Measurement of Business Intelligence in a Finnish Telecommunications Company

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Abstract: Business intelligence (BI) is a managerial concept and tool that is used to help organisations to manage business information and to make effective decisions. Measurement of BI is generally considered an important issue but at the same time it is considered difficult to carry out in practice. There is also a lack of research on the topic. The paper describes the current knowledge regarding the measurement of BI and makes a contribution on the currently small amount of empirical knowledge on the topic. The research is implemented by means of a literature review and action research.

Keywords: Business intelligence, case study, measure, measurement, telecommunications

1. Introduction

1.1 Background of the research

In today's rapidly changing business environment, the need for very timely and effective business information is recognised as being indispensable for organisations not only to succeed, but even to survive. Business intelligence (BI) is a concept which refers to a managerial philosophy and a tool that is used in order to help organisations to manage and refine information and to make more effective business decisions (see e.g. Ghoshal and Kim 1986; Gilad and Gilad 1986). Actually, the term BI is dualistic: it refers to 1) the relevant information and knowledge describing the business environment, the organisation itself and its own situation in relation to its markets, customers, competitors and economic issues and 2) the process that produces the intelligence described. Typically, a BI process has between four and six closely related phases: 1) identification of information needs, 2) information acquisition, 3) information analysis and 4) storage and information utilisation. The information technology used in analysing the data and storing and reporting the intelligence is also considered an important part of BI (Moss and Atre 2003).

The BI terminology in recent years has been confusing. There are different interpretations of BI and many terms applied to it (e.g. competitive intelligence, market intelligence, customer intelligence, competitor intelligence and strategic intelligence). The use of these terms is haphazard both in academia and the business world. After all, almost all the definitions share the same referent even if the term has been defined from several perspectives (Casado 2004) and they all include the idea of analysis of data and information. The main idea in BI is to aid in controlling the vast stocks and flow of business information around and within the organisation by first identifying and then processing the information into condensed and useful managerial knowledge and intelligence. The task described includes nothing too new and it responds to old managerial problems. For example, Gilad and Gilad (1986) have stated that organisations have 'collected information about their competitors since the dawn of capitalism. The real revolution is in the efforts to institutionalise intelligence activities.' Thus, it is likely that all organisations have some kind of BI activities or similar activities.

There are numerous examples of benefits that should be achieved by utilisation of BI (see e.g. Thomas Jr. 2001). However, the evidence on whether these benefits actually occur in practice is not conclusive. In addition, applying BI takes resources. Therefore, there should be a way to assess whether the costs are reasonable in relation to the benefits accruing. Measurement is a potential tool to actively improve BI activities or to determine the usefulness of BI products and services. This paper examines the measurement of BI from the pragmatic point of view.

1.2 Objectives and methods of the study

Currently, there is a lack of research on the measurement of BI. In particular, there are practically no empirical research papers at hand. Moreover, there is rather little normative literature on how to actually measure BI. This paper aims to offer an insight into the measurement of BI and by doing so, to remedy the lack of case studies on the research field. The objectives of the paper are:

- To discuss how BI can be measured and to identify what types of measures are available in the literature.
- To describe the measurement of BI in one case company.

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The research uses mainly the action research approach. In addition, a literature review is presented. In action research, the researchers interact with a case company and in-depth information is elicited. One of the co-authors of the present study works at the case company. Thus, the information gathered is insightful but it may be biased because of the dual role of one of the authors as a researcher and as a manager responsible for BI. However, two other authors have aimed to be critical enough to ensure that the paper does not present a view which is excessively partisan or positive. The case study increases empirical knowledge of the measurement of BI and concerns e.g. what measures are used in practice, how the measures are used, if the measurement results reveal the effects of BI or the areas of improvement within the BI process. According to Eisenhardt (1989), the case method is especially appropriate in a new topic area.

Results of the paper are twofold. First, a description of the current knowledge regarding the measurement of BI is derived using the literature research. Second, the paper makes a contribution to the currently small amount of empirical knowledge on the topic. There are also many organisation-specific issues which are likely to have an effect on how BI can be measured. Not all these variations can be considered here and therefore, the discussion is limited to a general level and to a case-specific exposition of the measurement of BI in the case company.

2. Literature review

2.1 Why measure BI?

The measurement of business performance has long traditions in organisations. It is a practical managerial tool that can be applied in various situations and for different purposes. In the context of BI, too, some authors have identified its measurement as an important task (Solomon 1996; Viva Business Intelligence Inc. 2000). A common view among scholars is that the measurement of BI is difficult to carry out (see. e.g. Gartz 2004; Hannula and Pirttimäki 2003; Simon 1998) and only a few organisations have any mechanisms in place to measure the value of CI (Marin and Poulter 2004). Thus, measurement is considered an important aspect of BI but at the same time it is considered difficult to carry out in practice.

According to Lönnqvist and Pirttimäki (2006), there are two main purposes for measuring BI: *the valuation of BI* in order to prove that it is worth the effort and the measurement of BI activities in order to help *manage a BI process*. Table 1 presents these main purposes and provides a comparison between them.

Table 1: Characterising the measurement of BI (Lönnqvist and Pirttimäki 2006).

Purpose for measurement	Main users of measurement information	Expected benefits
Valuation of the effects of BI	• Companies (I.e. executives) applying BI • BI service providers • BI professionals • Researchers	• Ability of prove that BI services are worth the effort and demonstrate the actual effects of BI • Increased credibility of BI as a managerial tool • Improved rigor in BI research
Management of BI process	• BI service providers • BI professionals	Continuous improvement of BI products and services

By evaluating BI, it is possible to prove that it is worth the effort. In the literature, this is considered as the most common reason for measuring BI (see e.g. Sawka 2000). Davison (2001) states that CI managers need measures in order to be able to justify their department's existence. Similarly, executives need to know whether it is rational for them to invest in BI. Thus, valid and reliable measures of the BI process may increase the credibility of the BI discipline among companies. Moreover, measurement results showing the actual effects of the BI processes applied in organisations would also be useful for researchers.

The other reason for the measurement of BI activities is to help manage the BI process. This ensures that the BI products suit the users' needs and that the process is well organised (see e.g. Herring 1996). A BI process can be a high-priced waste if the information gathered is not exact or it does not match the information needs. The users of this operative measurement information regarding the BI process are likely to be the BI professionals in organisations. In this view, the typical measurement purposes, e.g. guiding activities and learning, can be applied in order to continually improve the BI products and services.

2.2 Measurement for managing the BI process

In the case of BI process management, the BI professional is the key user of the measurement information. The aim is the efficient production of valuable intelligence for the specific needs of the users. Information Builders, a provider of BI prod-

ucts and services, suggests that three characteristics of intelligence should be measured: *deploying ability, scalability* and *usability of the intelligence* (Information Builders 2004). These characteristics mainly describe the properties of the BI software being used. Williams and Williams (2004), for one, have presented a method called "BI Readiness Assessment" which is used to determine the state of various issues that are related to an organisation's ability to utilise BI. These issues consist, e.g., of continuous improvement culture, information or analytics culture and technical readiness. The method is based on a qualitative survey.

According to a survey by Marin and Poulter (2004), some organisations have endeavoured to gauge accessing by users of the CI gathered and distributed through electronic means. In addition to previous practices, Hoadley (2004) has proposed a method he calls the "Hoadley Suite" for determining whether an essential amount of data has been captured and for evaluating the cost of additional data collection. His method is based on assessing the completeness of the data and the timeliness of the data. Combining these two viewpoints makes it possible to assess the degree to which the data intended to be captured have already been captured. The method relies on qualitative assessments made separately regarding different data sources. This allows focusing BI activities on areas where much of the data has not yet been quantified.

In the literature, measurement for managing the BI process has not been discussed as much as measuring the effects of BI. A large part of the current measures found in the literature focuses on proving the value of BI. Of course, many measures are useful for both managing the BI process and measuring the effects of BI. The main difference is in the purpose of measurement, which is why some of the measures used are somewhat different.

2.3 How to measure the value of BI?

Before discussing how to measure the value of BI, it is necessary to consider the concept of *value*. Namely, the first question is: Value for whom? The perceived value varies depending on the subjective appreciation and need of the person to whom the question is addressed. In this paper, value is viewed from the point of view of an organisation using BI (e.g. improved profit) or the user of the intelligence (perceived usefulness). On the other hand, it may even be suggested that BI has no value at all as such – the value is created as a result of utilising the intelligence (Kelly 1993).

From the perspective of the measurement of the value, a good starting point is to consider the resources demanded in a BI process and the benefits achieved by BI activities. It is easy to calculate the cost of BI (Davison 2001), but measuring the benefits is more complicated. Many of the benefits consist mostly of non-financial, and even intangible, issues such as enhanced quality and timeliness of information (Hannula and Pirttimäki 2003; Nelke 1998). However, there are some models for how to measure BI. For example, Davison (2001) has developed a measurement model called CI Measurement Model (CIMM), which can be used to calculate *the return on CI investment* (ROCII). The value of CI is assessed for individual CI projects. The CI output is measured by assessing issues such as objective fulfilment and decision-maker satisfaction. In addition, Davison suggests that a measure of an output could be simply a comparison of whether the targets set at the beginning of the project have been met. Input, for one, is calculated as a cost of carrying out the project. The formula of ROCII is following:

ROCII = (CI outputs - CI inputs) / CI inputs.

However, the fact that the value of CI outputs in the ROCII formula is based on qualitative assessments suggests that the ROI calculation is likely to be unreliable. Herring (1996) has identified four measures of the effectiveness of CI: *time savings, cost savings, cost avoidance* and *revenue enhancement*. In this model, these "measures" seem to be typical effects that are expected from successful BI activities and it is not clear how these effects can be measured.

According to the results of a survey carried out by Marin and Poulter (2004), the organisations interviewed compare the cost of consultants to the results obtained by the CI division and quantify the strategic deals that the CI team has been involved in and then compare the win / loss ratios to those deals where they were not involved. In one case, the use of CI was measured using statistics from a database of competitor information and access databases of requests for information. One approach to measure the effects of BI is subjective measurement of effectiveness; it is based on the concept of perceived customer (e.g. case decision-maker, satisfaction). In practice, the users of BI products are asked questions regarding the effectiveness of the products. (Davison 2001.) A positive aspect of subjective measurements is that the results show how effective the users consider the intelligence products. However, subjective measurements do not establish any monetary value for the effects of BI.

2.4 Balanced view of BI performance

Balanced performance measurement frameworks can be used to identify the factors to be measured and, at the same time, define the components to

be used to determine performance. The main principles are usually similar in different balanced measurement frameworks (Lönnqvist 2004; Tuomela 2000). First, performance measures are chosen based on the organisation's vision and strategy. Second, success factors are chosen from several perspectives (e.g. the shareholder's and customers) in order to provide a balanced and holistic view of the organisation and other factors contributing to its success. Third, measurement is focused on a limited number of critical success factors. Fourth, the measurement system is designed in such a way that there are causal relationships between the success factors. Fifth, the measurement system can be used as a tool in communicating and implementing strategy.

It seems possible also to use the idea of balanced performance measurement in the context of BI. For example, Herring (1996) suggests the Balanced Scorecard approach but does not go into detail regarding how it could be done. There are many ways to design a balanced performance measurement system for BI, depending, e.g., on the framework chosen. In practice, the measurement systems should be tailored according to needs of the specific situation. Relevant perspectives for examining the performance of BI could include, e.g. users, financers, the phases of a BI process and resources. Relevant factors and measures related to these perspectives might include, e.g. BI's effect on win / loss ratios of strategic deals, database utilisation rate and surveys among users.

2.5 Summary

A large part of the current measures found in the literature focuses on proving the value of BI. This is an important issue as long as the validation of BI is under consideration and also later when there is a need to determine if BI continues to provide valuable results. Many of the measures of the effects of BI seem problematic. However, there are also those that seem useful.

Measures intended for managing the BI process seem to be applicable in the continuous improvement of the process. In the literature, there are fewer measures of the BI process than of the effects of BI. In many cases in the literature, certain success factors of the BI process have been identified, but the actual performance measures have not been presented at all. However, the concrete issues related to the different phases of the BI process seem easier to measure than the effects. Therefore, it would seem easy to design new measures for this purpose. The application of the measurement approaches presented in the recent business performance measurement literature also seems quite useful in measuring BI. A balanced performance measurement system could cover both the effects of a BI process as well as the important factors of the process.

All in all, there are many potentially usable measures. However, there is virtually no experience of how to apply these measures in practice. In the next section, the measurement of BI is illustrated in one case company.

3. Case study

3.1 BI at Elisa Corporation

The case company Elisa is a Finland-based full-service telco whose customers include large companies, societies, small and medium-sized companies and consumers. Elisa offers diverse voice and data services, connections to the Internet and content services, voice solutions, customised communication and ICT solutions, international communication solutions and network operator services. In 2004, Elisa generated 1356 MEUR revenue and employed approximately 5400 persons.

Elisa Corporation faced major structural changes one and a half years ago. Elisa's corporate structure changed from a multi-company corporation to a centrally managed but locally serving unified company. Moreover, the BI function was reorganised and the new BI operating model was introduced. The old model was considered to be a traditional BI model, where the work was done exclusively by the company's own personnel. Nowadays, the BI function is partly outsourced at Elisa Corporation. This means that the BI function is operated by the Corporate Planning Unit in close co-operation with an external BI partner. Co-operation offers the BI users a comprehensive and filtered channel for relevant market and competitor intelligence. The partner provides an Intelligence Portal Tool, handles the information purchasing, administers contracts, produces content related to external market information and offers co-operation in needs-based assignments.

The main purpose of BI at Elisa is to enhance decision-making and service efficiency. The main targets include efficiency, reasonable coverage of BI and user satisfaction. BI comprises both internal and external business information, market information and analysis. Information is delivered to the users through one channel named Elisa Intelligence Portal. The Intelligence Portal is available to 300 persons from throughout the corporation who regularly need BI information in their work.

3.2 How does Elisa measure its BI activities?

Elisa measures its BI performance in various ways. Measurement is used as a tool to develop and improve BI activities as well as to demonstrate its usefulness. Performance measures are chosen based on Elisa Corporation's vision and the BI function's targets and strategies. Parameters are chosen from several perspectives in order to provide a balanced and holistic view of the organisation. Figure 1 illustrates the chosen focus areas pertaining to BI measurement.

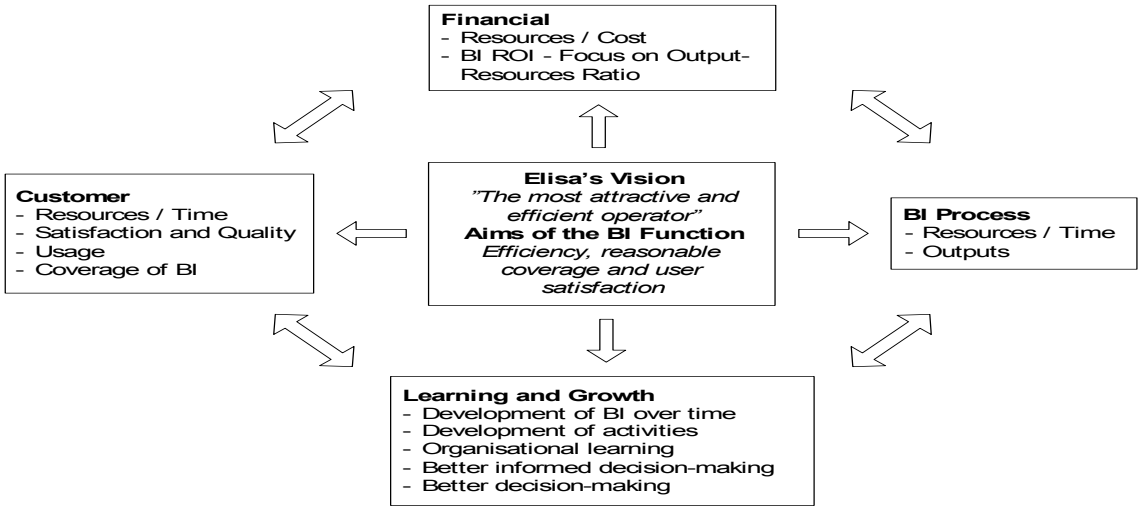

Figure 1: Balanced view of measurement of BI at Elisa.

In Figure 1, Elisa Corporation's vision and the BI function's targets are in the centre and they have a direct affect on the four chosen measurement focus areas; *financial*, *process*, *learning and growth* and *customer*. The most important issue in measuring Elisa's BI is the input-output ratio. BI measurement is implemented by a three-phased process: *measuring persons and system activities*, *establishing systematic information gathering as a base for measuring* and *through efficient communication and analysing between the BI parties*.

First, BI performance is measured by determining the individuals and system activities involved. These activities can be measured by using quantitative, qualitative and time-related indicators. Quantitative measurement involves both input and output indicators. On the quantitative output side, the focus is on keeping track of the amount of standard assignments completed and the amount of project-minded or ad hoc assignments accomplished. A key objective for the BI manager is to increase this output-resources ratio. The input side includes, e.g., hours worked, total cost of using the partner's services and information source costs in total. Also, the BI usage is measured by a monthly analysis of the number of hits in the Intelligence Portal and calculating the number of assignment requests. Qualitative indicators include, e.g., the satisfaction of information users. Satisfaction analysis is based on annual user surveys and instant feedback after each assignment. These most important indicators are connected to the balanced scorecards of Elisa's BI personnel and have an affect on the yearly salary bonuses.

It is also important to keep track of the BI usage and satisfaction levels in order to ascertain the optimal balance between BI resources and costs. Efficiency is mentioned in both Elisa Corporation's vision and in the BI function's objectives thus it is important to monitor the costs of the BI service. Table 2 summarises the objects of Elisa´s BI measurement and the indicators used.

Secondly, systematic information gathering is a prerequisite for efficient measuring. This means that Elisa conducts regular user surveys of its BI users. Feedback is also collected after each individual assignment. The BI partner reports weekly on its activities, including transparent billing concerning the information sources. In addition, reporting includes weekly data on the use of information seeking and usage of analysing quota and reporting about the usage of means-tested information source costs. Elisa and the partner meet frequently and review the development of information source budget and the whole service-entirety implementation and costs.

Table 2: Measurement of BI at Elisa.

Objects of Measuring	Indicator
BI output	Number of fulfilled assignments
BI input	Consumed working hours Total cost of using the partner's services Total costs of information sources
Satisfaction of information users	Regularly implemented user surveys Instant feedback after assignments
BI usage	Portal usage: the number of hits in the Intelligence Portal The number of BI assignments requests
BI costs	Transparent billing The partner's reports on the usage of analysing quota

Finally, efficient communication and analysis among the BI parties is important for the success of BI measurement. Both BI parties have precisely specified roles in order to guarantee the service quality. Both parties have also nominated their own contact persons. BI partner is organised on an "Account Team" model, account manager and account sponsor as responsible. Communicating and analysis are realised by regular meetings and reporting. Elisa also implements inter-company workshops in order to evaluate the services. Once in a year, the services are evaluated and developed on a longer horizon.

3.3 Advantages achieved and challenges

The new BI operating model has resulted in several advantages. For example, the information acquisition and delivery cost-effectiveness have improved when compared to the old model. The usability of information, the flexibility of analysing resources as well as the reliability of BI activities have also improved. Furthermore, one contact user interface has served to facilitate the administration of BI related contracts.

Measuring the learning and growth sector is the most challenging part in the balanced measurement process. Because of its intangibility, it is challenging to measure e.g. organisational learning or if BI has resulted in better decision-making. Calculating ROCII or BI ROI has not been in use at Elisa because of the lack of relevant indicators of the intangible effects. However, most ROCII components are measured, but not in the ROCII formula mode.

Use of outsourced analysis resources in general sets high requirements for the partner's industry- and company-specific knowledge. For the service buyer it is important to calculate the optimal input-output ratio for the right service scale and focus. In order to succeed with this service model the inter-company marketing has to be continuous. The usage level of the intelligence portal and information consumption as well as user satisfaction has to be high.

4. Conclusions and discussion

It seems rational to try to obtain, i.e. to measure information that can be used either in managing the BI process or evaluating the effects of BI activities, or both. In fact, the whole concept of BI deals with providing insightful information related to various business activities. Thus, it would be surprising if the managers responsible for BI were not interested in obtaining intelligence concerning its own operations.

There are two main challenges in measuring the effects of BI. First, the BI process produces information and knowledge, which have to be utilised before the effects are seen. The effects, if they occur, are intangible by nature, e.g. improved decision-making ability. It is difficult to quantify these intangible phenomena. These intangible effects may eventually have financial consequences. However, distinguishing between the specific benefits received due to BI and the achievements of ordinary decision-making is challenging. Many factors affect the success of business decisions, e.g. actions of competitors, changes in customers' behaviour and so on. Thus, the second key challenge in measuring the effects of BI is to distinguish what part of a phenomenon, say increased market share, results from increased knowledge produced by BI and what is caused by some other factors.

The empirical experiences from the case company illustrate the above-mentioned problems in practice. The measurement of the effects of BI activities would be desirable but it has proven problematic. In the case company, the aim of

measurement is to develop and improve BI activities as well as to demonstrate their usefulness. These objectives are achieved partially by using the current measures. As a whole, the BI measurement system and the related three-stage process seem quite sophisticated. However, there is ample room for improvement. For example, the output of a BI process is measured as the number of assignments completed. It is quite likely that the number of assignments is less important than the quality of the intelligence produced. Despite the problems, the measures may still produce valuable information. After all, the purpose of measurement is only to support management, by whom the decisions are ultimately taken.

This study described the current state of BI measurement on the basis of a literature review and the experiences of one case company. The results of the literature review showed that there are fewer measures of the BI process than of the effects of BI. However, it was proposed that measures of the BI process could be easily designed. In addition, it was proposed that balanced performance measurement could be applied for measuring BI. The evidence from the case study suggests that both propositions are valid. However, more empirical evidence should be obtained to support them. Thus, there is still a need for more case studies and other empirical studies as well. Although the reasons for measuring BI were divided into two main purposes based on the literature review, it seems that this division does not occur as clearly in practice as it does in the literature. It seems that both ways of using might be necessary in practice.

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