Evaluation of electronic commerce forecasts and identification of problems affecting their evaluation

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I certify that all material in this dissertation which is not my own work has been identified and that no material is included for which a degree has previously been conferred on me.

Signed: _____

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Abstract

Businesses use forecasts in order to gather information concerning phenomena that are important to them. Since electronic commerce has grown in importance for businesses, forecasts concerning this area are becoming increasingly important. The work presented in this report aims at gathering information useful when improving forecast quality. In practice the report presents a collection of forecasts, concerning business-to-consumer electronic commerce, and a collection of factors affecting electronic commerce forecast outcomes. A categorisation and evaluation of the collected forecasts is performed, this evaluation is done by comparing the forecasts in the categories to the actual outcomes. Problems that occur during the evaluation process, such as problems with forecast wording and scope, are described, and suggestions of how to avoid these problems are provided. Structured methods to categorise and evaluate the forecasts are also presented. Finally, the outcome from the evaluation is analysed using the compiled factors and indications are given of how to use the results in order to improve future forecasting.

Keywords: electronic commerce, forecasting, forecast evaluation.

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1 Introduction

The work presented in this report starts out from the increasing importance of electronic commerce (EC), initiated primarily by the growth of the Internet during the 1990:s. Electronic commerce started out as phenomena only relevant to large businesses, with applications like EDI (Electronic Data Interchange) and EFT (Electronic Funds Transfer) (Seldon, 1997). But today EC is also relevant to medium sized and small businesses (OECD, 1997; Fredholm, 1998). Some of the features that make electronic commerce attractive to businesses are, among others, the possibility of cost savings and the ability to access new markets (Fredholm, 1998).

When faced with decisions concerning the future businesses often use forecasts to gather information in order to optimise the decision (Makridakis & Wheelwright, 1987). Forecasting is a way to predict the future, with the help of information (Oxford Dictionary, 1992). This use of information is what makes forecasting something more than simply guessing. However the use of information also introduces uncertainties to forecasting. This comes from the fact that it is impossible to have exact information about the future (Ackoff, 1981) i.e. forecasts will always involve uncertainties.

Since electronic commerce has become an important concept for all sorts of businesses, a need for forecasts concerning the future of electronic commerce has thereby emerged. In practise these forecasts are often made by independent consultant companies such as Jupiter Communications and Forrester Research. However, since forecasting is not a precise activity, there is a need for ongoing improvement of forecasting methods. One important way to improve forecasts is by comparing the forecast with the actual outcome, and thereby in a feedback manner make relevant changes in the forecasting routines used (Makridakis & Wheelwright, 1987).

Since electronic commerce is such a wide field; including as diverse features as smart cards for patient medical information (Castleman, 1998) and web based online shopping (ISPO, 1997), there is a need to sharpen the focus. This is done by categorising different types of electronic commerce, for instance into business-to-consumer and business-to-business electronic commerce. The focus of this report is on forecasts concerning business-to-consumer EC, made in the mid 1990:s. The sort of forecasts studied could for example be, *"by the end of 1998 Swedish web based storefronts will generate a total sale of X million SEK"* or *"by the end of 1997 intelligent agents will be frequently used in online shopping"*.

The aim of this report is to map out the outcomes of past forecasts concerning electronic commerce. While doing so factors that influence the outcomes will be identified and described. Appropriate ways to categorise the forecasts will also be identified in this process. In more detail this means that forecasts must be collected, categorised and evaluated, and factors, influencing forecast outcome, must be collected and compiled.

As discussed above this report aims at collecting and compiling different kinds of information useful in improving forecasts. Thereby businesses might have more information about how to make good forecasts in the future, making forecast quality improve.

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2 Background

In this chapter background information on the different concepts studied in this report are presented. A short description of electronic commerce history as well as ways to categorise and define electronic commerce is presented.

2.1 Electronic commerce

2.1.1 History of electronic commerce

Electronic commerce is not—despite the intense media hype during the last years—a new phenomena. The first EC applications were already in use in the sixties. Among the early applications were, for instance, early EDI (Electronic Data Interchange) systems. However it is not until the dawn of the Internet that EC has become indispensable (Fredholm, 1998).

The history of electronic commerce is tightly associated with the emerging communication technologies, and it is striking to see that whenever a new way of communicating appears, it soon gets a commercial area of use. Given the fast development of information technologies in general, and the Internet in particular, during the nineties it is thereby not surprising to see that electronic commerce has boomed in the last five to ten years. The Internet is the primary force driving the emergence of electronic commerce (Bollier, 1995). Internet went, during the mid 1990:s, from being of interest primarily to education and research institutions, to being a medium for electronic commerce. In December 1993, 4.6% of a total of 623 web sites had the extension *.com*, i.e. representing commercial sites, while in January 1996 50% of a total of 100,000 web sites were *.com* (Figure 1) (Kolding, 1996).

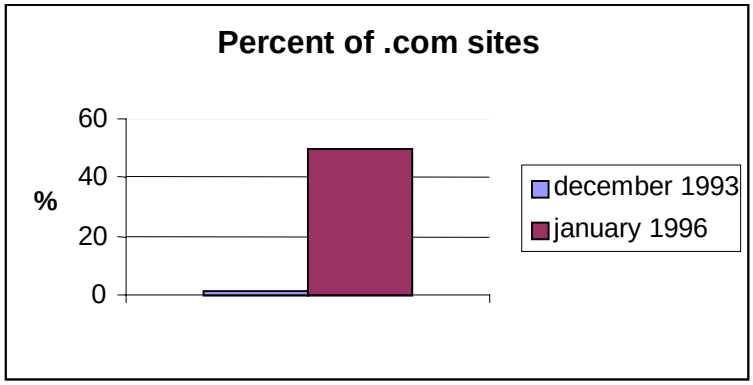

Figure 1. Percent of .com sites from total number of www-sites. From Kolding (1996)

These figures representing a growth of the relative of *.com* sites by 1135% in 13 months. Also the number of web users are growing fast; at the end of 1996 it was estimated that there were a total of 61 million Internet users while, at the end of 1998, there were 147 million Internet users (CyberAtlas, 1999). The reasons for this fast growth are increased Internet access, better payment systems and improving web

security (Nicholls, 1998). It is estimated that 65% of current Internet users have "shopped around" online (ICC, 1998), together with the estimate of 147 million users (CyberAtlas, 1999), this gives 95 million potential customers for a online shopping business.

Other statistics exemplifying this are figures from the Swedish electronic commerce scene; by the end of 1998 almost 3 million people in Sweden, of a total of 8.5 million inhabitants, had Internet access, representing a 36% growth rate from 1997. In December 1998, over 1 million Swedes accessed shopping sites, of which approximately 30% purchased goods (NUA, 1999a).

So far mostly large businesses have been able to benefit from electronic commerce, but EC also provides great benefits for smaller companies (Fredholm, 1998; OECD, 1997). The benefits for businesses are, among others; reduced design and manufacturing costs (ISPO, 1998), access to new markets (ISPO, 1998; Northeast Consulting, 1996), increased value of time by the use of intelligent software (intelligent agents) (Bollier, 1995; Garcia-Sierra, 1996; Fredholm, 1998) and increased efficiency in routine tasks like purchase and sales (Fredholm, 1998).

Seldon (1997) provides a structured view of the development of information technologies. This historical view will provide a model for the development of information technologies that will facilitate a definition of electronic commerce.

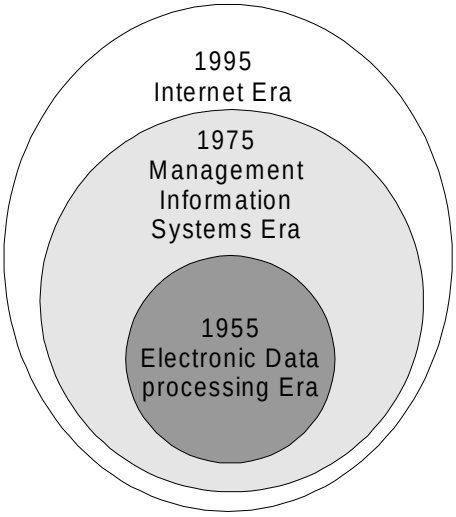

Figure 2: Development of information technologies (Seldon, 1997)

In this model, presented graphically in figure 2, the development of information technologies can be divided into three stages, which encapsulate each other: the Electronic Data Processing Era, the Management Information Systems Era and the Internet Era (Seldon, 1997).

The Electronic Data Processing (EDP) Era (Figure 2) started about 1955 and lasted about 20 years. During this era the cost of information technologies was at a level that only allowed large companies to buy computers and build EDP systems. A typical computer of this era cost millions of dollars.

During the mid 70´s the cost of information technologies had fallen to a great extent, facilitating new applications such as decision support systems. This era, starting about 1975, is named the Management Information Systems (MIS) Era (Figure 2). This era saw the birth of the PC and client-server computing. Despite the growing use of

digital information within firms during the MIS Era, electronic communication between firms was still scarce.

Twenty years later, about 1995, the Internet Era (Figure 2) commenced. The dramatically falling costs of information technologies during this period, has created an increase in the number of possible applications of information technologies to such an extent that terms from the preceding eras, like Management Information Systems, or even Information Systems, are inadequate to describe it. Information technologies has gone from being a topic only for the business community, to be of importance to the community at large. The by far most important technological breakthrough during this era is the Internet. The importance of the internet to electronic commerce is discussed more above.

2.1.2 EC concepts

To enable a precise discussion about EC, definitions and categorisations are at need. The definition clearly states what features that are included in the EC-concept and the categorisation provides tools, which can be used in handling the different features of electronic commerce.

Defining EC

Electronic commerce is not a well defined phenomenon. There are different definitions with different focus, reflecting the authors' approach to electronic commerce. To highlight these differences three definitions are presented below. Kalakota & Whinston (1996), with their economical and organisational focus give the following definition:

> … electronic commerce is a modern business methodology that addresses the needs of organisations, merchants, and consumers to cut costs while improving the quality of goods and services and increasing the speed of service delivery. The term also applies to the use of computer networks to search and retrieve information in support of human and corporate decision making. (Kalakota & Whinston, 1996, page 1)

While the US Department of Defence gives the following, more technically oriented definition:

> Electronic Commerce (EC) is the paperless exchange of business information using Electronic Data Interchange (EDI), Electronic Mail (E-Mail), computer bulletin boards, FAX, Electronic Funds Transfer (EFT), and other similar technologies. (Mañas, 1997)

The European Commission's Information Society Project Office (ISPO, 1998), which define electronic commerce as:

> Any form of business transaction in which the parties interact electronically rather than by physical exchanges or direct physical contact. (ISPO, 1998).

These three definitions show that “electronic commerce” has different meaning to different authors. This fact makes it important to always take into account the authors’ definition when relating to their work.

Seldon (1997) provides yet another definition, based on the term Internet-era technologies, which is presented above, and can thereby present a brief and concise definition:

> Electronic commerce is commerce enabled by Internet-era technologies. (Seldon, 1997)

From now on, if not explicitly stated otherwise, this is the definition of electronic commerce used in this report. The choice of this definition is motivated by its short and concise form, yet fully covering all traditional features of the EC-concept.

Categorisation

Electronic commerce, as defined above, is a wide concept, including web based shopping as well as electronic economic transactions between large businesses. This diversity raises the need for a categorisation of different types of EC, which later is used in the delimitation of the problem.

ISPO (1998) provides the following categorisation of electronic commerce:

(1) Business-to-consumer

(2) Business-to-business

(3) Business-to-administration

(4) Consumer-to-administration

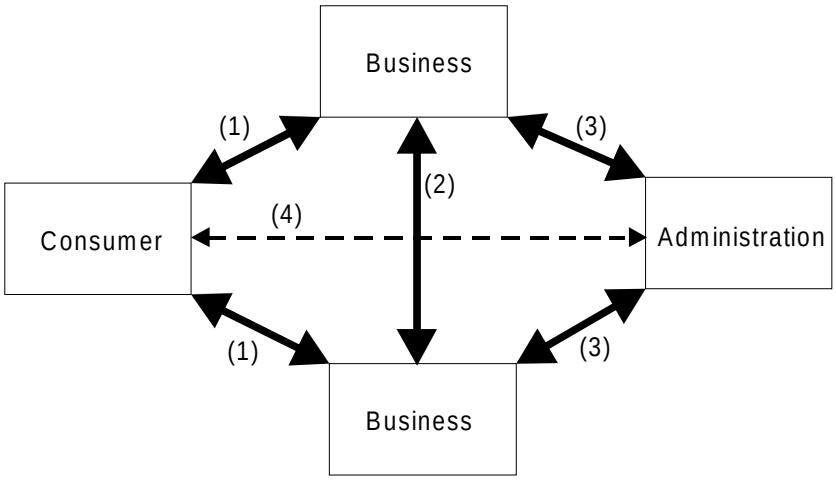

Figure 3: Categorisation of EC, from ISPO (1998)

(1) The business-to-consumer category largely equals electronic retailing (i.e. online-shopping). Typical applications within this category are software for online shopping, combined with either traditional ways of payment like cash on delivery, or electronic payment methods such as credit cards or electronic cash (Neches, 1996).

(2) The business-to-business category encapsulates phenomena such as EDI (electronic data interchange) and EFT (electronic funds transfer) (Kalakota & Whinston, 1996). Despite the media hype concerning business-to-consumer applications, business-to-business electronic commerce is estimated to be two times as big as business-to-consumer electronic commerce (Noack, 1997).

(3) The business-to-administration category involves electronic transfers between companies and all sorts of governmental and other public organisations.

(4) The last category, consumer-to-administration is not yet of great importance (ISPO, 1998). That is why it is represented by a dashed line in Figure 2. However, researchers see a large potential for growth in this category (Castleman, 1998). Examples of applications in this category could be the use of smart cards to keep track of educational services or medical records (Castleman, 1998).

Yap (1997), provides a partially different categorisation of electronic commerce. He distinguishes three categories, namely business-to-business, business-to-consumer and intra-organisation. When providing this categorisation Yap (1997) leaves out all administration interchange and instead including, like Kalakota & Whinston (1996), intra-organisational aspects into electronic commerce. According to Seldon (1997) this categorisation partially misses the core of EC, because it does not empathise the new characteristics of EC. Further, this categorisation does not match the definition of EC used in this report (Seldon, 1997) and is thereby inappropriate to use. Instead the above described categorisation, provided by ISPO (1998), is used. The use of this categorisation, from ISPO (1998), while using the more general definition of EC from Seldon (1997) is motivated by the close similarity between the two definitions in ISPO (1998) and Seldon (1997). Consider the definition from ISPO (1998):

> Any form of business transaction in which the parties interact electronically rather than by physical exchanges or direct physical contact (ISPO, 1998)

and the definition from Seldon (1997):

> Electronic commerce is commerce enabled by Internet-era technologies. (Seldon, 1997)

The only thing that differs between the two definitions at hand is that ISPO (1998) use of the term, *interact electronically*, while Seldon (1997) uses the term *Internet-era technologies*. Since the Internet-era in Seldons (1997) model encapsulates all the previous information technology eras, the two definitions can be considered equal. This similarity allows the use of Seldons (1997) general definition of EC and ISPO's (1998) categorisation of different types of EC.

2.2 Forecasting

Forecasting is today a fully fledged academic field of its own (Makridakis & Wheelwright, 1987). This report does however not aim to give a profound account of forecasting, only some basic features of forecasting, necessary when formulating the problem, are accounted for.

Oxford Advanced Learner's dictionary of Current English (1992) gives the meaning of the word forecast as:

> Tell in advance (what is expected to happen); predict with the help of information (Oxford Dictionary, 1992, page 350).

The last part of this definition, *predict with the help of information*, is a key feature of forecasts. This is what separates forecasting from simple guessing, and gives forecasts a certain amount of credibility.

The possibility to make forecasts about certain critical factors in the future is today essential to many organisations (Makridakis & Wheelwright, 1987; Bergström, 1982). Forecasts are used, for instance, by businesses when making strategic decisions about investments and marketing in new markets.

The usefulness of forecasting has been questioned, mainly because forecasts are based on historical information and not, by definition, on *real* knowledge of the future (Wallander, 1980; Ackoff, 1981). The study of forecasts in this report is however motivated by the fact that forecasts are in fact used by businesses and other

organisations in knowledge acquisition (Makridakis & Wheelwright 1987; Bergström, 1982).

Categorisation of forecasts

Makridakis & Wheelwright (1987) provides the following categorisation of forecasting, later used in delimiting the problem:

Method ↓	**Purpose** →	**Implicit**	**Explicit**
Intuitive		Estimating the sales of Product A for the coming month in an intuitive, ad hoc manner	Using a monthly meeting of senior management to develop forecasts for Product A for the next month
Formal		Predicting the sales of Product A for the coming month using a statistical forecasting method.	Obtaining monthly forecasts for each major product on a specified date for use in production planning

Table 1: Categorising Forecasting Possibilities,

from (Makridakis & Wheelwright, 1987)

Intuitive forecasting is internal to the planner, i.e. the planner do not make use of any formal methods. This is however not equivalent to guessing, because the planner may have useful inside knowledge and experience. A drawback to intuitive forecasting is that the planner may be subject to psychological biases, affecting the outcome.

Formal forecasting is based on formal methods, whose steps can be written down. Most formal methods are based on statistical methods.

Implicit forecasts are not part of any particular decision process or other plans. Implicit forecasts are forecasts being made in their own right.

Explicit forecasts are made for a specific reason, like for instance planners make a forecast about the growth of online shopping in order to plan the number of storefront software packages that can be sold.

Another way of categorising forecasts is by how the outcome can be evaluated; quantitative or qualitative (Patel & Davidson, 1994). An example of a forecast which can be evaluated by quantitative means is, *by the year 2000 50% of all adult web users will conduct online shopping at least once a week*. The correctness of this forecast can be exactly evaluated once the actual number of adult web users conducting online shopping year 2000 is known.

A qualitative forecast on the other hand is not that easy to evaluate. Consider, for instance, the fictive forecast; *at the turn of this millennium intelligent agents will be an essential part of online shopping*. When evaluating this forecast one must decide the meaning of *essential part*. Is 50% or perhaps 70% of all online shopping an “essential part”?

Evaluation of forecasts

One important method for improvement of forecasts is to study the performance of forecasts made in the past (Makridakis & Wheelwright, 1987; Bergström, 1982), and thereby try to get information that will facilitate increased accuracy of forecasts in the future. The performance of a forecast is given from how close the forecast is to the actual outcome, i.e. how well the forecast predicts events in the real world. This feedback loop is hence an important part of forecast improvement.

3 The problem

The importance of electronic commerce in contemporary society as well as the need for forecasts about EC, development have been accounted for in Chapter 2. Further Chapter 2.2 shows that one major way in which one can improve forecasting methods is by comparing past time forecasts with the actual outcome in the real world.

The problem to be investigated in this report is based on these facts. This report aims at comparing forecasts, concerning electronic commerce, made in the past with the actual outcomes. By doing so the quality of the examined forecasts will emerge. Further, factors that made the examined forecasts either come true or false will also be identified. This task also raises the need to define what a "factor" is and is not. Implicit in this problem is also the task to find forecasts, relevant to the problem.

3.1 Delimitations

To apply the above described problem to the whole area of electronic commerce and the full range of forecasts is a by far to immense task, thereby the following delimitations are used to set focus on the core problem:

1. Starting with the categorisation of EC presented in Chapter 2.1.2, only forecasts concerning consumer-to-business EC (ISPO, 1998) will be used. This delimitation is taken on because of the novelty of consumer-to-business EC as opposed to business –to-business EC which have been around for a longer time (Kalakota & Whinston, 1996), and is thereby more well known than consumer-to-business EC. Business-to-administration and consumer-to-administration (ISPO, 1998) is not so frequent, and is thereby not so interesting to study.
2. Only forecasts made between the start of 1995 and the end of 1996 will be considered. This limitation in time is motivated by two circumstances. Firstly, statistics show that the consumer-to-business EC was insignificant up until the end of 1994 (Kolding, 1996), which makes forecasts before 1995 scarce. Secondly, prognoses made after 1996 often describe the future some years into the 21:st century, and are thereby impossible to evaluate today.
3. Explicit forecasts (see Chapter 2.2) will not be considered. This delimitation is motivated by practical arguments. Explicit forecasts are, by definition, made in order to solve a particular problem. When a business makes an explicit forecast the outcome is often used internally to the business, and thereby there is no need to make it publicly available. An example of this sort of forecast could be sales managers making a forecast about the use of Internet in order to plan their sales strategy for storefront software. This will probably make explicit forecasts hard to come by. Implicit forecasts, on the other hand, are more general and often conducted by independent consulting agencies, which present their results in publicly available reports.
4. This report will make no difference between Intuitive and Formal forecasts, nor between any sorts of techniques used to perform forecasts. This is because the aim is to describe EC forecasts as a whole and not to point out differences between different forecasting methods.

3.2 Formal definition of the problem

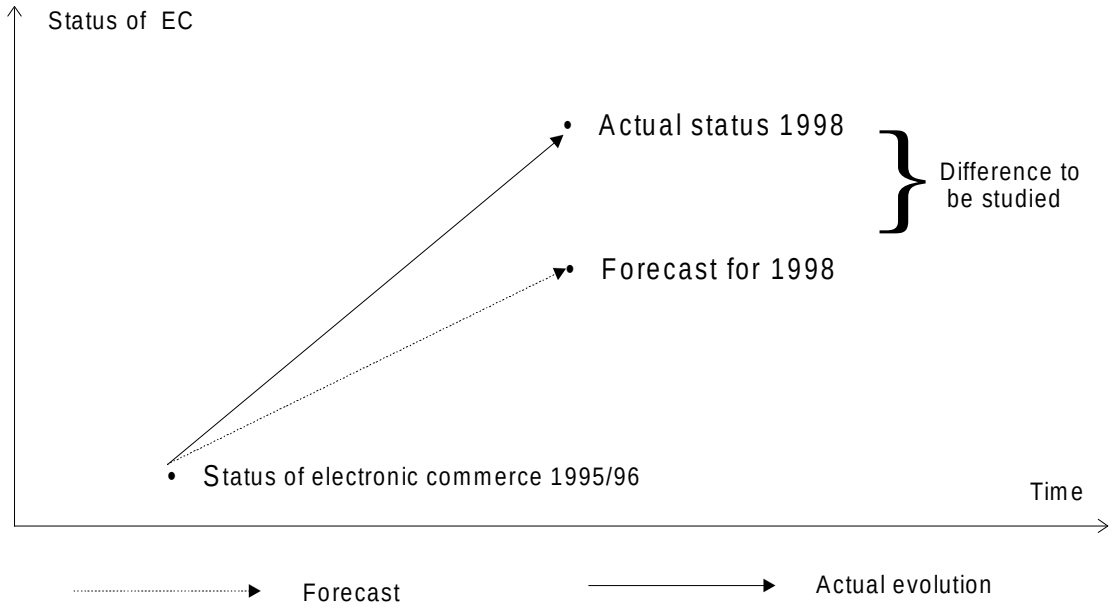

Figure 4: Graphical description of the problem

The work presented in this report aims at evaluating publicly available forecasts, concerning electronic commerce, made between 1995 and 1996. While doing so, factors, that determine the degree of correctness of the forecasts, will be identified and described. The "factor" concept also needs to be studied, and questions like; what is and what is not a factor will be answered. The problem also involves identification of and the division of forecasts in categories, suitable to evaluate as a whole. Further methods to evaluate these categories will be identified and used.

3.3 Expected outcome

Due to the fast development of electronic commerce, and to the uncertainties involved in all forecasting, it is likely that many forecasts made between 1995 and 1996 will be inaccurate, either over- or underestimating the speed of EC development.

Factors affecting forecast outcome will most probably be factors that have an impact on EC development in general, like political decisions, technical development and introductions of standards. However it is very difficult to make any predictions of these factors before the actual investigation has been conducted.

4 Method

The previously described problem states a number of tasks which results will be analysed in this report, for instance collecting and categorising forecasts, finding factors that influence forecast outcomes, and finding methods to evaluate forecast categories. Solving these tasks in an organised way demands the use of structured methods. This chapter will discuss available methods and choose one or more methods that will be used.

4.1 Methods to collect forecasts

There are two major ways in which forecasts can be collected, either by studying the printed sources where forecasts are presented (literature studies) or by interviews with people responsible for the forecasts.

Both of these two methods can be further refined. Interviews can be subdivided into oral interviews or written inquiries (Patel & Davidson, 1992), while literature studies can be divided into traditional search in printed text like scientific reports and books, and online search, typically using the internet.

The collection of forecasts will be conducted through literature studies, both on- and offline. No interviews of any sort will be conducted. This choice of method is motivated by one major reason:

It will most likely be difficult to get accurate information about forecasts made so long ago as 1995/96 by the use of interviews. The people in the target group for the interviews are likely to have forgot much about the forecasts they made in 1995/96. Text, online or offline, however is permanent in that way that does not change quality over time, i.e. it is either fully available or completely removed from the web.

4.2 Methods to find factors influencing forecast outcomes

Like the above discussed methods for collecting forecasts there are two major ways to find *factors* influencing forecast outcomes; interviews (or case study) and literature studies.

Because of the difficulties in defining a suitable target group for interviews or a case study concerning factors that influence forecast outcomes, literature studies will be used to find the factors.

More practical, the way in which literature studies will be used to solve the problem at hand is by identifying factors that different authors think are important for electronic commerce acceptance and growth. These factors will then be compared and put together to form the factors by which forecast outcomes will be analysed.

4.3 Work description

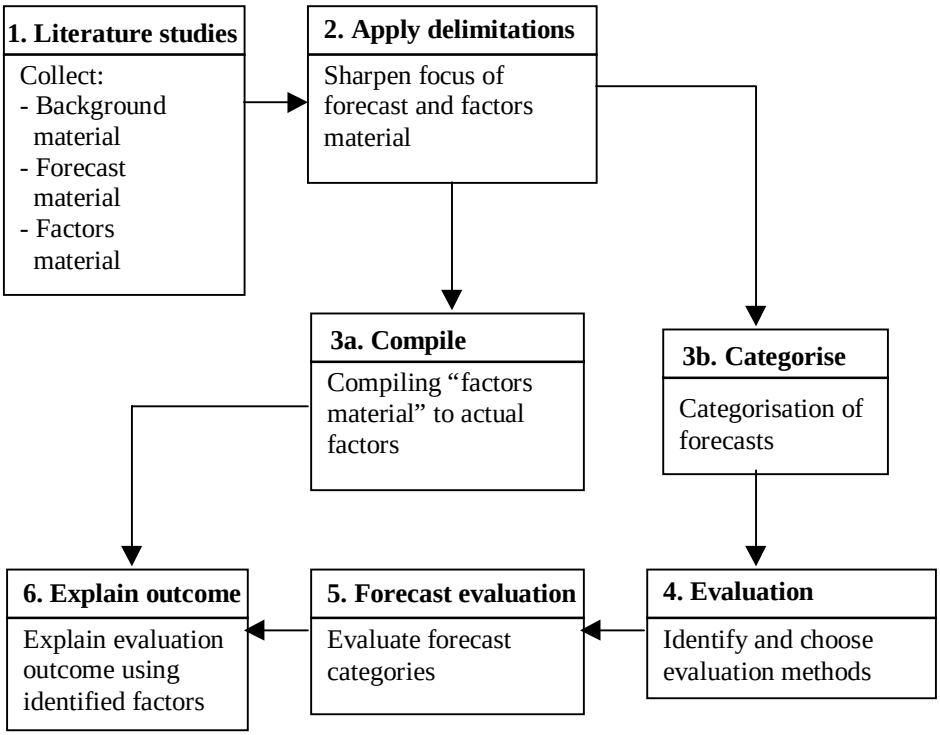

Figure 5. Graphical work description

Step 1. The outline of the work presented in this report involves an extensive literature study. Both the collection of forecasts as well as material on the identification of factors influencing forecast outcomes are to be performed based on literature studies. Material for the background and problem formulation also have come from literature studies, often from the same sources as material for the forecasts and factors will be collected from. This led to that, in practice, only one literature study was conducted, collecting background as well as forecast and factors material. Because it was not possible to know which forecasts and "factors material" which were to be useful before the problem definition was stated, a large amount of material concerning forecasts and factors was collected in step 1.

Step 2. When the problem has been defined and delimitations stated, part of the material, relevant to the problem and within the limits of the delimitations, is selected to be used in the work.

Step 3. The next step is to categorise the forecasts, using forecast characteristics such as those described in Chapter 2, for example quantitative or qualitative (Patel & Davidson, 1998) outcomes, and to compile the "factor material" into actual factors that can be used to explain the outcomes of the forecast categories.

Step 4. When this step will be conducted, evaluation methods to evaluate the different categories of forecasts are to be identified and one will be chosen for each category. The chosen methods will then be applied in order to evaluate the forecast categories.

Step 5. The identified factors affecting forecast outcomes will then be applied to the results from the evaluation of the forecast categories in order to find explanations for the outcomes.

Step 6. The work is concluded by a summary and discussion of the findings and suggestions for how future work can be based on the findings from this work.

5 Collected material

5.1 Collected forecasts

This chapter corresponds to step 1 and 2 in the graphical work model (Figure 5) and thereby simply displays all collected forecasts without any categorisation or other comments. The sources for these forecasts where found both on- and offline. The offline sources used where mainly reports like Bollier (1996) and OECD (1997). The single most useful online source where Staffnet (1998) which provided a majority of forecasts. To find the different sources, on as well as offline, web based search engines like Evreka® where used. Library databases proved to be inadequate for this search, since they did not provide any forecasts (the reason for this is not known). The following are the collected forecasts:

1. Forrester Research Inc. says consumers rang up $530 million in online transactions in 1996 and will drive that up to $7.17 billion by the year 2000 (Staffnet, 1998).

2. Currently, Internet commerce is quite small, representing at most about US$ 500 million world-wide […] The most conservative forecasts expect growth of at least ten-fold for three to four years, and the most optimistic foresee about US$ 780 billion in 2000 (Killen and Associates) (OECD, 1997).

3. Industry analysis facts and figures for the latter half of 95/96 financial year include; Internet-based commerce will hit $150 billion by 2000 and more than $1 trillion by 2010; sales generated via the web were projected to grow from $17.6 million in 1994 to nearly $400 million in 1995 […] the number of sites using the internet for product transactions will increase from 14% in 1995 to 34% in 1996 and 44% in the next three years.

4. The Yankee group in Boston estimates consumers spent $730 million in 1996; by the year 2000, consumers will account for $10 billion in e-commerce sales (Staffnet, 1998).

5. WEFA projects that by the year 2000, sales on the Internet will hit $13.8 billion (Info-Tech, c. 1996)

6. Jupiter Communications expect the number of U.S. households online to rise from 14.7 million in 1996 to 36 million by the year 2000 (Staffnet, 1998).

7. Within 18 months, the base of connected PCs grew 20 times, to an estimated 10 million people in October 1995-a number estimated to rise to 52 million by the year 2000, according to Forrester Research (Bollier, 1996).

8. According to projections by IDC, by 2000, 46 million consumers in America alone will be buying online, spending an average of $350 a year each (Staffnet, 1998).

9. Forrester Research predicts that three non-technology segments will drive revenues from the Internet in the year 2000: 1) content; 2) financial services; and 3) consumer retail. Improved security and the increasing number of households on the web will drive consumer retail to $7 billion in 2000 (Staffnet, 1998).

10. Women shoppers spent approximately $368 million online in 1996, according to Jupiter Communications. By 2000, Jupiter forecasts that this figure will grow to nearly $3.5 billion, based on the ever-increasing numbers of women going online (Staffnet, 1998).
11. […] Piper predicts that the most successful distribution channels will be interactive, three-dimensional, virtual environments, with the ability to scale upwards as computing bandwidth capacities increase. The hallmark of the new environment will be variety (Bollier, 1996).
12. […] , so there are likely to be diverse modes of payment in cyberspace (Release 1.0, January 24, 1995) (Bollier, 1996).
13. According to Hermans, "Agent empowered software that is as effective as a librarian for content search will be available in 1998, and may be expected to be used by a significant number of users near the year 2000." (Garcia-Sierra, 1996).

5.2 Collected material for identification of factors

As discussed in Chapter 4.2 the way to gather material for identification of factors influencing forecast outcomes are to be done by gathering factors that authors find important for electronic commerce growth and acceptance. This chapter corresponds with step 1 and 2 in the graphical work model presented in Figure 5. The reminder of Chapter 5.2 displays collected material from authors writing about critical factors for electronic commerce acceptance and growth.

Kalakota & Whinston (1996) provides a generic framework for electronic commerce. The framework describes different factors that support all electronic commerce and how they are interconnected.

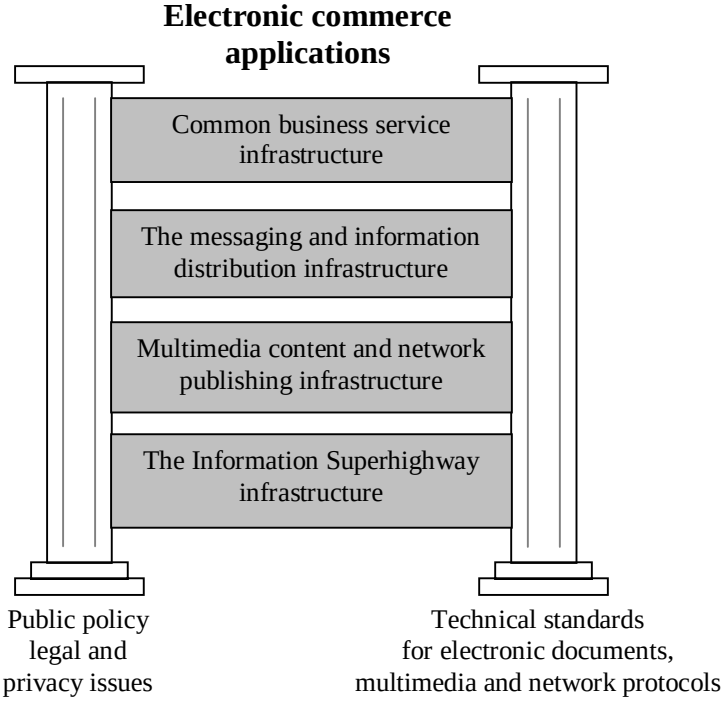

Figure 6. Generic framework for electronic commerce, from Kalakota & Whinston (1996)

Kalakota & Whinston (1996) provides four infrastructural building blocks that support electronic commerce (Figure 6):

- Common business services, facilitating the buying and selling process. For example services concerning security, authentication and electronic payment.
- Messaging and information distribution, i.e. means of sending and retrieving information.
- Multimedia content and network publishing, for creating a product and a means to communicate about it.
- The Information Superhighway. This is the very foundation for providing the system enabling all electronic commerce communication. The Information Superhighway is as important for electronic commerce as the network of interstate highways for traditional commerce (Kalakota & Whinston, 1996).

The two pillars (Figure 6) supporting both electronic commerce, infrastructure and applications, are indispensable for electronic commerce (Kalakotka & Whinston, 1996):

- Public policy. Laws, standards and general agreements governing such issues as universal access, privacy and information pricing.
- Technical standards. Creating compatibility in information transport and user interfaces.

Another author writing about different parameters necessary for electronic commerce success is Fredholm (1998). He states three wide parameters:

- Technology
- Business
- Organisation

The technique parameter involves network, hard- and software demands. This wide parameter coincides with Kalakota & Whinstons (1996) *technical standards* pillar as well as their *messaging and information*, *multimedia content* and *Information Superhighway* building blocks (Figure 6). The next parameter, business, stresses that—for electronic commerce to prosper—it is important to apply the technique in a way that increases the opportunities to do business. The organisation parameter, deals with the fact that it is difficult to adapt the organisation to new techniques and ways to do business electronically.

Yap (1997) states three barriers that raises obstacles to electronic commerce development. According to Yap—for electronic commerce to prosper—these barriers must be overcome. The barriers are:

- Security
- Information Privacy
- Legal Obstacles

In the security barrier Yap includes confidentiality, authentication and integrity aspects. He argues that security aspects have become more important to the internet as web based commerce has become more important. This barrier is covered in Kalakota & Whinstons (1996) model (Figure 6) by the *common business services infrastructure*-building block. The next barrier—Information Privacy—can be raised unconsciously when trying to tear down the security barriers (Yap, 1997). In trying to solve security problems it is easy to create new privacy problems, such as loss of anonymity. The Information Privacy barrier corresponds to the *Public policy*-pillar in Kalatota & Whinstons (1996) model (Figure 6). The last barrier also corresponds to the *Public policy*-pillar (Figure 6) in Kalakotas &Whinstons (1996) model. This barrier is labelled Legal Obstacles, and is, according to Yap (1997) raised from the use of differing legal systems in different countries, i.e. legal systems in different countries may allow and prohibit different things. This raises a problem because the internet—which the laws are supposed to control—is international, covering most of the planet. Thereby it is often unclear which countries' laws that can be applied to the internet (Olsson, 1996).

Toohey *et al.* (1998) stresses the importance of the use of multimedia applications. They argue that, small businesses, in order to get maximum prosper out of electronic commerce must use multimedia to communicate with their customers. Toohey *et al.* (1998) provides a graphical model for categorisation of different kinds of electronic commerce frameworks:

High Interactivity	Text based chat systems	Multimedia Audio-visual group support
	Text based e-mail and Messaging	Graphical non-interactive transfer eg., web graphics
Low		**High Context Richness**

Figure 7. Electronic commerce frameworks (Toohey et al., 1998)

Toohey *et al.* (1998) argues that small businesses can profit from the use of multimedia applications, due to their high interactivity and context richness, in web based shopping (Figure 7). Multimedia applications can, for instance be audio or video applications.

OECD (1997) raises the question of payment over networks (internet). They argue that when the technical problems of fund transfer over a network has been solved, and there exists a payment method that is widely available and used, electronic commerce will be stimulated. Also Kalakota & Whinston (1996) stresses the importance of prompt and secure payment for business-to-consumer electronic commerce, claiming that the payment process is a potential bottleneck in the fast-moving electronic commerce environment.

6 Factors material analysis

6.1 Compilation of factors

The material presented in Chapter 5.2 will in this chapter be used in order to identify factors that can influence development and thereby forecast correctness. The work presented in this chapter corresponds to step 3a in the graphical work model presented in Figure 5.

The choice of factors are based on the topics of the collected forecasts, and is thereby not meant to be covering all of the business-to-consumer field. Further criteria for the factors are that they must be general in that way that factors that only have an impact on a specific forecast will not be used. For example: the use of technical standards in a specific country will not be considered as a factor even though it can affect forecasts of sales in online commerce in that country, on the contrary a factor describing the use of technical standards in general can be used, since it can be used in a general way.

The factors that will be used are:

I. Uniform laws

II. Customer multimedia interface

III. Funds transfer systems

IV. Security/Privacy

V. Integration in business

VI. Technical standards

VII. Available technology

I. *Uniform laws*, this factor is based on the work by Kalakota & Whinston (1996), which covers this aspect in their *Public policy* pile (Figure 6), and Yap (1997) whom also stresses the importance of uniform laws for all actors in the electronic commerce field.

II. *Customer multimedia interface*, this factor deals with the consumers needs of multimedia interfaces in online shopping (Toohey *et al*., 1998). According to Toohey *et al.* (1998) a high degree of multimedia use will increase consumers' interest in online shopping.

III. *Funds transfer systems*, this factor is based on the need of well functioning and widely accepted payment systems for online shopping (OECD, 1997). This factor has two features; technical aspects of online payment and consumer acceptance.

IV. *Security/privacy.* The security/privacy factor deals with the problems of only letting approved persons access information while not intruding on privacy features such as anonymity (Olsson, 1996; Yap, 1997).

V. *Integration in business*, this factor deals with the integration of electronic commerce in businesses and their organisations (Fredholm, 1998). According to

Fredholm (1998) this integration is important to get the most value out of electronic commerce.

VI. *Technical standards.* This factor is named *technical standards* and is based on material from Kalakota & Whinston (1996) and Fredholm (1998). Kalakotas & Whinstons *Technical standards* pillar is concerned with the need of compatibility in user interfaces and information transportation, created trough the use of technical standards. Fredholms (1998) *technology* parameter also stresses this need in terms of software technology

VII. *Available technology.* This last factor deals with purely technical aspects of electronic commerce. These aspects are covered by Fredholms (1998) *Technology* parameter. The available technology is of course the very foundation for all sort of online commerce. Without proper technologies there will be no electronic commerce.

6.2 Justification of choice of factors

The chosen factors aims to cover all of the collected “factors-material” presented in Chapter 5.2. The reason for this is that it is favourable if the chosen factors can be used to explain the whole area, and aspects, of business-to-consumer electronic commerce. That way a complete analyse of the results from the forecasts evaluation might be done.

7 Forecast analysis

This chapter corresponds to step 3b (Figure 5) in the chronological work model presented in Chapter 4. The aim of the chapter is to go through and categorise the forecast material collected in Chapter 5 in order to make it possible to use for evaluation.

7.1 Categorisation method

To enable the categorisation of the forecasts in a structured way, an method is used. Figure 8 graphically displays this method:

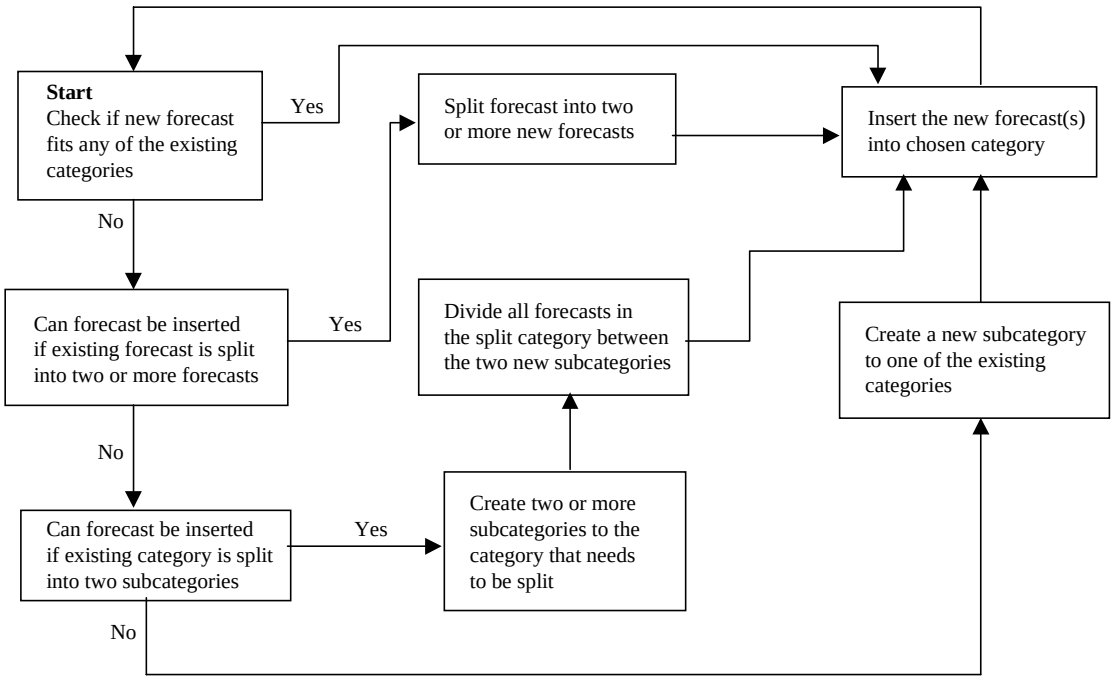

Figure 8. Graphical description of categorisation method.

The first step in this method involves checking if the forecast to be categorised (the new forecast) fits any of the existing categories. If this is the case, the forecast is inserted in the category.

If the forecast does not fit any existing category, check if the forecast can be inserted into a category if an existing category is split. If the answer to this question is *yes*, create two new subcategories to the category that is split. Then divide the forecasts in the split category between the two new subcategories and insert the new forecast into chose category.

If the answer is *no*, check if forecast can be inserted into existing category if forecast is split into two or more new forecasts. If it is so, split the new forecast into two or more forecasts then insert these into chosen categories.

If the new forecast can not be split, create a new category as a sub category to any of the existing categories, and insert the forecast in the new category.

7.2 Material

The forecasts presented in Chapter 5.1 are—according to the problem formulated in Chapter 3—to be categorised. This categorisation will facilitate the evaluation, since very different types of forecasts cannot be evaluated in the same way. The categorisation will be conducted in a way that all forecasts belonging to a specific base category can be evaluated in the same way. The categories are created in a hierarchical manner so that similarities between different base categories are captured by a category at a higher level.

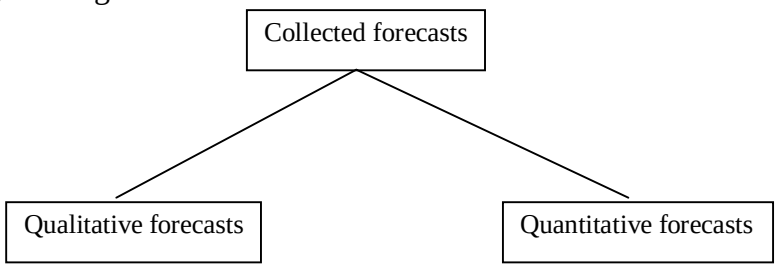

Figure 9. Basic hierarchical categorisation of forecasts

Figure 9 displays the basic categorisation of forecasts that is described in Chapter 2. This distinction between forecasts with quantitative and qualitative outcome is well founded in literature (Patel & Davidson, 1998). However, these two categories of forecasts are not enough to categorise the collected forecasts, since it is stated in the problem formulation that all forecasts in one category are to be evaluated in the same way. The creation of further categories will be done by examining the collected forecasts. The remaining part of this chapter deals with this examination and categorisation of the collected forecasts:

1. Forrester Research Inc. says consumers rang up $530 million in online transactions in 1996 and will drive that up to $7.17 billion by the year 2000 (Staffnet, 1998).

This first forecast clearly belongs to *quantitative* category because it predicts the future in terms of figures that can be mathematically evaluated. Because of the need of a more detailed categorisation than the one presented in Figure 9 (see above), a new category will be created for this forecast. This category will be named *EC growth* because of the topic of the forecast; growth of EC sales.

2. Currently, Internet commerce is quite small, representing at most about US$ 500 million world-wide […] The most conservative forecasts expect growth of at least ten-fold for three to four years, and the most optimistic foresee about US$ 780 billion in 2000 (Killen and Associates) (OECD, 1997).

The second forecast fits, like the first one, in the *quantitative* category. This is because it predicts sales in internet commerce in actual figures ($780 billion). Since this forecast can be evaluated in the same way that forecast number 1, it will also fit in the *EC growth* category.

3. Industry analysis facts and figures for the latter half of 95/96 financial year include; Internet-based commerce will hit $150 billion by 2000 and more than $1 trillion by 2010; sales generated via the web were projected to grow from $17.6 million in 1994 to nearly $400 million in 1995 […] the number of sites using the internet for product transactions will increase from 14% in 1995 to 34% in 1996 and 44% in the next three years.

The third forecast is like the two first clearly belonging to the *quantitative* category. So far so good, but further examination of the forecast unveils that it is composed of two parts, which, maybe, cannot be evaluated in the same way. The first part of the forecast describes future electronic commerce sales in actual figures, while the latter part deals with percent figures. This calls for the forecast to be split up into two parts that can be categorised separately:

3a. Industry analysis facts and figures for the latter half of 95/96 financial year include; Internet-based commerce will hit $150 billion by 2000[…]

Forecast 3a shows enough resemblance with forecast number 1 and 2 to be categorised in the *EC growth* category.

3b. […] the number of sites using internet for product transactions will increase from 14% in 1995 to 34% in 1996 and 44% in the next three years.

The topic of this forecast, increase of product transactions, makes it clear that it fits into the *EC growth* category. However, as discussed above, this forecast—as opposed to the other forecasts in the category—predicts the future growth in percent figures rather than actual figures. This raises the need for a split of the *EC growth* category into two new categories; the *Actual figures* category and the *Percent figures* category.

Forecasts 1, 2 and 3a will be put into the *Actual figures* category, while forecast 3b will be put into the *Percent figures* category. Figure 10 displays the state of the category-tree after the categorisation of forecast 3b.

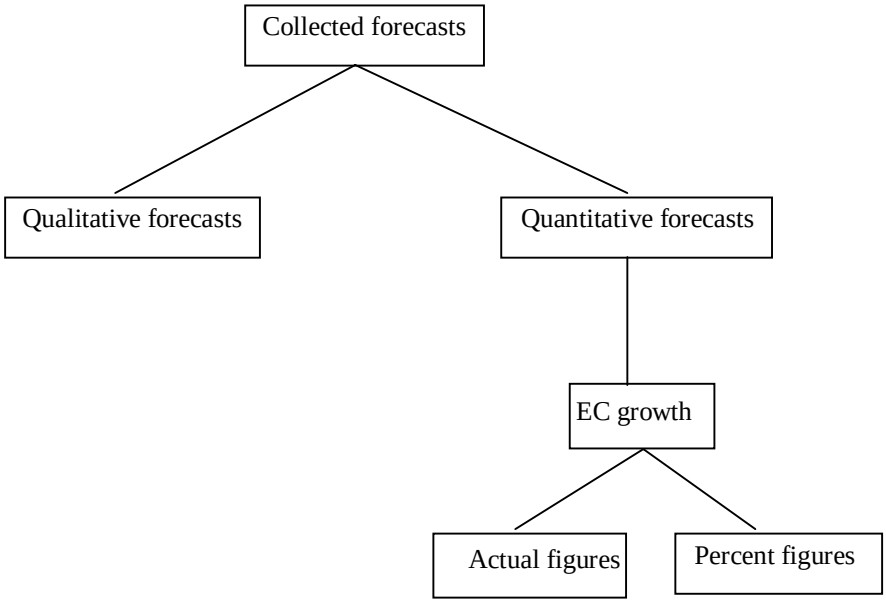

Figure 10. Hierarchical description of categories

4. The Yankee group in Boston estimates consumers spent $730 million in 1996; by the year 2000, consumers will account for $10 billion in e-commerce sales (Staffnet, 1998).

Forecast number 4 clearly fits into the quantitative category, as its topic deals with the growth of consumer spendings it also fits the *EC growth* category. Because the forecasts predicts future sales in actual figures it will be categorised in the *Actual figures* category.

5. WEFA projects that by the year 2000, sales on the Internet will hit $13.8 billion (Info-Tech, c. 1996)

Like forecast number 4, and for the same reasons, this forecast—number 5—is categorised in the *Actual figures* category.

6. Jupiter Communications expect the number of U.S. households online to rise from 14.7 million in 1996 to 36 million by the year 2000 (Staffnet, 1998).

Forecast number 6 predicts the number of online households to grow in quantitative terms (36 million). This makes it possible to put it under the *quantitative* category. Since it predicts growth of the electronic commerce market it also fits the *EC growth* category. However it does not fit any of the existing base categories. To solve this problem two new subcategories are created under the *EC growth* category. The new categories are named *Sales* and *Market.* All forecasts, previously belonging to the *EC growth* category are put in the *Sales* category, while forecast number 6 is put into the *Market* category, since online households form the market for business-to-consumer electronic commerce. Figure 11 displays the categories after the categorisation of forecast number 6.

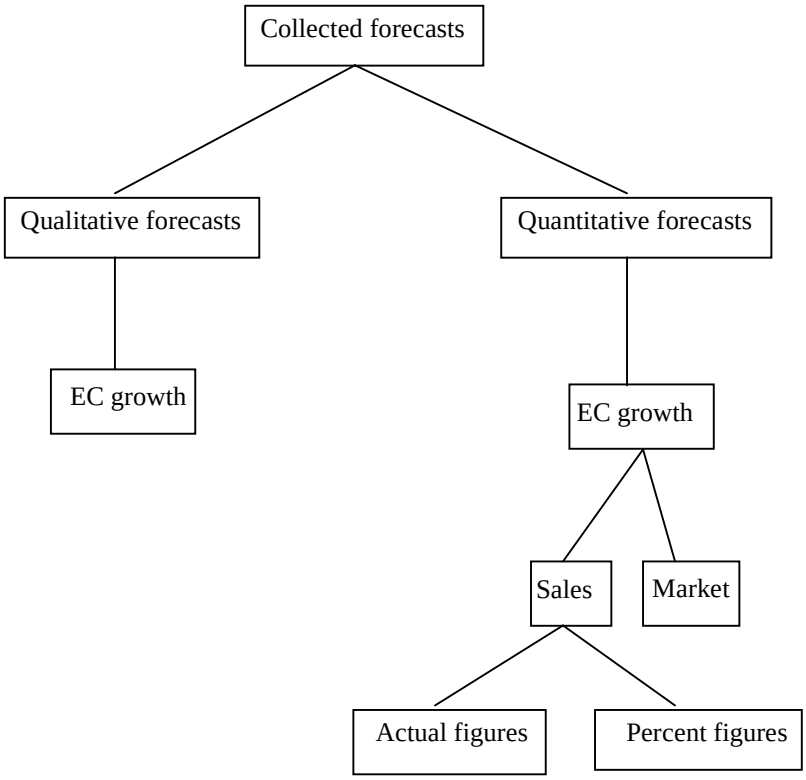

Figure 11. Hierarchical description of categories

7. Within 18 months, the base of connected PCs grew 20 times, to an estimated 10 million people in October 1995-a number estimated to rise to 52 million by the year 2000, according to Forrester Research (Bollier, 1996).

This forecast, number 7, is placed in the *Market* category because it predicts the rise of the number of people with connected PCs, a topic that fits the *Market* category. This categorisation is OK since the forecast also fits the *quantitative* and the *EC growth* categories.

8. According to projections by IDC, by 2000, 46 million consumers in America alone will be buying online, spending an average of $350 a year each. (Staffnet, 1998)

Forecast number 8 belongs to the *quantitative* as well as the *EC growth* categories because it predicts the growth of the EC market (number of consumers) and the sales (customer spendings) in quantitative terms. However it does not fit any single one of the *Sales* and *Market* categories, since the first part of the forecast deals with the market and the latter part with EC sales. This raises the need to split forecast number 8 into two new forecasts, 8a and 8b, that can fit the existing categories.

8a. According to projections by IDC, by 2000, 46 million consumers in America alone will be buying online[…]

As the argumentation above shows forecast number 8a fits in the *Market* category and is therefore put in the *Market* category.

8b. […] by 2000 […] consumers in America […] will be […] spending an average of $350 a year each.

Forecast number 8b is, based on the argumentation above placed in the *Sales* category. Because it predicts future consumer spendings in actual figures rather than percent figures this forecast is categorised in the *Actual figures* category.

9. Forrester Research predicts that three non-technology segments will drive revenues from the Internet in the year 2000: 1) content; 2) financial services; and 3) consumer retail. Improved security and the increasing number of households on the web will drive consumer retail to $7 billion in 2000 (Staffnet, 1998).

The forecast number 9 does not fit neatly into neither the *quantitative* nor the *qualitative* category. This is because the first part of the forecast is clearly qualitative, dealing with the future prospects of different features on the internet in qualitative terms, while the latter part of the forecast predicts the growth of EC consumer retail in quantitative terms. Forecast number 9 is therefore split into two new forecasts, 9a and 9b.

9a. Forrester Research predicts that three non-technology segments will drive revenues from the Internet in the year 2000: 1) content; 2) financial services; and 3) consumer retail. (Staffnet, 1998)

As discussed above, this forecast fits the *qualitative* category. Since there are no base categories in this branch of the tree (Figure 11), a new category must be created. This category is named *EC growth* since the forecast predicts that consumer retail will drive revenue, and thereby grow, from the internet. The fact that the forecast also predicts that contents and financial services will drive revenue from the internet is not of interest to this work since it deals exclusively with business-to-consumer electronic commerce, and that financial services and content is not considered to belong to business-to-consumer electronic commerce. Figure 12 shows the state of the category-tree after the categorisation of forecast number 9a.

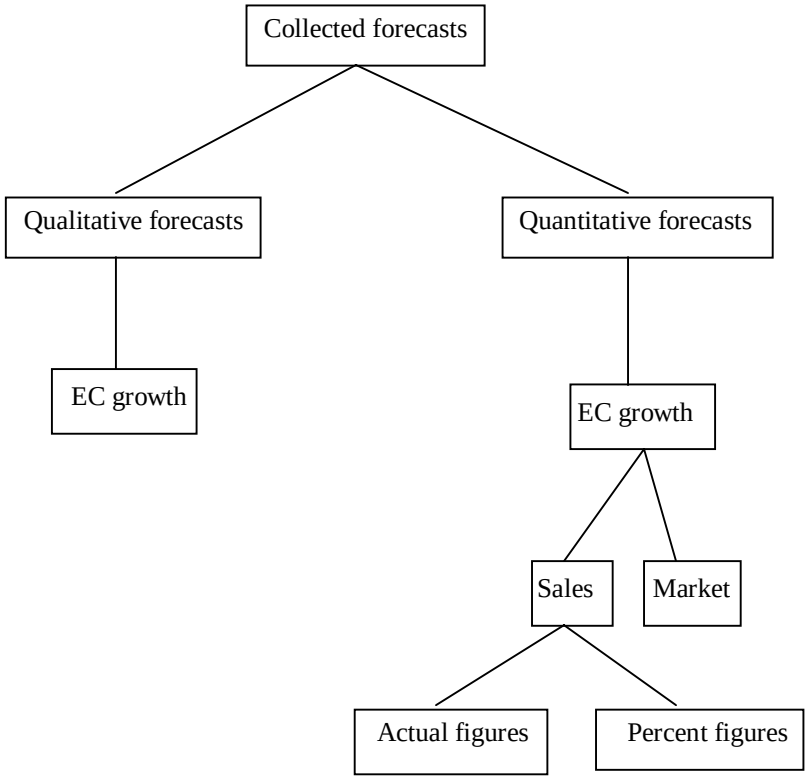

Figure 12. Hierarchical description of categories

9b. Improved security and the increasing number of households on the web will drive consumer retail to $7 billion in 2000. (Staffnet, 1998)

Forecast 9b is placed in the *Actual figures* category because it deals with the growth of consumer retail (sales) in the future, measured in actual figures.

10. Women shoppers spent approximately $368 million online in 1996, according to Jupiter Communications. By 2000, Jupiter forecasts that this figure will grow to nearly $3.5 billion, based on the ever-increasing numbers of women going online (Staffnet, 1998).

Forecast number 10 fits the quantitative category since it predicts the future in quantitative terms. It also fits the *EC growth* category, since it deals with this topic. However the forecast does not fit very well into the *Sales* or *Market* category since the forecast more deals with demographic aspects of internet users. A new sub category is therefor created under the *EC growth* category. This category is labelled *Demographics.* Forecast number 10 is categorised in the *Demographics* category.

11. […] Piper predicts that the most successful distribution channels will be interactive, three-dimensional, virtual environments, with the ability to scale upwards as computing bandwidth capacities increase. The hallmark of the new environment will be variety (Bollier, 1996).

This forecast predicts how future electronic commerce distribution channels will evolve in qualitative terms, and therefor fits the *qualitative* category. Since the topic of the forecast does not match the existing *EC growth* category (Figure 12) very well, a new category, named *EC channels*, to reflect the topic of the forecast, is created. Forecast number 11 is put in the *EC channels* category.

12. […] , so there are likely to be diverse modes of payment in cyberspace (Release 1.0, January 24, 1995) (Bollier, 1996).

Forecast number 12 clearly fits the *qualitative* category, however since it does not fit any of the existing categories (*EC-channels* and *EC growth*) a new category is created to fit the topic of forecast number 12, which is payment methods. Forecast number 12 is put into this new category, labelled *Payment methods*. A graphical description of the categories after the categorisation of forecast number 12 can be seen in Figure 13.

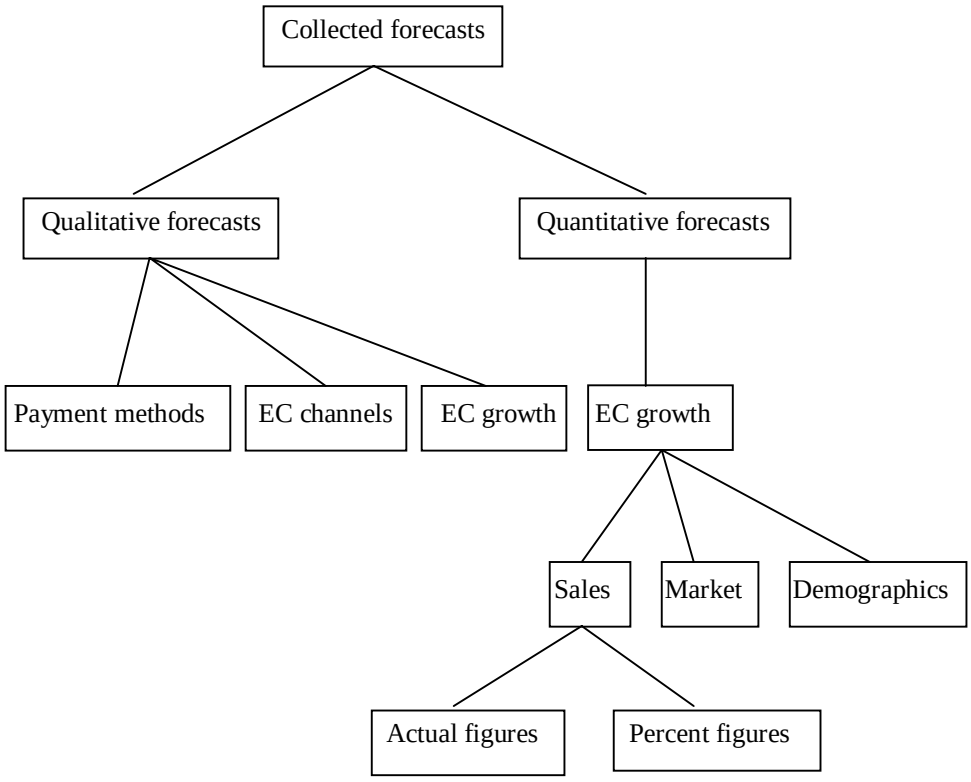

Figure 13. Hierarchical description of categories

13. According to Hermans, "Agent empowered software that is as effective as a librarian for content search will be available in 1998, and may be expected to be used by a significant number of users near the year 2000." (Garcia-Sierra, 1996).

The text in this forecast does not mention electronic commerce explicitly, however like Garcia-Sierra (1996) points out the use of intelligent agents could facilitate more effective electronic commerce, and thereby have an impact on the electronic commerce field. This forecast—number 13—is categorised under the *qualitative*

category. Since its topic, intelligent agents, does not fit any of the existing categories (Figure 13) a new category, named *Intelligent agents* is created and forecast number 13 is put into it.

Figure 14 graphically displays the final state of the categories and table 2 displays which forecasts belong to which category.

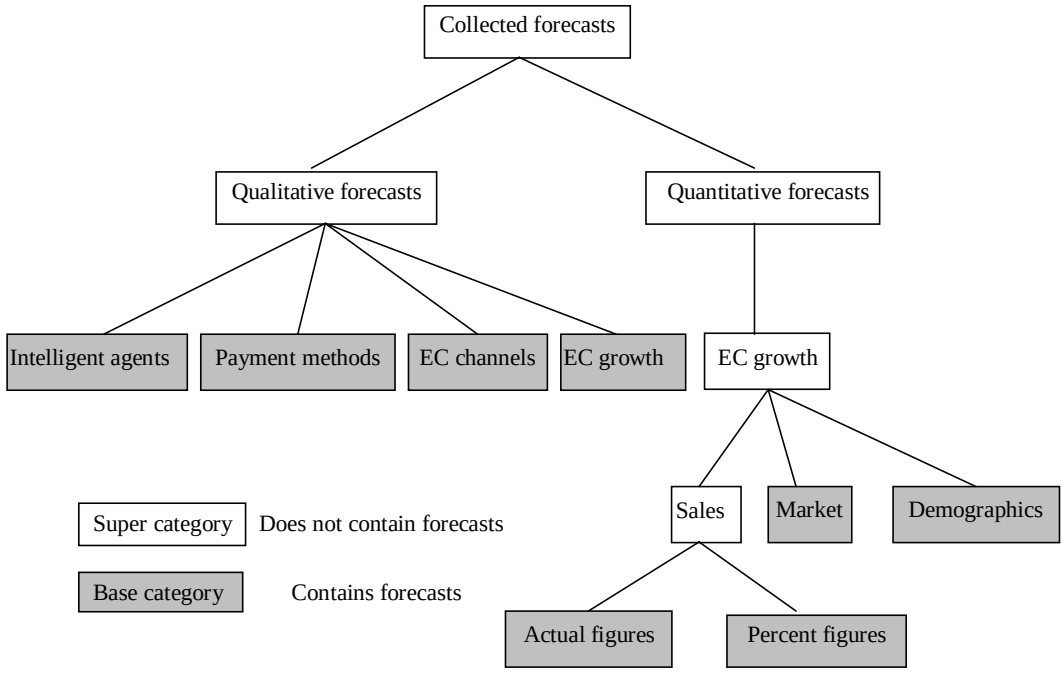

Figure 14. Final graphical description of category hierarchy

7.3 Summary of forecast categorisation

The graphical description of the forecast category hierarchy presented in Figure 14 displays the final state of the category hierarchy. The first level of this hierarchy represents a split between quantitative and qualitative forecasts, i.e. forecasts which outcome can be manipulated with statistical methods and forecasts which outcome must be analysed through informal methods. This separation is supported by the material presented in Chapter 2.

The next level consists, in the qualitative branch, of base categories, i.e. categories containing forecasts. These are: *Intelligent agents*, *Payment methods*, *EC channels* and *EC growth*. All these categories are based on the topics of the forecasts belonging to it. No further subdivision was necessary in this branch and thereby this level is the final level. The second level in the quantitative branch consists of the super category *EC growth*. This category is created to contain all categories containing quantitative forecasts concerning different aspects of electronic commerce growth.

The third level consists in the quantitative branch of three categories, one super category, *Sales*, and two base categories, *Market* and *Demographics*.

The last (fourth) level represents the division between forecasts concerning EC sales which use actual figures and those that use percent figures. These two groups are represented by the two base categories *Actual figures* and *Percent figures.*

Category	Forecasts
Payment methods	12
Intelligent agents	13
EC distribution channels	11
EC growth	9a
Sales-actual figures	1,2,3a,4,5,8b,9b
Sales-percent figures	3b
Market	6,7,8a
Women shoppers	10

Table 2. Summary of categorisation of forecast

8 Evaluation of forecasts

This chapter, which corresponds to step 4 and 5 in the graphical model presented in Figure 5, aims to display the process of choice and application of suitable methods for evaluation of the collected forecasts. As stated earlier, the different categories were created in such a way that all forecasts belonging to a specific category can be evaluated in the same way. During the evaluation of the qualitative categories, it became obvious that this does not hold. The qualitative forecasts displays too big a diversity to enable this. However, the categorisation is useful in another way since forecasts on a common topic need to have certain common terms defined. This is discussed further in Section 8.2.1. The quantitative categories are still used so that all forecasts in a specific category can be evaluated in the same way.

When evaluating the collected forecasts the most important difference between the forecasts is if their outcome are qualitative or quantitative (Patel & Davidson, 1998). Quantitative forecasts can be evaluated using well defined statistical methods, while qualitative forecasts must be evaluated in a more informal way. Because of this difference, evaluation methods for the categories containing qualitative and quantitative forecasts will be dealt with in two different subchapters.

8.1Evaluation methods

8.1.1 Qualitative forecasts

Qualitative forecasts must, as discussed above, be evaluated in an informal way due to their informal content. However—in a wider perspective—qualitative and quantitative forecasts are evaluated in a similar way, by comparing the predicted outcome to the actual outcome. In fact, when it comes to evaluating qualitative forecasts this is all that can be formalised. Thus a method for evaluation of qualitative forecasts simply is to compare the predicted outcome to the actual outcome. The actual comparing cannot be formalised or described more thoroughly because it differs depending on the theme of the forecasts. One big problem when evaluating qualitative forecasts is that they often must be interpreted in order to be evaluated. This problem is so important that it will be separately dealt with in a section of its own.

8.1.2 Quantitative forecasts

In contrast to qualitative forecasts, quantitative forecasts can be evaluated in a formal manner. Because of their common quantitative nature, all categories on the quantitative branch can be evaluated using the same method which will be presented in this chapter.

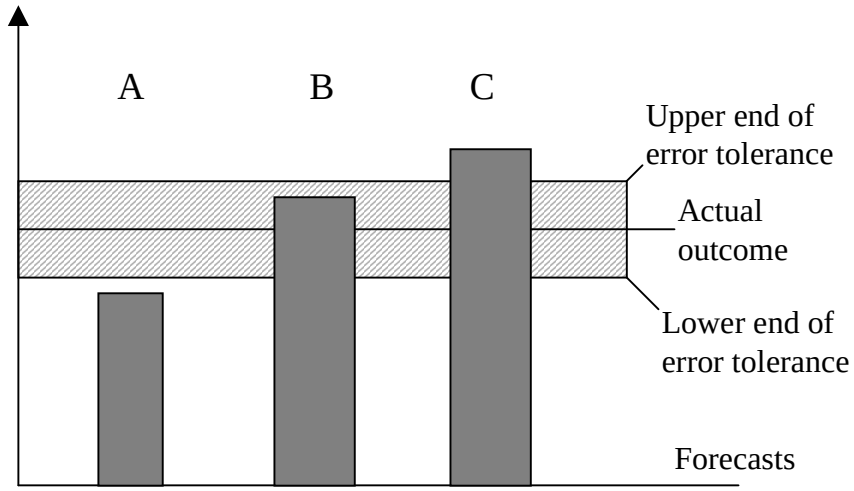

Figure 15. Visual example of evaluation model

The categories can be evaluated by the use of statistical methods. It is for instance possible to evaluate each forecast by comparing its prediction with the actual outcome, and if the prediction matches the outcome the forecast is considered to be *true*, otherwise, if the prediction does not match the actual outcome the forecast is considered to be *false*. Of course, forecasts cannot be considered true only if they match the outcome exactly. If this where the case almost all forecast would fail. Instead a forecast is considered to be *true* if it predicts the outcome within a certain range of the actual outcome, say within ±10% of actual outcome. This is illustrated by Figure 15, which displays three forecasts. Forecast A which will be considered *false* because it does not reach the lower part of the *correct* area, forecast B which is considered *true* because it stays within the correct area and finally forecast C which is considered *false* since it dose not stay within the correct area. When all forecasts in the category are evaluated, the category is considered to be *true* if the *true* forecasts outnumber the *false* forecasts and *false* otherwise. The benefits of this method are that it is easy to use and to apply. The downside is that the evaluation is not very detailed, it only displays whether the forecasts predicts the future correctly or not. Details about how far the prediction is from the actual outcome is lost.

This problem can be solved by applying a different method that takes into account how much each forecast in a category deviates from the actual outcome. The category itself is then evaluated by summarising the outcome from each forecast and calculating a mean divergence (Bergström, 1989). This method benefits from the fact that it is more precise, i.e. describes more details, than the previously described one. The downside is that this evaluation method can give too much details, this is a problem when the evaluated forecasts do not have a high degree of detail or when the actual outcome is unclear. Too much details can in a case like this give a false sense of security, when the evaluation in a sense gives a more detailed result than reality can.

Because of the limited degree of detail in the collected forecasts, many lacking detailed chronological information, the first model described will be used. Forecasts and categories will thereby be attributed either *true* or *false*.

The following formula will be used to evaluate the forecasts and categories:

$$X \text{ is } \begin{cases} \textit{true} \text{ if } |V_f - V_o| \leq V_o * E \\ \textit{false} \text{ otherwise} \end{cases}$$

Where X is a forecast, V_f is the forecasted figure, V_o is the outcome in the real world and E is the error tolerance, for instance 10%. The category itself will then be evaluated by applying the following formula:

$$C \text{ is } \begin{cases} \textit{true} \text{ if } T - F \geq 0 \\ \textit{false} \text{ otherwise} \end{cases}$$

Where C is the category, T is the number of *true* forecasts, F is the number of *false* forecasts.

8.2 Problems with evaluating forecasts

A number of problems have occurred when trying to evolve the different forecasts, like may other forecast features, these problems can be divided into two groups; one that contains problems related to the evaluation of qualitative forecasts and one that contains problems related to the evaluation of the quantitative forecasts. These two groups will be dealt with, each in its own section.

8.2.1 Problems with the evaluation of qualitative forecasts

As discussed in the introduction to Chapter 8, the most striking problem when evaluating the qualitative categories, is that common evaluation methods can not be applied to all forecasts of a particular category. This is because the qualitative forecasts displays such a wide variety of ways to describe a specific topic. It is important to notice, however, that this problem have not caused any practical problems to this work because all of the qualitative categories contains only one forecast. It become obvious during the evaluation however that if any other forecasts were to be added to one of the categories, they would probably not be able to be evaluated in the same way as the forecast already belonging to the categories. The categorisation is not however completely pointless, during the evaluation it become clear that in order to evaluate the qualitative forecasts different key concepts must be defined. For example: all forecasts in the *Payment methods* category needs the term “payment method” defined. The categorisation is then useful because it can serve as a way to share these definitions between different forecasts (belonging to the same category). To sum up: the different categories of qualitative forecasts are not created in order to make it possible for all forecasts in one category to be evaluated in the same way, but rather to make it possible for forecasts belonging to a specific category to share definitions previously made for important concepts in the category.

A basic problem in evaluating the collected qualitative forecasts has been that they need to be *interpreted* in many ways. Take for instance forecast number 13:

13. According to Hermans, “Agent empowered software that is as effective as a librarian for content search will be available in 1998, and may be expected to be used by a significant number of users near the year 2000.” (Garcia-Sierra, 1996).

To be able to evaluate this forecast in a structured way one needs to define what one, or rather the author of the forecast, means with the term *intelligent agents*. What is and what is not an intelligent agent? Another thing that must be addressed is what can and can not a librarian perform in the field of content search. And finally it must be defined what the term "a significant number of users" mean (is 20% a significant number of users, or perhaps 30% or 50%?). This type of statement is very hard to interpret and therefore makes the forecast very difficult to evaluate.

The pervading problem when evaluating the collected qualitative forecast has accordingly been twofold. To find out how the author defined different concepts, something that the context often does not unveil, and to decide on, and motivate, whether the forecast has come true or not. These problems have imposed such a significant setback in evaluation quality that it must be taken into consideration when judging the results. How the problems have been dealt with for each forecast will be described when the forecast is evaluated.

8.2.2 Problems with the evaluation of quantitative forecasts

Some of the problems affecting the evaluation of the qualitative forecasts also applies to the quantitative forecasts. The problem of interpretation is for instance also valid for the quantitative categories. What does it for instance mean that "36 million households are online" (compare forecast 6)? Does it mean that 36 million households have access, one way or the other, to the internet, or does it mean that 36 million households have internet access in their home? These types of problems impose some problems when evaluating the quantitative forecasts, but in no way as big as the problems met with evaluating qualitative forecasts.

A problem that has inflicted bigger setbacks to the evaluation of the quantitative forecasts is a time problem. It seems that the turn of the millennium have a certain appeal to forecast makers. Of all the collected forecast stating a specific year when some thing will or will have occurred, all, that is 11 out of 11, forecasts use the year 2000. Since this report is written during the first half of 1999, this of course creates a problem. How can one evaluate a forecast that states that something will happen by the year 2000, already in the spring of 1999? This is a serious problem when evaluating the quantitative forecasts and the results must be judged thereafter.

In more detail, the forecasts use two different ways of referring to the year 2000; *by the year 2000* and *in the year 2000.* This difference is important when evaluating the forecasts. One interpretation of these terms, and the one that will be used in this work, is that forecasts that use the term *by the year 2000* will be true if the condition set by the forecast is met *before* the end of year 2000. This makes it possible to evaluate the forecasts today (first half of 1999) if the condition is met by today. The formulation *in the year 2000* is more troublesome however, since it implies that the condition set must be true during the year 2000, about which it is impossible to have exact knowledge today.

8.3 Evaluation of qualitative categories

This chapter displays how qualitative categories (Figure 16) are evaluated and presents the results from the evaluation. The results from each category are presented

in a separate subchapter. The work presented in this chapter corresponds to step 5 in the graphical work model presented in Figure 5.

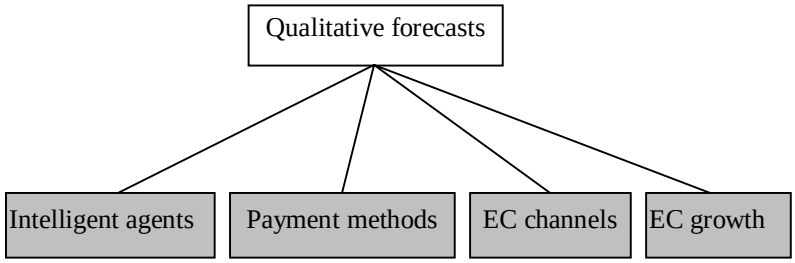

Figure 16. Graphical description of qualitative categories

8.3.1 Intelligent agents

This section contains forecast number 13:

13. According to Hermans, "Agent empowered software that is as effective as a librarian for content search will be available in 1998, and may be expected to be used by a significant number of users near the year 2000." (Garcia-Sierra, 1996).

As already described in Chapter 8.2—to evaluate this forecast—one needs to define the term *intelligent agent* and find out how effective a librarian is when it comes to content search. The term *a significant number of users* must also be defined.

According to ETHOS (n.d.) there exists no commonly accepted definition of intelligent agents. However ETHOS provides the following description of intelligent agents which will be used as a definition:

> […] they [intelligent agents] are software entities that assist people and act on their behalf. Intelligent Agents are characterised by their use of artificial neural network technology, and other fuzzy-matching paradigms typically developed in artificial intelligence departments. (ETHOS, n.d.)

This forecast, number 13, will be considered as *false*. The reason for this is that the forecast states that there will be intelligent agents available in 1998 that is as effective for content search as a librarian. As discussed above this raises the need to define what a librarian can and cannot do in terms of content search. One great advantage that a librarian still has over an intelligent agent is that the librarian is not limited to electronic media, but can search all different types of media, for instance books. An intelligent agent on the other hand is still, and in the foreseeable future, limited to search data that is displayed electronically, on the internet or elsewhere. Should however intelligent agents in the future be able to search through printed information, or, more likely, if the importance of books and papers as information carriers will diminish, then the forecast might come *true*. In the mean time however forecast number 13 is considered as *false.*

8.3.2 Payment methods

The Payment methods category contains forecast number 12:

12. […] , so there are likely to be diverse modes of payment in cyberspace (Release 1.0, January 24, 1995) (Bollier, 1996).

Like all the collected qualitative forecasts this forecast needs to be interpreted before it can be evaluated. So what does it really say? The key word in this forecast is *diversity*. If it exists a diversity of payment methods in cyberspace it is *true* otherwise it is *false*. The term diversity has been interpreted in the following way: If it exits more than one payment method in cyberspace that is frequently used, the forecast is *true* and otherwise it is *false*. This interpretation creates a new problem; when is a payment method *frequently used*? This problem will be dealt with below. Another problem in evaluating this forecast is that it does not specify a specific time when the forecast will be true. This problem have been dealt with in the following way; the forecast is evaluated using the facts that are available at the time of the writing of this report (first half of 1999). This forecast is considered to be *true*, since, even though traditional, non-secure, credit card payments still are the most frequent payment method, there exists alternatives. One example is SET (Secure Electronic Transaction), which is a method to make credit card payments over a network more secure and which is used on a commercial basis (Loshin & Murphy, 1997).

8.3.3 EC distribution channels

This category contains one forecast; number 11:

11. […] Piper predicts that the most successful distribution channels will be interactive, three-dimensional, virtual environments, with the ability to scale upwards as computing bandwidth capacities increase. The hallmark of the new environment will be variety (Bollier, 1996).

This forecast suffers, like forecast number 12, from the fact that is does not specify a specific date when it should have come true. This problem is solved in the same way like forecast number 12, i.e. it is evaluated according to the circumstances at the time of the creation of this report (first half of 1999). Another problem when evaluating this forecast is that it must be interpreted. Especially the term *interactive, three-dimensional, virtual environments* must be defined.

The primary distribution channel for business-to-consumer is today the WWW (World Wide Web). On the WWW, html-based sites are standard. These sites are almost all graphically two dimensional. One could argue that the use of different sorts of sounds, especially common on shopping sites specialised on music records, makes up a third dimension. But this forecast will yield *false* anyway, since the forecast predicts a diversity of distribution channels. Because of the dominance of html-based WWW sites, this diversity can not be considered to be *true*.

Since all forecasts in this category is *false*, the category, EC distribution channels, is considered to be *false*.

8.3.4 Qualitative-EC growth

9a. Forrester Research predicts that three non-technology segments will drive revenues from the Internet in the year 2000: 1) content; 2) financial services; and 3) consumer retail. (Staffnet, 1998)

As stated earlier (Chapter 7) the only part of this forecast that is of interest to this work is the *consumer retail* part. Given this fact the forecast states that consumer retail will drive revenues from the internet in the year 2000. Because of the formulation, *in the year 2000,* this forecast is formally impossible to evaluate in 1999, when this report is written, because one can have no exact knowledge of what is going to happen in the year 2000. However the forecast can be evaluated in that way that it is beyond doubt that until now consumer retail have driven revenues from the internet (Bollier, 1996), and it is hard, if not impossible, to find authors that think consumer retail will decrease in importance on the internet in the future. Based on these facts forecast number 9a is considered to be *true.*

Since the single forecast in this category is *true*, the whole category yields *true.*

8.4 Evaluation of quantitative categories

The material presented in this chapter corresponds to step 5 in the graphical model presented in Figure 5. Evaluation and results will be presented for each category in a separate section.

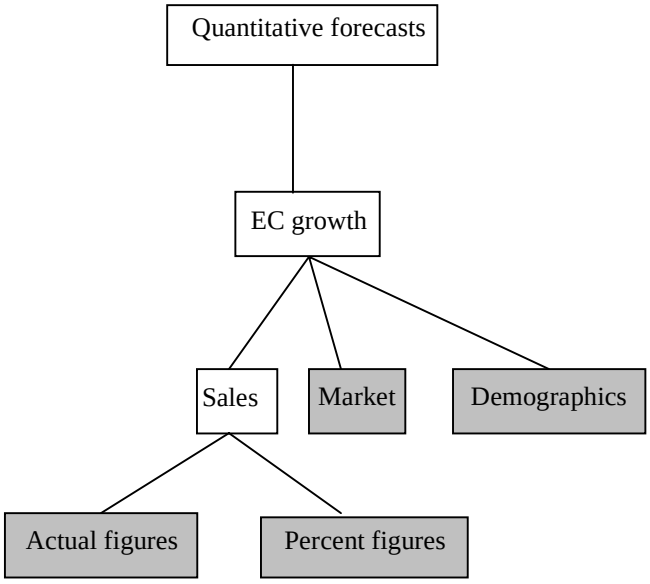

Figure 17. Graphical description of quantitative categories.

8.4.1 Sales-actual figures

The forecasts in this category all displays different figures of how online sales will develop in the future. The actual outcome which these forecasts have been evaluated by is $13 billion 1999 (Ernst & Young, 1999).

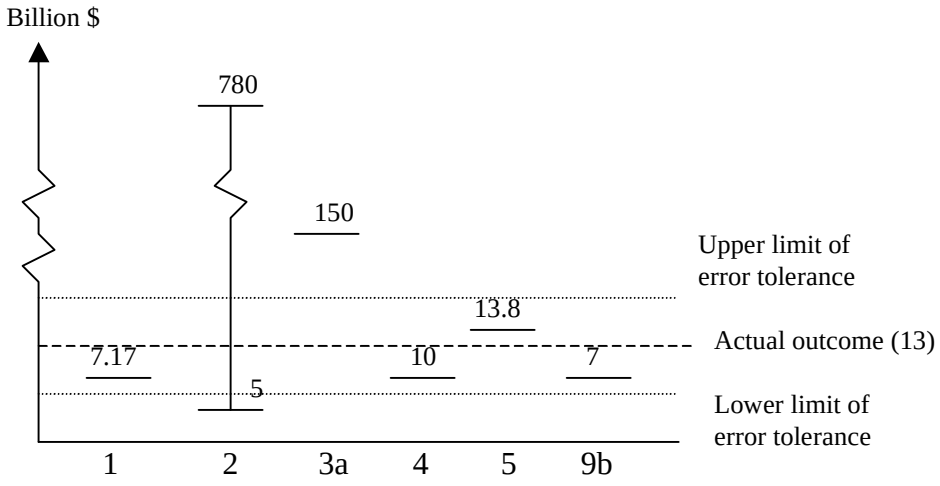

Figure 18. Graphical description of internet sales predictions

This category contains the forecasts 1,2,3a,4,5,8b and 9b which are evaluated using the formula given in Chapter 8. Since all forecasts exhibits small variances in their content, some for example covering American consumers EC spendings (8a), others covering consumers EC spendings as a whole (1,2,3,4,5,9b). Figure 18 displays the forecasts graphically, with the actual outcome and the error tolerance displayed. The remaining part of this section will present these forecasts and their evaluation:

1. Forrester Research Inc. says consumers rang up $530 million in online transactions in 1996 and will drive that up to $7.17 billion by the year 2000 (Staffnet, 1998).

Forecast number 1 possesses, like many of the others, the problem of exact timing which is discussed above. The term, *by the year 2000,* is the root of this problem since the forecast doesn't state explicitly when EC sales will be $7.17 billion. However, the forecast is interpreted so that it will be true if EC sales up to today have reached $7.17 billion, otherwise the forecast will be reckoned as impossible to evaluate and be dismissed from this work.

Given the fact that the US company Intel inc., on its own, generates a sale of $1 billion each month trough internet commerce (NUA, 1999b), a total sale of at least $7.17 billion most likely will be created by the total group of businesses operating on the web. In fact, estimates show that sales, generated to customers trough the internet (Ernst & Young, 1999) will rise up to $13 billion. Using the formula given in Chapter 8, and a error tolerance of 50% gives the following results:

$$\$13 \text{ billion} - \$7.17 \text{ billion} \leq \$13 \text{ billion} * 0.5$$

And thereby forecast number 1 yields *true.* A error tolerance of 50% might seem high but given the many sources of error when creating forecasts (Makridakis & Wheelwright, 1987) and the fact that the collected forecasts differs a lot, between $530 million and $780 billion, 50% is considered as an acceptable error level. A

smaller error level require to big accuracy of the forecasts while a bigger error level might make forecast that predict sales far away from the actual outcome to come true.

2. Currently, Internet commerce is quite small, representing at most about US$ 500 million world-wide […] The most conservative forecasts expect growth of at least ten-fold for three to four years, and the most optimistic foresee about US$ 780 billion in 2000 (Killen and Associates) (OECD, 1997).

This forecast is not very well formulated because it will yield *true* if internet commerce is between $0.5 billion and $780 billion, which is a very large area, making the forecast most likely to turn out *true*. This forecast also suffers from the time problem discussed above, since it states that a certain sale will be met *in* [the year] *2000*. Of course this makes it hard to evaluate. However, given the fact that it has a very wide scope, and that it is very hard to find authors claiming that business-to-consumer electronic commerce will decline in the next year, forecast number 2 is considered *true*. This decision is based on the fact that the Intel company, on its own, generates a sale of $1 billion each month through the internet (NUA, 1999b), and thereby the lower limit ($5.3 billion) is passed.

3a. Industry analysis facts and figures for the latter half of 95/96 financial year include; Internet-based commerce will hit $150 billion by 2000[…]

Like some of the previous forecasts this forecast can only be evaluated if sales generated trough internet based commerce already have reached $150 billion. Given the fact that internet sales will be around $13 billion this year (Killen, 1999), this forecast can hardly be evaluated since it is not known what will happen to internet sales up until the end of year 2000. Forecast 3a is therefore not evaluated.

4. The Yankee group in Boston estimates consumers spent $730 million in 1996; by the year 2000, consumers will account for $10 billion in e-commerce sales (Staffnet, 1998).

Because the formulation, *by the year 2000*, this forecast, like forecast number 1, can only be evaluated if consumers spent more $10 billion on internet commerce by today (first half of 1999). Otherwise the forecast can not be evaluated because it is not possible to have any exact knowledge about events, in the year 2000, today. The forecast is however considered to be *true* since:

$$\$13 \text{ billion} - \$10 \text{ billion} \leq \$13 \text{ billion} * 0.5$$

Forecast thereby matches the conditions for a *true* forecast given in the formula in Chapter 8.

5. WEFA projects that by the year 2000, sales on the Internet will hit $13.8 billion (Info-Tech, c. 1996)

Since sales on the internet is estimated to be $13 billion for 1999, and forecast number 5 predicts $13.8 billion, this forecast cannot be evaluated. This is because it is not possible to know if internet sales will rise another $800 million by the year 2000, i.e. before the end of year 2000. However, given the growth of electronic commerce up until now, it is likely that the forecast will be quite accurate. But, as already mentioned, the time period set in the forecast makes it impossible to evaluate at this time (first half of 1999).

8b. […] by 2000 […] consumers in America […] will be […] spending an average of $350 a year each.

To be able to evaluate this forecast the term "America" must be defined. Does "America" label the whole American continent or only the United States. From now on "America" will be interpreted as the U.S. A survey which results are presented in IS (1999) shows that the largest part of the consumer group spent between $51 to $500. The forecast estimates spendings to be $350 per person an average. A figure which is well within the boundaries of $51 - $500, and therefor forecast 8b will be considered to be *true*.

9b. Improved security and the increasing number of households on the web will drive consumer retail to $7 billion in 2000. (Staffnet, 1998)

Forecast number 9b is considered to be *true* since:

$$\$13 \text{ billion} - \$7 \text{ billion} \leq \$13 \text{ billion} * 0.5$$

The reason why this forecast is able to be evaluated is because the figure that it sets for year 2000 have already been met.

Five (1,2,4,8b and 9b) forecasts in the *Sales-actual figures* category has been evaluated as *true*. No forecasts has been attributed *false*, and two (3a and 5) forecasts has not been able to evaluate. Therefore the outcome aspect of the category will be considered as *true*.

8.4.2 Sales-percent figures

This category contains one forecast, number 3b. Each of them will be evaluated on its own:

3b. […] the number of sites using internet for product transactions will increase from 14% in 1995 to 34% in 1996 and 44% in the next three years.

This forecasts has not been possible to evaluate because it has not been possible to find relevant statistics. However it is known that the number of commercial sites on the internet (.com) were 50% of the total number of sites 1996 (Kolding, 1996). All of these sites does however not support product transactions since many of the only contains PR information related to the company.

8.4.3 Market

This section includes a evaluation of the three forecasts 6, 7 and 8a which will be evaluated separately:

6. Jupiter Communications expect the number of U.S. households online to rise from 14.7 million in 1996 to 36 million by the year 2000 (Staffnet, 1998).

This forecast can only be attributed *true* or *false* if the prediction of 36 million US households online, today. This is, like some of the forecasts above because of the formulation *by the year 2000*. Unfortunately it have not been possible to find suitable statistics to evaluate this forecast. But, since according to Jupiter (1999), there is a population of about 60 million Americans (U.S.) who are online, and given the assumption that the average American (U.S.) household holds more than 2 persons, the figure 36 million households online have probably not yet been reached. This assumption is strengthen by the figures presented by Jupiter (1998) who claim that 31 million American households were online by the second quarter of 1998. Given these figures it is not unlikely that the forecast will be quite accurate. Formally this category will be considered as not possible to evaluate.

7. Within 18 months, the base of connected PCs grew 20 times, to an estimated 10 million people in October 1995-a number estimated to rise to 52 million by the year 2000, according to Forrester Research (Bollier, 1996).

ConPCs (1997) says that 82 million PCs was online by the end of 1997. It seems unlikely that the number of connected PCs will decrease until the year 2000, so the prediction of 52 million connected PCs have already come true, and can thereby be attributed a *true* or *false* label. The forecast will be evaluated by the use of the formula presented above, with the use of a error factor of 50%, and since:

$$82\text{ million} - 52\text{ million} \leq 82\text{ million} * 0.5$$

the forecast is considered to be *true*. However it is not unlikely that this forecast will be *false* before the end of 2000. Because, if the number of connected PCs rise from 82 million in 1997 to a little bit more than the double (105 million or more) before the end of year 2000, this forecast will be *false* since:

$$105\text{ million} - 52\text{ million} > 105\text{ million} * 0.5$$

The forecast is however considered *true*, since data available today does not support any other outcome.

8a. According to projections by IDC, by 2000, 46 million consumers in America alone will be buying online (Staffnet, 1998)

Because of the formulation *by 2000* this forecast can only be fully evaluated if 46 million consumers in America buy online today (1999). Jupiter (1999) states that of around 60 million people online 35% had bought something online in the last year. This makes 21 million peoples. Because this figure dose not reach up to the prediction of 46 million buyers, this forecast can not be attributed with *true* or *false*. It is also difficult to make a judgement of the correctness of the forecast based on available facts, because of the fast moving electronic market, and the fact that the predicted figure is unlikely to be neither extremely high or extremely low.

Since one forecast in this category yields *true*, and none *false*, the outcome aspect of this category is considered to be *true*.

8.4.4 Women shoppers

This category contains the single forecast number 10:

10. Women shoppers spent approximately $368 million online in 1996, according to Jupiter Communications. By 2000, Jupiter forecasts that this figure will grow to nearly $3.5 billion, based on the ever-increasing numbers of women going online (Staffnet, 1998).

Because it have not been possible to find statistics suitable to evaluate this forecast, this forecast can not be attributed a *true* or *false* label. But it does not seem unlikely that it already has come *true*, maybe even gone past the error marginal of 50% used to evaluate the collected forecasts. This assumption is based on the total online sales of $13 billion (Ernst & Young, 1999) and the share of female shoppers being 39% (Ernst & Young, 1999). If male and female shoppers spend equally much, on online shopping this would generate a sale of about 5 billion for female shoppers. Formally this forecast, and by that the category, is not considered possible to evaluate.

8.4 Evaluation summary

This chapter presents an evaluation of the collected forecasts as described in step 5 in the graphical work model presented in Figure 5. Some forecasts has however not been possible to evaluate. These are: 3a, 3b, 5, 6, 8a and 10. There are two main reasons why these forecasts have not been able to evaluate, lack of relevant statistics and the fact that some of the forecasts predict events in the future which not yet can be evaluated. This has led to that the categories *Sales-percent figures* and *Demographics* have not been possible to evaluate.

Forecast number 13 yielded *false* making the outcome aspect of the *Intelligent agents* category to be *false*.

8 Evaluation of forecasts

Forecasts number 1, 2, 4, 7, 8b, 9a, 9b, 10, 11 and 12 has been evaluated as *true*, making the outcome aspect of the categories *Payment methods*, *EC channels*, *EC growth*, *Sales-actual figures* and *Market*, to be *true*.

9 Analysis of evaluation results

This chapter corresponds to step 6 in Figure 5, and aims at analysing the results from the evaluations in the previous chapter, using the factors compiled in Chapter 6:

I. Uniform laws

II. Customer multimedia interface

III. Funds transfer systems

IV. Security/Privacy

V. Integration in business

VI. Technical standards

VII. Available technologies

Because of the problems with the evaluation of some of the forecasts discussed in sections 8.2.1 and 8.2.2, some categories was not possible to evaluate and thereby it is not useful to analyse the outcome of these categories, they will however be dealt with in the discussion chapter. It is also notable that the factors compiled in Chapter 6, are not so useful in examining the results from the qualitative categories as for the quantitative categories. A reason for this is that the qualitative categories contain forecasts which often concerns special, non-general, EC topics (like intelligent agents and payment systems), for which the general factors are not so useful. The quantitative categories on the other hand contains forecasts concerning more general topics such as sales, and market growth, which more easily can be explained using the general factors from Chapter 6.

The evaluated categories, *Intelligent agents*, *Payment systems*, *EC distribution channels*, *EC growth*, *Sales-actual figures* and *Market* will be analysed each in a separate section:

9.1 Intelligent agents

The outcome aspect of this category was attributed *false* in the evaluation, i.e. there are not any intelligent agents as effective as an librarian for contents search. Like discussed above it is however not so useful to explain this result using the identified factors. One factor that could be appropriate is the *Technical standards* factor. If it is true that the lack of standards has been restraining the performance of intelligent agents, this factor would have an influence on this category. If this is true then maybe new standards like XML (XML.COM, 1998), which contains meta-information which could be useful for intelligent agents, could trigger a faster development. However this has not been possible to confirm since appropriate sources could not be found.

Another factor that might have an effect on this forecast is the *Available technologies* factor. The lack of effective systems for (artificial-) intelligent search, might work restraining to the implementation of intelligent agents on a common basis.

9.2 Payment systems

The outcome aspect of this category yields *true* in the evaluation because it is considered that there exists a diversity of payment systems today, this is most likely because of the lack of a widely accepted standard of payment methods, thereby the outcome can be affected by the *Technical standards* factor. This has given rise to a diversity of different systems and thereby causing the forecast to become *true*.

9.3 EC distribution channels

The outcome aspect of the *EC distribution channels* category yielded *false* in the evaluation, since it was not considered that the most successful distribution channels were 3-dimensional, but rather 2-dimensional html pages. The reason for this is most likely the importance of uniformity of the techniques used for user interfaces. A diversity of technical standards would create problems when they may not be able to interact with each other. Therefore the widely used, 2-dimensional, html technique has become standard. Thereby the outcome of this category is affected by the *Technical standards* factor.

9.4 EC growth

The outcome aspect of the *EC growth* category was considered to be *true* in the evaluation made in the previous chapter. The single forecast in this category states that consumer retail will drive revenue from the internet. The reason why this has come true might be the *technical standards* factor, the all accepted html-standard allows customers to access all shopping sites on the internet without having to worry about, for example, changing between web-browser. Also the use of multimedia, in for instance music record online shopping sites, might have a positive effect on online retail, as described in the *Customer multimedia interface* category. On the other hand there are more factors that might restrain consumer retail on the internet. Among these are the *Uniform law* factor, that states that if common laws are applied to all online customers, electronic commerce will draw profits from this. According to Olsson (1996) there are no such international law systems, laws are being constructed and passed by national governments. The *Funds transfer* factor says that a common and secure fund transfer system will facilitate online commerce, however today this is not a fact, as discussed in Chapter 8. This lack of standard payment systems would also have a checking effect on online retail. The security problems associated with the most common payment system today, traditional credit card payment, as described by the *Security/Privacy* factor might also work as a obstacle for online retail growth. Despite these problems online retail drives revenues from the internet, a fact that might show that online shopping is quite appealing to consumers, despite its downsides.

9.5 Sales-actual figures

The outcome factor of this category was evaluated *true* in Chapter 8. This was since the majority of the forecasts predicted the actual outcome within the error tolerance-level applied. The forecasts in this category can be affected by a number of the factors from Chapter 6.

According to the *Uniform laws* factor, a legal system, common to all electronic commerce agents, will have an influence on electronic commerce in that way that the existence of uniform laws will facilitate electronic commerce growth. Today uniform laws can not be said to exist, even though integration in the European union, works in that way. Maybe this lack comes from the fact that an international organisation with power to create laws does not exist. In practise this problem can become a reality when for instance goods bought trough online shopping is damaged on arrival, where do the consumer make his complain, in his own country or in the country of the seller, maybe these two countries does not support the same policy in consumer rights issues.

The use of customer multimedia interfaces will according to Toohey *et al.* (1998) increase consumer interest in online shopping, thereby affecting the *Customer multimedia interface* factor. The growing use of multimedia applications on shopping sites, for instance sound, might thereby have a positive influence on online sales. An example of this use of multimedia can be shopping sites which sell music records and were a consumer, prior to buying a record, can listen to parts of the record to find out if he approves of the music.

As earlier described there exists no standard payment system for transactions over the internet, thereby affecting the *Funds transfer* factor. This could have a limiting effect on electronic commerce sales, due to the fact that the most common payment system, traditional credit card payments is associated with a security risks, i.e. the fear of leaving ones credit card number with strangers. This would thereby affect the *Security/privacy* factor. Surveys show that consumers think that this security risk is a big downside to online shopping (Ernst & Young, 1999; IS, 1999b). Solving these security problem, for instance by applying more secure payment methods can probably increase online sales even further.

The last factor that can be considered to have an effect on online sales is *Technical standards* factor, i.e. if there is a lack of technical standards, this could have a limiting affect on online sales since consumers then would have to adapt to different standards in order to reach all sales sites. This would create more work for the consumers and thereby lowering their desire to shop online. The widely accepted html-standard however makes it unlikely that.

Accordingly the majority of the forecasts on online sales has come true even though payment methods lack security and uniform laws regulating electronic commerce does not exist. Should these problems be solved it is thereby likely that online sales will rise even further.

9.6 Market

The outcome aspect of this category was considered *true* in the evaluation made in the previous chapter. A factor that can effect the electronic commerce market and thereby making forecasts to come *true* or *fail* is the *Technical standards* factor. The compatibility of all computer manufacturers systems when it comes to internet access is positive for the consumer. If this compatibility did not exist this might decrease customers urge to buy computers and go online, because they might not be able to access the whole internet with all shopping sites, and thereby making them not so eager to become a part of the online sales market.

Another factor that might be influencing the EC market to grow is *Available technologies.* This factor can have an affect in that way that the relatively low prise of

PCs in the internet era (Seldon, 1997). This have made it possible to access the EC market to a reasonable prise, and thereby making it grow.

9.7 Summary of results analysis

The evaluated categories from Chapter 8 have been analysed in this chapter. The analysis is based on the factors identified in Chapter 6. There are some things worth to notice in the results from the analysis. Firstly, the fact that the two categories associated with electronic commerce sales growth *Sales-actual figures* and *EC growth*, were considered to have outcome aspects that are *true*, even though most of the factors might indicate otherwise. Another fact that is worth noticing is that one of the compiled factors was not used in the analysis. This was the *Integration in business* factor.

10 Discussion

The problem formulation given in Chapter 3 involves five major tasks which will be performed, these tasks are also described in Figure 5 (Chapter 4.3), which displays a graphical description of the work model. This listing summaries these tasks and gives directions of how each task fits the work model in Figure 5:

1. Collect forecasts and material for the creation of factors influencing forecast outcomes (step 1)
2. Compile factor material into actual factors and straighten out the factor concept (step 3a)
3. Categorise forecasts (step 3b)
4. Choose evaluation methods and apply these to evaluate the categories (step 4 & 5)
5. Analyse the results from the evaluation using the compiled factors (step 6)

This discussion will start out from these tasks and describe and summarise the work. In doing so special attention will be given to different problems that have affected the final outcome.

10.1 Collection of forecasts and factors material

There were all in all 14 forecasts collected. They were found in both online and offline sources. The most frequent sources were online collections of forecasts, this later proved to be a problem due to the lack of context information in the collections. The sources from which the forecast collections gathered their material were often reports made by consultant agencies. Such reports are a major part of these agencies' work, and are thereby quite expensive. Reports that could be of interest to this work often cost from $500 and up. Due to the fact that this work has not had access to any external financing these fees have not been possible to cover, the work has thereby lacked some useful context information which otherwise could have been obtained. Thereby it was possible to access the actual forecasts but not the contextual information, which created problems during the evaluation.

Another problem when collecting the forecasts was that almost all of the forecasts—accepted by the used delimitations—used the year 2000 as the time when the condition stated by the forecast should come true. As will be seen this led to problems in evaluating the forecasts. It was not possible however to ignore all forecasts using year 2000 as a date specification since this would dramatically lower the number of useful forecasts and thereby making the results from the evaluation and analysis processes less useful. It has not been possible to determine why forecast authors use the year 2000 so frequently, but it most probably has something to do with the fact that it represents the turn of the millennium, century and decade.

The material for the *factors* was also gathered from both printed and online sources. This material was collected in a way that it would represent different authors' views of electronic commerce so that they later could be compiled into general factors.

10.2 Compiling factor material

To make it possible to compile the factor material into actual factors it was necessary to describe the factor-concept more thoroughly. It was decided that, in order to get useful tools for the analysis, the factors were to describe concepts affecting electronic commerce growth and acceptance in a general manner, i.e. no factors that are specific to a specific implementation of electronic commerce were to be used. Using this information the collected factor material was compiled into the following seven general factors:

I. Uniform laws
II. Customer multimedia interface
III. Funds transfer systems
IV. Security/Privacy
V. Integration in business
VI. Technical standards
VII. Available technology

10.3 Categorisation of forecasts

When the forecasts were collected they were put into categories that were arranged in an hierarchical tree structure as displayed in Figure 19:

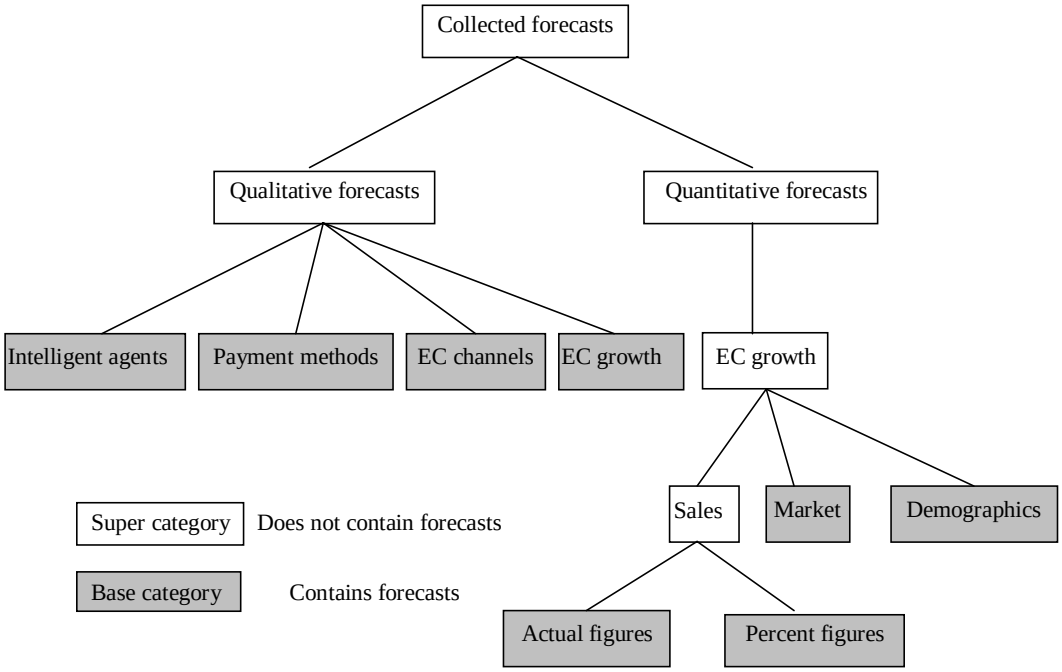

Figure 19. Hierarchical description of forecast categories.

This tree (Figure 19) was created based on the collected forecasts and can thereby not be seen as a general description. The tree was created using an iterative process where two original categories were given; quantitative and qualitative forecasts. When new forecasts were to be added to the tree it was first checked if they fitted into one of the existing categories. If this was not the case, a new category was created and fitted into the tree in an hierarchical manner or the new forecast was split to fit any of the existing categories, or, eventually, it was checked if a split of an existing category could make the new forecast to fit the tree. The decision if a forecast fitted into an existing category or not was based on features such as the topic of the forecast, if it was of qualitative or quantitative nature and how it presented quantitative information (for example by actual figures or percent figures). The quantitative forecasts displayed a high degree of similarity among each other, and it was thereby possible to have multiple forecasts in each category. The qualitative forecasts on the other hand proved to have more differences among each other. It was thereby not possible to place more than one forecast in each qualitative category.

10.4 Evaluation of categories

The next step was to create evaluation methods and apply these in order to evaluate the forecast categories. Evaluation of the categories was done so that all forecasts in a category were evaluated individually, and if the majority of the forecasts came out to be *true* then the category as a whole was considered to be *true*, i.e. containing accurate forecasts. If on the other hand the majority of the forecasts were considered to be *false*, then the category was considered *false*. The individual forecast was evaluated by comparing the statement made by the forecast to the real world situation, if the statement made by the forecast was considered to be within reasonable range from the actual outcome the forecast was considered to be *true*, otherwise the forecast

was considered *false*. During the evaluation a number of problems occurred. These problems are described below.

10.4.1 Problems related to the categorisation

During the evaluation it become obvious that the aim to construct the categories so that all forecast in one category could be evaluated in the same way, would not hold for the categories on the qualitative branch of the tree (Figure 19). This did however not create any practical problems since, as stated above, all qualitative categories only contained one forecast each. Due to the very specific nature of the qualitative forecasts it could however be seen that if any other forecasts would be added to an existing category, it would not be possible to evaluate all in the same way. The categorisation was, however, not rejected since it could proved useful since different forecasts belonging to a specific qualitative category were in need of definitions of certain, common, key concepts. Due to the categorisation definitions of concepts, important to the forecasts in the category, could be done for the entire category rather than for each forecast. The categorisation was thereby still useful and was not rejected.

10.4.2 Problems related to the problem formulation

These types of problems are associated with the problems to evaluate forecasts, that describe the state of some feature in a specific time in the future, before the specific time has occurred. This need arose from the fact that all collected forecasts that stated a specific time for their prognosis turned out to use the year 2000, and since this report was created during the first half of 1999, this was of course problematic. One example of this was forecast number 3a:

3a. Industry analysis facts and figures for the latter half of 95/96 financial year include; Internet-based commerce will hit $150 billion by 2000[…]

Forecast 3a was considered to be impossible to fully evaluate and could thereby not be attributed *true* or *false*. But since online sales is about $13 billion for 1999 (Ernst & Young, 1999) the figure given by the forecast for year 2000—$150 billion—seems highly unlikely. For the forecast to come true online sales will have to rise more than 1,000%, from $13 billion to $150 billion, during year 2000. This seems unlikely, and it would thereby be preferable if it was possible to attribute forecast number 3a with *false*. However, since one can have no exact knowledge of events in the year 2000, likely or unlikely, this forecast could formally not be evaluated.

The root of this problem was the fact that forecasts predicting events in the year 2000 were not excluded by the delimitations stated in the problem formulation. This fact comes from a badly formulated delimitation (number 2):

2. Only forecasts made between the start of 1995 and the end of 1996 will be considered. This limitation in time is motivated by two circumstances. Firstly, statistics show that the consumer-to-business EC was insignificant up until the end of 1994 (Kolding, 1996), which makes forecasts before 1995 scarce. Secondly, prognoses made after 1996 often describe the future some years into the 21:st century, and are thereby impossible to evaluate today.

This delimitation aimed at excluding forecasts that predicts events in the 21:st century, however as described above it was not very effective in doing this. A more natural delimitation would be to ban all forecasts predicting events in the year 2000 or later, instead of all forecasts made after the end of 1996. So, instead of constructing the delimitation in an indirect manner, as done in this work, it would be better to construct the delimitation in a direct way, explicitly stating that forecasts predicting events in the year 2000 or later are not accepted. Doing this would however probably give rise to other problems, like lack of forecasts. This problem is discussed in more detail in Chapter 10.1. The collected forecasts were however still useful since several of the collected forecasts used the formulation *by the year 2000*, and thereby making it possible to evaluate these before the year 2000 (see further explanation in section 10.4.3). Because of this and the fact that this problem could be used to find ways to improve forecast formulation, the work was not terminated due to the lack of suitable forecasts. Instead, this led the focus of the work to change somewhat from the forecast evaluation and analysis to finding general problems in forecast formulation that make them hard to evaluate.

10.4.3 Problems with forecast wording

The evaluation of the categories also displayed some problems with the wording of the collected forecasts. Ambiguous date specifications, i.e. date specifications that are open to interpretations, and the lack of definitions of key concepts in the forecasts were among these problems.

Key concept definitions

The need to define concepts in the collected forecasts and the need to make assumptions about the authors' intentions with the forecast, that arose when trying to evaluate the collected forecasts (Chapter 7), points at the fact that some of the forecasts were poorly formulated, i.e. they did not provide enough information to enable an effective evaluation.

The problem with defining key concepts in the forecasts was present both in the quantitative and the qualitative forecasts. The problem is in fact not actually to *define* concepts that occur in the forecasts but rather to find out how the *author* defined the concepts. This information is essential in evaluating the forecasts since we must know exactly what we should evaluate. Some definitions and explanations of key concepts could be expected to be found in the context in which the forecast exists, but most of the collected forecasts lacked this context because they were found in forecast collections (this problem is further discussed in Chapter 10.1). Forecast number 13 is an example of the problem with lacking contextual information:

13. According to Hermans, “Agent empowered software that is as effective as a librarian for content search will be available in 1998, and may be expected to be used by a significant number of users near the year 2000.” (Garcia-Sierra, 1996).

To be able to evaluate this forecast a number of concepts must be defined or clarified. At first the term “intelligent agents” (as in agent empowered software) must be defined, or rather it must be found out what the author means with this concept. Further it must be found out what a librarian is capable of when it comes to content search, and finally it must be found out what the author puts in the expression “a significant number of users”. It is also not clearly defined what the term “used” means, does a person “use” an application if he has used it once, or does he have to use it regularly to be “using” it? Given all these problem it is very hard to correctly evaluate a forecast of this type. To point out how this forecast could be improved a fictive forecast, labelled “13new”, is created:

13new. According to Hermans, “Agent empowered software, as defined by Doe (Year), that is as effective as a librarian for content search, in the way that the agents can search large amounts of electronic information for certain concepts, will be available in 1998, and may be expected to be used at least once a week by more than half of the total number of internet users near the year 2000.”

Of course this forecast only reflects in part what a librarian can do in the term of content search, but on the other hand it can be more easily evaluated, since it clearly states what will be expected to happen in the future.

Ambiguous date specifications

The problem with fuzzy date specifications was severe in that way that it is hard to evaluate a forecast when it does not specify an exact time when the condition stated by the forecast will come true. The problem with fuzzy date specifications was solved by using definitions constructed especially for this work. This led to a uniformity of how fuzzy date specifications in the forecasts were interpreted but, since these definitions may not coincide with the authors’ interpretations of the date specifications this may have caused some uncertainties to appear in the evaluation.

The problem with fuzzy date specifications also exists both among the quantitative and the qualitative forecasts. This problem comes from the fact that the collected forecasts do not state a specific time when the predicted outcome will be true. Instead they use formulations like “in the year 2000” or “by the year 2000”. This way of formulating date specifications is not exact, and thereby open to interpretation. For example, a forecast stating that a specific event will occur “by the year 2000”, can be interpreted so that the forecast is true if the event has occurred some time before the *start* of year 2000. Another interpretation is that the forecast will be true if the event that is predicted occur before the *end* of year 2000. The ambiguity in the formulations of date specifications makes the forecasts more difficult to evaluate since an *interpretation* of the date specifications must be made. If the date specifications were formulated more exactly on the other hand this problem would disappear since it would be known exactly when the forecast could be evaluated. The fictive forecast 13new, which is described above, can be used as an example. This forecast states that

some event (more than half of all internet users will be using agent empowered software) will occur "near the year 2000". This way of formulating the date specification is ambiguous, since "near the year 2000" can have many different meanings depending on the context. Forecast 13new could for example be improved like this:

13final. According to Hermans, "Agent empowered software, as defined by Doe (Year), that is as effective as a librarian for contents search, in the way that the agents can search large amounts of electronic information for certain concepts, will be available in 1998, and may be expected to be used at least once a week by more than half of the total number of internet users before the start of year 2000."

Now the forecast can be more easily evaluated, if more than half of the total number of internet users use agent empowered software, at least one a week, before 2000-01-01 this forecast will come *true*, otherwise it will be *false*.

10.4.4 Problems associated with forecast level of detail

This problem is that of forecasts that cover too big a scope, making them almost certain to come true. The reverse problem is of course also problematic, forecasts that have a too narrow scope making them almost certain to fail. Most of the forecasts in the *Sales-actual figures* category were examples of this, by predicting future online sales as a specific figure, for example $7 billion, they would most certainly fail, since it is highly unlikely that the actual sales will be *exactly* $7 billion. Since it seems probable that the authors did not intend the forecasts to be interpreted in this way, this problem was solved by allowing the forecasts to deviate a certain degree (50%) from the actual outcome and still turn out *true*. This made forecasts with a to narrow scope less of a problem than the forecasts with to large a scope. One example of a forecast with a too wide scope is forecast number 2:

2. Currently, Internet commerce is quite small, representing at most about US$ 500 million world-wide […] The most conservative forecasts expect growth of at least ten-fold for three to four years, and the most optimistic foresee about US$ 780 billion in 2000 (Killen and Associates) (OECD, 1997).

This forecast will come *true* if online sales is between $5 billion and $780 billion in the year 2000. This big scope makes the forecast quite meaningless since no one can make use of a forecast that is certain to come true. This problem can be described in the terms of Claude E. Shannon's information measure (van der Lubbe, 1997) which is visualised in Figure 20.

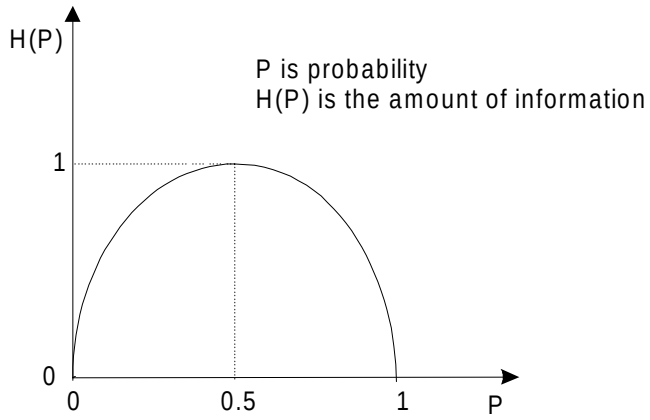

Figure 20. Visualisation of Shannon's information measure, from van der Lubbe (1997)

Figure 20 graphically describes Shannon's information measure, which can be used in a way that forecasts, that have a very high (P ≈ 1.0) or low (P ≈ 0.0) probability of coming true, contains very little information, i.e. H(P) ≈ 0.0. Forecasts that have a probability of about 0.5 to come true on the other hand contain a large amount of information (P(H) ≈ 1.0). A simple example can illustrate this; imagine a coin that has heads on both sides, instead of heads on one side and tails on the other as usual. A forecast of a flip of this coin stating that heads will come up does not contain any useful information (H(P)=0.0) because there is only one possible outcome—heads (P=1.0). The same goes for a forecast stating that tails will be up, this cannot happen (P=0.0) and the forecast thereby does not contain any useful information (H(P)=0.0). In plain language this means that forecasts that either have a very high or a very low probability to come true will be less useful than forecasts that have about fifty percent chance of coming true. It is of course very difficult to construct forecasts that have a probability of exactly 0.5, but Shannon's information measure is still useful because it says that forecasts that most likely either will come true or fail, are not so useful.

10.4.5 Evaluation results

Irrespective of these problems the majority of the categories were evaluated. Out of eight base categories (categories that consists of forecasts) six were evaluated. Of these six, five categories were accurate (*true*) and one inaccurate (*false*). This implies that most electronic commerce forecasts were in fact accurate. During the problem formulation phase it was assumed that the majority of the forecasts would be inaccurate, this assumption was thereby false. The reason for this could be that forecasting methods are better than assumed or, perhaps more likely, that too big error levels were allowed.

10.5 Analysing evaluation results

The analysis was done by explaining the outcomes from the category evaluation using the compiled factors. As stated above six out of eight categories were possible to evaluate, and thereby to analyse. During the analysis it became obvious that the factors were more suitable to use for analysis of the quantitative categories than the qualitative categories, because the qualitative categories more often contain forecasts

concerning special, non-general, electronic commerce topics, thereby general factors are less effective as a instruments for analysis.

Out of the seven factors only one—*Integration in business*—was not used in this analysis. This could be because it was falsely assumed to have an effect on electronic commerce growth or, more likely, because there were no forecasts concerning topics affected by this factor. The reason for this lack of forecasts most likely comes from the fact that this work only concerns business-to-consumer electronic commerce. Forecasts affected by the *Integration in business* factor would be more likely to come from the business-to-business category.

Among the other factors the *Technical standards* factor stands out, it was considered to have an impact on all the analysed categories, making it the most widely used factor. Other factors that were widely used were the *Funds transfer systems* factor and the *Security/Privacy* factor.

11 Conclusions

11.1 Conclusions based on the problem formulation

The aim of this work was presented in the problem formulation, taken from Chapter 3:

> The work presented in this report aims at evaluating publicly available forecasts, concerning electronic commerce, made between 1995 and 1996. While doing so, factors, that determine the degree of correctness of the forecasts, will be identified and described. The "factor" concept also needs to be studied, and questions like; what is and what is not a factor will be answered. The problem also involves identification of and the division of forecasts in categories, suitable to evaluate as a whole. Further, methods to evaluate these categories will be identified and used.

This summary of conclusions is based on this problem formulation, line by line:

The work presented in this report aims at evaluating publicly available forecasts, concerning electronic commerce, made between 1995 and 1996.

As can be seen in the problem formulation, the collected forecasts are to be evaluated category by category. Out of a total of eight categories containing forecasts, six were evaluated. Two categories were thereby not evaluated, the reason for this is that problems occurred during the evaluation. These problems were related to poorly formulated delimitations (section 10.4.2), poorly worded forecasts (section 10.4.3) and lack of statistics relevant to evaluate the categories (Chapter 8.4). Of the six evaluated categories, five categories had a majority of forecasts which were accurate (*true*) and one had a majority of inaccurate (*false*) forecasts. Thereby the majority of categories were accurate, this contradicts the assumption made in the beginning of this work that most forecasts would be inaccurate. The reason for this could be that forecasting methods are better than assumed or, perhaps more likely, that too big error levels were allowed during the evaluation.

While doing so, factors, that determine the degree of correctness of the forecasts, will be identified and described.

A total of seven factors were created from the collected material (Chapter 6):

I. Uniform laws
II. Customer multimedia interface
III. Funds transfer systems
IV. Security/Privacy
V. Integration in business
VI. Technical standards
VII. Available technology

It was assumed in the beginning of this work that factors like political decisions, technical development and introductions of standards would be compiled. All these three can be said to be included in the seven compiled factors; technical development corresponds to the *Available technology* factor, introduction of standards corresponds to the *Technical standards* factor and political decisions can be said to correspond to the *Uniform laws* factor.

The "factor" concept also needs to be studied, and questions like; what is and what is not a factor will be answered.

It was decided that a factor would be a concept that affects electronic commerce in a general way, i.e. features that only affect a certain implementation of electronic commerce could not be considered as factors (Chapter 6). Thereby factors influencing only a specific business' use of electronic commerce were not used.

The problem also involves identification of and the division of forecasts in categories, suitable to evaluate as a whole.

The collected forecasts were placed in categories constructed in a hierarchical manner, and thereby creating the following tree structure:

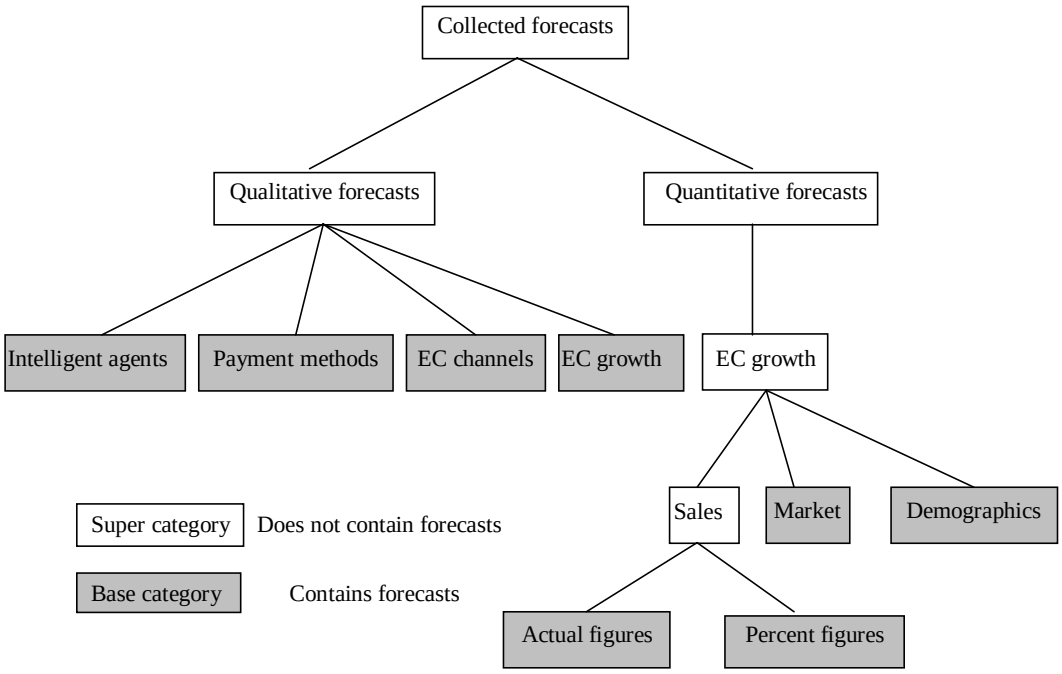

Figure 21. Graphical description of forecast categories.

This tree was created solely to enable categorisation of the collected forecasts and can thereby not be used as a general way of categorising forecasts.

It become obvious during the evaluation that categories belonging to the qualitative branch of the tree (Figure 21) could not be evaluated as a whole (section 10.4.1), as intended in the problem formulation. The reason for this was that the qualitative forecasts displayed too much variation among each other. The categorisation was however still useful since it enabled forecasts belonging to a specific category to share definitions of common key concepts (section 10.4.1). In the quantitative branch the categorisation worked as intended.

Further, methods to evaluate these categories will be identified and used.

Methods for forecast and category evaluation were identified and used. These methods were, in short, to compare each forecast's statement to the actual outcome, and then, based on how accurate the forecast's prediction was either attribute it *true* or *false*.

The categories were evaluated by checking whatever the majority of the forecasts in the category were *true* or *false*. If the majority of the forecasts were *true* the category was considered to be accurate, otherwise it was considered to be *false*.

A last task, that is not explicitly stated in the problem formulation, but still considered to be part of the problem, is to explain the outcome from the forecast evaluation using the compiled factors. This task has also been concluded. Out of seven factors one—*Integration in business*—was not used, the reason for this is most probably that non of the collected forecasts displayed a topic relevant to solve by the *Integration in business* factor. The reason for this is probably that this work solely concerns business-to-consumer electronic commerce, the *Integration in business* factor would probably have a greater influence on business-to-business electronic commerce forecasts. The most widely used factor was *Technical standards*, displaying the great

importance of standards to electronic commerce growth. Other widely used factors were *Funds transfer systems* and *Security/privacy*.

11.2 Experiences

During the work a number of problems have occurred, these are hereby summarised:

- The original sources of electronic commerce forecasts are often reports constructed by consultant agencies. These reports are often expensive—from $500 and up—making them hard to access for the common public (Chapter 10.1).
- Forecast collections (summaries), which often can be accessed for free through the www, do not contain enough contextual information to enable a good evaluation of the forecasts in them (Chapter 10.1).
- Forecast wording is important for the possibility to evaluate forecasts in an effective manner (section 10.4.3). Key concepts and date specification needs to be defined thoroughly.
- Forecasts that have either a too big or too small possibility to come true, contain only a minimum of information, and are thereby less useful (section 10.4.4).
- Finding statistics relevant to evaluate the collected forecasts sometimes proved to be difficult. This can be avoided if statistics describing the actual outcome is collected at the same time as the forecasts. This way no forecasts, that later cannot be evaluated due to the lack of information concerning the actual outcome, are collected (Chapter 8).
- It is not very useful to construct delimitations that are to work in an indirect manner, i.e. aiming at having an influence that is not explicitly stated. These type of delimitations may not have the intended effect. It is more useful to make delimitations that work in a direct manner, i.e. explicitly state what the delimitation aims to do (section 10.4.2).

As for the work itself, it went without any major problems. The bulk of the workload were to gather useful forecasts and material for the creation of factors influencing EC. The internet proved especially useful for these task while printed literature only contributed a minor part of the material.

11.3 Results put into context

As stated earlier in the report, the aim of this work is to gather information which can be used to improve electronic commerce forecasts—this has been done. The seven factors compiled in Chapter 6 is a part of this information, as well as the information about the evaluation problems discussed in Chapter 10.

The compiled factors can be used as guidelines when deciding on which information that are relevant for a certain type of electronic commerce forecast, for instance, when creating a forecast about future online sales, all factors affecting future sales must be taken into account.

The problems discussed in Chapter 10 can be used to improve forecasts in that way that they can contribute to make forecasts more easy to evaluate, which is necessary for the ability to improve forecasting.

The results from the evaluation in Chapter 7 also contributes to this report. These results show that, if one considers an error tolerance of 50% to be acceptable, then the majority of the forecasts actually made accurate predictions about future online sales. This information can be used when judging the credibility of other forecasts on online sales.

11.4 Future work

One of the main problems during this work has been the lack of information concerning the collected forecasts. A reason for this might be that the possibility to access the forecasts is time dependant, i.e. forecasts made at one specific time are less useful, and thereby harder to come by, a few years later—when the possibility to evaluate the forecasts exists. It would thereby be interesting to do a survey, like the one done in this work, and collect contemporary forecasts. This material could then be evaluated a few years later when the actual outcome is known. Using this method, it is also possible to use interviews to gather context information. This is because, the forecast authors can more easily access the material they based the forecasts on since they constructed them not to long ago. This way additional contextual information could be gathered and thereby enabling a better evaluation.

Another interesting area to go further into is the categorisation of forecasts. The categorisation provided in this work is based on the collected forecasts, and could thereby hardly be used as a general way to categorise forecasts. However, if further work is invested into this model, it might be able to turn into a general model. A general model for categorisation of forecasts could be useful in creating general evaluation methods for forecast categories.

The poor wording of forecasts has been a problem in this work. It would therefore be useful to create general guidelines that can be used when creating forecasts. These guidelines can make use of problems encountered in this work, poor forecast wording and forecasts displaying a too high or too low level of detail. Forecasts created using these guidelines would be easy to evaluate since they would not require the evaluator to make own interpretations of concepts in the forecasts.

It would also be interesting to test the compiled factors on a larger amount of forecasts. This way the factors could be refined, and additional factors could maybe be added.

At last it would be interesting to carry out a survey, similar to this, but concerned on business-to-business electronic commerce forecasts. Business-to-business EC is predicted to be three times as big as business-to-consumer EC by the year 2000 (Fredholm, 1998) making it a important area of electronic commerce. It is also possible that results from a survey like that could be useful in interpreting the results from this work.

11.5 Final thoughts

As stated in the beginning of this work the aim was to gather different kinds information useful to improve forecast accuracy. Since businesses use forecasts as an important part in decision making, and since electronic commerce is of growing importance to businesses, it is important to have electronic commerce forecasts that are of good quality. Good forecasts could lead to growing profits for businesses, and thereby a growing prosperity in the society as a whole. The work presented in this report could be a first step in order to improve electronic commerce forecasting.

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