

The BI Framework

How to Turn Information into a Competitive Asset

Published by Logica

Copyright © 2009 by Logica

All rights reserved. This document is protected by international copyright law and may not be reprinted, reproduced, copied or utilised in whole or in part by any means including electronic, mechanical, or other means without the prior written consent of Logica. Whilst reasonable care has been taken by Logica to ensure the information contained herein is reasonably accurate, Logica shall not, under any circumstances be liable for any loss or damage (direct or consequential) suffered by any party as a result of the contents of this publication or the reliance of any party thereon or any inaccuracy or omission therein. The information in this document is therefore provided on an 'as is' basis without warranty and is subject to change without further notice and cannot be construed as a commitment by Logica.

The products mentioned in this document are identified by the names, trademarks, service marks and logos of their respective companies or organisations and may not be used in any advertising or publicity or in any other way whatsoever without the prior written consent of those companies or organisations and Logica.

ISBN/EAN: 978-90-814105-1-9

Bestellen Sie die Printausgabe auf www.logica.de/bi-buch

The BI Framework
How to Turn Information into a Competitive Asset

Table of content

1	Introduction	14
2	Business value of BI	18
2.1	Enterprise Value Management	19
2.2	BI Market pull	21
2.3	Track risk and compliance	23
2.4	Extract more value from customer interactions	25
2.5	Track performance and align metrics across the organisation	28
3	Business Intelligence definition	34
3.1	BI Foundation.....	36
3.2	Related Disciplines.....	38
3.3	Creating value with BI.....	40
3.4	Maturity models	42
4	Managing BI	48
4.1	Cost Effective Management of BI.....	49

4.1.1	BI content rationalisation	50
4.1.2	Infrastructure rationalisation	51
4.1.3	Processes and organisation optimisation	51
4.2	BI Competence Center (BI CC)	52
4.3	BI Delivery models	55
4.3.1	Iterative approach	55
4.3.2	Degree of specification	56
4.3.3	Information security	57
4.3.4	Technology	58
4.3.5	Blended sourcing model	58
4.4	Estimating investment in BI	59
4.4.1	Top-down estimation	59
4.4.2	Bottom-up estimation	61
5	BI Lifecycle	66
5.1	BI Strategy	68
5.1.1	Strategy Study	69

5.1.2	Feasibility study.....	71
5.2	BI Definition.....	73
5.2.1	Requirements analysis	74
5.2.2	Architecture design	79
5.3	BI Development.....	85
5.3.1	Data warehouse realisation	87
5.3.2	Reporting and analytics realisation.....	90
5.3.3	Transition.....	93
5.4	BI Exploitation	94
6	BI Solution Engineering	98
6.1	Benefits of the BI Engineering Framework.....	99
6.2	Connection to the BI lifecycle.....	100
6.3	Stakeholder perspectives.....	102
6.4	Engineering disciplines.....	104
6.5	The BI Engineering Framework Model	106
6.5.1	Business Context (scoping).....	107

6.5.2	Business context (analytical)	108
6.5.3	System Context	109
6.5.4	BI Architecture	110
6.5.5	System Concept	111
6.5.6	System Specification.....	112
7	Best Practices	116
7.1	DWH Architecture evaluation.....	117
7.1.1	Data Warehouse Architecture	117
7.1.2	Establishing architecture evaluation criteria.....	119
7.1.3	Common BI architecture topologies.....	120
7.1.4	Using the data warehouse architecture score card	122
7.2	ETL Framework.....	123
7.2.1	Core ETL Stages.....	125
7.2.2	ETL management processes	126
7.3	Data Quality	126
7.3.1	The business value of data quality	127

7.3.2	Data Quality Aspects.....	129
7.3.3	Assessing data quality	130
7.3.4	Data Quality Management.....	133
7.4	Data Vault.....	134
7.4.1	Data Vault components.....	135
7.4.2	Building a Data Vault	140
7.4.3	Data Vault architecture foundation	141
7.4.4	Loading a Data Vault	142
7.5	Dimensional modelling	146
7.5.1	Dimensional model components.....	147
7.5.2	Building a dimensional model.....	149
7.6	Data and Text Mining	153
7.6.1	Data Mining Definition	154
7.6.2	Data mining process	155
7.6.3	Data mining techniques.....	157
7.6.4	Data Mining and BI.....	158
7.6.5	Leveraging unstructured information	160

7.6.6	Document warehouse.....	161
7.6.7	Text Mining.....	163
7.6.8	References.....	166
8	Ferrari Case	169
8.1	Introduction.....	170
8.2	Strategy study.....	170
8.3	Feasibility Study.....	171
8.4	Requirements Analysis.....	173
8.5	Demonstration.....	174
8.6	BI Architecture.....	175
8.7	Data warehouse Realisation.....	176
8.8	Reporting and analytics Realisation.....	177
8.9	Data Quality.....	178
8.10	Data Vault Modelling.....	179
8.11	Dimensional Modelling.....	182
8.12	Exploitation.....	183

Preface

Dear reader,

Welcome to our newest version of the Logica Business Intelligence Framework. It has come about thanks to the global collaboration between multicultural, multi specialist and very experienced people dedicated to improving organisational performance enabled by CPM and BI. When we listen to our customers, or look at our own company's organisation, we still face some of the traditional challenges:

- We have many ways of producing metrics.
- We do not have a common language within each part of our organisation.
- We provide alignment in mergers but we have experienced challenges in supporting them.
- We have a wealth of data but have yet to determine what value it adds and how to deal with the quality control.

I could keep going, and it is an easy job to list all of the challenges, but that does not help create value. We consider every project that involves Business Intelligence to be an opportunity for transforming and improving the organisation. It is part and parcel of the change management process. Since the 90's we have been delivering process-oriented projects using pre-built applications, such as ERP-related solutions. This greatly helped to rationalise behaviour involved in such a process, gave us a sense for how IT departments and new maturity levels operate with an industrialised approach, but in many cases lacked the impact it had on the associated decision-making process. If we need proof of this, we just need to ask ourselves a few questions.

- Do I have the same common language and definition of indicators throughout my company?
- How do I explain the need for so many reports, dashboards, etc.?
- Is my Business Intelligence as mature as my ERP?
- If I was to make a call to the helpdesk for every data quality issue, would I need to double the size of the helpdesk?

Today, our goal is to give you our latest vision of the Logica Business Intelligence Framework, and so help you to take full responsibility for some of the challenges listed above, and some of the other challenges that have to be faced. We face them knowing that it will not be easy. We have shaped visions, crafted strategies, scoped and delivered projects, and then we completely outsourced them; this work represents millions of man hours. Our challenge is to leverage our former common language that we used for Business Intelligence and to make it a source of additional value for our customers and our people. The main difference is that it is not a book written by a few of our experts but a collaborative effort. It is also the result of different practices that have been merged together and the blended experience from a variety of our constituent countries. They have been challenged by our best people and customers; the practices that are used are present because we are confident that they deliver results in today's global environment.

So what can I expect from the Logica Business Intelligence Framework? A quick win could be to benchmark an approach, a vision, the performance of a

Business Intelligence Competence Center, or simply your operational costs. Another possibility could be to use the framework in your own effort of aligning your organisation, thus avoiding the need of making the investment yourself.

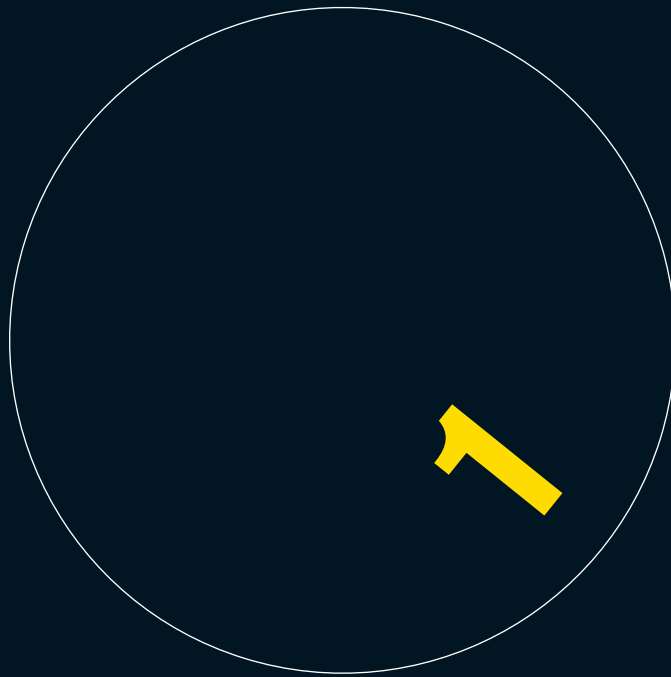
We strongly believe that the Total Cost of Ownership of BI can be lowered significantly by implementing a standardised BI development and management methodology in your organisation. Sharing the same standards, procedures and guidelines within your organisation and with your BI suppliers enables effective communication between the parties involved and makes BI development a repeatable and predictable process. We use the BI Framework to align and optimise the blended delivery of BI, combining local expertise with near- and offshore delivery centres.

We like to consider this BI framework to be an open source project. We will maintain it, provide new releases and commit to improving it with our community and in doing so unify our customers, partners and people in doing so. We always talk of Web 2.0 and we would like to think of our Framework as BI 2.0. Therefore, we invite you to be part of our innovation process. We prefer talking about collaboration and development rather than research and development. We encourage you to read this book and to become acquainted with BI and our vision of it. We look forward to your comments.

Stéphane Jaubert,
Managing Director
Business Intelligence
Global Practice Leader

A handwritten signature in black ink, appearing to read 'S. Jaubert', is displayed on a light grey background.

Bestellen Sie die Printausgabe auf www.logica.de/bi-buch



Introduction

1 Introduction

In a world of uncertainty and economic downturn Business Intelligence has become critical to survive. The importance of monitoring and measurement of the performance of your organisation, knowing the customers behaviour and complying with regulatory demands has become evident. Well implemented BI solutions deliver competitive advantage to an organisation.

With this book we introduce the value of business intelligence to achieve your business objectives. To give you an understanding of how to achieve this business objectives with the use of BI we provide you with a clear understanding of what BI is. Knowing that most organisations already have some BI solutions in place we focus on cost effective management of BI and provide you with a clear roadmap on how to lower the Total Cost of ownership of the current landscape and how to utilise BI to the best advantage of your organisation.

Another important aspect to consider in organising BI is the continuously changing demand of the organisation for information. That is why we provide a structured approach to manage the BI lifecycle in an cost effective and future proof manner. Then we will dive deeper into the design and development aspects, presenting our BI engineer framework. We will end the book with some of the best practices collected in our Bi community over the years.

All together a lot of material to read, aimed at a broad audience of business management, BI management and BI practitioners. The table below provides some guidance to what chapter is most relevant for what part of the audience.

Chapter	Business Management	Business Intelligence Management	Business Intelligence Practitioner
2. Business value of BI	■	●	●
3. Business Intelligence definition	■	■	■
4. Managing BI	■	■	●
5. BI Lifecycle	●	■	■
6. BI Solution Engineering	●	●	■
7. Best Practices	●	●	■

■ Recommended, ● Optional

Table 1.1 Target audience



Business value of BI

2 Business value of BI

This section provides an introduction to Business Intelligence from a business perspective. Too often we find Business Intelligence initiatives at customer sites that are very IT oriented. These initiatives started with good intentions and for very good reasons. Somewhere down the road however, business focus is lost and technology pushes the initiative forward. With this section we offer some guidelines to keep your Business Intelligence initiative business-driven. We start with an understanding of business value based on a scientific model, the Treacey and Wiersema business value discipline model, and a pragmatic model, the Logica Enterprise Value Management model. We define the market pull of Business Intelligence based on current market intelligence. We finish this section with a more detailed definition of common business drivers for a Business Intelligence initiative in an organisation today, including their stakeholders and real life customer cases.

2.1 Enterprise Value Management

A business case for Business Intelligence should always be related to the business strategy and business objectives of an organisation. To get an understanding of the business strategy of an organisation we use the value discipline model of Treacy and Wiersema, as shown in figure 2.1.

In this model three different strategies for an organisation are characterised:

- **Operational Excellence;**
Superb operations and execution. Often by providing a predictive quality at the lowest possible price. Task-oriented vision towards personnel. The focus is on efficiency, streamlined operations, Supply Chain Management, no-frills. Volume is important. Many large international corporations are operating out of this discipline. Measuring systems are very important. Precise defined product assortment. A typical example of a company with this type of strategy would be Toyota.
- **Product Leadership;**
Very strong in innovation and brand marketing. Company operates in dynamic markets. The focus is on development, innovation, design, time-to-market, high margins in a short time frame. Flexible company cultures. A typical example of a company with this type of strategy would be BMW or Mercedes.
- **Customer Intimacy;**
Company excels in customer attention and customer service. Tailors its products and services to individual or almost individual customers. Focus is on delivering products and services on time and above customer expectations, including lifetime value concepts, Give

decision authority to employees that are close to the customer. A typical example of a company with this type of strategy would be Rolls Royce.

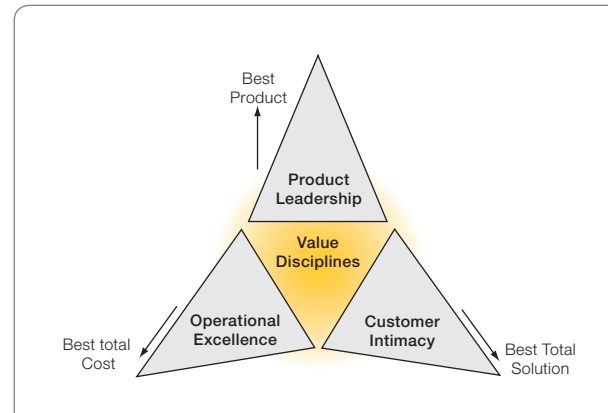


Figure 2.1 Value disciplines

Usually an organisation chooses to excel on one of the defined value disciplines to be successful. However the other two cannot be neglected of course, and should score at least on minimum level. In large organisations often separate divisions or business units own one of the defined value disciplines. For example a service business unit that chooses for customer Intimacy and a projects business unit that chooses for operational excellence.

Analysing your business strategy based on the value discipline model enables you to identify the areas where the organisation will gain the most value from Business Intelligence. An organisation with a focus on operational excellence will be interested in information related to costs

and quality. A BI solution for the marketing organisation of such an organisation will identify customers that are looking for the low prices in the first place. An organisation that focuses on operational excellence will probably invest less budget, and therefore a high end solution will not be realistic. It is however critical for any organisation to monitor and manage its enterprise values. These values are based on the business strategy in combination with the risk and compliancy demands, every organisation is facing today. The Logica Enterprise Value Management (EVM) model, as shown in figure 2.2, enables you to do so. This model balances business risks (KRI's) and

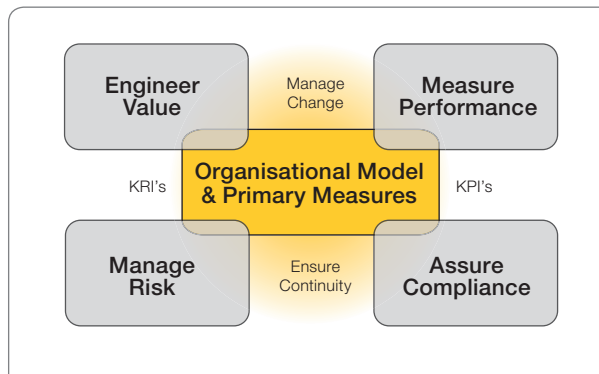


Figure 2.2 Enterprise Value Management

performance (KPI's) on one axis. On the other axis continuity and change are balanced. Integrating these value indicators creates an balanced enterprise value model for an organisation.

In order to obtain enough high level investment support, a compelling business case is required. The business

case - containing benefits, costs and the ROI - is a critical success factor in mobilising key players to drive the initiative. The business goals and the strategy define what the organisation wants to reach and how this should be accomplished. The strategy will be in line with the value discipline that the organisation chooses for. A business plan - complying to the goals and strategy - is specified in which objectives and policies are set. Budgets are provided to the business functions throughout the organisation. For a compelling business case it is necessary that the anticipated benefits contribute to the objectives of the corresponding business owner while the costs stay within the budget. If more than one business owner is involved in a BI initiative, then it is necessary to find a business owner at a higher level in the organisation. In that case it becomes important to link the benefits to the business strategy as well because a common goal must be found. Also, it is very difficult to implement a demanding initiative, while the people involved are focused on something different. Therefore, the BI initiative should also be in line with the chosen value discipline or business priority.

2.2 BI Market pull

Enterprises face a number of issues that drive the need for timely and accurate information for management decision making:

- Globalisation is intensifying competition and promoting consolidation. To remain competitive, enterprises must work smarter and reduce costs. For dominant players the challenge is to integrate acquisitions and reduce the number of systems and suppliers.
- In order to improve both market share and customer retention – especially of their most valuable customers – market leaders across a wide range of industries have to build and enhance their knowledge of customers' needs, preferences and behaviour.
- Organisations need to restructure quickly to cope with changing market conditions. The speed at which they can re-design company structures can be a major source of competitive advantage.
- Enterprises have to extend and enhance their monitoring of financial, environmental and safety aspects of their organisations, and improve the accuracy of information used for reporting and control. Such information often resides in multiple systems, needing to be consolidated, analysed and presented in alternative formats.
- In addition, the environmental 'green agenda' is encouraging IT departments to reduce their carbon footprints, by streamlining data processing and delivering more energy efficient IT.

All these factors continue to generate increased investment on BI platforms, but with an underlying need to improve strategy, implementation and outcomes.

A Gartner Executive Program survey, as shown in figure 2.3, conducted in 2008 across 1,500 organisations found that BI is the top technology priority for CIOs. But existing investments in ERP and BI have become a major barrier to change.

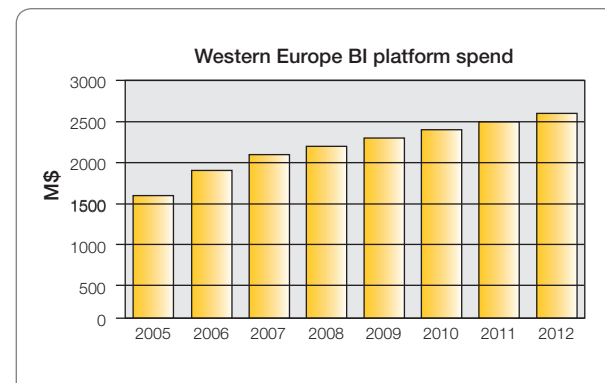


Figure 2.3 BI Spend Prediction (Source Gartner, Feb 2008)

CIO resources have been absorbed in managing multiple systems and migrations as vendors consolidate, and consequently CIOs have been unable to deliver the service levels expected. The result is that, while existing BI implementations may be growing, they are not doing so in ways that are either manageable or optimal for the enterprise. IT resources have been absorbed in managing multiple systems and migrations and CIOs have therefore not been able to deliver the expected service levels. Another consequence is that BI implementations do not extend in a manageable and for the business optimal way. Owing to their complexity, a proliferation of systems from different vendors, and the lack of a clear strategy, current

BI implementations rarely meet these expectations. Organisations are looking for, and desperately need, BI solutions which can deliver information based on a 'single view of the operational data', rather than multiple views and therefore inconsistent information.

In summary, the market demand for BI is based on the following:

- The impact of globalisation is putting pressure on C-level executives to make informed decisions, and on the CIO to provide accurate, consistent and timely information from a dynamic organisation.
- Additional information must be gathered and presented to stakeholders so as to comply with a growing body of regulations. compliance is a key issue, as it affects the share price and ability to trade.
- Organisations need to adapt to operational issues with appropriate decisions based on up-to-date and correct information, which is rarely obtainable in the form required from current BI implementations.
- Managers are used to having access to on-demand information from the internet, and likewise expect internal information to be readily available.
- Reducing the costs of BI has become a top priority – it is not unusual for an enterprise's BI systems today to be supplied by many different vendors, resulting many standards.
- Environmental concerns are also encouraging IT departments to streamline their data processing requirements.

Based on these demands we identified a number of business drivers that justify BI initiatives nowadays:

- Track risk and compliance;
Enable an organisation to be accountable and 'in control' by providing auditable and traceable information flows from operational systems to regulatory reporting.
- Extract more value from customer interactions;
Leverage the full potential of customer data in an organisation to analyse and predict customer behaviour and value.
- Track performance and align metrics across the organisation;
Support the performance management initiatives in an organisation by collecting, analysing and presenting the required metrics.

In the next sections these business drivers will be defined in more detail, including their stakeholders and a real life customer case.

2.3 Track risk and compliance

Compliance Stakeholders	
Risk Manager, Chief Compliance Officer	Wants to mitigate the risk of non-compliance. Needs reliable data. Needs an audit trail
CEO, Marketing Director	Wants to maintain reputation and avoid brand damage. Wants to improve brand value.
CFO, Finance Director	Wants to avoid penalties. Needs to maintain licence to operate.

Organisations have the obligation to inform stakeholders such as regulatory bodies (national banks, government), the shareholders and the public about their performance. Several regulations like Basel II, Solvency II, the Sarbanes-Oxley Act (SOX) and MIFID were introduced only in the last seven years. The timeline presented in figure 2.4

shows the regulations that have been introduced and the increasing rate with which new regulations have been introduced in the recent past.

The core requirement of Risk and Compliance initiatives is to prove that certain business processes are under

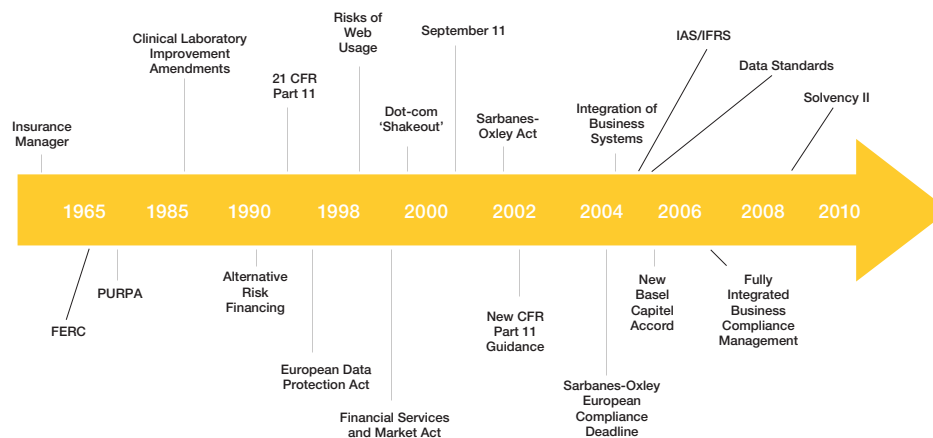


Figure 2.4 Regulations introduced (Source: Gartner)

control. By requiring that organisations, and even managers personally, are liable for the information provided, the information must be auditable and traceable from the administrative source to the final report. Business Intelligence offers the capabilities to audit and trace the information, in design- and run-time. Managing a company can be compared with navigation by means of a compass and a map. In both situations you need to select the right route to the goal and need information while underway. Applying this to BI, BI Solutions are the tools that provide the information to understand where you are. What BI can provide and support is:

- The need and urgency to address risk mitigation to reduce your risk profile based on quantitative data (Risk).
- The support and design of performance processes based on accurate data supporting evidence that you are in control to achieve the enterprise goals (Governance).
- The registration and presentation of data evidence and justification in support of operational and legal compliance requirements (Compliance).
- The registration and presentation of evidence supporting that the risk mitigation controls that have been implemented exist and work.

However, while BI exactly tells where you are and where you were coming from, it does not tell you the direction to follow, the rules or legislation to comply to and the risks to address. To be successful in achieving the governance, risk and compliance objectives in an organisation a comprehensive framework is needed that enforces:

- The blueprint for the quantitative data required by BI to function successfully.
- Assurance of the effectiveness of the risk & compliance framework.
- Assurance of visibility of targets, risk and compliance requirements.
- Improved access, reliability and relevance of management information used for decision-making.

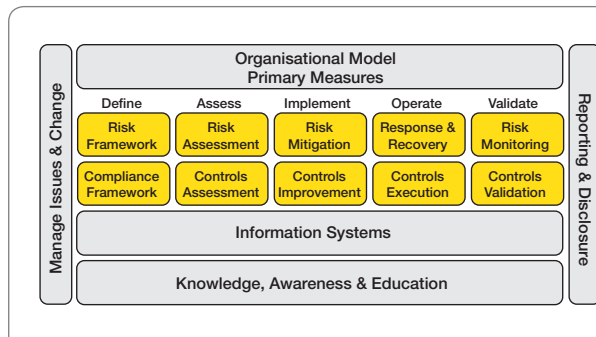


Figure 2.5 Logica GRC Framework

The framework for Governance, Risk and Compliance, as shown in figure 2.5, provides an organisation with a structured approach for Risk and Compliance management through the complete lifecycle, from definition to validation.

Compliance Case	
The Challenge	The Results
Major Bank needs to improve the management of both operational and credit risk across its global operations. The company requires information to create and validate group-wide risk rating models so it could improve business performance and, more importantly, ensure compliance with the requirements of Basel II, in order to demonstrate that its systems are secure and resilient.	Major Bank achieved its objectives, including the most important objective of being able to comply with Basel II in time, which had been a major concern for some time.

2.4 Extract more value from customer interactions

Customer Value Stakeholders	
Chief Marketing Officer	Needs to reduce churn and maximise market share. Needs a coherent pricing strategy, including bundles, offers, margin maximisation etc.
Head of Customer Service	Wants a single view of customer interaction. Needs to change from being a cost centre to a profit centre.
CEO, BU Director	Has to increase revenue and profit. Needs visible, trusted immediate information for decision making.

With the increasing mobility of customers to choose their suppliers, knowledge of customer needs is critical to retain customers, to attract new customers, or to offer other products to existing customers. Therefore, from a marketing and sales perspective it is essential to offer the right product at the right moment. The customer's behaviour is recorded within applications for CRM and call-centre processes. Business Intelligence offers solutions for marketing and sales organisations to analyse their customer behaviour.

Predicting customer product preferences and purchasing habits - and crafting the most relevant marketing

messages around this information - requires a carefully orchestrated mix of business acumen and an analytical framework that supports fact-based decision making. Without an analytical structure in place, even an experienced analyst will have difficulty manually analysing all of the complex information they may be collecting on customers. And, while still a powerful resource, an operational Customer Relationship Management (CRM) system alone will be unable to provide the deeper customer understanding required to add value to every interaction with each customer. Predictive Analytics is a general term, which describes a number of techniques used to identify pieces of information or decision-making

in data. A common misconception is that it always involves huge amounts of data through intelligent technologies to find patterns and give magical solutions to business problems. This is not true. Instead a predictive model is generated following a highly interactive and iterative process, based on CRISP-DM, as shown in figure 2.6. Business expertise must be used jointly with advanced technologies to identify underlying relationships and features in the data.

A seemingly useless pattern in data discovered through data mining can often be transformed into a valuable piece of actionable information using business experience and expertise.

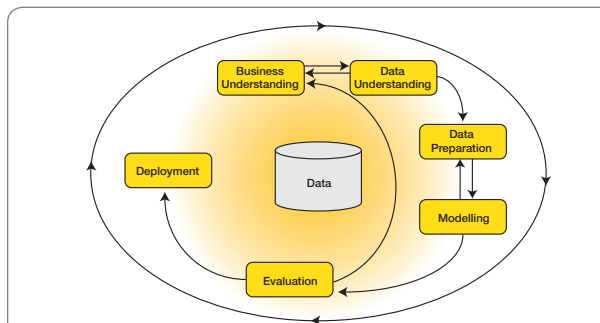


Figure 2.6 Predictive model generation (The CRISP DM Model)

The ability of a predictive model to measure, predict and optimise customer relationships is directly proportional to the degree of information an organisation provides to its data mining process. Ideally, there is an aim towards a 360° view of customers. A sound analytical infrastructure

allows for the gathering of all the relevant information about customers, as well as the organisation of it in a consistent manner. In this way, a 360° view of customers is achieved, which then forms the basis for wide-ranging analytical methods that aid in the measurement and building of truly interactive, profitable propensity models.

Once developed, predictive models can be used in conjunction with other models or business rules to accurately predict customer behaviour. The real skill is to find the best predictive model, and its corresponding predictors, for a particular business problem. This is difficult since there are so many options, algorithms, formulas, rules and weights you can apply to determine precisely how best to combine predictor variables. To make sense of large volumes of data and how best to model them, several Data Mining products have been developed.

More detail on the specifics of data- and text mining is given in section 7.6 on best practices in data- and text mining.

These products use customer data to build specialised predictive models to solve business problems, such as:

- How can we reduce churn.
- How can we increase customer profitability.
- Which customers will default on their payments.

The modelling process learns from the organisation's collective experience by leveraging customer habits, behaviour and demographics.

The knowledge gained is encoded in the predictive model itself. We have seen this approach of Predictive Analytics work successfully in many areas, such as:

- Predicting bad debt customers for a leading mobile operator, as shown in figure 2.7.
- Deploying officers on threat assessments to prevent crime.
- Predicting which underground network of pipes is likely to fail for a utilities company.

Satisfying customers in today's highly competitive global marketplace has never been more challenging. Having a deeper insight into customer expectations and future behaviours is the key to successful marketing campaigns. Predictive Analytical techniques to enable businesses to understand the key factors that drive customer value and loyalty, and attract more customers. As we measure and monitor the effects of marketing campaigns in light of the

impact on customer profitability, we can help organisations meet and exceed their Key Performance Indicators (KPI's) around improving the value of their customer base.

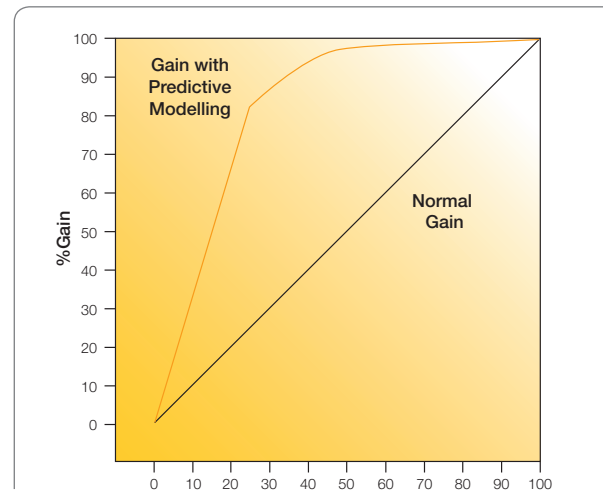


Figure 2.7 Predicting bad debt customers

Customer Value Case	
The Challenge	The Results
<p>A mobile operator made a significant annual investment in 40 general marketing campaigns. These failed either to reverse the decline in average revenue per user (ARPU), or reduce customer churn, which was running at 48% for pre-pay and 26% for post-pay. The operator had a data warehouse containing 12 months' off call detail records (CDRs) and billing data, but was unable to analyse this or develop strategies to improve performance.</p>	<p>Using predictive analytical models to offer the most appropriate product to each caller, our customer has been able to convert a customer service centre into a highly successful inbound sales channel. As a result, in just 6 months the operator achieved a double-digit reduction in percentage churn and generated additional revenues of €1.3 million. The operator now runs more than 200 highly targeted campaigns a year to stimulate usage and sell specific bundles. Return on investment in marketing campaigns exceeds the best previous results by over 230%. The new solution continues to identify further innovative offerings to improve customer retention and to stimulate revenue growth.</p>

2.5 Track performance and align metrics across the organisation

Track Performance Stakeholders	
CxO	Needs visibility of management information. Wants to implement closed loop processes for managing corporate performance.
CEO	Needs information to measure against KPI's. Wants to improve stakeholder information.
CIO	Needs the flexibility to deliver a continually changing set of performance information to the enterprise.

Corporate Performance Management is a strategic management approach aimed at structurally X-raying an organisation on all levels relative to the specified objectives and budgets. Examples of performance management methodologies are the Balanced Scorecard, INK-model, and Activity Based Costing. In the text-box below the more formal definition of CPM is given by the founders of the Balanced Score Card, Kaplan and Norton.

Definition of CPM...

'...provides managers with a comprehensive framework that translates a company's vision and strategy into a coherent set of performance measures.'
(Source: Kaplan and Norton)

Performance management certainly requires more than an IT-tool for the presentation of Key Performance Indicators. CPM should be based on an unambiguous definition of the essential motivation of an organisation. Therefore the organisational decision making process must be defined at the following levels:

- The mission and vision statements lead to business goals and a strategy. Critical Success Factors (CSF) define the prerequisites to reach the goals. The strategy states how the goals should be reached.
- The business goals and imposed strategy lead to objectives and a policy (business plan). Key Performance Indicators (KPI) define how the objectives will be measured. The imposed policy will be stated with business rules.

Decision making process level	Essential Motivation	Implementation in organisation
Strategic level	Business goals and strategy	CSF's
Policy level	Business objectives and policy	KPI's
IT level	Business rules logic	Score cards and Dashboards

Table 2.1 Decision making levels

- Within the BI environment the KPI's will be presented by scorecards, dashboards, etc. Business rules may be enforced by logic in the operational systems (for example to provide signals to end users) but may also be applied within the BI environment (for example to monitor if business rules are applied as required).

The table shows that when CPM is limited to a dashboard, several critical steps have been missed, resulting in different views within the organisation. Some examples of this lack of alignment within an organisation are given in figure 2.8.

A well-structured approach covering organisational, functional and technological aspects, is required to make

any performance management initiative successful. To be successful also for the long term, the exploitation aspects cannot be neglected as well. Working along balanced scorecard perspectives provides a structure that assures alignment between various perspectives.

Corporate Performance Management using Business Intelligence support requires a strong link to the goals & strategy and objectives & policy. To perform managerial activities information and standards are required that provides insight in just those goals and objectives. The strategy and policy must be translated into business rules. Business rules control business scenarios and must also be monitored to check if the business is running according to the imposed strategy and policy.

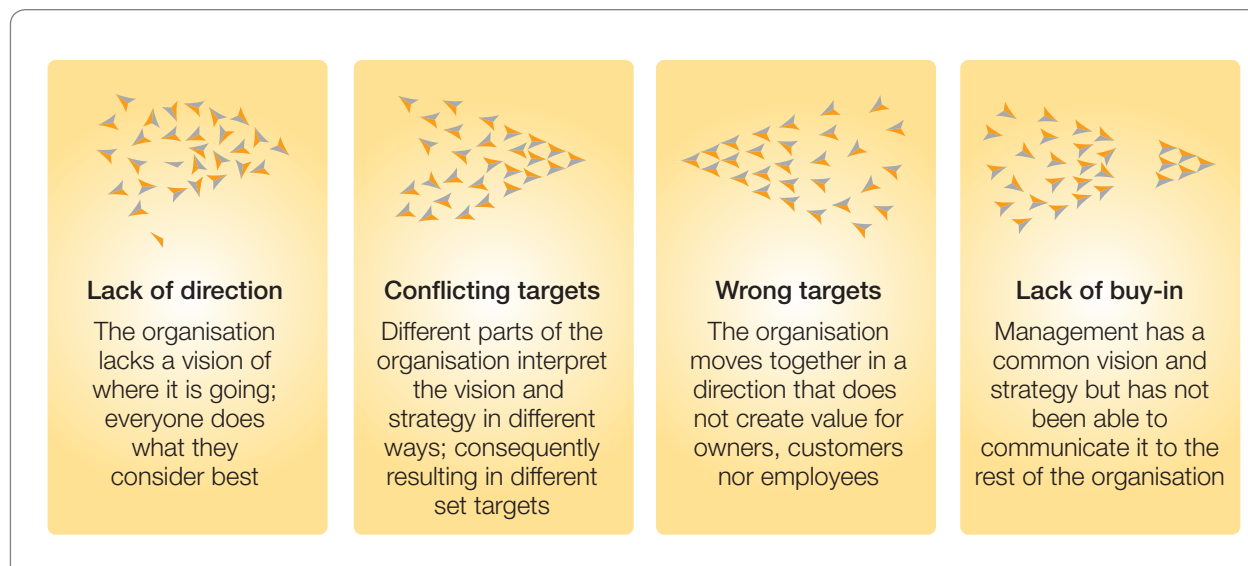


Figure 2.8 Lack of alignment on vision, mission and strategy

Identifying the relevant Critical Success Factors (CSF) and defining accurate Key Performance Indicators (KPI's) is a real challenge. When completed, key processes and activities with the highest business value, i.e. highest impact on the KPI, should be identified and prioritised. It is also important to have a satisfactory mix between leading and lagging indicators that reflects both the historical results and the upcoming trends and forecasts in different activities and processes.

For each key process, activity or initiative the decision points have to be analysed to identify the measures relevant to the decision. This analysis results in a clear set of required business information. Finally, the relevant sources of information requirements are analysed with regards to availability, completeness and quality.

All steps in the pyramid, as shown in figure 2.9, need aligned execution to ensure the effectiveness of the performance management initiative.

Effective measurement, monitoring and analysis of key performance indicators is critical to support performance management processes in an organisation. The CPM approach results in a comprehensive pyramid from strategy to operational goals and gives a clear picture of the alignment between strategy and the accumulated business information where Business Intelligence can support the continuous measuring, monitoring and analysis of the performance indicators at all levels.

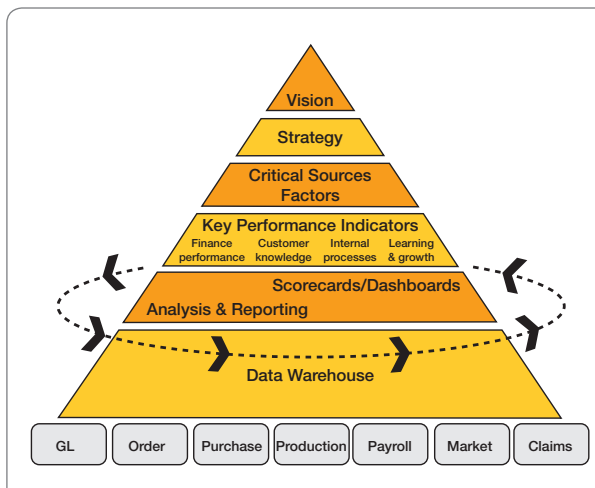


Figure 2.9 BI and CPM alignment

Track Performance Case	
The Challenge	The Results
<p>A major passenger rail operator was constantly struggling with weak financial performance. Management had a need for consistent information in general, and to define a set of information that could be used for steering the company's strategy. The company was also concerned that the information currently available was not supporting the developing organisation. Management data was on different systems and the process of capturing the information needed streamlining.</p>	<p>The project has supported this major passenger rail operator drive for unified corporate performance management and has rationalised the management decision process. The company is prosperous and the days of weak financial performance are over. The organisation now has effective decision-support information at all levels. Staff use the KPI's to control and comment on their area's performance on a monthly basis, and do so directly in the application, rather than on separate reports. Management uses the application in its meetings, and documents decisions in the application, avoiding parallel reporting mechanisms and reducing the management overhead.</p>

5 BI Lifecycle

Our knowledge and experience of many years has now been consolidated in a practical framework. Many approaches, methodologies and architectures are available for BI solutions in the market. Each of them has its advantages, disadvantages and specific application areas. Our BI Framework is not a new approach, methodology or architecture for BI solutions. It offers guidelines in the complex world of Business Intelligence to make the right choices and trade-offs between the many possibilities offered by the market.

Figure 5.1 presents the BI Framework. The BI framework consists of four stages, covering the business and ICT perspective (upper vs. lower half) as well as the change and the service perspective (right vs. left half). The BI framework represents a dynamic system of interaction between business and ICT, and between development and maintenance. The BI framework considers Business Intelligence as a lifecycle, implemented by a continuous business improvement program. Part of the BI Framework is a BI maturity model, supporting an organisation in each stage of the BI lifecycle. The BI framework provides a comprehensive inventory of the activities, models and products needed in the full BI lifecycle. This inventory is based on well-established principles in the ICT architecture arena and supports structured and consistent delivery of BI. Also each stage is supported by standardised evaluation and review packages.

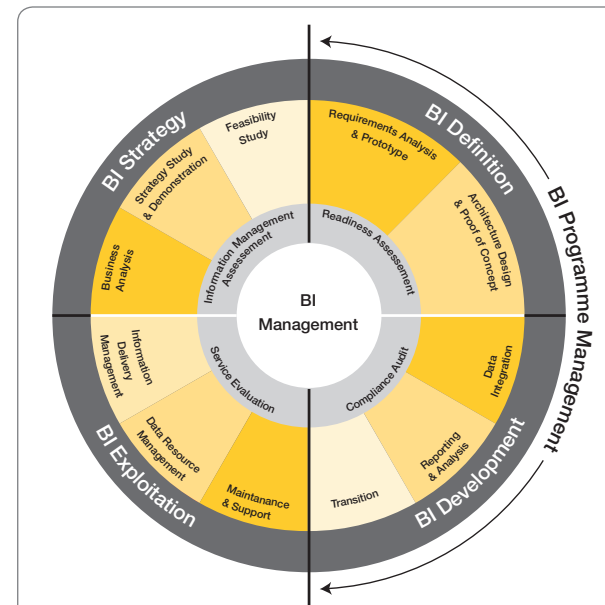


Figure 5.1 BI Framework

The BI Framework Stages are:

- **BI Strategy**

The BI Strategy enables an organisation to define and manage its Business Intelligence strategy. Based on the goals, objectives and the business drivers of an organisation the criteria of BI are determined within the BI strategy study. Of course there must be a business case that allows the development of a BI-solution. A feasibility study is performed to assess the current BI maturity of an organisation and to set expectations for the future BI solution at a realistic level. Business analysis describes the business model to which the organisation operates.

- **BI Definition**

The BI Definition defines what capabilities the BI solution must have in order to fulfil the BI Strategy. Therefore, a requirement analysis is conducted driven by and adhering to the criteria that are set in the BI strategy. Based on the requirements and the current ICT situation an appropriate BI architecture is designed. A manageable change programme is compiled to incrementally deliver the solution.

- **BI Development**

The BI solution is realised in increments, fulfilling the requirements and adhering to the defined BI architecture. Although reviews are an integral part of the activities within the lifecycle, we advise a compliancy audit during each increment. The compliancy audit looks at the solution under construction from a different perspective to verify if the incremental solution supports the originating BI strategy. Projects under time pressure have the tendency to make decisions only for the short term.

- **BI Exploitation**

The exploitation activities are focused on continuity, availability and stability of the realised BI solution. This starts with a controlled transition to the exploitation organisation. Data Resource Management manages the continuity of data deliveries and the related data quality. Information Delivery Management delivers information products to the end-users and enforces adequate usage of the BI solution.

Alignment is required between the business perspective and the IT perspectives on the one hand and the change and service perspectives on the other hand. Therefore, the stages in the BI Framework are interrelated. They constitute a dynamic system and should not be seen as a one-way street.

Forward seen the stages and activities give direction to the subsequent stages and activities. Although this sounds not surprising it is not the practice in many cases. Especially during the requirements analysis we tend to define all the requirements of all the business users instead of defining the requirements that support the tasks that fit within the BI strategy and the business case. In other words: We need to ask ourselves which tasks really require a BI solution.

Backward seen it is important that during the change process within BI definition and BI development and during the BI exploitation scope, changes with regards to the originating BI Strategy are identified. The project manager and the service manager must signal those back to the owner of the BI strategy. Scope changes can be refused or admitted. Accepted scope changes may be applied within the current change process or BI exploitation or may be part of a new initiative.

Because a BI solution develops incrementally, the BI organisation will be active in all four stages (BI strategy, BI definition, BI development and BI exploitation) simultaneously. For Business Intelligence the above must therefore be seen as a dynamic system. The stage reviews

(eventually offered as audit services) act as checkpoints to keep the BI organisation in the right direction.

This chapter will guide you through the various stages of the BI Framework and how to manage the BI lifecycle as

a whole. The objectives, activities and products in each stage will be demonstrated by the Ferrari case. The entire Ferrari case is defined in chapter eight.

Ferrari Case / Introduction

Since 1950 Ferrari has been at the peak of F1. When the titles come along, and there have been many, the season has been viewed positively. But even when championships were not won, Ferrari was at the centre of things. Success hasn't always come along and there have always been times of hardship. Racing will always be fundamental to Ferrari. The history of Formula 1 is tied to that of Ferrari. The Ferrari F1

team is the only team to have taken part in all world champion races in the maximum formula that have taken place until know. In describing each Ferrari model, inevitably, you will find some information on the drivers that won on circuits around the world as they too are part of our history. Of course, our fans are also fundamental and their joy adds a shine to all our victories. (Source: www.ferrariworld.com) ■

5.1 BI Strategy

Most organisations already have existing Business Intelligence solutions. In many cases, these initiatives are created from a specific business case and, therefore, have a limited scope and have resulted in stovepipe BI solutions. The BI strategy phase supports an organisation in determining an enterprise strategy for Business Intelligence. Based on the BI strategy the maturity of existing BI solutions is determined and the organisation can decide to integrate existing solutions or to (re)design an new BI solution. In the case of a complete redesign, a demonstration can help the business users to envision the new BI solution.

The results of all other phases of the BI Framework will be reviewed for compliancy with the BI strategy. Vice versa, the BI strategy will be periodically reviewed and adjusted based on the results and experiences during the subsequent phases of the BI Framework.

The following main activities are included in the BI Strategy:

- Strategy study;
 - Determining the criteria for the BI-solution based on the business strategy and ICT-strategy of the organisation.

- Feasibility study;
Defining viable alternatives for the implementation of the BI strategy.
- Business Analysis;
Defining business terms, semantic model, business rules and KPI's.

- Demonstration;
Envisioning the preferred solution by demonstrating a prototype compliant with the BI strategy and within the boundaries of the feasibility study.

The next sections explain in more detail the objectives, the activities to perform and products to deliver.

5.1.1 Strategy Study

The objective of the strategy study is to define the appropriate Business Intelligence approach, based on the business goals and objectives of an organisation. A BI strategy study is performed using various work forms like interviews, brown paper sessions and workshops with business management, ICT management and key users. Good skills in Business Intelligence consultancy as well as a keen knowledge of the customer's business domain are required to perform these kinds of activities. Key to the success of a strategy study is the level of commitment achieved by all stakeholders involved in the outcome. This commitment will prove to be crucial in the next steps of the BI initiative.

- **Business Strategy**

The overall business goals & objectives of the organisation determine the specific business drivers for Business Intelligence. For a customer centric organisation, the Business Intelligence initiative will most likely be supporting customer intelligence objectives. For cost-driven organisations the business

cases should be expected in the area of operational intelligence. For almost every organisation, especially financial organisations, risk and compliance will be a major generator of business cases. In order to achieve a successful BI programme the BI strategy has to be aligned with the current business cases. These are the initiatives on which the organisation will be spending put effort in and where the success will be most visible.

- **Scoping**

It is important to identify the correct scope for the BI strategy. In the scoping it is critical to determine whether the scope of the BI initiative is achievable within the responsibilities of the sponsor. When the BI strategy and the related business cases support a broader scope than the sponsor's responsibility does, at least one other relevant person within the organisation must be involved to achieve sufficient commitment. The scope has of course impact on the architecture.

- **Organisational Culture**

Another important factor in choosing the right strategy is the culture and organisational structure. Within a centralised hierarchical organisation the Enterprise Data Warehouse concept might work best. In a decentralised more informal organisation Data Mart concepts would be more appropriate.

- **Information Management Culture**

For the architecture and the approach of a BI solution, it is very important to obtain insight into the type of information that should be supported. Usually this can be derived from the level and location within the organisation where the strategy study takes place. When the BI strategy study, for example, is realised for the primary business operation of the organisation, the focus will be mostly on information for operational monitoring activities. When the BI strategy study is positioned in a staff department, the focus will be on information for analysis activities. When the BI strategy study is positioned for middle and higher management, the focus will be on performance reporting.

- **ICT strategy**

The BI strategy should be compatible with the ICT strategy within an organisation. It is important to support the strategic choices that have been made. When an organisation implements ERM (Enterprise Resource Management) or CRM (Customer Relationship Management) platforms, the BI capabilities of those platforms should be considered first.

As part of a strategy study sometimes a demonstration of the capabilities and possible future benefits is organised. The objective of a demonstration is to make the BI strategy tangible for the business users. By developing very limited BI functionality with a simple toolset the business users are able to envision how the BI strategy will work out for them in the future.

➔ Ferrari Case / Strategy Study

2005/2006 Evaluation

After a six year winning streak, the Ferrari run comes to an end. Nine wins, seven pole positions and 201 points on the board: that is a resume of Ferrari's 2006 World Championship. The figures are impressive but they were not enough to take either of the two titles. 2005 Has been a very difficult year and on the eve of the Bahrein Grand Prix, the first round of the new season, there was tension in the air. A less than perfect reliability record and a few too many mistakes proved very costly. (Source: www.ferrariworld.com)

Business strategy Ferrari F1 team

After two years without success Ferrari really needs a successful season to live up to its reputation. Success in F1 obviously has a positive effect on the image and sales of Ferrari Company as a whole. To gain success coming season, the Ferrari F1 team will in addition to excellent drivers and cars, focus on:

1. Investing in Racing intelligence, leverage past race experience, combined with long-term weather forecasting, to gain insight in specific conditions and requirements for each race in the new season and to predict racing conditions for upcoming races.
2. Reliable pits-driver communication, preventing last season mishaps.
3. Optimise information delivery to the FIA (Fédération Internationale, de l'Automobile), to stay compliant with regulations and prevent fines or worse penalties.

BI Strategy Ferrari F1 team

The Ferrari F1 team needs a Business Intelligence solution to support reporting and analysis on racing statistics and long-term weather forecasting. The same BI solution will also deliver the necessary information delivery to the FIA. Reliable pits-driver communication is of course very important but will not be supported by the BI solution due to the pure operational nature of this process. ■

5.1.2 Feasibility study

A feasibility study assesses the gap between the desired BI situation and the current BI situation of an organisation. The results of this assessment are used to estimate the necessary investments to realise the BI strategy and also to manage expectations of the business users. The

results of the feasibility study are important input for the BI roadmap which will be defined in the next stage, the BI Definition. The feasibility study examines technological as well as organisational and process-related aspects of BI.

- **Organisational aspects**

An inventory of the current organisation structure in relation to the BI strategy is made. The representation and participation of Business and ICT from the service and change perspective is determined, as well as ownership of the current BI solution. The relevant functions and roles from the BI discipline are identified, and their current performance is verified. In addition to the structure of the organisation, the capability level and experience of those employees responsible should be assessed.

- **Change and service processes**

A number of questions need to be answered. How are the processes for developing and managing of the BI solutions organised? Does a clear separation exist between development and maintenance? Is acceptance of changes formalised and how is this managed? Is a clear relationship between the BI efforts and the business drivers of the organisation (business case driven) recognisable? Are the exploitation processes equipped to support necessary service levels in terms of continuity, stability and availability of the management environments?

- **Technology**

In technology we assess the current architecture and infrastructure of a BI solution. It is important to investigate whether the technology used is future proof and maintainable. Does the technology comply with market standards? Also, providing separated development, test, acceptance and production environments is very important. Therefore, a close look on how this is accomplished is relevant. Further, do the development tools provide adequate capabilities

for developers to do their job properly and are the business users sufficiently supported by reporting and analytic capabilities? Is the business user sufficiently supported by reporting and analytic capabilities?

- **Data Management aspects**

Key in achieving accountable, consistent and traceable information in a Business Intelligence solution is the presence of data management processes. Business data definitions, data quality measurements, data ownership and data governance processes should already be part of any organisation. In many cases the first iterations of a Business Intelligence initiative still fail due to a lack of these capabilities being present in an organisation. The BI framework considers data management as a critical part of the BI foundation.

➔ Ferrari Case / Feasibility Study

Current BI situation

Currently Ferrari does use the circuit information systems to acquire race statistics during a race. The race statistics are used to evaluate the race but are not stored historically. Information about the performance of the cars in the race is fed real-time from the cars into the pit system to determine necessary pit stops and/or adjustments to the cars' configurations. After the race this data is sent to the Ferrari Factory for further analysis and historical perspectives. Race analysts and constructors in the Ferrari team are used to working based on their experience and available real-time data and do not use any historical data. Reporting to the FIA is performed by manually typing up a report based on data

available from the pit systems, where traceability and audit ability of this information is not guaranteed.

Gap Analysis

The Ferrari F1 team does not have any serious BI capabilities available yet to support the business strategy of the team. Neither a BI system nor experience with trend analysis and predictive analysis is available within the team. Also historical data is not available, except perhaps for car statistics within the Ferrari Factory. Reporting to the FIA is not compliant with traceability and audit-ability requirements of the FIA. The Ferrari F1 team has to invest in acquiring the right data, BI technology, skills and capabilities to fulfil the requirements as stated in the BI strategy. ■

5.2 BI Definition

In the BI Definition requirements analysis and architecture design are performed, within the constraints of the BI strategy stage. The scope of the BI initiative is finalised and the roadmap is defined for developing the various increments. After realisation of any BI increment the BI definition is evaluated and adjusted where needed. The objective of the requirements analysis is to define the capabilities of the system and especially to get an overview of the information needs of the different information users. The requirements analysis is performed using various work forms such as interviews, brown paper sessions and workshops with business management, ICT system owners and key users. Key is to determine what

information is needed and the availability of that data in the various data sources. Analysing the availability of source data, not only relating to the sheer existence of data but also the quality and timeliness, is an important part of this phase. Important is also to assess the way the information is actually used, assuring a good fit within the business environment. Also requirements like security, availability, traceability and audit-ability must be taken into account.

The architecture for the required BI solution must be designed such that the solutions will be future proof, flexible and maintainable. The architecture should cater for a swift implementation of the first increment.

Anticipating too far ahead will result in a lengthy and costly architectural phase which adds no value to the programme or the business on the short term. On the other hand, not anticipating future requirements will lead to a short term architectural design needing major adjustments and rework after each increment. Compared

to a regular system development initiative this stage delivers the business requirements and project start architecture. The next sections explain in more detail the objectives, the activities to perform and products to deliver.

5.2.1 Requirements analysis

Analysing the information requirements requires good consultancy skills as well as a good understanding of the analysed business domain. Specific for BI is that you need knowledge of the operational processes as well as the business domain of the BI users. Information requirements must be defined as clearly and structured as possible, but still in business terminology. Too often information requirements are translated directly into logical or even technical data models that are very hard to understand by the business users. Information requirements must be understood by the business users to keep them committed to the BI initiative.

In capturing the need for information, it is important to identify facts and dimensions. Facts are the measurements. These are, in general, the variables that are measurable in numbers, such as sales, profit, number of sold products. Dimensions are the views that allow the users to filter, summarise and aggregate the facts. Facts constitute whereupon a user can manage, Dimensions constitute what a user can manage. The set of dimensions constitute the scope of a user.

Commonly used dimensions are organisational hierarchies, product hierarchies, client hierarchies etc. A standard hierarchy present in every data warehouse is the calendar. The calendar shows the values of time hierarchies in days, weeks, months etc. Plotting the inventory of facts against dimensions per user group in a matrix, delivers a comprehensive understanding of the overall information requirements. Next step is to combine the information requirements of the different user groups to identify the overlap of informational needs.

➔ Ferrari Case / Requirement Analysis

Based on interviews and workshops with the constructors and race analysts of the F1 team an information requirements matrix is defined, indicating the measurements and the dimensional view on the measurements for both the constructors and the race analysts.

Also, in this early stage a data source analysis is performed to ensure the availability of data or to identify any data sourcing issues upfront. The analysis shows that the F1 team relies on a lot of external data. Efforts can now be started to acquire this external data to support the future BI solution. ■

Dimensions	Race Results		Measures Car Statistics			Weather		Data Source Dimensions
	Position	Time	Oil Temp	Tire Pres	Susp.	Temp	Humidity	
Location	Race Analysts	Constructors	Race Analysts & Constructors	Race Analysts	Race Analysts	FIA Database		
Continent								
Country								
Circuit								
Calendar	Race Analysts & Constructors	Constructors	Race Analysts	Race Analysts	Generate in BI Solution			
Year								
Quarter								
Month								
Day								
Week								
Time	Race Analysts & Constructors	Constructors	Race Analysts	Race Analysts	Generate in BI Solution			
Hour								
Min								
Sec								
Race	Race Analysts & Constructors	Race Analysts & Constructors	Race Analysts	Race Analysts	Circuit Database			
Type								
Lap								
Sector								
Corner	N/A	Constructors	N/A					
Data Source Measures	FIA Database for history, Pit system for actuals	Ferrari Factory Research lab for history, car telematics system for actuals	FIA Database for history, Weather forecast agency for predictions					

The integrated facts and dimensions matrix clearly shows overlap in information requirements of different user groups. This is very useful information in determining increments. Attention must be given to match the definition of the overlapping information requirements. The amount of overlap also indicates the most suitable data warehouse architecture topology. Where there is a lot of overlap, a more centralised BI architecture is preferred. With little to no overlap, a more decentralised BI architecture is commonly a more viable option.

The fact dimension matrix also shows the detail necessary in the combination of facts and dimensions. This level of detail is defined as the granularity of the data that should at least be available. Granularity can also be presented in a diagram notation as shown in figure 5.2.

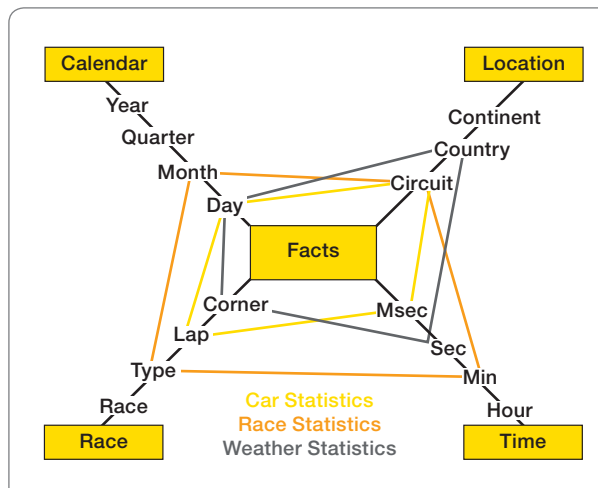


Figure 5.2 Granularity diagram

In the requirements analysis we determined what information is required by the business users. Now we need to determine which data are available in the source systems of the organisation. Based on the fact dimension matrix, including the defined granularity, we will scan the various source systems of the company to determine availability of source data. When identifying candidate source data we need to examine the fitness for purpose of the particular data elements. Important aspects are the definition, quality, timeliness and completeness of the source data. When making such an inventory many challenges will arise concerning the availability and quality of the data. The most common ones are:

- Differences in definition;
 - Investigating the documentation of source systems often uncovers serious flaws in data definitions compared to the definitions identified during the requirements analysis. Through workshops with the system owners and the business users for the BI solution, these differences in definition and omissions can be clarified or solved to a certain extent. Mapping of source data against information requirements results in transformation rule definitions. The transformation rules will be implemented within data transformation processes in the data warehouse. The transformation processes must allow traceability and audit ability of data backwards from a report to its original data source. Ideally, this exercise may be done even without a business case for BI, because clear and unambiguous business definitions (business analysis) are relevant for all ICT initiatives.

- Data not available;
In some cases the required data is not available in any source system. In these cases research is performed to establish whether this data can be derived from available data based on transformation rules. In some cases missing pieces of data are available externally and can be purchased.
- Information available more than once;
Within one source system data will not be stored redundantly in most cases. However, multiple source systems often do store the same data redundantly. In those cases the leading source system for that specific data element must be determined. A rule of thumb is to choose the source system that is first to store the data element in question, and in doing so limiting the chain of data transfers and possible loss of quality.
- Information not available at the right granularity level;
In general, source systems contain data with a lower level of detail than needed for the BI solution. Aggregation to the desired level in the BI solution is not a problem in those cases. It is even advised to store the lowest level of detail also in the data warehouse to assure that any time integration with other data sources is possible. A common challenge is to find the right data sources to build up a dimension. Due to the different perspectives of management information compared to the daily operations, dimension data may be available, but often structured quite differently. transformation rules will have to be defined to transform the operational structures to the required dimensional structures in the BI solution.

Last step in the requirements analysis is to determine the requirements that are not related to data or information. The future BI infrastructure and architecture are highly impacted by those requirements. In addition, the acceptance of the BI solution depends not only on the information requirements but also on the below types of requirements:

- Information Security;
Information from different sources is integrated in a BI solution, creating a valuable and highly confidential integrated data collection. This often encompasses strategic information that should not reach unauthorised people, not within and definitely not outside of the organisation. Therefore, it is important to determine what specific security measures should be taken.
- Volume;
Typical for a BI solution are the large volumes of stored data and the set-oriented analysis of data. Infrastructure and database design should cater for these characteristics as they are particular to a BI solution. In addition to the source data availability, the impact of the volume on the infrastructure determines the feasibility of the information requirements.
- Location;
The location from which data is delivered and from which the BI solution is used is also an important factor in the design of the infrastructure and architecture. An internationally deployed BI solution often needs specific capabilities such as multilingual support and availability around the clock, 7 days a week. The same may be valid for organisations

that deliver BI as a product to external information consumers.

- Availability, stability en continuity;
The degree of availability required for the BI solution needs to be determined as well. For example, BI solutions that are used on a global scale within a company are commonly available 24 hours a day to access report and analysis applications. In those cases loading the data warehouse should not interfere with the ability to report and analyse the available information in the data warehouse. Many business management processes have peak moments. For example, at the end of a month or closure of the fiscal year. During these moments availability of a BI solution is crucial, whereas during other periods less availability does not necessarily cause an immediate problem.
- Traceability of information flows;
Results from analysis and reporting applications are often used for strategic decision making and must often comply with regulatory demands. Traceability and an audit trail of the data from a report back to the source becomes very important in those cases. The BI architecture must be well-equipped to support these capabilities.

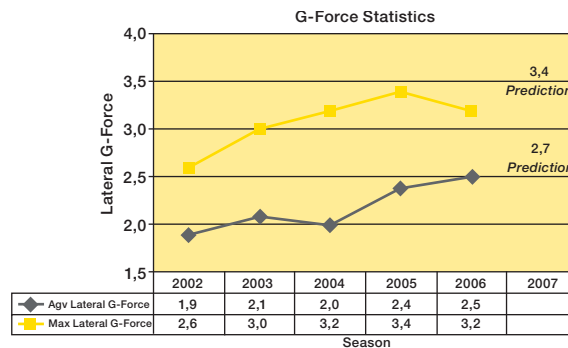
To support the requirements analysis a prototype is advised. During a 'scoping workshop' for all stakeholders the scope is set to realise only the most relevant requirements, achievable in a few weeks. To implement the prototype, desktop software - such as Microsoft Office products - could be used. These kinds of products are readily available in almost every organisation. They offer adequate possibilities to show the basics of Business

Intelligence. The prototype is a disposable product that focuses on the outside of the solution and may not even contain internal data transformation processes. It should never be expected to last as the first increment of the real BI solution. The product selection and testing of alternative products in a proof of concept takes place at a later stage, as part of the Architecture definition during the BI Definition.

➔ Ferrari Case / Demonstration

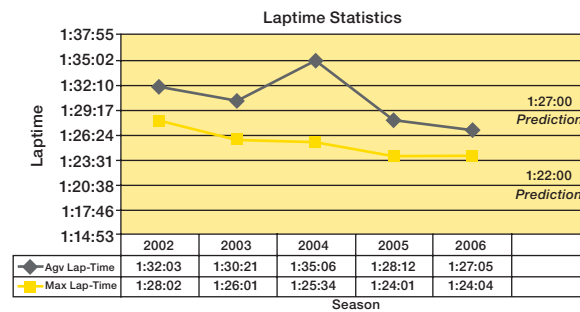
A prototype supports the requirements analysis and provides feedback to the constructors and race analysts about how the BI solution will look like.

For the constructors a simple model is configured to predict the average and maximum lateral G-force of the car on a specific circuit based on races on that circuit in the past. G-force prediction is very important for the constructors to optimise the configuration of the suspension of the car.



For the race analysts a simple model is configured to predict the required minimum lap time and average lap time on a specific circuit based on races on that circuit in the past. Lap time prediction is very important for the race analysts to plan the right racing strategy with the drivers.

Both demonstrations are realised using sample data and very basic analytical functionality. By selecting the most relevant analysis subjects the future end-users are now convinced of the benefits of a BI solution. ■



5.2.2 Architecture design

The architecture to be designed has to be future proof, flexible and maintainable. The architecture should cater for a swift implementation of the first increment. Anticipating too far ahead will result in a lengthy and costly architectural phase with too little added value for

the business in the increments. Not anticipating to future requirements will lead to major adjustments and rework after each increment. The following aspects should be taken into account during the architecture design:

- **ICT architecture Alignment;**
The data warehouse should, of course, fit into the total ICT architecture within the organisation. Many organisations are currently working on Enterprise Application Integration (EAI), and Service Oriented Architectures (SOA). The data warehouse architecture should fit into these developments.
 - **Information Architecture;**
The architectural design has to be as comprehensive as possible. Insufficient attention to critical BI components will lead to serious adjustments and rework in the future.
 - **Technology Architecture;**
Various architectural topologies exist for BI architectures in the marketplace today. None of them are bad, but choosing the right one for your organisation is very important and relies on the specific requirements of your organisation. In the section on best practices a objective evaluation method is presented to select the right data warehouse architecture for your situation.
 - **Market Development;**
Standard solutions for BI are increasingly more common on the ICT market. A BI component is also often found in an ERM or CRM platform. These developments must be taken into consideration when designing the BI architecture.
- In all organisations different types and levels of information requirements reside. In general terms, the following levels of information services exist within an organisation:
- **Information services for operational workers**
The information in these systems is the basic administration of the product data, client data, financial data and process data. Many users frequently assess relatively small amounts of transactions. The data is structured to provide efficient, fast and reliable transactional processing. Reports with integrated operational data to support operational work
 - **Information services for operational management**
Monitoring and managing the primary business processes requires specific information. The necessary information mainly consists of up-to-date reporting of results from the primary processes and are often structured by product type, business process or business function. For a proper comparison with the past, a solid historical perspective is important.
 - **Information services for tactical management**
In supporting tactical management it is important to signal trends and compare these across procedures, company business and products. An integrated and consistent recording of information, based on a business object model called 'Single Source of Facts', is essential.
 - **Information services for strategic management**
At a strategic level it is not only about analysis of the past but also about building business models for the future, based on the past and on market development. Information is structured to support a specific research objective like customer value, financial analysis or risk management.

Based on the information requirements and the other aspects mentioned before, the target architecture can

be designed. The basic components to provide in the BI architecture are presented in figure 5.3.

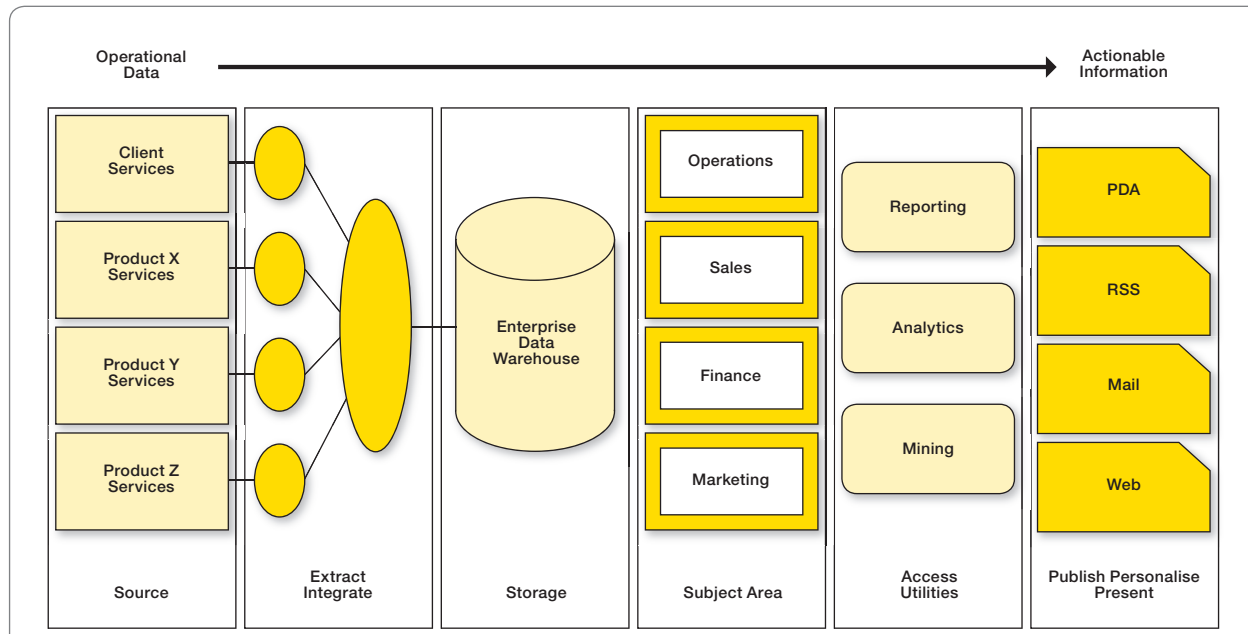


Figure 5.3 Architecture components

Not all components in this overall information flow are always required to fulfil the specific requirements of an organisation. In a basic scenario a simple extract from a source system, preparation of the data for the information needs and analytic functions and presentation of the information to a single user group might be sufficient. When combining multiple source systems usually more sophisticated functionality for integrating and storing data is required to create a 'single source of facts' or data warehouse. When a variety of different user groups have

to be supported specific subject areas or data marts have to be created each presenting the relevant subset of data for a specific user group. Also more sophisticated capabilities for publishing and personalisation of information products might be needed in those cases.

When designing a BI architecture all components should at least be considered on their relevance. In the table below the various components are explained in more detail combined with the scenarios in which to use them.

BI Architecture components		Scenarios				
Managed by	Advantages	Basic	Different channels and formats	Data from multiple sources	Demanding historical reliability	For various organisational purposes
Extract	Extracting data from data sources.	●	●	●	●	●
Integration	Integrating data from multiple sources.			●	●	●
Storage	Creating 'Single source of facts' with historical perspective.				●	●
Subject Area	Creating subsets of information to support various information requirements					●
Access	Preparing data to support specific information requirements including calculations and aggregations.	●	●	●	●	●
Utility	Analytical tools to generate specific information products.	●	●	●	●	●
Publish	Managed publication of information products.		●	●	●	●
Personalize	Delivery of information products specific to a user (group) profile.		●	●	●	●
Present	Presenting information products to the business user.	●	●	●	●	●

Table 5.1 BI Architecture components

In the marketplace today several technologies and methodologies exist to implement these components in a technical BI architecture. Important market developments, influencing technical BI architecture, are:

- **ERM and CRM platforms**

Currently organisations are often in the process of

implementing ERM (Enterprise Resource Management) or CRM (Client Relationship Management) platforms. These platforms often also contain a Business Intelligence component. Examples are SAP Business Warehouse and Siebel Analytics (now Oracle). The BI components of these platforms are very useful when the majority of business processes are already

integrated into these platforms. However, when large areas of the information requirements are not covered by these platforms, but are supplied by other sources, a challenge arises. The standard BI solution delivered with these platforms offer sufficient possibilities to import 'external' sources. However, in many cases very generic storage structures are used, making reporting on the 'external data' quite difficult.

- **Industry Data models**

Several standard data models for data warehousing are available in the Business Intelligence market, supplied by vendors like IBM or open source data models like the DWII models of Inmon. The most important added value of these kinds of models is that they give an objective referential framework independent of the organisation. This can significantly speed up preparations for the development of a BI initiative by focussing internal discussions. However, these models do not offer an out-of-the-box implementation of a data warehouse. Therefore, there are few benefits to the realisation of increments.

- **Meta data driven Data Warehousing**

The market has solutions in which the data warehouse is generated automatically, based on 'functional' specifications (metadata). Examples are Kalido and BI-Ready. Benefits of these solutions are strongly standardised data models and data transformation processes.

- **'Canned' data warehouses**

Vendors nowadays promote the usage of out of the box data warehouse solutions or data warehouse appliances. These type of solution comprise of hardware, database, ETL tooling and data models. Considering the achievements of these type of solutions in terms of performance, time to market and relative low pricing, we should take this development very seriously. Not only specific vendors like Kognitio and Datallegro offer these solutions, also main stream vendors like Teradata, Oracle and IBM are moving in this direction.

Part of the architecture design is also the selection of the right technology for the future implementation of the BI solution. Usually the BI technology selection starts with an inventory of available technology in the marketplace, including existing technology within the organisation it self. Information from independent research institutes, like Gartner, OVUM or TDWI, is available to match the BI technology to the specific architecture requirements in the organisation. The preferred technology based on selection and matching is tested in a proof of concept. Based on the most important architecture requirements the technology is tested in the environment of the organisation to prove its capabilities.

➔ Ferrari Case / BI Architecture

The prototype showed how a Business Intelligence solution would support the F1 team and the decision has been made to implement a brand new Business Intelligence solution. The solution must provide all required information by the FIA and support the race analysts and the constructors with predictive analytics. Data will be extracted from multiple sources and historical data must be stored to provide trend analysis capabilities. Information to the FIA will be provided with a

secure publication mechanism, audit-able and traceable. Information for the constructors and race analysts will be provided in multiple formats to maximise flexibility. Because of the competition within the F1 world and the rotation of professionals between the various teams, authentication and authorisation are very important. In the table below the requirements of the new BI solution are mapped onto a standardised BI Architecture framework.

Function in Architecture	Ferrari F1 BI Solution
Extract	Data from the circuit databases and the FIA database will be purchased and delivered. Historical data from the Ferrari factory research lab will be acquired. All data from the pits and car systems will be collected.
Integration	All acquired data will be integrated to provide maximum support to the race analysts and constructors.
Storage	A single source of facts, keeping track of all historical data, is very important for Ferrari.
Subject Area	Subsets of data will be created to support the different information needs of the FIA, the race analysts and the constructors.
Function	To map our data to the information requirements of the FIA, specific calculations and aggregations will be performed.
Utility	Analytical tools will be provided to the race analysts to perform simulations.
Publish	Authentication and authorisation are very important due to the value of the available information to our competitors. A secure publication mechanism has to be provided.
Personalize	The information to the FIA will be delivered compliant with the specific interface requirements of the FIA officials.
Present	All BI products will be presented through the standardised portal of the Ferrari F1 team.

Ferrari needs the most comprehensive architecture scenario, based on the mapping of the requirements onto the BI architecture functions. Now we know what type of functions

and supporting software we have to consider when starting development. ■

8.1 Introduction

Within this book we use a case to illustrate the vision and approach we take in achieving Business Intelligence solutions. The information used in this case is based on public available sources. The case does however not necessarily reflect the actual situation at Ferrari. The

case is used to demonstrate the activities to perform and the products to deliver in the defined stages of the BI Framework. The table below present the case against the BI Framework stages.

Ferrari case	BI Framework stage
Strategy study	BI strategy
Feasibility study	
Requirements analysis	BI definition
Demonstration	
BI architecture	
Data warehouse realisation	BI development
Reporting and analytics realisation	
Data quality	
Data vault modelling	
Dimensional modelling	
Exploitation	BI exploitation

Table 8.1 Ferrari case - BI Framework stages

8.2 Strategy Study

Since 1950 Ferrari has been at the peak of F1. When the titles come along, and there have been many, the season has been viewed positively. But even when championships were not won, Ferrari was at the centre of things. Success hasn't always come along and there have always been times of hardship. Racing will always be fundamental to

Ferrari. The history of Formula 1 is tied to that of Ferrari. The Ferrari F1 team is the only team to have taken part in all world champion races in the maximum formula that have taken place until know. In describing each Ferrari model, inevitably, you will find some information on the drivers that won on circuits around the world as they

too are part of our history. Of course, our fans are also fundamental and their joy adds a shine to all our victories.

2005/2006 Evaluation

After a six year winning streak, the Ferrari run comes to an end. Nine wins, seven pole positions and 201 points on the board: that is a resume of Ferrari's 2006 World Championship. The figures are impressive but they were not enough to take either of the two titles. 2005 has been a very difficult year and on the eve of the Bahrein Grand Prix, the first round of the new season, there was tension in the air. A less than perfect reliability record and a few too many mistakes proved very costly. (Source: www.ferrariworld.com)

Business strategy Ferrari F1 team

After two years without success Ferrari really needs a successful season to live up to its reputation. Success in F1 obviously has a positive effect on the image and sales of Ferrari Company as a whole. To gain success next season the Ferrari F1 team, next to excellent drivers and cars, will focus on:

1. Investing in Racing intelligence, leverage past race experience, combined with long-term weather forecasting, to gain insight in specific conditions and requirements for each race in the new season and to predict racing conditions for upcoming races.
2. Reliable pits-driver communication, preventing last season mishaps.
3. Optimise information delivery to the FIA (Fédération Internationale, de l'Automobile), to stay compliant with regulations and prevent fines or worse penalties.

BI Strategy Ferrari F1 team

The Ferrari F1 team needs a Business Intelligence solution to support reporting and analysis on racing statistics and long-term weather forecasting. The same BI solution will also deliver the necessary information delivery to the FIA. Reliable pits-driver communication is of course very important but will not be supported by the BI solution due to the pure operational nature of this process.

8.3 Feasibility Study

Current BI situation

Currently Ferrari does use the circuit information systems to acquire race statistics during a race. The race statistics are used to evaluate the race but are not stored historically. Information about the performance of the cars in the race is fed real-time from the cars into

the pit system to determine necessary pit stops and/or adjustments to the cars' configurations. After the race this data is sent to the Ferrari Factory for further analysis and historical perspectives. Race analysts and constructors in the Ferrari team are used to working based on their experience and available real-time data and do not use

any historical data. Reporting to the FIA is performed by manually typing up a report based on data available from the pit systems, where traceability and audit ability of this information is not guaranteed.

Gap Analysis

The Ferrari F1 team does not have any serious BI capabilities available yet to support the business strategy of the team. Neither a BI system nor experience with trend analysis and predictive analysis is available within the team. Also historical data is not available, except perhaps for car statistics within the Ferrari Factory. Reporting to the FIA is not compliant with traceability and audit-ability requirements of the FIA. The Ferrari F1 team has to invest in acquiring the right data, BI technology, skills and capabilities to fulfil the requirements as stated in the BI strategy.

8.4 Requirements Analysis

Based on interviews and workshops with the constructors and race analysts of the F1 team an information requirements matrix is defined, indicating the measurements and the dimensional view on the measurements for both the constructors and the race analysts.

Also, in this early stage a data source analysis is performed to ensure the availability of data or to identify any data sourcing issues upfront. The analysis shows that the F1 team relies on a lot of external data. Efforts can now be started to acquire this external data to support the future BI solution.

Dimensions	Race Results		Measures Car Statistics			Weather		Data Source Dimensions
	Position	Time	Oil Temp	Tire Pres	Susp.	Temp	Humidity	
Location	Race Analysts	Constructors	Race Analysts & Constructors	Race Analysts	Constructors	Race Analysts	FIA Database	
Continent								
Country								
Circuit								
Calendar	Race Analysts & Constructors	Constructors	Race Analysts	Race Analysts	Constructors	Race Analysts	Generate in BI Solution	
Year								
Quarter								
Month								
Day								
Week								
Time	Race Analysts & Constructors	Constructors	Race Analysts	Race Analysts	Constructors	Race Analysts	Generate in BI Solution	
Hour								
Min								
Sec								
Race	Race Analysts & Constructors	Race Analysts & Constructors	Race Analysts	Race Analysts	Race Analysts	Race Analysts	Circuit Database	
Type								
Lap								
Sector								
Corner	N/A	Constructors	N/A	N/A	N/A	N/A	N/A	
Data Source Measures	FIA Database for history, Pit system for actuals		Ferrari Factory Research lab for history, car telemetrics system for actuals			FIA Database for history, Weather forecast agency for predictions		



Logica

250 Brook Drive

Green Park

Reading, RG2 6UA

United Kingdom

T: +44 20 7637 9111

F: +44 20 7468 7006

E: hga.bi.ww@logica.com

I: www.logica.com/BI

Bestellen Sie die Printausgabe auf www.logica.de/bi-buch

About Logica

Logica is a business and technology service company, employing 39,000 people. It provides business consulting, systems integration and outsourcing to clients around the world, including many of Europe's largest businesses. Logica creates value for clients by successfully integrating people, business and technology. It is committed to long term collaboration, applying insight to create innovative answers to clients' business needs. Logica is listed on both the London Stock Exchange and Euronext (Amsterdam) (LSE: LOG; Euronext: LOG). More information is available at www.logica.com.

Bestellen Sie die Printausgabe auf www.logica.de/bi-buch