), and *InputResource* and *OutputResult* (in Production) related to each other?
- How are the *Supplier* concept in Purchase and the *Provider* concept in Store related to each other?
- Could a *Customer* be (a) a company; (b) a private person?
- Could the same company be (a) a *Supplier*; (b) a *Customer*? If so, are they identified in the same way?

12 The topic of conceptual models will be treated more in detail in Chapter 7.
The information systems in the upper part of the figure support basic, operative business functions. They may also feed a data warehouse with input data – the lower part of the figure. Whereas the different applications in the upper part of the figure are by and large dedicated to different business functions, the data warehouse will be a corporate asset, available to all parts of the business.

**Metainformation: information about information and concepts**

As long as a business is small, “obvious”, and involves only a small number of people, who meet each other on a daily basis, it may be relatively safe to assume that all important concepts and data are well understood, and interpreted in the same way, by everyone in the business. However, as soon as the business grows, becomes more complex, involves more people, possibly located in different places, becomes dependent on formalised, computerised information systems, etc, it may be necessary to take certain steps to ensure that all involved in the business share the same understanding of important concepts and information. Such a step is to make sure that information stored in and retrieved from information systems is
accompanied by metainformation, information about information, explaining the meaning and quality of the information.13

Metainformation (represented by metadata) is particularly important when the information is used by people who have not made the underlying observations and measurements themselves, and when the information is aggregated and compiled from several underlying sources. Thus in connection with high-level analysis and decision-making on the basis of so-called directive information systems (see ...), good metainformation is absolutely essential as a complement to the information itself. How much time has not been wasted by managers in meetings trying to understand, and arguing about, the figures in reports they have received? Enterprise systems and data warehouses are examples of complex information systems, where data are compiled and integrated from different sources and used by different users with different frames of reference and with different purposes in mind. Data in such systems should be accompanied by well designed metadata for the different types of users and usages.

Metadata enable information system users14 to

- search for data that are potentially relevant for the users’ problems
- retrieve data and interpret them in a reasonable way
- analyse and further process data

Metadata may inform about

- the meaning of data: underlying concepts and definitions
- what the data were originally intended for
- how data have been obtained and processed

Information systems as business infrastructure

Information, information processing, and information systems are integral parts of all business. A lot of information processing in the daily life of an organisation may not even be recognised as information processes, e.g. informal communication during coffee-breaks and gossiping in the corridors. The more structured and formalised the information and the information processing is, the more likely it is that it is explicitly recognised and handled by some kind of consciously designed and computer-supported information system. Formalised information systems may or may not be more efficient than informal exchange of information. For example, it is often efficient for the organisation to make sure that important knowledge about key processes are not dependent on the presence of individual persons, but is well documented and easily available from a common knowledge base – as we discussed in connection with “tacit knowledge”. On the other hand “management by coffee-drinking” is often a more efficient way of influencing the employees of an organisation than written orders or formalised information meetings.

13 The reader is reminded that information is always represented by data, as soon as it occurs outside a human mind, e.g. in a report on paper or some computer medium. This also applies to metainformation. When the terms “information” and “metainformation” occur here, they should be understood as “data/metadata as interpreted by a human being”.

14 Some examples of users are internal users (business process operators, managers on different levels), external users (suppliers, customers), software tools.
We may look upon all the information systems of a business together as a system, or network, where people are the main components, processing information by their minds, possibly assisted by computerised tools.

The computer-supported information systems are nowadays covering most areas of a business. They are more advanced, better integrated, and easier to use than they used to be in the past, and they are becoming an indispensable part of the business infrastructure, the information systems infrastructure. The information systems infrastructure is based upon, but not limited to, the IT infrastructure of the organisation. More important, from the perspective of this book, is that it covers applications, databases, and knowledge bases.

Figure 46 visualises the information systems infrastructure of a business. It indicates that the infrastructure consists of a network of loosely coupled business-internal and business-external information systems.

The **operative systems** are the traditional information system applications of a company: order management, production control, inventory, customer management, accounting, personnel. Today many of these applications may be covered by a so-called enterprise system. The applications focus on the management of individual objects and transactions like specific orders, customers, suppliers, employees etc. Since the information directly affect individual cases of individual people and enterprises, it is important that the information in these systems is correct and up-to-date. This kind of information is called operative information, object-specific information needed by basic operations in the business.

The **analytical systems** manage information needed in the evaluation of business processes on different levels and in high-level planning and decision-making. This kind of information, analytical information, often consists of statistics and is also called directive information. Analytical or directive information systems often rely on data inputs from operative information systems. However, analytical information usually need not be so precise and up-to-date as operative information; it is enough if it has good statistical quality. The purpose of directive information is to improve the quality of decisions.

**Office systems**, including personal systems, are systems that the employees of an organisation use for managing their own daily work, including communication with others, inside and outside the organisation. Office systems also facilitate for the employees to provide the administrative systems of the organisation with necessary input. Examples of office systems are word processors, spreadsheets, calendars, time accounting systems, knowledge
and contents management systems, etc. The office systems may also provide entries to other internal and external systems that are part of the information systems infrastructure. The organisation’s intranet is typically used for this purpose.

It is becoming more and more common for organisations to make external systems more or less integrated parts of their own information systems infrastructure. For example, links to websites of other businesses and government organisations may be of interest for business operations as well as administration (e.g. travel management) and knowledge retrieval. Web links are examples of loose integration. The co-operation with suppliers, customers, and other partners may benefit from stronger forms of integration, e.g. so-called extranets.

Household systems, or home systems, may also become part of the information systems infrastructure of a business. Employees may sometimes work from home and may need access to at least some parts of the information systems infrastructure of the business. Furthermore, households and individuals may also be customers, and as such they may prefer to maintain their relations with the business via the Internet (e.g. electronic banks and other e-businesses).15

Many tasks in business processes will require smooth interactions between the different categories of information systems visualised in Figure 46. There is no sharp borderline between what belongs to different systems.

One desirable feature of the information systems infrastructure of a business is that the different systems that are part of the infrastructure should be easy to integrate with each other. Furthermore, it should be easy to add other internal and external information systems in the future. Thus the infrastructure should be an open network of co-operating systems. Standardised interfaces are efficient instruments for achieving this quality (see figure Figure 47).

The model is very general and can be applied on all levels, from information system infrastructures down to individual software products and their components. If \( m \) systems are to be able to communicate directly with \( n \) other systems, one needs to specify and construct up to \( m \times n \) “communication protocols”; this is shown by the left-hand part of Figure 47. By introducing a standardised interface, as shown in the right-hand part of the figure, \( m + n \) protocols will be sufficient.

Thus, by introducing standardised interfaces in a “system of systems”, we increase the usefulness and flexibility of all component systems; at the same time we decrease times and costs for systems development. If we add yet another system to the “system of systems”, this system can immediately communicate with all existing systems; we do not have to specify and construct any new “communication protocols”.16

---

15 When we treat household systems as information systems in that interact with business systems on an equal basis, it means that we do not just see them as external access points to internal systems of businesses and other organisations (which would reduce the issue of household systems to an issue of security and techniques). We rather see it as a broader challenge to businesses and organisations to make some of their systems become natural partner systems for household systems, similarly as information systems of different businesses may mutually benefit from becoming partner systems of one another.

16 In order for a common interface, or communication protocol, to be able to serve the purpose described here, it must include everything needed for complete communication on the level at hand. If the communication requires an understanding of certain concepts, the interface must include definitions of these
Another desirable quality of the information systems that are part of an information systems infrastructure is that they should have the same “look and feel”; ideally you should be able to use the systems without any formal training. Common principles for user interfaces, like those in software products based on Microsoft Windows™, is a way to achieve this quality.

In a network of co-operating systems it is not necessary to have a central, superior system controlling all the others, but in order to make it easier for the individual systems to co-operate, all the systems should be able to communicate via agreed standardised interfaces.

By designing the information infrastructure of the company as a system of equal, voluntarily co-operating information systems (cf Internet), one will hopefully avoid the pitfalls that led to costly failures of many strongly integrated systems in the past.

One way of achieving flexibility is to organise different types of software components and applications into different layers, or tiers. Figure 48 illustrates how this can be done. On the bottom level we have the technology layer, or platform, with the hardware and the operating system software managing the hardware. On the next level we have the information platform with data and metadata, maybe organised into a data warehouse, and accompanying software. On the third level from the bottom we have a service platform with software components providing services to business applications. An enterprise system, or components of such systems, may be on this level. On the top level we find the full-fledged business applications themselves, supported by service components, using data and metadata from the information platform.

If the different layers in an information systems architecture of the kind just mentioned are separated from each other by relatively simple, standardised interfaces, it will be possible for the organisation to develop on the different levels as required. For example, it will be possible to change the hardware platform with a minimum of effects on the information platform, and it will be possible to create new business applications using existing service components, etc.
Thus a viable strategy for incremental development and improvement of the information systems in an organisation may be formulated as follows:

1. Define levels:
   a. business applications
   b. service platform
   c. information platform
   d. technology platform
2. Define standardised interfaces between the levels
3. Define standardised components on each level, which can be used as “building blocks” on the next higher level
4. Acquire standardised tools
5. Compile standardised solutions on all levels, while maintaining independence between the levels

Operative and directive information systems

We have already introduced the concepts of operative and directive information. Operative information is necessary for the basic operations of an organisation, “the daily business”. For example, a retailer must know the prices of the products to be sold, a library must know who have borrowed their books, an airline company must have a reservation system in order to be able to book passengers, etc. Without all necessary operative information, a business will stop working more or less immediately.

---

17 Different authors use slightly different terms for what we here call “operative information” and “operative information systems”. For example, Turban (...) uses the term “operational systems”, and Applegate et al. talk about “operating systems” for the corresponding type of business processes.
Directive information, on the other hand, is used as a basis for non-routine, managerial decisions. Examples of such decisions are

- whether the company should invest in a new production plant, and if so, where to locate it
- which products to focus on in a forthcoming marketing campaign
- whether information services offered on the company’s web-site should be free of charge
- whether the company should put a bid on another company, and if so, what price should be offered

Directive information is also used in the evaluation of business processes on different levels as well as in research and development processes.

If we look at the semantic and syntactic aspects of directive information, it is often summarised information, statistics, presented in the form of tables or graphs. However, it should also be noted that a lot of information that is used for managerial decision-making is of a more or less informal nature, based upon the decision-maker’s personal intuition.

Directive information is not necessary, strictly speaking, for the daily business of an organisation. However, it is expected to improve the quality of planning and decision-making. Directive information may be of critical importance for the survival of the business, especially if it operates in a competitive environment.

It is relatively easy to find out which operative information is needed by a certain business. In principle you identify the information that is needed by the basic business processes of the organisation. Once you have identified this information, there is no need to argue about whether it is needed or not. It is needed. If you think it is expensive to produce, you still cannot avoid it, but maybe you can find a more efficient way to produce it.

The situation is quite different for directive information. In a technical sense, many managerial decisions can be taken without any information at all. As an example, suppose your business is going to invest in a new factory somewhere. You have a choice between two sites, A and B. As a serious, rational manager, you will probably ask for a lot of information, before you make the decision. But why not toss a coin instead? It will save you a lot of time and a lot of work as well.

There are at least two reasons why a typical western business manager would collect and evaluate information before an important decision is taken. The first reason is of course an ambition to be rational. Many of us are convinced that a decision will be more rational, in the sense that it will lead to results of higher quality, if we behave like “the economic man”:

- identify decision alternatives
- collect information about the alternatives
- evaluate the alternatives
- choose the best alternative

The second reason is an ambition, typical for our culture, to be rational, or rather “pseudo-rational”, even in situations where we have de facto already decided what to do. Even in such situations we often want to present the decision as if it had been prepared according to the “economic man” model.

---

18 Here “directive information” should be interpreted as “information that gives direction or guidance”. It should not be mixed up with directives in the sense of (e.g. military) orders or commands.
mentioned above. In other cultures there may be opposite preferences about how to present decisions. There may be a dictator who may want the decision to look like an act of God. Nevertheless, a clever dictator in such a culture may secretly collect and evaluate information in order to “help” God (or an oracle) to come to “the right” decision.

Another example, which has been an object of debate, is whether experts do better than monkeys on the stock market, that is, whether an information-based placement strategy will beat a strategy based upon a random number generator (or a monkey’s random choices).

It is sometimes debated among business managers, which kinds of directive information, and how much of it, would be optimal. Obviously it takes time and resources to collect and process directive information, so there is a balance to be struck between the costs and the benefits of such information. One extreme view on this was expressed by the managing director of a major Swedish bank, who stopped all production of management reports in his organisation. The production of such reports would be resumed, only if there were strong and well motivated requests for them. The same managing director also claimed that budgets and prognoses are useless.

Typical tasks for operative and directive information systems, respectively, are listed in Table 16.

<table>
<thead>
<tr>
<th>OPERATIVE INFORMATION SYSTEMS</th>
<th>DIRECTIVE INFORMATION SYSTEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automating or supporting manual and, to a large extent, repetitive processes</td>
<td>Supporting planning and control processes, which are, to a great extent, of a non-repetitive character</td>
</tr>
<tr>
<td>Supporting repetitive processes within a function, e.g. personnel administration</td>
<td>Supporting decision-making ad hoc</td>
</tr>
<tr>
<td>Taking note of regular events (transactions, operative decisions)</td>
<td>Supporting non-routine strategic decisions</td>
</tr>
<tr>
<td>Supporting a business process initiated by a customer until it is completed</td>
<td>Supporting research and development activities</td>
</tr>
</tbody>
</table>

*Table 16. Typical tasks for operative and directive information systems.*

Real world information systems often support a combination of operative and directive tasks. For example, a personnel management system, or a customer management system, may support both routine and non-routine decisions and actions concerning employees and customers, respectively. Another example is a banker, who is handling a loan request from a customer; the banker may use a directive information system in order to determine whether the request should be granted, and if the request is granted, the banker may use an operative information system in order to settle the details of the loan business between the bank and the customer.

In business processes where operative and directive tasks appear closely together, it may be clarifying to analyse the operative and directive subsystems separately.

Table 17 contrasts some typical properties of operative and directive information systems:
A directive information system should serve situations, which can only partially be foreseen at systems development time. When a concrete, directive information need becomes manifest, for example when a decision-maker is going to make a concrete decision, there is seldom time to change the information system, or even to collect new data. Thus the user must use existing systems and existing data. On the other hand, in an operative information system the usage situations are repetitive and can often be described with good precision at system development time.

In an operative information system there are often close connections between collection and usage of data. An order receptionist, for example, adds new data to the order management system in the same process as he or she uses data from the same system. One good effect of such close connections between data collection and usage is that the user will gain a good understanding of the meaning and quality of the data in the system.

In a directive information system the connections between collection and usage of data are much weaker. Data often come from several other information systems, and formalised, computerised information must often be combined with informal information from other sources, including the user’s own memory and judgement. In order for the user to be able to interpret the meaning and relevance of information that has been collected elsewhere and for other purposes, the information must be accompanied by some kind of “quality declaration”, or metainformation.

Requirements on directive information systems are not as precise and stable as requirements on operative information systems. A directive information system must not only be able to adapt to changes in transaction volumes and other technique-related changes; it is constantly confronted with new information and processing requirements. For such a system one can never “freeze” a requirement specification; on the contrary, the system must be planned for ever on-going changes in user needs and environment conditions.

The role of computers in information systems

Most basic thoughts about information and information systems are independent of technology. Many issues concerning concepts and knowledgeformation can be traced back to the ancient Greeks. Nevertheless, the massive penetration of computers and computer-based technology in business has certainly had a significant impact on both the role and the nature of business information systems. We did not even speak of information systems as systems before we started to use computers to support them. The
computers forced us to see information systems in a more structured and formalised way, and then we realised that this approach may be quite useful, even when computers are not used. For example, many errors and misunderstandings in human communication are caused by the fact that underlying concepts have not been analysed and defined properly.

The introduction of computers in information systems has had two major effects:

- computers are faster and more accurate than human beings in making computations and data management operations; they never get tired or demotivated, and they do not make mistakes by being careless

- computers enable completely new types of information systems and information services.

The second effect is a consequence of the first one in the sense that computerised systems are not only more efficient than previous methods and technologies in performing certain types of operations – they are several orders of magnitude more efficient.

Organisations have been relatively alert to make use of the first effect of introducing computers in information systems: by computerising manual processes quite impressive rationalisation effects have been achieved.

The second effect requires more imagination and creative thinking. These qualities are not always at hand even among the most competent experts, as is seen from the following example. The first computers that became available in the 1950s occupied big rooms and had much less capacity than the smallest PCs of today. Several countries, including Sweden and the United States, made investigations of how many computers would be needed in the respective countries. The typical result of these investigations was that a country would need one, two, or possibly three computers.

How could highly competent experts make such stupid predictions – stupid according to what we know today, that is? The answer is that the experts made several mistakes. First of all, as can be seen from the very word “computer”, they considered only the computation capacity of computers, that is, the computer’s ability to make mathematical computations. The computer’s capacity to handle other types of applications than mathematical problems, e.g. database management, was completely neglected. For a long time computer manufacturers did not even bother to provide the computers with adequate facilities and procedures for more advanced input/output operations than those needed to enter some figures and a computation algorithm and to present the final result of the computation – typically a cardreader and a console.

Another mistake made by the experts was that they did not even recognise that within the very field of mathematical computations, problems that were earlier completely out of reach now became tractable; and for each further improvement in performance/cost relationships, more and more problems would become tractable.

During the last 50 years none could have missed to make the observation that computers have become more and more powerful and cost-effective, and that the universe of applications that have become tractable by means of computers is expanding rapidly. Up to now, however, the human ability to imagine new, useful application types, is lagging behind the technical development. Most progress in the field of information systems has so far been technology-driven, whether we like it or not. There are also cases, however, where the appetite for growing computer capacity is bigger than is healthful. For example, legislators of today sometimes have such confi-
dence in the potential of computerised information systems that they happily invent legal systems of such complexity that they would not be manageable without computers. Similarly, in private business, considerable parts of the enormous productivity gains enabled by computers have been wasted in functional improvements that provide marginal benefits to the business as such.

Relative advantages of human beings

Whereas computers should be recognised and appreciated for their superiority in certain respects, human beings still have many decisive advantages over computers. For example, computers are not very imaginative or creative, and they do not detect even “obvious” errors in input data, unless they have been carefully told, by software created by humans, how to do this. Human beings have several advantages in comparison with computers: they are able to make context-sensitive interpretations of data, and they are able to take initiatives in order to obtain missing information and to find solutions in unforeseen situations. Experts in artificial intelligence have tried to equip computers with these typically human capabilities, but although a lot of resources have been put into this field of research, progress has so far been relatively slow and limited.

Figure 49 shows two examples where the human being has a relative advantage. In the first example the task is to find outliers, i.e. potential errors, among observations. A human being will immediately identify the five suspicious observations by looking at the graphical presentation. The computer will have to apply a rather heavy mathematical machinery on the corresponding numerical data.

In the second example the task is to organise the observations into classes. Once again, a human being will immediately see from the graphical presentation that there are three natural classes and will also immediately
identify the observations that belong to the respective classes, and once
again the computer will need a heavy mathematical machinery.

Major components in an information systems
architecture

We have already mentioned that the information systems architecture of a
modern organisation is moving towards becoming a network of co-operat-
ing components. Some typical components are:

- Databases and database management software
- Enterprise systems
- Data warehouses, data marts, and OLAP\(^\text{19}\) software
- Metainformation systems, including knowledge systems

Databases have been around for several decades already. Enterprise sys-
tems have been a major theme of development in many organisations for
the last few years. Data warehouses and metainformation systems are still
in an emerging phase.

Databases and database management software

During the 1970s there was a movement towards database oriented infor-
mation systems. Application programs were decoupled from data storage,
and databases containing business data became regarded as valuable assets
in their own right. The database-oriented architecture facilitated incre-
mental development of information systems. It became relatively easy to
add new applications without having to change other applications or the
common database.\(^\text{20}\) Application development *ad hoc* was also facilitated
by new design methods like data modelling and by new development tools
like application generators. These methods and tools were often introduced
together with databases.

The first databases supported important business processes and thus re-
lected the business and its environment, the so-called “reality” or “object
system”. There was an ambition to store every relevant fact about this real-
ity once and only once. This so-called non-redundance was supported by
the database software that relatively soon could be seen to dominate the
market: relational database management systems.

However, information systems were still by and large centrally controlled,
due to mainframe-based technology and strongly centralised management
of information technology in companies.

Since then a decentralisation of database management has taken place by
means of local area networks (LAN), client/server technology, and web
technology (Internet, intranet, extranet).

\(^{19}\) OLAP = On Line Analytical Processing in connection with data warehouses, as
opposed to OLTP = On Line Transaction Processing in connection with databases
supporting the basic operations of an organisation.

\(^{20}\) This can be seen as an application of the principle shown in Figure 47 above.

— 80 —
Enterprise systems

According to Davenport (2000) enterprise systems (ES), also known as enterprise resource planning (ERP) systems, are

“packages of computer applications that support many, even most, aspects of a company’s ... information needs. ... From accounting to manufacturing, from sales to service, ES modules support thousands of business activities. Aside from personal productivity applications such as spreadsheets and word processors on personal computers, highly specialised production systems such as process control, and Internet-based systems for information and knowledge access, an ES may be the only business information system an organisation requires. This breadth is one of the key factors that distinguishes enterprise systems from earlier systems.”

It is easily understood that enterprise system must be able to interact with databases. This can be done in different ways. Some ES products have their own proprietary database management, but it has become more and more common to interface the ES software with relational software from leading database vendors, e.g. Oracle, Microsoft, IBM.

It is also common for ES vendors to offer functionality in a flexible way, both by means of their own application modules that can be installed separately as needed, and by means of interfaces to third-party application providers. Thus, although enterprise systems are in a sense big, monolithic software packages, they also provide some of the flexibility and incrementality offered by so-called loosely coupled systems discussed earlier in this chapter.

Data warehouses and OLAP systems

The analytical systems in the architecture shown in Figure 46 above are often built around a so-called data warehouse, consisting of large, well organised sets of data accumulated in a systematic way from the correct, up-to-date, and readily available operative databases.

The analytical, or directive, information systems with their well organised data archives may be referred to as decision support systems, executive information systems, or multi-dimensional analysis systems.

Multi-dimensional systems are also called OLAP systems. OLAP stands for “On Line Analytical Processing”. The opposite pole of OLAP is OLTP, “On Line Transaction Processing”. The operative information systems that directly support operative processes are often OLTP systems.

An OLTP system must be able to handle large volumes of transactions in such a way that each transaction is completed quickly and correctly. A transaction usually concerns only a single object, or a small number of objects, for example a customer, an order, etc. The transactions often lead to database updates of varying complexity.

An OLAP system need not necessarily be updated as soon as there is an update in an underlying OLTP system. The database of the OLAP system can be updated once a day or even more infrequently. The transactions hitting an OLAP system are typically queries, often of a complex, analytical nature, causing large volumes of data to be processed. Response times for such queries should be predictable, but they often need not be extremely short and uniform, as in OLTP systems. A user requesting a complex analysis of a large amount of data is likely to expect some time to pass before he or she gets the answer. When the answer comes, it often leads to new queries. It is important then, that the data archive is organised in a
flexible way, permitting new approaches. Multi-dimensional databases are designed to meet such requirements.

Operative databases (components of OLTP systems) typically contain detailed data about individual objects, so-called microdata. Directive databases (components of OLAP systems), on the other hand focus on summarised (aggregated) data about groups of objects; so-called macrodata. There may be microdata in directive databases, too, but then these data are typically summarised (aggregated) before they leave the system and reach the user in the form of statistics, graphical presentations, etc.

Statistical offices have worked with the data warehouse concept for a very long time, under other names like “statistical file system” and “archive-statistical system”.

Metainformation systems and knowledge systems

Metainformation systems are still in their infancy in many organisations. It is not unusual that an organisation has made unsuccessful attempts in the past to develop a so-called data dictionary, a repository, or some other kind of metadata system. One problem is that it is the business-oriented parts of a metainformation system that is usually most needed by the users, whereas the IS/IT specialists may be more interested in developing technically oriented metadata systems, enabling the development of metadata-driven application systems.

As has already been explained, metainformation systems are important, even necessary, for ensuring that information from information systems is interpreted and used in a correct way. Metainformation systems may also facilitate the retrieval of relevant information, given a certain problem, using internal as well as external sources together with powerful search engines such as those available on the Internet.

In a broader sense, metainformation systems include systems that are also labelled as knowledge management systems, or contents management systems. Such systems can be used for a wide range of business tasks, including creative activities like research, environment analysis, and strategic planning.
PART II: BUSINESS MODELLING

The second main part of this book focuses on ways to explore a particular business and its solutions from different perspectives. For this purpose, three ways of business modelling are presented: value, process, and concept modelling. Each perspective is illustrated by means of a specific model type, used to shed light on the important issues identified for each type of business solution (cf. Table 18).

<table>
<thead>
<tr>
<th>PERSPECTIVE TAKEN</th>
<th>MODEL TYPE USED</th>
<th>STARTING POINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value perspective</td>
<td>Factor models</td>
<td>Strategy solutions</td>
</tr>
<tr>
<td>Process perspective</td>
<td>Process graphs</td>
<td>Operations solutions</td>
</tr>
<tr>
<td>Concept perspective</td>
<td>Object graphs</td>
<td>Information solutions</td>
</tr>
</tbody>
</table>

Table 18. Perspectives and model types presented in the following chapters

Although each perspective takes a particular type of solution as its starting point, it is used for understanding the business as a whole. For example, the value perspective not only highlights factors relating to strategy solutions, such as customer satisfaction. It also encompasses operations factors, such as lead times, and information factors, such as degree of systems integration.
Value Modelling: Exploring Strategy Solutions

Christofer Tolis

To facilitate the exploration of strategy solutions, the perspective of value modelling is presented in this chapter. The graphical language of factor models is put forward as a tool focusing on the influences between means and ends in the business. Following a presentation of the foundations of factor models, they are further elaborated in terms of additional clarifications and sources of input. The chapter ends with a discussion of three important uses of the value modelling perspective: for change processes, performance indicators, and technology evaluation.

The case for value modelling

Depending on the perspective that you bring to a situation, you will see some things more clearly and miss others. This is not only true in a literal sense, where your physical position will enable you to observe things within your field of vision, and prevent you from noticing things that are obscured by walls and other tangible objects. Your perspective also influences your perception in a more wide-ranging sense.

Taking your education as an example, you are more likely to spot a mistuned engine if you’re a car repairman, or a developing disease if you’re a physician. Whatever education you have gone through, you can be sure that it has affected your perception of your surroundings. It has made you adopt a certain perspective that is in line with your work as repairman or physician.

Figure 50. Our perspectives influence our view of the world (adapted from Wittgenstein, 1953/58, p. 194).

To give another example, you might see a duck looking left in Figure 50 if you usually spend time at garden ponds. If, on the other hand, you are a carrot-freak, you might instead see a rabbit looking right in the figure. The same type of ambiguity exists in the realm of business exploration. Also when exploring strategy solutions, the topic of this chapter, our perspectives influence our perceptions and the problems that we see. Rather than one perspective being the “right” one, the challenge lies in appreciating
their respective merits. Borrowing the words of Donald Schön, a main challenge is therefore to “reflect on the problem-setting processes which are usually kept tacit, so that we may consciously select and criticise the frames which shape our responses.” (Schön, 1979, p. 269.) Indeed, reflection is a key reason for engaging in business modelling.

**The value perspective and factor models**

Following our examination of some general patterns in business strategies in chapter 2, we have now reached the challenge of exploring specific strategy solutions in a particular business. The exploration will be done using a tool called *factor models*, a graphical model type that builds on the perspective of value modelling. As shown in Figure 51, this represent one of the three perspectives used in this book, and it can be applied to all three types of business solutions that we have covered.

<table>
<thead>
<tr>
<th>TOPICS OF EXPLORATION</th>
<th>TOOLS FOR EXPLORATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Value modelling</td>
</tr>
<tr>
<td>Strategy solutions</td>
<td>Process modelling</td>
</tr>
<tr>
<td>Operations solutions</td>
<td>Concept modelling</td>
</tr>
<tr>
<td>Information solutions</td>
<td></td>
</tr>
</tbody>
</table>

*Figure 51. The focus of the chapter: using value modelling to explore strategy and other business solutions.*

As with all perspectives, factor models will emphasise certain things in a business at the expense of others. Common to different forms of models within the value perspective, is a shared focus on the influence between what’s considered as objectives, goals, strengths, problem, critical success factors, etc. That is, things that might vary over time and hence influence other things to vary as well. In his work on learning organisations, Senge (1990) sees this type of model as the underlying structure of the organisation, and the basis for the different behaviour that occurs. A factor model can thus be seen as an illustration of what is believed to drive the particular business.

In addition to Senge’s specific form of value modelling, there are a number of alternatives being used when dealing with more or less strategic business issues. However, in the context of information systems and technology, the value perspective has often been poorly recognised and seen only as a peripheral perspective (cf. Olle et al, 1988/91). Processes and concepts, the other two perspectives dealt with in this book, have been much more used in the IT field. Part of the explanation for this might lie in the fact that there are no direct links from value modelling to the actual implemented system.\(^{21}\)

---

\(^{21}\) In a similar manner as offered by concept modelling (e.g. entity-relationship diagrams and object-oriented models) for realising the structure of a database, or process modelling (e.g. dataflow diagrams and flowcharts) for realising the behaviour of the system.
Despite its weaker position in the actual development of information systems, the value perspective has become increasingly important in the early phases of development, e.g. in the activity of change analysis (cf. Lundeberg, 1993). One important aim of this is to increase the likelihood that an IT system will be used and beneficial to the business. Moreover, in the wider setting of business exploration in general, the value perspective is more on par with the other perspectives of process and concepts; dealing with strategic issues, it is often the most salient.

**Challenges of value modelling**

Do we really need factor models, or other graphical modelling tools, to explore strategy solutions? Isn’t it enough to discuss the issues in natural language, e.g. in English? Although no form of expression is inherently superior in all circumstances, there are some advantages with pictures over text. One is that it enables us to escape the linear flow of regular texts, making it easier to create and interpret a graphical model in an interactive way. Another advantage is that a picture more easily can provide a quick overview of the business in addition to the details that emerge after more careful examination.

There is the age-old saying that “a picture says more than a thousand words”, emphasising the possibility of easily depicting complex relationships with graphical means. However, graphical models might not be that easy to use for representing abstract meanings, such as the quote in the previous sentence. Moreover, it is still important to remember that different people have different preferences. Depending on a number of things, you might prefer certain means of expression while doubting others. Our emphasis in this book on different perspectives of course extends beyond graphical models. They should always be seen as a complement to, and not a substitute for, other means of expression.

*Figure 52. Graphical models: Four schematic examples of different types of models expressed in graphical form.*

In addition to all unique graphical models, there is a great number of more or less established “languages” that have been proposed over the years (cf. Figure 52). These languages, i.e. modelling techniques or notational systems, comprise a set of symbols and rules for their use and interpretation. The model types that we discuss in this book, e.g. factor models emphasising the value perspective, are all of this kind. The limited language of such models is both for good and for worse. Its rules impose a certain type of structure, reminding the modeller to focus on specific details at the expense of others. This can be of great assistance when communicating with others. However, instead of the freedom of being able to express “everything” in a natural language, the model user must learn to see the limits of different modelling languages and select the most appropriate one.
for the situation. As someone has said, “one first needs to master the rules before one is able to go beyond them”.

Before we go into the details of factor models, please note that the focus of the following examples lies on their meaning rather than on their form. An important ability in all cases of business modelling is to separate what the different symbols mean from how they actually look. Being able to “look through” the visual appearance of a certain model and understand its meaning provides great help when switching between different schools of thought and communities of practice. It’s a challenge to recognise when two different symbols have the same meaning, and when two similar symbols actually mean very different things. For example, an arrow in one type of model does not necessarily mean the same as an arrow in another type of model. This is certainly the case for the three modelling perspectives used in this book.

Exploring key values in the business

In order to introduce factor models as a tool for exploration of strategy solutions, we will use Rent-A-Video as an example. As the name implies, Rent-A-Video is a video shop where people can hire videocassettes to watch at home. Our aim is to understand the strategy solutions of Rent-A-Video. We will do so from a value perspective, trying to get a grip on the relevant ends and means for the business. As a tool, we will create factor models, a graphical modelling language that comprises three basic building blocks: factors that may vary over time, current and future values of the factors, and influences between the factors.

We will develop the model step-wise on our way towards an overview of Rent-A-Video’s value system. Among the range of stakeholders, we will start by focusing on the customers. By definition, they have a leading role in any business, as they are the main beneficiaries, at least officially. In the case of Rent-A-Video, the customers are mostly made up of adolescents and adults in the age of 15 to 35, in part as a result of the store’s product range, i.e. the films that they choose to offer. Talking with a customer, one might get a response like the following:

“I choose to rent my videos here because I appreciate to find the latest releases available quickly, not only from the US but also from different European countries. What I don’t like is when I have decided on a particular title for the night, only to find all the copies of it already rented out when I arrive. Fortunately, the people in the store are very knowledgeable, and can often suggest alternatives that I can try instead.”

Factors and their values

Having a statement like the above, one can start to structure the information gained in order to see what values are important and how they influence each other. It is often a good idea to begin with trying to tease out the things that may vary over time, i.e. the factors or conditions that are expressed as important. Taking the fragment “…latest releases available quickly…” as an example, one can try to separate the underlying factor (availability of latest releases) from the current value of this factor (quick). From this we get our first components of the factor model being developed, shown in Figure 53. As this current value is something that is seen as positive, it is labelled as a strength. If the value instead had been considered negative, it could have been labelled a problem.
Each factor (variable, condition) is drawn as a small circle and given a precise name. Factors – whatever might vary over time – are the core of what is perceived as problems, strengths or goals. As seen above, a statement about the business often contains “compound” values, consisting of both a factor and the actual or desired value of that factor. If, for example, a perceived problem is “long queue”, the core factor is “length of queue” and the present value is “long” (whatever that means). Table 19 shows some examples of fragments about Rent-A-Video and their resulting factor and value.

<table>
<thead>
<tr>
<th>STATEMENT</th>
<th>FACTOR</th>
<th>VALUE</th>
<th>TYPE OF VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long queue</td>
<td>Length of queue</td>
<td>Long</td>
<td>Current problem</td>
</tr>
<tr>
<td>3% annual turnover of employees</td>
<td>Annual turnover of employees</td>
<td>3%</td>
<td>Current strength</td>
</tr>
<tr>
<td>Too many complaints</td>
<td>Number of complaints</td>
<td>High</td>
<td>Current problem</td>
</tr>
<tr>
<td>Time-consuming task</td>
<td>Time required for task</td>
<td>Long</td>
<td>Current problem</td>
</tr>
<tr>
<td>Dissatisfied customers</td>
<td>Customer satisfaction</td>
<td>Low</td>
<td>Current problem</td>
</tr>
<tr>
<td>Aiming at 7% market share</td>
<td>Market share</td>
<td>7%</td>
<td>Future goal</td>
</tr>
<tr>
<td>Systems will be better integrated</td>
<td>Degree of system integration</td>
<td>Higher</td>
<td>Future goal</td>
</tr>
</tbody>
</table>

Table 19. Examples of factors and rough values extracted from statements.

**Influences between factors**

Continuing from the first fragment of our factor model of Rent-A-Video, we can ask if we know what influences the availability of latest releases, or what is being influenced by it. We find an answer to this in the very beginning of the customer’s statement: “I choose to rent my videos here because…” What follows this obviously has something to do with the customer’s choice of place for renting videos. From the perspective of Rent-A-Video, this can be captured by the factor “propensity to rent”, with its current value of “high”.

When searching for influences, words like “because”, “hence”, and “therefore” are common cues for influences between factors. In this case we find the word “because” expressing an influence from “availability of latest releases” to “propensity to rent”. Other things being equal, higher availability seems to lead to higher propensity, indicating a supporting influence. In the statement, we also find that the range of the titles that is offered matters for the customer. This can be understood as the factor “international coverage”, with a current strength of “high”, also influences the propensity to rent. Figure 54 shows the resulting model, consisting of three factors and two influence relationships.
As shown, each influence relationship is drawn as an arrow from the factor influencing to the factor being influenced. The arrow is marked with a plus sign (+) if the influence is “straight”, i.e. if an increase in the first factor leads to an increase also in the second, or a decrease leads to a decrease. A minus sign (−) indicates that the influence is “inverted”, i.e. that an increase leads to a decrease, or a decrease to an increase. Continuing with the reminder of the statement of the customer, the model extends as in Figure 55.

Elaborating the factor model

Above, we quickly sketched a factor model by using the three basic building blocks: factors, values, and influences. This is often a good way to start, focusing on the big picture before going into details. It is better to let the clarity of the model develop gradually than to drown in definitions at the very start. In the following, we will discuss some important improvements of an initial sketch in order to increase its clarity and usability.

Clarifying factors and their values

Especially when using the factor model in communication with people in the business or external stakeholders, it is crucial that it is easy to understand. Even if you’re completely clear yourself of the meaning of the model when it is developed, this might no longer be true when you return to the model some time later. More so for people who have not been involved in the creation of the model – they have to rely on the model itself for understanding (cf. the discussion of outcomes of business modelling in the introductory chapter).

An important key to clarity in factor models lies in the factors themselves. As indicated above, a factor is something that may vary over time, and it is
often referred to as a variable or a condition of the business. Factors might be either quantitative (their values are numeric) or qualitative (their values are non-numeric categories). As there are an endless number of factors in every business, the core of factor modelling lies in identifying the important ones. There are no definite answers to which factors that are most important, this has to be distilled from different stakeholders within and close to the business.

In factor models, especially in their first drafts, one has to spend time on getting the factors clear enough to be easily understood. Using ambiguous or incomplete factor names has to be avoided. In particular, look out for names of whole objects or processes, for example “queue” or “development work”. Ask yourself what it is, specifically, with the queue or the development work that makes them interesting for the model. The “length of the queue” is a totally different factor from the “location of the queue”. Likewise, the “time available for development work” is a different factor from the “number of persons engaged in development work”.

<table>
<thead>
<tr>
<th>FACTOR</th>
<th>DEFINITION, UNIT OF MEASURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of queue</td>
<td>Average number of persons waiting to get served during shop hours.</td>
</tr>
<tr>
<td>Annual turnover of employees</td>
<td>Percentage of employees at the beginning of the year that no longer are employees at the end of the same year.</td>
</tr>
<tr>
<td>Number of complaints</td>
<td>Average number of complaints per working day.</td>
</tr>
<tr>
<td>Time required for task</td>
<td>Number of work days</td>
</tr>
<tr>
<td>Customer satisfaction</td>
<td>Percentage of customers that answer “satisfied” or “very satisfied” when asked about their feeling about their latest rental.</td>
</tr>
<tr>
<td>Market share</td>
<td>Number of rentals in proportion to the total number of rentals in the city.</td>
</tr>
<tr>
<td>Degree of system integration</td>
<td>Proportion of total number of links between different information systems that do not require human intervention.</td>
</tr>
</tbody>
</table>

Table 20. Clarification of factors.

Table 20 shows an attempt to clarify some factors from the business of Rent-A-Video. The proposed definitions are by no means absolute. On the contrary, there are several alternatives possible for each factor. Instead of searching for the “true” definition, it is often more fruitful to settle for one that is sufficiently clear and meaningful for the people in the business. Moreover, there is often a need to extract the ones that are most important among a large number of factors. This is sometimes referred to as identifying the Critical Success Factors (cf. Rockart, 1979), the handful of factors most important for a particular situation. For example, even if it might be argued that also the wall colour of the boardroom influences the strategic direction of the business, there is probably a couple of other factors that are more important.

As unclear factors also make it hard to get at their values, clarifying the meaning of factors and values often goes hand in hand. Each factor might have one or more values associated with it. Different values apply to different points in time, normally in the form of a current value (which might be considered a problem or a strength) and/or a future value (which might be considered a goal or an objective). By going through the values of each factor, one can contribute to clarify both the current situation and the desired future situation of the business. The factor model thus gives an
overview of important strengths to maintain, weaknesses (problems) to solve, and objectives (goals) to try to reach.

**Clarifying influences**

It is the influences between factors that illustrate the network of means and ends in a business. If a factor influences another factor, the first can be seen as a means for changing the other. For example, if Rent-A-Video are interested in increasing the propensity to rent, they can try to increase either the international coverage or the availability of latest releases. That the model only contains a limited number of influences is not to deny that there might be other causes, as well as other consequences, but rather that the included ones have been the most salient ones.

It might very well be that the influence is more complex than a simple plus (+) or minus (−) sign convey. Moreover, plus and minus are not at all appropriate for qualitative factors, such as the gender of a customer or type of firm. Should this be important for the understanding of the business, the influences might be further detailed and clarified, either in the model or separately.

But what exactly is meant by an influence link? There are different answers to this question depending on one’s view of the world, all the way from seeing it as “objective” causality to “subjective” creation by the observer. What’s important when working with factor models is not so much your own view, but an awareness of the diversity of views. A common ground is often the observation that there is a recurring pattern for humans to understand and act in the world according to influence links (cf. our use of words like “because”, and the whole concept of explanation). Whether people discover or create these relationships has for long been a topic of philosophical debate and is beyond the scope of this chapter.

![Figure 56](image.png)  
*Figure 56. Example of linear (left) and circular (right) chains of influence.*

When exploring strategy solutions by using factor models, a special case of influence is feedback. Feedback occurs when there is a circular chain of influence (cf. Figure 56) and the factors are influenced by their own influence, either directly or indirectly. The concept of feedback are emphasised by certain authors, e.g. Senge (1990) in his use of systems thinking, but has a long tradition also in other fields of inquiry (cf. Richardson, 1991).

**Getting input from other stakeholders**

In our example of Rent-A-Video, we have started by basing our factor model on the input from customers. However, their point of view is only one of a number of possible sources for input. In order to get a more complete understanding of the strategy solutions, one needs to take into account also the views of other stakeholders. A valuable source of information is people’s talk and writing, indicating the values they perceive in
their interaction with the business. Some examples from the business of Rent-A-Video are shown below:

- **Employees:** “To be able to give good advice to customers, you really need to be very interested in film yourself. However, you also need to have a good personal knowledge of new films appearing. My colleagues and I are all fanatic film freaks, although a lot of the others only tend to watch old classics.”

- ** Suppliers:** “Since Rent-A-Video began to let us have access to their customer demand, we have been able to quickly supply them with more copies as a result of increased demand for certain titles. It really helps both of us, and of course also the customers in the end. Hopefully, we will be able to do more improvements together in the future.”

- ** Managers:** “In order to increase profitability, we have succeeded in getting our customers do more than just rent our films. In addition, they now buy quite a lot of chips, candy, and soft drinks as well. Through last year’s good profitability, we have managed to increase our range of international titles considerably.”

![Factor model elaborated with input from other stakeholders.](image)

In this way one can explore similarities and differences between different stakeholders’ views. When developing an overall factor model of the business, supporting and conflicting values become explicit and can be analysed further. So can different views on means and ends of the business. Although some of the differences might be able to reconcile, there might very well be cases of genuine disagreements that the value modelling can highlight. In practical terms, different views on the values of certain factors can be shown in the model, e.g. “Goal/owners: Yes” and “Goal/employees: No” for the factor “Around-the-clock opening hours”.

**Getting input from other value models**

So far, we have focused on text and speech as input for our modelling. An additional source of information is other graphical value models that might exist in the business. Doing this can give important insights into the exploration of the business solutions. However, one challenge is to be able to recognise a value model – whatever it is called, and however it looks – when you see one, and be able to distinguish it from other types of models.
To facilitate using other value models as input, we will present some examples of different types of value models. An added bonus of this is that you become aware of other tools for value modelling, in addition to factor models, thus strengthening your ability to discuss value issues in a number of different “dialects”. The examples are chosen from a number of different fields (cf. Table 21). As they all share the value perspective, they all make use of the core elements of factor values and means/ends relationships – although in different ways and with quite different symbols.

<table>
<thead>
<tr>
<th>MODEL TYPE</th>
<th>PREDOMINANT CONTEXT OF USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem and goal graphs</td>
<td>Change analysis</td>
</tr>
<tr>
<td>Causal loop diagrams</td>
<td>Systems thinking</td>
</tr>
<tr>
<td>Fishbone diagram</td>
<td>Quality control</td>
</tr>
<tr>
<td>Cognitive maps</td>
<td>Organisational psychology</td>
</tr>
<tr>
<td>Causal research models</td>
<td>Positivist research</td>
</tr>
</tbody>
</table>

Table 21. Type of value models and their main fields of use.

**Problem and goal graphs**

Before commencing development of a new information system, some kind of analysis of problems and goals in the organisation is often done (cf. Röstlinger & Goldkuhl, 1988). Figure 58 shows a partial example of a problem graph illustrating the problems in a purchasing department of a large organisation. Each box represents a problem, and an arrow indicates a causal relationship between two problems.

![Figure 58. Example of problem graph (adapted from Röstlinger & Goldkuhl, 1988, p. 37).](image)

For example, one important cause of the problem that damaged goods is handled as if it was OK, is the problem that damages are not discovered as soon as possible. This latter problem is itself caused by three other problems as indicated in the graph. By extending the chain of causes in this way, root causes of problems are sought. In a similar manner, goals of an organisation are illustrated by means of a separate goal graph.

**Causal loop diagrams**

Causal loop diagrams (cf. Senge, 1990/94) build on the work by Forrester (1961). This type of model is rather similar to the factor models presented in this book, although it lacks specific current or future values. As the name implies, causal loop diagrams often have a strong emphasis on circular chains of influence and feedback loops (cf. Richardson, 1991).
In the example, the development of new products in an organisation is explored. The number of new products is influenced both by the R&D budget as well as the product development time. Whereas there is a reinforcing loop on the left-hand side (illustrated by the snowball), there is a balancing loop on the right-hand side (illustrated by the scales).

Fishbone diagrams

Fishbone diagrams are often used in areas of quality work, in particular Total Quality Management and many Japanese approaches. Fishbone diagrams focus on a single end, and explore the means influencing it (cf. Figure 60). The structure is normally a simple hierarchy, neglecting more complicated relationships, including feedback loops.

The example depicts a number of causes for the wobbling of a particular machine. The causes are grouped into four larger categories: Workers, materials, inspection, and tools. From the diagram, one can learn that causes may range from the training of the workers to the “punch width” of the “F axle cover”.

Cognitive maps

Cognitive maps (Eden, 1988) are used for articulating specific aspects of people’s beliefs and cognitive structure. They build on the work by psychologist Kelly and his personal construct theory (Kelly, 1955). Following
Kelly, cognitive maps use bipolar constructs as their building blocks (cf. Figure 61). In the maps, this is done for each factor by one or two sentences (separated by “…” to indicate the opposite poles of possible factor values. For example, “Many problems …” and “High inflation … Low inflation” are characterisations of the factors number of problems and inflation rate, respectively.

![Diagram](image)

*Figure 61. Example of cognitive map (adapted from Eden, 1988, p.4).*

The example explores the question about the value of repertory grids (a particular analysis model) in operational research (OR). It shows that the model as a powerful negotiation device contributes to making it helpful in OR projects. In the same manner, it also shows, although implicit, that the model as a powerless negotiation tool contributes to making it not helpful in OR projects. In the case of an inverted relationship (indicated by a minus sign), the model for example shows that it is the addressing of substantive issues, rather than just team development, that contributes to making the repertory grids helpful in OR projects.

**Causal research models**

Causal research models are widely used in research contexts. Especially in quantitative research, this is the predominant perspective used, explicating the research area in terms of a model with a number of independent variables influencing a dependent variable (cf. Figure 62). Using the label variance theory for what is here called causal research models, Mohr (1982) describes the situation as “the variance-theory outlook dominates thinking about theory by scientists, philosophers, and the general public, even though the variance-theory form does not in practice dominate theory itself” (ibid., p. 45; emphasis in original). When used as input for business modelling, there is a risk that the research model is too general, not taking into account the particular circumstances of the actual business. It is also lacking specific current or future values.
In the example, the determinants of the importance of politics in an organisation are depicted. The factors are related in a hierarchical manner, ultimately leading to an effect on the factor “politics”. In addition to a normal influence illustrated by an arrow between two factors, mediating factors are shown by an arrow that points at another arrow. For example, the factor “importance” mediates the effect that conflict has on politics, rather than influencing politics independently.

Using value modelling

So far in this chapter, we have mainly focused on the actual development of a factor model, e.g. using input from different stakeholders and existing value models. However, the value modelling perspective, and its resulting models, can be used for somewhat different purposes depending on your role in the business. Below, we present three practical examples of uses for value modelling.

**Focusing change processes**

For project leaders, value modelling can be used to focus the change process and aligning it with overall strategies and objectives of the business. In a change process, it is advantageous to be clear about the results that one tries to achieve. What problems are addressed? What deliveries and effects (cf. Lundeberg, 1993) are planned? What goals, objectives, and ideals (cf. Ackoff, 1981, p.104) are aimed at? By using a factor model of the business, the change project’s initial focus and end results can be mapped against the values of the business, as a tool for discussing the direction of the project.

**Developing key performance indicators**

For managers, value modelling can give an overview of the contribution of values to the overall mission and vision of the business. Factor models can be used for (re-) formulating the business mission, identifying and evaluating alternative strategies. Mismatches among different means and ends can be identified and the values of various stakeholders can be acknowledged and balanced. Vital resources and competencies, either available or lacking, can be recognised. A set of key performance indicators can be developed with the aid of factor models, forming the basis for a balanced scorecard that is appropriate for the particular business.
Evaluating new technologies

For consultants, value modelling can be used for anchoring new technologies in business values. Factor models can help when examining current and future technologies in the light of the business. Both to search for new ends for the current means (IT and others), and to search for new means to reach the desired ends. Supporting and enabling technologies might be evaluated in response to the business’ needs and capabilities.

Conclusions

In this chapter, we have discussed value modelling as a tool for exploring businesses, especially their strategy solutions. By focusing on the values for different stakeholders, factor models provide a tool for grasping the relationships between problems, strengths and goals of the business. Chains of influences link the factors together in a network of means and ends, for example to be used for focusing projects, developing performance indicators, and evaluating technologies.

Working with value modelling not only leads to an appreciation of its possibilities, but also of its limitations. There are circumstances that benefit from the addition of other perspectives and tools, also when exploring strategy solutions. In the following two chapters, we will therefore move on to the other two modelling perspectives of this book: process modelling and concept modelling. In this way, the possibility of using alternative perspectives on each type of business solution, is emphasised, something that will be further developed in the integration part, concluding the book.
Process Modelling: Exploring Operations Solutions

Gösta Steneskog

Process modelling is a tool for analysing and designing business processes. It is the primary tool for further analysis of operations. In this chapter, we present our approach to process modelling and when to use it. The purpose may be to get an overview and overall understanding of operations, to have a base for measuring and controlling the performance of a process and/or to describe the process in detail to be a manual for the process workers. During the last 10 years the use and importance of Process Modelling has grown dramatically.

Introduction

Business modelling is a convenient tool for systematic analysis of the ongoing operations of a business. How the work is done and how customer value is created are identified and modelled by using a process view. It is a way to get a more detailed understanding of value chains, business transactions and order fulfilment; not only to understand but also to control and improve. Here we describe how the steps in a process modelling may be taken in practice. This is by no means a standard recipe but one way to do it.

Modelling is usually not done in one straight sequence. First get a rough picture of the process and then improve it in a more iterative way until the “business painting” is relevant for the current purpose.

There is a wide spectrum of business processes in terms of how pre-defined and repetitive their results as well as their activity sequences are. It is necessary as early as possible to try to understand what type the current process belongs to, as they have to be treated differently.

We present here a number of conventions on how to model processes. In practice it is not that important to use exactly these conventions but they constitute a list of the concepts that is useful to be able to express in process models. Modelling is an art. You need to know and master the basic rules but you may have to go beyond them to express what the business is really about.

Business processes and task units

Business processes are the core of value creation. They are the raison d’être for the task units. The business process in itself is both the successive transformation of input to output and the necessary activities to achieve that transformation.
In all business process concepts there is a strong focus on the activity view of the process. We believe the object view to be of equal importance because it is the object that is transformed and carries the value further on. When the process execution is over, the activities have vanished but the output object remains. Accordingly, there are two “schools” of process modelling – one has more focus on transformation and value creation, one on activities and resource usage/cost. They could well be used complementary in order to understand what a task unit is doing (cf. Figure 63).

The process is the “How” to create the object out – the “What”. The actor/participants perform activities that cause transformations of the objects (cf. Figure 64). Very visible processes are found in manufacturing (e.g. with clogs as objects) and it is easy to track the flow of objects/products along the production lines and to understand their how and what.

The basic symbols we use here are the arrow-shaped process, the rectangular object, and the arrow indicating that the process creates the object.
The Rent-A-Video case

Let us take a look at Rent-A-Video, a shop where the customers may rent videocassettes. What are the important processes in the shop? How do they create value for the customer? Who is the customer?

Producing video cassettes

One approach is to start to look at the business constellation. In the Rent-A-Video Shop we find easily the customer and the shop clerk (to begin with, cf. Figure 65).

![Figure 65. Process Actors/Participants.](image)

Next step is to find out what is main object that is transformed and carries value. What are the important objects? Especially, what is delivered from the process as object out, from shop to customer to provide value?

That is obviously the videocassettes (cf. Figure 66).

![Figure 66. Symbol for a transformation object.](image)

And now for the processes – the set of transforming activities executed to create customer value and to push the flow of objects further on (cf. Figure 67).

![Figure 67. Symbol for a transforming business process.](image)

One process is obviously where the customer enters the shop, walks around, selects and picks videocassettes, continues to the cashier. The lease is recorded and the customer is paying and leaving. By using our model of the business transaction it is easy to identify these steps.
The basic graph (cf. Figure 68) shows:

- an incoming object – the customer’s need for a video
- search and select/buy processes (done by the customer) that is adding value to the need by transferring it into a video title and then an order for the selected video title
- a production process where a matching cassette is picked from the shelf and provided to the customer – now the immaterial need is transformed into a physical cassette given to the customer as a loan.
- the object out – the “right” cassette available for 3 days is brought home by the buyer and loaded into the video player.

This seems to be the central process showing the flow of cassettes through the shop creating customer value. To express that it is very useful to rigidly follow a convention of showing an object-process-object-process-object chain to identify the value created. Note the incoming object driving the process forward is not the cassette on the shelf but the customer’s need of it. The need is transformed into a cassette.

Two rules of thumb:

- OPOPO object-process-object-process-object.
- Backbone – then one and same object is transformed all the way through.

Creating customer value

But that is not the whole story. There is no value in just having a loaded cassette. The real value for the customer in this case is how the user (maybe the same person as the buyer, maybe not) is experiencing the performance. Let us track the lifecycle of the object further through the business transaction. It is brought home by the customer (delivered), put into the recorder (integrated) and its data content is exposed to the spectator(s). But who is that? The customer/hirer? Or the customer’s children? Grandmother? (Who is after all the real customer? Cf. Figure 69) The participants may be noted below the process symbol.
But how is value created for the customer? The real value for the customer is created when the video is looked at – it is where the main task is performed (cf. Figure 70). The videocassette is a transformation resource hired by the customer to create pleasure (if it is an entertaining video) or maybe profit (“How to repair your own house”) or free time (“Keep the children quiet”).

The cassette is temporary a part of the process platform, of the transforming resources. Enabling the customer process by lending him resources/cassette for his process is another way of value creation/having fun than to buy clogs and have nice walks that includes transfer of ownership.

This video service is similar to hotel services – the customer is temporary hiring a resource – a room - from the provider in order to perform his intended value-creating task all by himself.

We have a service situation – the video shop is just providing resources to enable the customer to run his process.

So, Rent-A-Video is far from the traditional manufacture-deliver business where the normal case is that there is an object out with value is sold to the customer and never coming back. *Especially in service situations it is*
necessary to model and understand the customer's process because it is there the desired value is created.

Now we have a process model of the business transaction including order fulfilment. What do have more? Let us return to the object life cycle to find out if there is more.

When the cassette has been played one or more times it is returned to the shop, the return is recorded, and the cassette is put back on its shelf. OK? (Receive and restore.) Then the cassette is ready to be selected by another customer.

The payment process

But where does payment appear in the models?

As a matter of fact the order consists of two parts (or sub-objects): the desired delivery (the cassette, now) and the economic conditions (50 SEK). The latter in transformed into a demand for payment and then into money for the provider. Figure 71 shows the payment process from order to money.

![Business Transaction Process Diagram](image)

*Figure 71. The payment part of the total business transaction process.*

Now, we have identified all the different parts of the business transaction: Buy/sale, produce, create customer value and pay.

For the customer the need is transformed into own value creation and satisfaction and money to the provider. For the provider the object is enabling customer satisfaction and the money (cf. Figure 72).
Figure 72. The Objects of Exchange in a Business Transaction.

Value chain process

But is really the complete transaction lifecycle the same as the complete lifecycle for the cassette as such from the video shop’s point of view? Doesn’t the cassette as such have a birth and a death, too as well as the customer’s need? These questions lead us to model the value chain for the cassette as such (cf. Figure 73).

![Diagram of the life-cycle for a videocassette.](image)

There is a long production process to create the cassette including writing the script, recording the video, copying and distributing the cassettes. Then comes for the Video Shop the purchasing process, where the cassette is bought and put on the shelf. What they buy is the content packaged on the cassette. The death then occurs when either the body (the cassette) is broken or the soul (the content) is no longer in demand among the customers. Depending on which died first, different actions are taken.

The Lease/Hire sub-process in the Life-cycle Value Chain process is the shown in the business transaction process. Here, the business transaction between the user and the Video Shop and the long value chain process overlap.

In order to make the graphs easy to grasp and understand we add two more recommendations (in addition to OPOPO and backbone):

- Name each process with a verb in the imperative mode (Search, Put, Lease, Scrap)
- Describe each object with its name and state

It is important that there is no confusion or misunderstandings about what the object really is and to write a clear description or provide a conceptual model may be useful.
**Business landscape**

Now we have a good overview of the business landscape and the most important processes. A primary condition for having an ongoing business is that all nodes perceive a win-win situation. Hence we have to take a closer look at the customers. We have identified two different roles: as a buyer coming to the shop (an actor, a node) and as the user – the spectator looking at the video (an object to be changed). The buyer and the spectator may be the same person but the buyer might be a parent hiring the video for his children in order to keep them quiet and get some time for himself (so he is maybe still the end-customer). All participants must be satisfied, the children must like the video and the parent must be satisfied with the quiet time. Both should want to lease another video.

But is this really process analysis? Isn’t it goal analysis? Yes, it is: In order to understand processes we have to understand why they are run, why the participants are motivated to participate. Thus, during process analysis we do some strategic thinking, too, because the processes are going to create value in the customer’s task according to our business strategy. When modelling the processes only rough strategic modelling may be done, but has to be in accordance with more complete strategy models.

In the same way process modelling requires some object modelling to avoid confusion. Sometimes a careful description of the business object and its different parts are necessary to do. In the Rent-A-Video case there are two different parts of the object we have to be aware of: the video (data) and the cassette (physical carrier). In our case they are stuck to each other but in some cases the data may be set free and run amok on the Internet in the same way as music is doing.

A detailed concept model of all relevant objects is usually done first when the data requirements for an IT solution are to be identified.

Process modelling needs to be completed with ideas/models of the business landscape, the objects/concepts and the goals/strategies in order to be put in context.

---

**What is a business process?**

This question is misleading. “What do we mean by calling something a business process” would be a better formulation. To look upon something with a process view is to organise the description of the reality according to a given framework (cf. Figure 74). There is no generally agreed-upon definition of the basics of such a framework but one version is “... a process is simply a structured, measured set of activities designed to produce a specific output for a particular customer or market.” (Davenport, 1993).

---

![Figure 74. A structured Factory process.](image)

- A Business Process is “a structured, measured set of activities”. The key word is activities. (We add the object view to this definition by “and a measurable value-increasing transformation of objects”).
• The set of activities, the Business Process, is “designed” i.e. there is some sort of planned structure in the execution of these activities. (In our model the same for the objects but we also cover less designed processes.)

• These activities are to “produce a specific output” i.e. there has to be an output, not necessarily a physical one; it might be data or even mental concepts.

• The output is “for a particular customer or market”. In our approach we build upon that and focus yet more upon the provider’s customer’s process i.e. “for our customer’s pleasure and/or profit.”

Our modifications of the definition depend on that our basic question is “What can we do to create profit and pleasure for our customer?” Our goal is to contribute to the success of customer’s task in all possible ways. Another reason for our extensions is the characteristics of non-factory processes.

In the above graphical notation the Business Process is an arrow-shaped box and the object a rectangle.

Davenport’s definition is very relevant for what we call factory processes with physical objects i.e. the traditional manufacturing business with pre-defined output and very repetitive, structured set of activities. That is very relevant for factory-type processes but there are other dimensions we have to consider.

• Repetitiveness: how pre-defined and repetitive is the process/sequence of activities and the result/object out? For many development processes neither the output nor the activities are possible to define in advance.

• Object types: physical, digitised data, people. These different types of objects do have different attributes leading up to very different processes.

• Degree of interaction between customer and service provider

• Value created: economic and/or experiential – profit and/or pleasure

• Type of value delivery/customer support: product delivery (selling clogs), enabling services (hire out video cassettes) and/or relieving services (perform a customer process).

We will discuss below how to identify and model these different types of business processes and business transactions in more detail. What was developed during the first generation in order to improve manufacturing processes with physical objects is still valid for those types of processes and tasks. However, those principles have had to be modified in order to be of value for the other types of business processes and objects. It has been ineffective or even disastrous to use the methods for analysis and improvement of industrial mass-producing processes in a fundamentalist way for trying to model and improve the other types of processes – service processes and creative ones.

**Process models and process executions**

Another cornerstone in process thinking is to understand the difference between a process model and the corresponding executions.

In order to explain this difference we can use a three-world model inspired by the philosopher Karl Popper (cf. Figure 75). The model shows:
1. the real world – the “Reality”
2. the mental world – our internal intrasubjective mental models
3. the world of models and descriptions for intersubjective communication.

A *process model* exists in the 3rd – intersubjective – world and describes the course in its entirety from start to end. A person who is going to participate in the execution of the process has to build his personal mental model of the process (in 2nd world) by combining the process model with his own knowledge and experience. This mental model is then his base for action.

The *process execution* exists in the 1st real world and is caused by the enactment of the mental models by the participating persons. In the “psychological now” – the only reality that exists – only a slice of the process model is reflected in the execution. The process model exists all the time in its entirety but process executions only as temporary slices, and often not at all (when no executions are active).

In the clog factory the process *models* exist all the time. Process *executions* do not exist during the night. When the morning comes, a number of parallel executions are started and run successively during the day.

The inability to differentiate between the model and the execution has for a long time created confusion in process theory. Attempts to define what a process is has run into trouble because then you try to formulate one definition for two very different (although related) phenomena.

Process executions do almost never happen as described in the process model. The creative, unreliable human being in between has his own unique mental model and his own will. The process model is a framework for desired action but the human being makes his own interpretation of it and adapts it to the current situation. This is a problem in factory type processes and a priceless asset in studio type processes (see further below).
Process types

Factory type processes

Process modelling is nothing new in the manufacturing area. Already Taylor and Ford did have processes in mind when they designed operational flows in manufacturing although they did not use that term.

How do we describe and model a factory type of business process?

Its main characteristic is the creation and gradual change of an object: object in – change – same object out in a new state. This change is achieved by performing intentional and well-organised activities over and over again in order to transform the input and create the wanted output (cf. Figure 76).

![Figure 76. The basic transformation process.](image)

There is an incoming object e.g. an unpainted clog (state A), a set of activities – painting, and finally an object out – the painted clog (state B). The object has been transformed; customer value has been added, loaded into the object. This process is enacted over and over again. For industrial processes it is an objective to have no unwanted variations in the objects out – all clogs have to be well painted in the same way. Unwanted variations in output are “quality problems”. The design of the object out and of the process is done in advance – when the factory process is executed it is pure production.

A process is then usually broken down in sub-processes with a clear definition of how objects flow between the sub-processes. An order process may be broken down in three sub-processes (cf. Figure 77). Each department (actor, node) performs its sub-process: Order office, Warehouse and Transport. All that counts, is that the customer gets what he wants, the right items at the right place in the right time at lowest possible cost. Each order object is passing through that chain step-by-step and value is added in each step.

![Figure 77. A process broken down into sub-processes.](image)

The aim of the Business Process modelling is to

1. At least understand the process
2. Maybe also be able to measure and control the process
3. Maybe also be to be able to improve the process e.g. by redesigning it or create a new supporting IT system for it.
4. Finally, to be able to describe it to be used as a worker’s manual.

Level 1 is both achievable and very useful for most companies to really understand how they create value for their customers. Level 2 may be per-
formed for essential processes in order to be able to control them. Level 3 – development/improvement requires a more detailed analysis. If the ambition is to create instructions for the workers/participants one has to consider what professional competence level they are expected to have. Modelling for level 3 and especially level 4 is resource-consuming both to develop and to maintain and often ends up in piles of unused documentation.

For factory type processes (e.g. car manufacturing) it is relatively easy to study the operational flows by tracking the objects and describe how they are transformed step-by-step in order to create value to the customer. But, there are other types of processes that are not so easy to identify and that are not so structured and repetitive.

Since Taylor there has been an ambition to structure and automate all processes to become factory processes. Remaining manual work is treated as just not-yet-automated and still performed by not-so-reliable human beings. However, this ambition is not constructive for all types of processes as will be described below. Attempts to “automate” creative processes tend to be very unsuccessful if not counter-productive.

**Workshop type processes**

The activities in the workshop type processes (e.g. care repair) are not executed in the same rigorous repetitive way as in normal factory type processes. Every execution is here unique, although you will find reoccurring structures of activities and transformations. The execution is more controlled by rules (of thumb) than by rigid process scripts. The skills and the creativity of the human actors as individuals is an important asset for the process.

When working in workshop mode – where the incoming object is e.g. a customer problem or a customer need – the individual execution of the process is adapted to the situation and the result/object out is more or less unique. In a workshop process the sequence of activities as well as the object out is designed and performed/produced concurrently within the limits of the workshop’s resources and rules.

Part of management work could be looked upon as some sort of information workshop. Reoccurring problem are solved in similar but not identical ways.

To represent this workshop mode, we use another symbols for the process. The arrow-formed to represent the fixed factory processes where variances, design and creativity are undesired, the rounded form the workshop type processes where creativity is wanted and unique top-notch objects out are aimed at (cf. Figure 78).

![Symbols for Factory and Workshop type processes.](image)

In reality every process is a mix of both types and may be put on a scale between inflexible routine and complete chaos with no ones at the extreme ends but it is useful to express what is typical for the processes in focus.
Also we used different symbols (cf. Figure 79) for physical objects that are hard to change, re-produce and transport and data objects that are easier to change, easily re-produced (copied) and transported (if in electronic form).

![Figure 79. Symbols for physical and data objects.](image)

Initially, we introduced the following classification of processes (cf. Table 2).

<table>
<thead>
<tr>
<th>Process structure</th>
<th>Objects</th>
<th>Physical</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory type</td>
<td>Traditional manufacturing e.g. cars, furniture</td>
<td>Billing, book-keeping</td>
<td></td>
</tr>
<tr>
<td>Workshop type</td>
<td>Sculpturing, Product development (parts of)</td>
<td>Sales</td>
<td>Product development Management</td>
</tr>
</tbody>
</table>

*Table 22.*

*Ad hoc/studio processes*

Many development and managerial processes are not routine at all. It is not possible to define the outcome in advance (this is often done during the process execution), they have or a very sketchy re-occurring structure. There may be some rules of thumb for them but they do need a lot of creativity and experience. Not even the necessary transforming resources may be defined when they start.

To prepare for efficient and effective execution of this type of processes focus is not upon defining objects and describing processes in advance but to collect resources, build a platform of primarily people with knowledge and creative characteristics. The design of the process model and the object is then done real-time during the execution of the process and here the creativity; knowledge and experience of the human beings are assets of immense important.

For these type of processes there is an eternal fight between management that wants to have control (these processes are risky – they may end up in nothing) and the creative people who want as much freedom as possible.

IT development started as ad hoc, creative processes. During the decades they have got more and more structure and control – moved into the workshop type. Sometimes this has led to a lack of creativity and has produced mediocre IT applications but avoiding total disasters. Initiatives to move those processes all the way to the factory type have not proven to be successful. One objective for the design and development of factory-type processes is to create fixed routines and avoid risky creativity but it is counter-productive to enforce this thinking on creative processes. A reaction has now been the school for so called agile development of IT solutions.
Business objects

Another important characteristic for a business process is what type of object it is transforming. To differentiate between physical objects, digitised data and/or people is useful due to the different attributes of these types of objects.

The basic approach in process modelling is to identify the created business object out, identify the object in, track and describe its way through the different sub-processes until the object out is produced. It has proven to be very powerful to describe the state of the object at the transition points between the different sub-processes, departments i.e. at borders where responsibility for the object is transferred from one sub-process to another, from one management node to another. With an increase in outsourcing initiatives and virtual organisations these interfaces and transition points are getting more and more critical.

Different types of objects

The business object may be physical, digitised data, people and often in combination.

Information appears as all these three types:

- physical (printed on paper)
- digitised (stored in a computer – sometimes called electronic or virtual form)
- mental (information in people’s head)

(Note. Here we use the term information for something in people’s head and the term data for something outside the heads but that has the capability to be transformed into information – i.e. understood by someone.)

Value is created by the change of objects. These different types have very different attributes for transformation (and transportation – which is another type of value creation) it is important to understand those differences.

Digitised data objects have some peculiarities compared to physical ones:

- Easy to copy. In manufacturing the production is in reality a cumbersome re-production of the product developed in a costly development process. For digitised data objects the main process is development – copying and re-production is a minor process. Also the same object (e.g. an electronic article) may appear at the same time to be in all object states (outline, draft, early version etc.) and be processed in all sub-processes at the same time. Physical objects (e.g. clogs) move step by step along the process, exist only in one state and are processed by only one sub-process at a time.

- Easy to transport. Transportation for data objects is very cheap and fast. The same object (e.g. a picture on TV) may appear to be in many places at the same time.

- Easy to modify and change. It is possible to have changes in any state (outline, draft, early version, etc.) without changing any of the other ones (which creates problems). What you want is that a change in an earlier state will update the other downstream states (a change in the outline – new concept is introduces – will later be reflected in draft and final version).

People (or other living creatures) are unique and much more complex. We are objects and participants, we experience the change, we are a mix of
physical, psychological and mental active beings, and we have our own will. This makes human change a very special process. We cannot treat human beings in the same way as physical or data objects.

So the type of object has a major influence on the characteristics of the transformation process.

Physical objects are often transformed in well-structured processes, each object is in one sub-process at a time and is moving forward step-by-step.

Processes dealing with data objects are more often of the workshop type.

As soon as people is subject to transformation their reactions is more or less individual and unpredictable. Although we may have a well-defined change process we really have to be prepared to unexpected reactions and to adjust the process accordingly.

Now let us take a closer look upon these different types of transformation.

**Different types of object transformation**

An object is a “thing”, a logical entity but it must not be the same type of object all the way. In the order process it starts as a data object – the order, is transformed to another data object – the item list, is transformed into a number of physical objects – the package and is transported to the customer. It is the data order that is the object in, the object that contains the vision of the physical output object.

The transformation of an object in a process may be of different types:

- Normally we have transformations without changing object type: physical (a clog is painted), data (an article is revised), person (a lesson is learned).
- A conversion of the object from data to physical (item list to physical package), from data to mental information and so on.
- A transportation of the object (package to customer) without any change of the object in itself.

However, the common quality of these different transformations is that they all increase the customer value of the object.

**Processes for transformation of physical Objects**

The Clog Factory order fulfilment (cf. Figure 80) is a case where we treat all objects as physical ones. The arriving customer order (although it might be arriving via the Internet) is the object in and we are able to physically track how the different physical objects are transformed and put together to create the required object out.
The processes are pre-defined, routine, value-creating transformations. The output is pre-defined the moment we start the process.

**Processes for transformation of data Objects**

Compared to physical things and objects, data objects have some special qualities.

First, data (coded information) does not exist without having a carrier. It might be attached to a physical base e.g. paper or electronically coded in computers. The characteristics of the carrier decide what type of process we have i.e. data carried by a physical object is marred by physical characteristics (e.g. a rune stone).

Newspapers are data carried by physical paper. Once printed, they are difficult to modify, every copy has to be physically produced and then transported as any other physical object.

So, could the creation of a newspaper edition be looked upon as a physical factory operation? But isn’t it a lot of creative work in the production of articles and of the content of the edition?

Let us take a look at it (cf. Figure 81).

---

**Figure 80. An example of a process transforming physical objects.**

**Figure 81. Creating next newspaper edition.**

The creation of the first edition of the day starts with a preliminary design: how many pages, what balance between advertisements and editorial parts etc. Then these editorial parts of the newspaper have to be filled in: what do we have left from yesterday, what is going on out there in the world, what are our journalists and correspondents producing just now?

If we model the underlying flow of data objects becoming the content of the next edition and we use the traditional process view we will get a graph like this (very simplified) one:
An event occur, the journalist gets there, captures the data (get informed) and creates text and pictures. This is edited into an article; the articles are rejected or accepted. A number of articles are put into the edition according to the edition plan and at a certain point in time the completed edition is ready for printing.

The usual comment after having modelled this type of processes is: “Well, in a way it is right but in reality it is not done this way because everything is done concurrently. There is an almost continuous inflow of data (electronic form) because new events occur, already captured events develop further etc. There is also feedback (cf. Figure 82) from the process of editing the edition in order to create a physically and logically well-balanced edition: articles have to be re-edited or extended etc.”

![Figure 82. Data flow creating next edition.](image)

As in a manufacturing factory there are new “orders” coming in as new interesting events occur and there is a flow of new articles moving up to the edit process. However due to the copy characteristics of digitised data these changes are not just moved up the chain – they are copied up the chain and finally the data is in a number of places. If the original event develops further or the journalist gets more data the corresponding change is entered and is the (hopefully) propagated up along the process.

The inflow is also controlled by feedback from the edit process because the on-going design of the edition creates demand for more or specific input.

Manufacturing processes are of a step-by-step type, the physical object moves in heavy steps up the line. Digitised data processes are more flows of parts of data objects. These flows are both production i.e. they create data in the articles that are of for the reader, but also design as the journalists design the different articles and the editorial board designs the edition and manage and control the whole edition development process

Then suddenly, at a certain point in time, the newspaper process is taken to the next step.

![Figure 83. "Freezing" the current edition.](image)

The constantly changing edition object is now decided to be what is going to be delivered. The edition is “frozen” by a decision from the editor. It is now converted from being a “free” electronic data object to be stuck to its new carrier – printing plates and then multiplied on physical paper (cf. Figure 83). The edition data object is delivered for printing – getting stuck to physical paper – and then distributed as physical objects according to the rules of the traditional physical world.
Compared to that, the web version of the newspaper maybe continuously changed and enhanced all the time. The electronic uploading process maybe not negligible but much simpler that the physical printing. It is possible to upload new editions very often (almost continuously) and make them available on the Internet. Delivery (down-loading) is then taken care of by the reader.

When trying to understand data flows it is important to be aware of their fluent nature. To see them as step-by-step processes as in manufacturing is sometimes a good start and is good enough for many routine data flows. However, the more important and essential data development processes are usually of this more fluent nature consisting of many concurrent executions of the basic creation process.

These processes are usually not carried out in the same predefined repetitive way as the more “hard-wired” factory type of processes (cf. Figure 84). Every execution is partly unique, but you will find certain reoccurring structures of activities for e.g. editing an article. The flow of activities is controlled more by rules, experience and creativity than by rigid job and process description. The skills and the creativity of the human actor as an individual is an important asset for the process. In factory type processes there is an ambition to have “identical”, exchangeable actors and to reduce the risky creativity factors. This is what distinguishes factory operations from workshop operations.

Processes for transformation of people and organisations

Changing people cover a wide spectrum of change from physical hair-cutting to psychological analytical therapy. In some rare cases they may be treated as physical processes (hair-cutting), in many cases as data processes (teaching/learning) but in many cases these approaches are insufficient. We are not going to study all those different types of processes, only to give some hints for those concerning organisational development i.e. how to change the ongoing tasks in a business.

As people is so different compared to other transformed objects it is important not to forget their uniqueness and individuality. In order not to forget that, it is helpful to use a special symbol for that (cf. Figure 85).

A major difference is that for persons the relation between activity and change of the object is not of the same clear cause-effect type as for the other types of objects (painting a clog). As each person is an individual with individual frames of reference each person will have a unique response to an activity and often there is a varying time lag between
stimulus and response. In an organisational change we then have to con-
sider the interactions between the members of the organisation – interac-
tions that may influence the direction and speed of change tremendously.
“Organisational change is a process – it takes its time.”

An organisational change process is then not possible to predict in
advance. First, an organisation is very complex so we are not able to
understand it fully. Even if we had the necessary knowledge to model it
completely (and we don’t have that knowledge) we would never had the
time. Second, as mentioned above – the reactions from individuals and
formal and informal groups are unique and not possible to really foresee.
Hence, an organisational change has to be managed by trying to control a
process proceeding partly according to its own will. To manage such a
process it is necessary to have a vision of to what to achieve and a strategy
for how to achieve it. It is then possible to plan the next step and see what
happens in some sort of controlled trial-and-error. Running a change pro-
cess is learning new things all the time. “If you want to understand a sys-
tem, try to change it.”

This creates a major management problem. Do you dare to start such a
process which will cost you a lot of money when you don’t know what the
outcome will be and when it will be in place? So, you have to try to make
some sort of plan and cost estimate in order to dare to start and not be sur-
prised if the trip will be different from the planned route.

There are similarities between managed organisational change and warfare
but there is a main difference – management should not treat their
employees as enemies but friends with unpredictable reactions. (Com-
petitors reactions will also count, are also more or less unpredictable – they
may be looked upon and enemies.)

Modelling business processes

Core elements

The core elements of a process are the object in/out and the transforming
activities in between (cf. Figure 86). Often we have also to consider and
model further entities and are getting close to model the task unit frame-
work from a process view.

The core elements are the business object in/out and the symbol for trans-
formation caused by activities. For each execution of the activity set one
business object is transformed, one object out is produced. Also other
material e.g. products to pick and pack are consumed by the process at the
same rate.
Figure 86. The standard process model.

Then we have the platform, the task resources (the task base). They are necessary for the execution of the process and are used in a number of executions. The three categories are:

- equipment: factories, machines …
- participants: people/actors including their skill, knowledge and mental models
- data: to be used by the participants when necessary

We have used special symbols for the arrows in the figure to express the different types of synchronisation (arrow for just in time with the process execution, dot = used for multiple executions.)

Figure 86 also shows how lanes or “swimlanes” are used to express who is responsible for the process executions.

**Process relations**

The order fulfilment process (cf. Figure 87) is an example of a process that is a part of a more complex process web.

- Object in - The order object in contains two data objects – one of what is going to be delivered, where and when – and another of what is going to be paid for it, how and when. The first is triggering the real order fulfilment process. The latter is triggering an invoicing process that is synchronised by the order process. It is symbolised by unbroken lines with arrows to the left side of the processes.
- Control message - When a package is ready for delivery a message (dotted line) is sent to the invoice process (on top) to enable invoicing.
• Material - Manufacturing processes are building stocks of products. These products are material in to the order process (unbroken line with arrow from below).

Relationships between different processes are of different types and should be denoted in the graphs differently (cf. Figure 87).

• Object out from one process is object to the receiving one for further value adding (consumption) e.g. products from manufacturing to pick & pack. Arrow to the middle of the left side of the receiving process. The relation is synchronised i.e. one object in for each execution of the process.

• Object out from one process is material to be consumed. Arrow to the left side or bottom part of the receiving process.

• Object out from one process is transforming resource for another. Then we have to add a rectangle below the transforming process to denote the process base and the arrow in points to the left side. (There might be an arrow out on the right side if the object is returned to the provider after it is used – a service type situation.)

• Control data emerging in one process is sent to another as control data and is represented by a dotted line to the top of the controlled process. Be very restrictive with this type of arrows because there is usually lot of data flowing between the processes and only those really improving the understanding of the interaction should be used. (If the purpose is to build an IT application for the processes then all links have to be identified and analysed. This is described further under “Modelling IT requirements” below.

The multiple roles of objects

Objects are passed from process to process. The object out from one process is passed to another. However, it is important to understand what role the delivered object is playing for the receiving process.

Physical objects can take one of the following input roles for the next process

• Business object - to be value-added by the receiving task (order converted to 300 pair of clogs)
• Material - to be consumed by the receiving task (wood, leather, paint, ...)
• Resource - for repeated use in the process platform (capital investment e.g. nailing machine)

Data is here a complicated object. In the graphs above and below we have selected to use two different symbols for objects: a square for physical objects and a rhomb for data objects. Sometimes it is important to make that difference clear.

Data might appear in many different roles for different purposes.

• Main business object - to be transformed in/out (e.g. a film story)
• Directive data – controlling the current execution of the main object (“This clog is to be green”)
• Directive data for all executions of the process.
• General data – in the platform (process model and description)
• Information - in the participants, heads (know-how)
When e.g. analysing the data requirements for a given business processes it is sometimes necessary to consider and express all these aspects.

**Business platforms & swimlanes**

To describe who is running a process, which task unit is the responsible one, different ways may be used. The simplest is just to write its name under the process.

Another, very expressive, is to have different shelves or swimlanes for different actors/nodes as in the graph below (cf. Figure 88) describing provisioning and order fulfilment for the Clog Factory.

![Business Transaction Process](image)

*Figure 88. Use of swim lanes to point out the responsible task unit.*

(The name swim lanes emerged out of the fish-like symbol used to model factory type processes.)

As shown in a number of examples above, sometimes the content of a platform is changed by another process. Then also the platform may be shown in the graph (cf. Figure 88)

**Products and services**

A common phrase when a company presents its process map is “here are our processes for delivering goods and services”. Then there is one problem with process modelling in the service business. “What is the business object out from a service process?” In order to identify how value is created and delivered to the customer we have to find and define the object out and that has proven to be not so easy for service businesses.

Factory type of processes produce goods, data processes data chunks, but what does service processes produce?

If a customer has a transport task to perform there are three ways for a provider to support him.
• **Providing enabling products.** The provider is selling nails to the Clog Factory that uses them as material and they are consumed during clog manufacturing. The product could be a resource i.e. the provider offers cars for sale; the customer identifies the offering as a convenient one, buys a car and uses the car as a transforming resource to perform the transportation task (cf. Figure 89).

![Figure 89. Enabling by Product Delivery and Transfer of Ownership.](image)

• **Providing enabling services.** The provider offers cars for leasing and the customer rents a car. The customer uses the car and the car is adding value to his task by enabling him to move his goods from A to B. When the task is finished the car is returned to the provider (cf. Figure 90).

![Figure 90. Enabling by leasing resources.](image)

• **Providing relieving services.** Here the customer out-sources or out-tasks the whole (or parts of the) transportation task to the provider. The customer is still responsible to his customer for a punctual delivery but the provider relieves him from performing the task by executing the process (cf. Figure 91).
Of what type is the Rent-A-Video? The shop just provides a transforming resource – the cassette – to be used by the customer when she is running the process herself. The provider delivers an object that enables the customer to run her process, perform her task so we have an enabling service by leasing a transformation resource – the customer is transformed but the video cassette and content is not (only used).

Another case is ATM-services where the bank is providing a complete system (platform) for self-service. The customer the only actor and is able to withdraw money and to execute the transfer of value from his account and convert it into bills in a self-service mode. The customer is responsible for the task of withdrawal but the bank relieves him by providing a system that performs the process.

### Modelling a company

Process models are in many cases available company-wise although the scope more and is widened to cover also customer value creation processes as described above. In spite of the selected scope the following levels of models are the usual ones.

On the top level we have the overall map. This map tries to cover and describe the business as a whole. The main processes are classified according to their overall role. Core processes create and deliver objects of value directly to outside customers. Other processes are named development, support and control processes according to their relations to the core processes.

On the next level these main processes are then described in separate graphs and broken down in subprocesses. Sometimes these subprocesses are further broken down in sub-sub-processes. By following the above rules for modelling value creation processes these graphs shows What is done (transformations) and Why (value objects).

The third level (if used) is usually a shift in view from transformation to activities. The activities of each subprocess are then described using workflow diagrams or simple checklists depending on the needs. By shifting focus from objects to activities the descriptions become much simpler. To
understand the “what & why”; people have to turn to the previous level of process models. The activity descriptions may then be used to further specify IT requirements, IT use cases etc.

The shelving technique may be used not only to express who is responsible for running what process but also to express what resources such as databases or IT-systems has to play role. In this way we find the different use cases or interactions with the IT-systems.

**Internet and business processes**

Internet processes transform and transport data. The scope and flexibility of the Internet network has had and will have substantial impact upon businesses and their constellations and processes. Modelling is a necessary tool to invent, design and implement new ways of doing business. The important processes (value chain, business transaction and order fulfilment) take place between the nodes/task units in the business constellation and will be radically changed as the possibilities to create new constellation networks is provide by the capabilities of Internet.

To understand e.g. the Internet Bookshop and how it was built it is necessary to relate the order fulfilment process to the different actors in the constellation. Internet enables the construction of new business constellations and gives room for new types of businesses and new patterns of processes.

Some Internet organisations are virtual, i.e. to the customer they look like one organisation but behind the scene there is a number of business nodes in a complex process pattern. The processes are on-going operational processes and there are also processes/tasks for the further development of the products/services and processes. The processes in such an Internet business network may be modelled as other processes. The difference is not in the process view but in the opportunities of the underlying constellation network.

**Summary**

To understand more in detail how a business creates value for its customers, business process analysis is a powerful method and an almost unavoidable tool for the development of business in the Internet age. Modelling is used to identify, invent, design and implement the main operational flows, what constitutes customer value and where and how it is created.

These value creating processes and flows have different characteristics that should be distinguished. At least the following have to be taken into account:

- **Process structure**: how pre-defined is the process/sequence of activities and the result/the object out?
  - Factory type: a rigid activity structure in order to secure the quality of output, to reduce dependence of individual persons
  - Workshop type: an open structure where process and result are designed and performed/produced concurrently. Craftsmanship and creativity are needed to meet customer needs.

- **Object characteristics**
o Physical objects: hard to change, arduous to transport, will only be on one place at a time.

o Digitised data objects: easy to change, easy to transfer electronically, easy to copy = may seem be on multiple places at the same time

o People: very complex as objects and at the same time being active subjects that may participate in the process (performing activities) or at least have an experience of the process.

• *Degree of direct interaction* between provider and customer during the customer’s value creating process and the rest of the business transaction process.

• *Type of value created* for the customer: economic and experiential (profit and/or pleasure).

• *Type of provider’s support* to customer’s value-creating task: product delivery, enabling services and/or relieving services.

The manufacturing processes i.e. factory processes creating physical objects have been the source of process thinking. From this sound base it has been possible to extend this thinking and modelling to fit also the other types of work situations. But to model non-factory processes for non-physical products the manufacturing way of thinking has to be extended but not abandoned.

*How to start?*

One approach to find out what a business really in doing in terms of value creation, processes and flow is to take the following steps:

• Identify the task unit/node in focus – the “Star” – whose world is going to be understood.

• Identify the most obvious participating business task units/nodes around (suppliers and customers)

• Study the business transaction process between our provider node and its customers and identify the type of provider support that is the dominating one (product delivery, enabling services, relieving services).

• Turn inwards
  
o Sales, order flows, production/manufacturing processes, (development processes), management and control of these processes.

  o What are they doing in order to create customer value? What is unique and/or difficult to copy?

  o Where do problems appear in the processes and where in the processes are these problems created?

• Turn outwards
  
o Who is the end-customer? What is their value-creating process?

  o What are the nodes between?

  o Do we have any important value chains upstream and downstream?
• Map the Business Landscape including Constellation etc.
• Iterate the work with the processes: Order Fulfilment, Business Transaction and Value Chain.

As data plays an increasingly important role in business today both as value added object in processes as well as control data for processes, IT and Internet has had and will be of major importance. It is used to rationalise and support existing processes but also creates opportunities for new types of processes and new business ideas and strategies.

Internet and its possibilities to easily connect a great number of business actors independent of time and place has already been used to improve existing processes and to develop new ones. Still, one should not forget that all nodes in the new business constellation must be motivated to participate. If one group won’t participate, the business will not get into the air. In many cases the presumed customers have not lived up to expectations. For a business constellation to work all nodes must participate.

For a company – to model and understand its Business Landscape and the different processes crossing it, is getting more and more necessary as new technologies cause radical changes of both constellations in the landscape and of the value-creating processes.
In order to investigate information solutions, this chapter presents an approach to modelling information structures in a business. The focus lies in identifying central concepts, their relationships, and their properties. Taken together, this approach can be used to clarify the underlying structure both of particular information systems as well as the business as a whole.

Modelling information structures

Modelling the conceptual structure of a business will help to understand the business. It will also help to plan the information infrastructure and the information system applications that the business needs.

We will use a simple example here, Rent-A-Video – a video-renting business, in order to introduce and explain the concepts and methods used in object-oriented modelling of business structures. It does not matter that the example is simple; it is still sufficiently complex for illustrating most problems that occur in a modelling situation of this kind. Businesses of larger complexity anyhow have to be broken down into sub-business of less complexity. This follows from the theory of unperceivable systems (Langefors).

Which are the most important concepts of a video-renting business? Different people may answer this question in slightly different ways, but probably most of them would mention at least “video film” and “customer” as important object types in the business. They might also mention that these object types are related to each other in a certain way: a video film may be rented by a customer (see Figure 92).

![Figure 92](image-url)

Already after this short discussion we have a rather good idea of the core of the business structure of a video-renting business. As the next step we may analysed the three basic concepts a little further. Let us start with the relation “IsRentedBy”.

The relationship between two object types will belong to one of the following four categories:
To which category does the relation “IsRentedBy” belong? The answer is determined by the following two questions:

- How many customers can rent a video film at the same time? (One or more?)
- How many video films can a customer rent at the same time? (One or more?)

The second question is the easiest one. The video renting business will allow customers to rent several video films at a time. Thus we get a fork where the “Rents” line hits “VideoFilm” (see Figure 93).

The first question may seem to be equally easy to answer. Obviously one and the same physical video film can only be rented by one customer at a time? (If we accept this, there should be an arrow where the “IsRentedBy” line hits the “Customer” box in the figure above.) But what do we actually mean by “video film”? Do we mean the physical film copy, or do we rather mean the film title as an abstract piece of art, which in turn may be physically represented by one or more film copies?

This is an example of a phenomenon that typically appears many times during conceptual modelling of a business. We have discovered a vagueness in a key concept, in this case the concept of a video film. There are different solutions to this problem. One solution is to agree on one of the two possible definitions of the concept. In the figure above we have settled on a VideoFilm to be a VideoCopy.

Another solution is to replace what we first thought was one concept, “video film”, by two concepts, “film title” and “film copy”. We will choose the second solution here. Thus we will now have three object types in our model (see Figure 94).

The relation IsRepresentedBy between FilmTitle and FilmCopy is “one-to-many”, since there may be several physical copies of one and the same film title, whereas every film copy will belong to one unique film title. The FilmTitle object type is a so-called abstraction of the FilmCopy object type. It represents everything that all physical film copies have in common.
Figure 94.

One can argue that there is also a \texttt{IsRentedBy}/\texttt{Rents} relation between \textit{FilmTitle} and \textit{Customer}. However, this relation is redundant (marked by a dotted line in the figure below), since it can be derived from this other relations according to the following formula:

\[
\text{FilmTitle}.\text{IsRentedBy}.\text{Customer} =_{\text{def}} \text{FilmTitle}.\text{IsRepresentedBy}.\text{FilmCopy}.\text{IsRentedBy}.\text{Customer}
\]

Omission of derivable concepts in a graphical model will make the model easier to grasp.

Figure 95.
Figure 95 also shows another relation between *FilmTitle* and *Customer*, representing the possibility that a customer may reserve a video film that is not available for the time being. Such a reservation would apply to a film title rather than to particular copy of the film, and it would be “many-to-many”. This relation is not derivable. This example also illustrates the importance of having names for relations; if there are several relations between the same two object types, we would not otherwise be able to keep them apart. Even if there is only one relation between two object types, it is advisable to name them, since otherwise there are increased risks for different interpretations by different persons and at different times.

The discussion above about *FilmTitle* and *FilmCopy* illustrates one aspect of defining an object type: distinguishing between related object types on different abstraction levels. Other examples of the same thing are: cars, car models, car types; products, product types; a person’s education (taking place during certain years and resulting in certain marks) and an education as such (civil engineer, priest).

There are many other aspects of defining object types, and there are certain “tricks” for finding particularly important aspects. One such “trick” is to ask what causes or constitutes the “birth” and “death” of objects belonging to a certain object type. For example, when does a customer become a customer of our Rent-A-Video business, and when does he or she cease to be a customer? Note that we do not necessarily mean the physical birth and death of the customer. We are rather looking for the answers to questions like:

- When does a person become interesting for our business?
- When does a person cease to be of interest for our business?

Obviously, if a person rents a film, not being a customer already, he or she will become a customer. But may be would like to include potential customers, prospects, into our customer concept, so that we can direct marketing activities towards them? (What is then the criterion for being a potential customer?) On the other hand, when a person has not been an active customer for a very long time (how long?), maybe we would not like to regard that person as a customer any longer.

Thus even if the natural birth and death of a person is relatively well-defined (with reservation for certain medical and ethical discussion during the last decades), the birth and death of person in his/her role vis-à-vis some kind of business (customer, patient, student, criminal) is not always quite obvious. Even more difficult questions occur, when an object is subject to substantial changes now and then without actually ceasing to exist; for example, a household that gains and loses members, a company that sells out part of its business, or merges with another company, or moves to another country, or changes its legal form. Is such an object the same object after the change, or is it a new one? The answers that we give to such questions may drastically effect our perception of the system under consideration. If we define objects in such a way that relatively small changes result the death of one object and the birth of another on, the system will appear to be very dynamic, and if we make our object definitions in the opposite way, the system will seem to be very stable. In reality, the system is actually the same, regardless of our definitions, but the definitions have the role of a pair of glasses, through which we see the reality.

So far we have discussed the structure, the conceptual structure, of the business we are interested in, the so-called object system. We have defined the structure in terms of objects and relations between objects. This is in
line with systems theory, which defines a system as consisting of parts and relations between parts. One reason for identifying the conceptual structure of a business is that it gives us a possibility understand and analyse the business in a more efficient way. When a business grows, it may become more complex, and a complex business may be difficult for the human brain to grasp. A complex business is thus an example of an unperceivable system (Langefors), and such systems must be broken down into subsystems in order to make it possible for human beings to manage them. The conceptual structure of the business in terms of objects and relations between objects, as discussed here, offers one possibility to break down a complex business into subsystems. Other possibilities to structure and analyse the business in a systematic way are discussed elsewhere in this book, e.g. the process structure and the goal structure of the business. All these methods facilitate, in different ways, the understanding, analysis, and management of a complex business. In certain situations one method may be superior to the others, but very often it is a good idea to use several structuring methods in parallel in order to obtain the advantage of looking at the same business from several perspectives, not to get stuck with prejudice.

But the world is not structure only. First of all the term “structure” sounds very static. The object graphs that have been shown above admittedly give a static, “snap-shot” view of the business. However, we have already seen that, in order to get a good understanding of the meaning of certain objects, e.g. a customer, we need to study their birth and death dynamics. Thus, in addition to the static structure, we also have a dynamic structure of the business.

Furthermore, in addition to structure there is contents. A naked tree in the winter is not very interesting. It is pure structure. But when the leaves are coming in the spring, the tree is struck by life, and as the seasons pass, colours change. The structure has become filled with living contents.

The contents of an object graph are the properties of the objects. Figure 96 shows our Video business object graph after we have associated the objects with some properties. Properties are also called “variables” or “attributes”. More precisely expressed, variables (attributes) take values from value sets. For example, the variable “Category” of the object type FilmTitle may take values like “science fiction”, “detective story”, “comedy”, etc.

Normally, a variable takes one unique value for a certain object instance at a certain time. However, there are multi-valued variables as well. In the example, the variable “Actor” will probably have several values for the same FilmTitle. This is marked by an asterisk (*) after the variable name in the object graph.

Some variables are derivable from others. For example, the NumberOfRents and NumberOfCopies variables of the FilmTitle object type are derivable according to the following definitions:

\[
\text{FilmTitle.NumberOfRents} =_{\text{def}} \text{FilmTitle.IsRepresentedBy.FilmCopy.NumberOfRents} . \text{sum}
\]

\[
\text{FilmTitle.NumberOfCopies} =_{\text{def}} \text{FilmTitle.IsRepresentedBy.FilmCopy} . \text{count}
\]
So now we have an object graph reflecting both the structure and the contents of our Rent-A-Video business. Is the model complete? It depends upon our intentions. We have certainly gained a better understanding of some very basic concepts in the business. This is good for the purposes of analysis and communication. But does the model help us to find better business solutions? That is more doubtful. Then we must consider the question of business objectives (cf. chapter 2). A possible business objective is that we would like to improve the management of the renting operations of Rent-A-Video, that is, to obtain a more efficient control of who have borrowed which film copies, which rentals are overdue, etc. If we consider this objective, we will find that our model needs to be extended, because in the present model we cannot find the rentals that we want to keep track of. We have the customers, and we have the film copies, but the rentals are missing.

We have something that comes close to the rentals in the object graph above, and that is the rental relation between customers and film copies. But we need to “objectify” this relation, so that we can talk about the rental as such, when it took place, for how long time it should last, etc. This has been done in the figure below.

The information structure in Figure 97 is a good starting point for the design of information system supporting the basic operations of the Rent-A-Video business. It would be appropriate to implement the model by
means of a relational database with relational tables corresponding to each object type, each many-to-many relation, and each multi-valued variable in the information model. Many-to-one relations are represented by so-called foreign key columns in the relational table corresponding to the object type on the “many” side of the many-to-one relation.

By following these simple rules we get the relational model shown in Figure 98. The relational model contains one relational table corresponding to each one the object types FilmCopy, Customer, FilmTitle, and Rental. The relational table corresponding to the object type Rental also corresponds to the object relation Rents/IsRentedBy.

The multi-valued variable Actor of the object type FilmTitle is represented by its own relational table called ActorsInFilms, which contains one row for every valid Film/Actor combination as well as some information about which role the Actor plays in the Film.

The many-to-one relation Represents/IsRepresentedBy is represented by the foreign key column FilmId in the relational table FilmCopies. The many-to-one relation IsRentedBy/Rents could also have been represented by a foreign key column in FilmCopies, but it is already represented by the Rentals relational table corresponding to the Rental object type.
Note the name convention here that plural nouns are used for relational tables, whereas singular nouns are used for object types. Thus the object type Customer is represented by the relational table Customers, etc. This convention can be traced back to the distinction between the intension and the extension of a concept. The intension of a concept is what it means, and the extension of a concept is its occurrences or representations in reality. The naming convention reflects the idea that an object type is primarily an abstraction of all objects that have certain properties in common, whereas a relational table contains representations of all objects belonging to an object type.

A relational database implemented on the basis of the relational model above would be more or less non-redundant in the sense that each piece of information, each fact, about the business is stored in only one place. This minimises storage needs, but, more importantly, it facilitates updating. If you have redundancy in a database or in the information system of the company, seen as one integrated system, you will always run the risk that you will not update all occurrences of a certain fact, when the fact changes, and after such a mistake, the database or the information system will be inconsistent, which will often lead to severe consequences for the business.

There are formal methods to ensure that a relational database is non-redundant. These methods are called normalisation techniques and are well described in the literature on the relational data model. By the method that we used above for constructing the relational model for Rent-A-Video, starting from an object-oriented conceptual model, we got a relational model that was (almost) normalised without having to think too much about it. The only potential redundancies in the model are the columns corresponding to the following formally derivable variables:

- FilmTitle.NumberOfCopies
- FilmTitle.NumberOfRents

However we may easily avoid these threatening redundancies by defining these columns as so-called virtual columns, that is, they are derived automatically by the software, whenever they are needed; they are not stored physically in the database.

Normalised relational databases are well suited for supporting the basic operational business processes, especially business processes that require fast and efficient processing of individual transactions. In the case of Rent-A-Video, a relational database may be used for:

- keeping track of films and film copies
- keeping track of customers
- keeping track of rentals: who rents this film? which films are rented by this customer?
- keeping track of rentals that are over-due, sending out reminders to customers

More and more companies are using computerised information systems not only for their basic operations but also for supporting more high-level, strategic processes. Such information systems are called directive information systems in contrast to the basic operational information systems.

Directive information systems are often used for providing decision-makers with the more or less formalised information, “facts”, that they need when they consider decision alternatives and finally make decisions. The role of formalised information may vary quite a lot, depending on the decision situation and, not least, on the personality of the decision-maker.
However, in a country like Sweden there is a rather solid tradition among decision-makers and in the business culture that decisions should be rational and based on facts. This is even the case in situations where the decision-maker has already made up his or her mind on the basis of “guts feelings”. In other business cultures there may be an opposite business culture: even if the decision-maker uses facts, he or she would like to present the decision as the result of an enlightened moment of inspiration (from God, an oracle, or some other authority). Nevertheless, in most cultures formalised information has some role to play in decision-making.

To a large extent the formalised information needed in high-level decision situations, and produced by directive information systems, has the character of statistical information, that is, summarised information about groups of objects, information about the development of a certain phenomenon over time, etc, usually presented in the form of graphs and tables. From a quantitative point of view, statistical processes reduce the information contents, but from a qualitative point of view they may drastically increase the usefulness of available information. For example, compare a listing of all the customers of a company, with all their characteristics, with a tabular or graphical presentation, where you can see the distribution of customers between a small number of important categories, depending upon what and how much they buy, where they live, etc.

It follows from the discussion above that a directive information system must be able to support efficient processing of more or less complex statistical queries. The queries will often appear in an ad hoc manner, that is, they have not been planned in advance. There are of course certain types of queries that appear more regularly, e.g. the monthly report of the company, but many information requests are rather unique for the decision situation at hand.

A normalised relational database is not ideal for supporting directive information processes. Instead it has become popular to organise so-called data warehouses as a basis for directive information systems. A data warehouse takes its input data from the operational information systems of the company, data which are available at no extra cost, and organises these data in a way better suited for statistical processes. In technical terms this may mean that we transform a relational data model into a so-called multidimensional model, or star model.

As an example, consider again the business of Rent-A-Video. In the object-oriented conceptual model, as well as in the relational data model, there is basically a kind of network between nodes, where the nodes are object types or relational tables, respectively. Like in all networks the nodes are in a sense equal; there is no hierarchy between them.

In a statistical process we focus on one object at a time. We select a population of objects of the same kind, and we count and summarise these objects and present the results of these calculations and analyses for the whole population and for a number of subcategories of the population. A typical structure for statistical information requests is shown in Table 23.
| SET OF OBJECTS O | POPULATION | CLASSIFICATION | SUMMARIZING FUNCTION | STATISTICAL MEASURE | REFERENCE TIME T | STATISTICAL CHARACTERISTIC S = O.V.f | |
|------------------|------------|----------------|----------------------|---------------------|------------------|---------------------------------| |
| α-dimension      | Persons registered in Sweden at the end of t | Commune(t): the commune where the person was registered at the end of t | Income(t-1): the person's income during t-1 according to taxation performed during t | average | Year t = 1995, 1996, ... | “Average income during the year t-1 for those persons who were registered in Sweden at the end of the year t; by commune, sex, and age.” | |
| β-dimension      | Income(t-1): the person's income during t-1 according to taxation performed during t | Sex(t): the person's sex at the end of t | Customer discount category | count | Year t = 1998, ... | “Number of rentals of film copies by customer discount category, film category, and year.” | |
| γ-dimension      | Commune(t): the commune where the person was registered at the end of t | Age(t): the person's age in whole years at the end of t | Film category | | | |

**Table 23.**

The structure contains two examples, one from general population and income statistics for Sweden, and another one from our Rent-A-Video business example.

Each statistical query puts one object type in focus. In the first example above it is Persons, in the other one it is Rentals. We arrange all other information that is relevant for the query around this focus object. The second example shows that this arrangement may require derivation of information from other objects that are related to the focus object in a more or less distant way. Thus FilmCategory (of Rental) requires a derivation via the object types FilmCopy and FilmTitle.
So-called multidimensional models and star models are used for illustrating the above-mentioned structures and arrangements of information that are typical for statistical information managed by data warehouses and related software.

Figure 99. Multidimensional structures – cubes.

A multidimensional structure is spanned by so-called classification variables, or γ-variables, that is the variables that classify the population of objects into subcategories. In the second example, it is Customer-DiscountCategory and FilmCategory that make up the two dimensions that we have in this case. The cells in a multidimensional structure contains the estimated values of one or more statistical measures applied to zero, one, or more variables of the objects in the subcategory of the population corresponding to the particular cell in the multidimensional structure.

Let us now consider the problem of transforming databases that are used for supporting operative business processes of a company into a data warehouse supporting directive business processes. This is also referred to as transforming the corporate data model into a warehouse data model.

There are a number of considerations that have to be made in this transformation:

---

22 The frequency function count is a statistical measure with zero variable arguments. It can be said to operate directly on the counted objects, in contrast to sum, for example, which operates upon one quantitative variable of the objects. The statistical measure correlation operates on two variables at a time.
1. Put one object type at a time in focus and arrange all relevant information around this object type in a multidimensional star model.

2. Delete variables in the corporate data model that are not of interest in the warehouse model, typically variables that are needed in the support of operative business processes, but which are not of interest in strategic decision-making.

3. Add derived variables that are often requested in strategic decision-making, e.g. counts and sums.

4. Increase the granularity of certain variables, so that summarised data can be organised in fewer categories.

5. Consider the management of time: snapshot data and historical data.

We will discuss each one of these considerations in connection with our Rent-A-Video example.

If we ask ourselves, which of the object types in the corporate data model of Rent-A-Video that are candidates for being in focus in strategic decision-making concerning the business, we might come up with three proposals: Customer, Rental, and FilmTitle. Information about all these three types of objects may seem to be of strategic interest, e.g.

- Which films and categories of films seem to be most popular?
- Which customers and categories of customers are most profitable?
- What percentage of rentals are not finalised before the agreed return date?

A closer analysis of typical directive information needs will show that most such requests could be served by a data warehouse based upon one single multidimensional star model, where the object type Rental is put in focus. Even information needs concerning films and customers (as those in the examples above) could be served by such a model, e.g.

- Number of rentals by film category and customer category

In general it is wise to look for object types that have a many-to-one relationship to as many other object types as possible, since such a structure will make it easy to organise a lot of information around this object type. In our example the object type Rental has a many-to-one relationship to all the other object types in the corporate data model.

Are there any variables in the corporate data model that can be deleted when we transform to the warehouse model? Probably we do not need the names of customers, or the stories of films, for example.

Are there derived variables that could be of such interest that they should be added to the model? For example, it may be useful to derive a variable “Delayed?” of Rental with the value “yes” when ActualReturnDate is later than AgreedReturnDate? After this derivation the two latter variables may even be deleted from the model.

Now to the question of increased granularity. For directive purposes it seems to be possible to replace a customer’s address by a cruder geographical category such as “area” or “region”, according to some natural subdivision of the city where the business is located and has its customers.

Finally, we come to the most complex consideration – time. As long as we are running a database only for the purpose of supporting operative business processes, we are typically only interested in a database that shows up-to-date information about the objects and the respective business processes, that is, in our example we are interested in snapshot information.
about rentals, customers and films. In a warehouse developed for directive purposes we are also interested in historical developments and trends, either in the form of regularly series of regularly registered snapshots or in the form of a more or less continuous flow of registrations of events.\footnote{If we compare the two time management strategies, the second one will make it possible to reconstruct all events and all changes that have ever taken place in the business as represented by the warehouse data model, and it will also make it possible to reconstruct the situation in the business at an arbitrary historical point of time. The first time management strategy, based upon snapshots taken at certain intervals, will only be able to give approximately correct descriptions of historical situations and developments. In a practical case, it may be desirable to have a model that combines (parts of) the two strategies, so that both snapshots and complete pictures of changes are supported.} In both cases the result will be an evergrowing database, from which historical situations and developments can be derived.

Given the corporate data model and the warehouse model, the data warehouse is typically updated from the operative databases at regular intervals, e.g. once a month, once a week, or once a day. What happens then if the status of, say, a customer has changed. Then we must make sure that the warehouse will contain information about both the old status, valid for the previous time interval, and the new status, valid for the next time interval. If the warehouse is implemented by means of relational tables, this means that the table corresponding to the particular object type, in this example the Customers table, must have a primary key consisting of “CustomerId” in combination with “TimePeriod”. Other implementation alternatives would be to have separate relational tables, or separate columns in the same table, corresponding to different time periods.

As a summary of the discussion above we present in Figure 100 a possible warehouse data model for our Rent-A-Video business.

![Figure 100. A possible warehouse data model for Rent-A-Video.](image-url)
INTEGRATION
In this concluding chapter, we bring together the main ideas of this book. A case study is used to illustrate the benefits of combining different perspectives to get a deeper understanding of the whole business. Following an appraisal of advantages and challenges of working with multiple perspectives, three stages of an integrated business analysis are presented. The first stage describes the business solutions, staying close the business’s own words and pictures. In the second stage, an analysis using multiple perspectives is done, bringing together relevant parts of the description. The final stage draws out conclusions by cross-analysing the perspectives.

Working with multiple perspectives

In this book we have used different business modelling techniques for analysing different areas of a business. Such analyses are meant to give all actors involved a better understanding of the business as such and to make the actors and stakeholders better equipped for making use of existing business solutions and finding new and more effective ones.

Business modelling for exploring business problems and solutions – that is what this book is all about. In the different chapters we have looked upon different areas of the business from three major perspectives:

- a perspective focusing on values (chapter 5), exploring strategy solutions (chapter 2) and other things
- a perspective focusing on processes (chapter 6), exploring operations solutions (chapter 3) and other things
- a perspective focusing on concepts (chapter 7), exploring information solutions (chapter 4) and other things

In the first main part of the book (chapters 2-4), we divided the study of business problems and solutions into three areas: strategy solutions, operations solutions, and information solutions. In the second main part of the book (chapters 5-7), we introduced a systematic approach for exploring business problems and solutions – business modelling – and gave examples of three major categories of business modelling methods: value modelling, process modelling, and concept modelling. Figure 101 is a reminder of all of this, showing the business solutions at the left and the business modelling tools at the top.
Before discussing advantages and challenges with combining different perspectives, it is worth noting that we use the word “perspective” in a rather general sense. Although we have focused on modelling perspectives – in the form of value modelling, process modelling, and concept modelling – there are a number of other determinants of the perspective that one applies on a business. Different actors and stakeholders have different perspectives on a business as a result of such things as their job position, prior education, gender, age, etc.

While some of the ingredients of a perspective might be easier to change and combine, others are more closely linked to the individual’s identity. For example, changing ones perspective from processes to concepts is something that is possible to learn in a limited amount of time. However, being able to switch between the perspective of a child and that of an elderly can be quite a bit harder. Furthermore, underlying all generalisations that are used to characterise perspectives, there are always the unique experiences of every individual. Important questions to ask in many cases are therefore “what type of perspective?” and “whose perspective?”

**Flexibility of thought**

A main idea behind this book is the need for flexibility of thought in many real-world business situations. Exploiting business opportunities and handling business threat often requires a capacity to look upon the business from different angles, an ability to shift focus, and a readiness to move between different levels of abstraction.

“Flexibility of thought” can be seen as another term for “creativity”. A few people are creative by birth. Some people feel they become more creative when doing certain things, e.g. taking a walk or having a drink. However, most of us can train ourselves in a more systematic way to become more creative in certain situations. This book is intended to show how you can become more creative in exploring business problems and solutions. The approach is meant to develop your flexibility of thought vis-à-vis your business by means of certain methods for analysis and modelling.

Real-life business problems and solutions have to be conceptualised and refined in order to become manageable. By using business modelling methods, we are able to focus on the most essential aspects of a real-world business phenomenon. The models make it easier to find new solutions. Of course, the new solutions must always be mapped back to the business in order to make sure that they really work.

When we apply one perspective at a time, we break down the very complex problem of analysing a business as a whole into several subproblems. One advantage of this is that each one of the subproblems is slightly more
manageable, and is easier to define clearly, than the total problem. Another advantage is that we become more explicit about what we are actually focusing on, which in turn decreases the risks of “mixing apples and pears” and of speaking beyond each other. By devoting time to different perspectives separately, we also avoid forgetting some important aspects completely, while maybe spending too much effort on others.

By analysing a complex business, or business situation, from separate perspectives, “through different glasses”, we will ideally get a nuanced, well balanced, and relatively complete understanding of the object of our analysis, where nothing important has been neglected, and where details of lesser dignity have not been overemphasized.

Iterative use of perspectives

However, the use of multiple perspectives entails a risk that we will get a lot of separate analyses rather than one integrated picture of the whole business situation. Therefore we must also make efforts to relate the different analyses to each other. This should not only be done at the end, but throughout the whole analysis. Whenever applying one perspective of analysis, we should always be aware of the others and be ready to use them as well, whenever that could help us.

There is an inherent difficulty in using a traditional book to describe an approach, where rapid associations and frequent shifts of perspectives and abstraction levels are so important. A book forces you to organise your ideas into chapters that the reader is likely to study more or less sequentially.

How then can we, the authors, convince you of using iterations, combinations, and associations? We have tried to accomplish this by avoiding to make the chapters of this book too delimited; in the treatment of one perspective, we have “thrown in” hints and references to other perspectives, not least in the examples.

There are many links between different business solutions that can be explored by switching perspectives. For example, when designing solutions in the areas of operations or information, it will often be helpful to refer to business strategies in order to select and prioritise among alternatives; those designs should be chosen that best support business strategies. On the other hand, when discussing what business strategies we should select and pursue, it may be useful to consider how alternative strategies could be supported or enabled by adequate solutions in the fields of operations and information. Another example was given in chapter 4, when we discussed a number of different roles that information plays in connection with (a) the specification of goals and the evaluation of their fulfilment; and (b) the planning, execution, monitoring, and evaluation of processes.

Concept modelling is sometimes regarded as “the mother of all business modelling techniques”. Well-analysed and well-defined concepts are essential, not only when we design information systems, but also for exploring business strategies and operations. For example, when designing business strategies for banks, concepts like “profit” and “risk” need to be carefully defined. However, concepts alone are not enough for a full understanding of a business; analyses of processes and values provide further opportunities for deepening the understanding of different business solutions and their interrelationships.
Exploring the business of a central statistical office

The use of multiple perspectives will be further shown in the following example, where we explore the business of a central statistical office. In this case, you will see more examples of the importance of switching between, and combining, different perspectives. The purpose of the case study is to show you how a particular business can be explored by means of the perspectives presented in this book – regardless of how well you know the business from the beginning.

Rather than illustrating a complete and finished exploration, the example aims at showing possible results of an initial iteration through the material, proving some answers but also giving rise to a number of further questions. Although statistics is the core of the chosen business, the case is not intended to make you an expert of statistics. Instead, you will see an exploration presented in three broad stages: description, analysis, and conclusions.

Describing the business and its solutions

The first stage of the exploration focuses on description. It is the business with its existing solutions that provides the foundation for the exploration. By staying close to the words and pictures of the business, the description helps to create a common ground that is readily accessible by the people concerned. The fact that people in the business use other terms and symbols, than the ones we as analysts might use, is something to pay close attention to. One approach to work with this is to restrict the use your own language to the back-office analysis while using the customer’s language in interactions with them. In this way, you get an shared foundation that is explicit and easily discussible. New concepts and symbols are more easily accepted if they bring clear advantages, e.g. in vehicles for new ways of seeing and analysing the business.

In describing the business, keeping different types of business solutions in mind is a way of remembering relevant issues. Even if the initial explanation is limited – “this is a strategy issue”, “we have problems with operations”, “information solutions are not up to date”, etc. – there are often many advantages of describing also other types of business solutions to get a richer feel for the business (cf. Figure 102). However, using strategy, operations and information solutions as reminders of key areas of the business does not imply that they need to be covered in any specific order, or that all will be equally important for the particular situation that the business is in.

![Figure 102. A brief overview of the business of a statistical office.](image-url)
Statistics Sweden is the central administrative authority for official statistics and for other national statistics in Sweden. The overall goal of a national statistical office like Statistics Sweden is to satisfy user needs for official statistics, nationally and internationally. Typical users of official statistics are social researchers, analysts, teachers, students, journalists, actors on finance markets, politicians, interested citizens, and international organisations. Typical tasks, where official statistics are used, are research and education, analysis, planning, public debate, political processes, and business activities.

The production of official statistics is usually funded by appropriation, i.e. by money coming from the public budget after decisions by parliament government. In some countries, the statistical office can also undertake statistical work on a commercial basis, thus increasing the yield from investments in competence, data capital, and production systems. For example, a researcher may need help to compile and analyse existing statistical data for a new purpose and may be ready to pay for this assistance; the researcher’s alternative may be to collect new data on his own, a very costly operation. At Statistics Sweden this kind of work accounts for about 50% of the turnover.

Production of objective official statistics of good quality is the core business of a statistical office (cf. the mission of Statistics Sweden in Table 4). Major stakeholders are users and producers of official statistics, respondents, managers on different levels, and funders (parliament and government on behalf of the citizens). Although some of these stakeholders are explicit in the business mission and objectives, others are implicitly addressed by the requirements for feedback that comes with the appropriation directive that regulates the public funding of the business.

<table>
<thead>
<tr>
<th>STATISTICS SWEDEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statistics Sweden’s mission is to produce and present statistics on various social areas as the basis for decision-making, social debate and research. The statistics shall be objective, timely, reliable, comparable, current and available.</td>
</tr>
</tbody>
</table>

Objective for statistics production

The objective is to produce statistics in accordance with the Official Statistics Act. In its commission-financed activities, Statistics Sweden is expected to enhance the potential for use of its statistical materials and statistical know-how to meet the needs of users. Statistics Sweden shall make it easy for respondents to supply data. The information they provide must be protected. The relevance, quality and availability of the statistics must constantly improve. Productivity must grow by an average of at least 2 per cent per year.

Feedback required by the appropriation directive
– quality development
– customer satisfaction
– public confidence for Statistics Sweden
– respondents’ costs
– departures from the objective;
– income, expenditures and achievements of operations;
– productivity development;
– grants from the EU;
– measures taken based on the advice of the programme councils;
– development of economic statistics and labour market statistics with respect to extra funding.
– income from activities, costs and volume with respect to type of commission and customer category
– a general report describing activities

Table 24. Mission together with objective and feedback requirements for statistics production (adapted from Statistics Sweden Annual Report 2001).
Operations solutions of the business

Statistics production consists of three major parts: design and planning, operation, and evaluation. During **design and planning** it is decided what statistics should be produced, and how it should be produced. During **operation**, the plan is put into practice and the statistics is produced. During **evaluation**, the performance of the operations is analysed in terms of criteria like efficiency, user satisfaction, and different quality components. The core part of operation can be broken down into four steps on a more detailed level:

- **Establish frame and sample.** A suitable frame is identified or constructed. A sample is selected, unless all objects in the frame are to be observed. Together with the next step, this work is often referred to as the input phase of the operation.

- **Measure, collect and prepare data.** Data are collected by means of observations or measurements. Some kind of measurement instrument may be used, e.g. questions in a questionnaire. Observations are registered, coded (for example, transforming free-text answers into certain predefined codes), checked, and corrected if necessary; these operations are called “data preparation”.

- **Aggregate and estimate.** Observed values for individual objects (e.g. persons or enterprises) are summarised into estimated values of certain predefined statistical characteristics (e.g. the number of people living in different parts of the country). This is referred to as the throughput phase of the operation, and the result of this step is what we usually refer to as “statistics”.

- **Present and disseminate.** The statistics is presented and made available to the users, e.g. through printed publications or via the Internet. This is referred to as output phase of the process.

In a statistical office there are two important, more or less parallel data flows: the flow of statistical data being collected, stored, processed, and disseminated, and the flow of metadata associated with the data. In the old days, when statistics were produced manually, these two flows were well integrated; the data descriptions were always in close physical connection with the data they described: questions in questionnaires (metadata) appeared together with the responses to the questions (data), and text labels (metadata) appeared together with figures in table cells (data) in tabular presentations. The introduction of computers first implied a separation of data and metadata in the production process; the transformation of data became automated, whereas the corresponding transformations of metadata by and large remained manual; now under the control of programmers rather than statisticians.

There are two main alternatives for organising the production of statistics. The upper part of Figure 103 illustrates the so-called stove-pipe architecture. This way of organising a statistical office by survey is the traditional one. Each survey collects data concerning a population or a subset (sample) of a population and processes these data until they become statistical end-products, which are typically published in a printed publication. Thus a survey processes data from start to end. Each survey constitutes its own organisational unit and is relatively independent of other surveys. There is little co-operation between surveys. Although all surveys perform more or less the same processes, at least when viewed on a certain abstraction level, this is seldom utilised for comparisons and benchmarking.
The lower part of Figure 103 illustrates the so-called clearing-house architecture. The production work is organised by process step rather than by survey. For example, all data collection may be looked upon as one process that is common for all surveys. Within this process the work may be organised by object. For example, all data needed, by different surveys, from one and the same company are collected at one and the same time. After completed editing and coding, the data are put into a clearing-house that is common for all surveys and for the organisation as a whole. The data in the clearing-house may be combined and used for different purposes by internal and external users. Quality control processes, including good documentation and metadata, as well as well-defined interfaces are essential for a good functioning of this architecture.

**Information solutions of the business**

Information resources and information systems are needed in production of official statistics. In addition to the statistical data collected and processed in the input, thruput, and output phases, different kinds of expert knowledge and metadata, “data about data”, are needed. The information resources are often organised in the form of databases or data warehouses with associated metadatabases and knowledge bases.

In the case of a statistical office, information resources and information systems are on the one hand used in the main production flow (corresponding to material resources and manufacturing operations in an industrial company). On the other hand they also used for controlling, monitoring, and evaluating the performance of the main production flow, as well as other types of information resources and information systems supporting the main operations, e.g. personnel systems and accounting systems. The metadata resources and metadata systems play a double role, being part of both the basic production system and the supporting control system. Figure 104 shows some of the major information resources and information systems – indicated by boxes with rounded corners – that are used and produced in a statistical office.
Regardless of the organisation of statistics production (cf. Figure 103), there is since long a trend to store data in well-organised databases. In a stove-pipe organisation, each survey tends to organise its own databases, typically an input database used during the data collection and preparation steps, a throughput database where data are stored and processed during the aggregation and estimation steps, and an output database organised for dissemination purposes.

Statistical offices are beginning to move in the direction of clearing-house organisations. The first step has been on the output side. Users do not want to retrieve statistics from a large number of different databases. They want to interact with one common output database, preferably via the Internet, where statistics from all different surveys are available in a uniform way and, hopefully, comparable with each other, regardless of which survey they come from.

A second step would be to put not only aggregated statistics (macrodata), but also the underlying observation data (microdata) in a common database regardless of their survey origin. If the two steps are combined we may make all kinds of statistical data available through a common data warehouse, managed by standard software. In order to be successful this kind of organisation calls for major improvements in co-ordination between surveys, metadata management, and confidentiality mechanisms for the protection of sensitive microdata.

A third step in the direction of a more full-fledged clearing-house organisation is now being taken by some statistical offices. All data collection activities for all surveys are being centralised into one common data collection process. This concentration facilitates generalisation and learning from experiences, and it may also lead to better co-ordination and less work for the respondents.

**Analysing the business from multiple perspectives**

While the previous section focused on describing the business in its own terms, we will now begin to more actively work with the different modelling perspectives for the analysis. The description showed a high-level overview of a statistical office, appropriate to analyse some problems and opportunities with. However, there are many issues that belong to somewhat lower levels, and that require the strategies, the operations, and the
information to be explored in further detail using tools from different perspectives (cf. Figure 10). This is done in the following, using both verbal accounts and graphical models.

![Figure 10. Analysis using the three modelling perspectives as tools for exploration.](image)

As shown in Figure 10, the tools for exploration cuts across the different business solutions that are the topic of the exploration. This means for example that although value modelling is particularly apt at shedding light over strategy solutions, it can also be applied to the realms of operations and information. Conversely, it means that the analysis of strategy solutions may benefit not only from value modelling, but also from the perspectives of processes and concepts.

Thus, in order to get a deep and balanced understanding of a business, there are a total of 3 times 3 combinations of what perspective to apply on what solution. Depending on the purpose of the analysis, there are two main alternatives for the order of covering all nine combinations. One is to focus on one type of solution at a time, applying the three perspectives to it (a horizontal sequence in terms of Figure 10). The other alternative is to focus on one perspective at a time, applying it to the three types of solutions (a vertical sequence in terms of Figure 10).

By choosing the second alternative – focusing the analysis on one perspective at a time – we make it easier to establish linkages between different solutions. In this way, the value analysis can reveal value linkages between information, operations, and strategy solutions, e.g. in terms of influence links between factors such as system response time, delivery time, and customer satisfaction. Similarly, process linkages and concept linkages can be searched for between all three types of solutions.

**Value modelling and analysis**

Applying the value perspective on a statistical office like Statistics Sweden puts the focus on important factor values and their means/ends relationships. Drawing on the material gained from examining the strategy, operations, and information solutions, we can begin to list factors such as customer satisfaction, public confidence in Statistics Sweden, objectivity of statistics, productivity growth, ease of supplying data, etc.

For some of these factors, we are also able to find out current value (perceived strength or problem) and/or future value (goal), e.g. the strength of 71 out of 100 points on the customer satisfaction poll from 2001 and the goal of a 2% productivity growth per year.

Adding means/ends relationships between the factors enable us to get a better understanding on the value linkages that combine to form a network
of influences in the business (cf. Figure 106). For example, it seems likely that the ease of supplying data influence the response rate both directly and indirectly through the respondents’ cost: It is likely that the response rate goes up if the ease of supplying data goes up, thereby lowering the respondents’ costs.

Although the overall goal of a statistical office can be summarised as satisfying user needs for official statistics, an analysis of different stakeholders’ interests may break down the overall goal into more specific objectives. We are likely to find that different weights are given to different objectives by different stakeholders, and we may even identify contradictory wishes that will have to be reconciled.

The major stakeholders of a statistical office are users and producers of statistics, respondents, managers, and funders. All stakeholders will probably agree with the overall goal of the business. Since the production of official statistics is publicly funded, the resulting statistical outputs will be regarded as free goods by the users. Thus the users will not care very much about production costs. Instead they will focus on quality aspects of official statistics, such as relevance, precision, timeliness, availability, and comparability with other statistics.

However, different stakeholders might value the quality aspects very differently. If we select one main category of stakeholders, the users of statistics, they may in turn be subdivided into different user categories as exemplified in Figure 107. The different types of users have different preferences regarding statistics and thereby different things that influence their satisfaction. For example, journalists and will request statistics that are easy to interpret and present to the general public. Researchers are more interested in detailed and well-documented data, which they can subject to their own interpretations and analyses. Actors on the finance market would like important statistical indicators to appear on their screens, as soon as they have been produced. International organisations will give priority to the comparability of statistics from different countries.
Whereas users like researchers want even detailed data to be easily available, the respondents (persons and companies) will be concerned about matters of privacy and confidentiality.

The funders (government and parliament) are also users, but unlike other users they care very much about the costs; they want value for money. To be more precise, they care very much of costs that hit the public budget. As a way of controlling this, they have set the goal of productivity growth of 2 percent per year. Respondents care about time and costs for reporting data to the statistical office, and users care about the costs that they may incur for their adaptation and processing of the data they receive from the statistical office.

The statistical office as such must maintain a balance between the interests of different stakeholders. It must meet the requests from users for detailed, easily available statistics, but at the same time it must preserve the trust of the respondents by recognising their needs for secrecy and low response burden. It must also convince the funders that the statistical work is done in an efficient way. The most valuable asset of a statistical office is its reputation for being objective, impartial, and professional.

**Process modelling and analysis**

Taking the process perspective implies focusing on the processes whereby the business creates value for and with its customers and users. Each activity or group of activities may be further analysed in terms of inputs, transformations, and outputs, using process modelling techniques as presented in chapter 6. In the earlier description of the business solutions, three main parts of the operations of a statistical office were mentioned:

- design and planning of statistics production
- operation of statistics production
- evaluation of statistics production

Taking the operation of statistics production as a starting point for process analysis, the relationships between different steps can be explored in a process graph as shown in Figure 108. Here the links between different steps are made explicit in terms of the output produced by one step that is used as input by the next. The initial step of establishing frame and sample is not included as part of the direct value creation but in an enabling process. Instead, the customer’s value creation is getting more in focus as a
follow-on to the dissemination step. Using this as a basis, the analysis could be extended by further use of process modelling to get a more detailed understanding of each value-creating process and of the value chain as a whole.

**Statistics Production Process**

<table>
<thead>
<tr>
<th>Respondent</th>
<th>Customer User</th>
</tr>
</thead>
<tbody>
<tr>
<td>Get input</td>
<td>Get input</td>
</tr>
<tr>
<td>Reality</td>
<td>Macro data</td>
</tr>
<tr>
<td>Knowledge</td>
<td>Create Value</td>
</tr>
<tr>
<td>Respond</td>
<td>Aggregate</td>
</tr>
<tr>
<td>Microdata</td>
<td>Estimate</td>
</tr>
<tr>
<td>Data Base</td>
<td>Data</td>
</tr>
<tr>
<td>Data</td>
<td>Disseminate</td>
</tr>
</tbody>
</table>

**Figure 108. Production process at a statistical office.**

Still we have not explored how the statistical office markets its offerings and get its orders from users and government. This could for example be illustrated by extending the analysis with a business transaction model.

The process view also throws some light upon the stove-pipe versus clearing-house discussion. When starting a statistical office it is certainly easiest to execute each production independently of the other ones (they are few anyway). However, when the number of such process executions become high there are many advantages to operate in a clearing-house mode, although it is not an easy step. If we assume that we are going to produce the same products (macrodata packages) in the new environment we have to consider the following:

- The execution of the dissemination process has to be co-ordinated with other dissemination processes for the same customers and that requires a good organisation for that.
- The input data for the aggregation process should also be collected from the existing databases. To make that possible requires not only good quality in the databases, good metadata, and good tools for identifying these data, but also trust from the persons responsible for the output of the process. The investments for building such a service are both time and cost consuming.
- Finally, the process of collecting special microdata has to be co-ordinated with other approaches to the same respondents.

Now let us take a wider look at the environment and describe the business landscape (cf. Figure 109). What is striking is the enormous amount of respondents of different types and the amount of users – many of them unknown and some even not yet born! Another peculiarity is that there is not at true market relationship with the respondents – they are in many cases obliged to provide the information. This is somewhat different to the traditional way to ensure that you produce what is needed: If your customers are able to get value (profit and pleasure) of what you deliver in a market mode, you are on the right track. If you are able to analyse that situation and not operate in the more hazardous trial-and-error mode, it is fine.
So a question to the statistical office would be: “How do you know you are producing the right macrodata packages?”

A substantial part of what they do is treated in that way and they have clear market relations with a number of business actors knowing what they want and are willing to pay for. However, 50% or the resources are funded from the government. How does it know that it gets most “bang-for-the-buck”? To a certain part the government and other public institutions are customers/users themselves and are able to evaluate the value they get (profit and pleasure). However, the statistical office is also getting resources to produce “free statistics” and to invest in databases and other resources for future production of statistics.

**Concept modelling and analysis**

Making use of the concept perspective for analysing the business of a statistical office involves concepts on two levels. First, there is the metalevel of the business, where we consider the statistics production itself as the reality, or object system, that we are analysing. Second, there is a basic level, where we analyse the data about the reality that the statistics should inform about.

Starting with the metalevel, the business makes use of a number of concepts that are crucial for understanding the world of statistics. Figure 110 gives a rather comprehensive overview of concepts that are used when analysing statistics production and their relationships. This model can thus be seen as a model of metainformation that is needed in connection with statistics production. Note that many of the objects in this model are actually processes (e.g. frame procedure, sampling procedure, measurement procedure, and estimation procedure). On the metalevel they are objects that we need information about.
Complementing the concept model of Figure 110, there is often a need to further describe the individual concepts when analysing the business. Below is a list of some of the core concepts in a statistical office:

- **Statistics.** Statistics are sets of estimated values of statistical characteristics. An example of a statistical characteristic is “average income for people living in Stockholm in the year 2000”. The estimated value of a statistical characteristic will deviate from the true value because of errors and uncertainties in the statistical production process, e.g. sampling errors, measurement errors, and processing errors.

- **Statistical characteristic.** A statistical characteristic $S = O.V.f$ consists of a statistical measure, $f$, for example “average”, applied to the values of a variable, $V$, for example “income”, of the object instances in a set (population) of objects, $O$, e.g. “people living in Stockholm in the year 2000”.

- **Register, frame.** A register is an authorised, updated list of objects of a certain type, e.g. “Persons living in Sweden”. A register that contains identities, names, and locations of the objects to be observed in a survey is called the frame of the survey. In sample surveys, only a sample of objects in the frame are observed, and this sample is drawn from the frame, usually by means of some random procedure.

- **Observation register, final observation register.** An observation register contains the observations obtained by a statistical survey, i.e. a set of observed values of certain variables for certain objects, for example sex, age, and income of persons living in Sweden at the end of a certain year. A final observation register is the result of a finalised data collection and data preparation process.
• **Statistical metainformation, statistical metadata.** Statistical metainformation is information about statistical data. It is needed for different purposes, but the most important one is to help users to interpret statistical figures correctly. Statistical metainformation typically provides information about the contents of statistics (definitions of populations, variables, statistical characteristics, etc), the data collection and estimation procedures behind the statistical outputs (including information about errors that have occurred during these processes), as well as technical information about how to access the statistical data. Statistical metainformation is represented by statistical metadata.

In order to better understand the statistical concepts at the metalevel, there might be beneficial to also have a feel for some examples of concepts at the basic level. This includes concepts that the statistics is all about. Figure 111 shows an object graph that illustrates the concepts behind some basic statistical data about persons, households, and regions. Figure 112 shows a different type of concept model, illustrating so-called multidimensional data, which may be stored in a data warehouse.

![Figure 111. Object graph for socio-demographic statistics.](image)

![Figure 112. Model of multidimensional data in a statistical data warehouse.](image)
Integrating and drawing conclusions

Following the previous analysis using value, process, and concept modelling, we have reached the final stage of the integrated business analysis outlined. Here, the aim is to integrate and cross-analyse in order to elaborate the results and provide further material for conclusions.

In line with our ambition to combine perspectives, we will ask what questions for further analysis these modelling tools themselves give us. Each of the perspectives used in the analysis reveals new insights and shows where we still miss information and have more questions to ask. In addition of applying the perspectives to different business solutions, as we did in the previous stage, we will now apply the perspectives to the resulting models developed. This can be seen as a meta analysis where we for example look at business concepts from the value, process, and concept perspectives in order to facilitate the development of new and improved information solutions. Although some combinations might be more relevant than others in specific situations, we will give examples of each.

Cross-analysis of key values:
Towards new strategy solutions

A statistical office must be good at reconciling a lot of different and even contradictory values. One way of doing this is to aim for compromises. But compromises are not always good. As suggested in Figure 107 earlier, a compromise may sometimes leave everyone disappointed. Instead of aiming for the big compromise, one can further analyse the relationships between different factors in order to see exactly where the factors lead to contradictions and where they instead may support other factors that might be common to several stakeholders.

Moreover, we may use the process perspectives to look more closely at how the values are being changed, and the possibilities of designing new processes that may satisfy contradictory needs in an economic way. By borrowing process modelling, we can explore the process aspect of values to implement action plans for achieving divergent goals. For example, a process analysis can aid our understanding of the means/ends relationship between factors such as product quality and customer satisfaction. It is through the processes that we can learn more how one factor influences another.

And we may also borrow concept modelling in order to analyse certain concepts that are critical for a good understanding of the values of the organisation. For a statistical office it is important to understand the meaning of factors like customer satisfaction, statistical quality, confidentiality, and response burden. For each factor, there is always at least two concepts that might benefit from further exploration, e.g. “customer” and “satisfaction” in the case of customer satisfaction.

Cross-analysis of key processes:
Towards new operations solutions

In analysing the processes of a statistical office, the question about how value is being created in the statistics production process keeps coming back. Staying with the process perspective, further process details can reveal some of the answers. But also extensions to the process towards the customer might help. Statistics may be used in many ways as information (a part of the task base) in an incredible number of decision processes. In other cases it has first to be processed (input to a transformation process)
and adapted to the user’s situation before it might be useful. Could we enable their process further by giving consultancy services? Or could we provide further relieving services by in-source statistics tasks from our customers?

Switching to the value perspective, we might apply it to the process in order to shed light on exactly what values that are being influenced by it. This knowledge is useful for the statistical office to match with the desired values of the customers in order to know that they produce the right statistic packages. As these questions are closely related to the overall values of the business, tools as factor models can provide valuable insights.

Applying the concept perspective on processes gives us the ability to further examine the meaning of the process as well as its inputs and outputs. Doing this enables us for example to characterise different processes in terms of their attributes, and also to examine their hierarchical relationship, i.e. whether there are different classes of processes in the business. Using the concept perspective on the input and output of a process helps us in improving the information content, the meta-data, and the presentation format that the process deals with. Concept analysis can also assist in the segmentation of the customer base. The decisions on what products and services to offer for what groups is further facilitated by a firm grip on concepts like microdata and macrodata. The statistical office is an extreme example of a business where concepts are crucial tools not only for making sense of and managing the business but also for understanding and developing its products and services.

Cross-analysis of key concepts:
Towards new information solutions

In the analysis of key concepts of a business there are occasions when certain concepts need to be further elaborated. The first step is often to extend the concept model so that it becomes more complete in relation to the unclear concept. Adding more attributes and/or relationships to other nearby concepts might increase the clarity. Also considering the hierarchical structure might be beneficial, i.e. whether the concept is a subtype to a more general concept, and/or if it is a supertype to some more specific concepts.

We may also enrich our analysis by asking ourselves not only what concepts are used, but also why and by whom they are used. By applying the value perspective on concepts, we can increase the chances of focusing on core concepts that make a difference in the analysis. Furthermore, we can get an increased understanding of a concept by checking what factors (if any) it is part of in a means/ends network.

On the other hand it may sometimes be fruitful to apply the process perspective to objects found through concept modelling. After all every object, e.g. a person or an enterprise, has a life from its birth to its death, and this life can be modelled as a process, during which the object undergoes different changes in its status and its relations to other objects. Figure 113 shows a first step in a dynamic analysis of the object system shown earlier in Figure 111. We have identified a number of events that imply the births and deaths of objects (persons, household, and regions) and relations between objects (belongs to, lives in). If we read this so-called event consequence matrix by row, we see the consequences of a certain event. If we instead read the matrix by column, we see which events will cause the birth or death of a certain object or relationship.
<table>
<thead>
<tr>
<th>Event</th>
<th>PERSON</th>
<th>BELONGS TO</th>
<th>HOUSEHOLD</th>
<th>LIVES IN</th>
<th>REGION</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1 A person is born</td>
<td>↑</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E2 A person dies</td>
<td>↓</td>
<td></td>
<td>↓</td>
<td>↓</td>
<td></td>
</tr>
<tr>
<td>E3 A person moves from one household to another existing one</td>
<td>↓, ↑</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E4 A person leaves a household and forms a new one</td>
<td>↓, ↑</td>
<td>↑</td>
<td>↑</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E5 A household moves</td>
<td>↑∗, ↓∗</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E6 Political decision to change the regional structure</td>
<td>↑∗, ↓∗</td>
<td>↑∗</td>
<td>↓∗</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

By combining static and dynamic modelling we may check the consistency and completeness of information and information systems. For example, if there is no event in the dynamic model that causes the birth of objects of a certain type, an information system based on this model will never get any information about such objects. This means either that the object type is superfluous, or that we have missed something in our analysis. On the other hand, if there is no event that causes the death of an object, this object will exist forever in our database. This may be the intention, if the database is some kind of archive, but once again it may also be possible that we have missed something in our analysis.

Some final words of advice

In the case study of a central statistical office, we saw a number of benefits from using multiple perspectives. Together they enrich our understanding of the business, thus enabling us to creatively and systematically explore important problems and solutions. By an awareness of strengths and limitations of different modelling perspectives, we are able to judge if and when they are appropriate to apply.

In addition to this, we want to leave you with two more points to keep in mind. First, try to make the most of the knowledge and experience of the people in the business. They are the experts. The real challenge for you as a consultant, project leader, or manager, lies in finding ways to leverage this knowledge. Business modelling can be such a way.

Second, try to keep the balance between analysis and implementation. At one extreme, all effort is spent on influencing and changing the business, without taking the time to step back and reflect. At the other extreme, there is the risk of drowning in analysis, never getting the opportunity to use the insights gained. Business modelling is a tool for both understanding the business and changing it (cf. Nilsson, Tolis & Nellborn, 1999).

Finally, we wish you good luck in your future involvement in business modelling for exploring business problems and solutions, and hope that you have found this book helpful.
References


