Master Thesis

Success Measurement for Cross-selling Mechanism in Customer Relationship Management

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Statement

Hereby I do state that this work has been undertaken by me. All literally or content related quotations from other sources are clearly pointed out and no other sources rather than the ones declared are used.

Fei Xiao

Hamburg, November 2004

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Abstract

"Data Mining is the process of extracting valid, useful, unknown and comprehensible information from data and using it to make business decisions."[1] Modern Customer Relationship Management (CRM) systems use data mining to analyze customers and their behaviour so as to improve and optimize the relationships of a company with its customers. However, whether the high investment in data mining project really brings tangible benefits to the company is uncertain. The return can only be demonstrated based on an adequate measuring and reporting system, whose development, however, lags far behind.

The goal of this research is to develop a detailed methodology to implement success measurement within SAP CRM Marketing solution. This project work is focused on the success analysis of the cross-selling scenario, which is based on the data mining technique - association analysis. The methodology should be easy to follow and reusable for standardized CRM software.

The thesis starts with background introduction on Customer Relationship Management, Data Warehouse and Data Mining to set the stage for the elaboration of the business problem. The discussion on the definition of success and the derivation of Key Performance Indicators lead to the establishment of a success model for cross-selling. A closed-loop cross-selling process with measuring and reporting mechanism is proposed in the next step. Accordingly the functionalities and data required to support the process are analyzed in detail. The practical part is the implementation of a prototyping solution that integrates measuring and reporting mechanism into the existing process. The reporting

[1] See: IBM Redbook: Mining Your Own Business in Retail: Using DB2 Intelligent Miner for Data.

results are not only exemplified and illustrated afterwards, but the feasibility of feeding them back into the system for automatic optimization is explained as well. The thesis ends with the conclusion and evaluation of the project findings as well as the observations about how the job might have been done even better were it not for data and time constraints.

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List of Abbreviations

ABBREVIATION	FULL NAME
aCRM	**A**nalytical **CRM**
APD	**A**nalysis **P**rocess **D**esigner
BAPI	**B**usiness **A**pplication **P**rogramming **I**nterface
BC	**B**usiness **C**ontent
BW	**B**usiness Information **W**arehouse
CIC	**C**ustomer **I**nteraction **C**entre
CLV	**C**ustomer **L**ifecycle **V**alue
CRM	**C**ustomer **R**elationship **M**anagement
CS	**C**ross-**S**elling
ETL	**E**xtraction**, T**ransformation**, L**oading
GUI	**G**raphic **U**ser **I**nterface
ISA	**I**nternet **SA**les
IT	**I**nformation **T**echnology
KPI	**K**ey **P**erformance **I**ndicator
OLAP	**O**n**L**ine **A**nalytical **P**rocessing
OLTP	**O**n**L**ine **T**ransactional **P**rocessing
PP	**P**roduct **P**roposal
RFM	**R**ecency**, F**requency**, M**onetary
ROI	**R**eturn **O**n **I**nvestment
SAP	**S**ysteme, **A**nwendungen, **P**rodukte in der Datenverarbeitung (Company name)

Chapter 1
Introduction

1.1 Motivation

The idea for the topic and the research interest came from the practical business issues.

Competitive markets, demanding customers and the need to optimize internal processes put companies under great pressure. They are now looking for software solutions, which provide seamless end-to-end integration, offer the functionalities required by their industry and can be flexibly deployed.

Customer Relationship Management is a business strategy aimed at optimizing customer-facing activities for the greatest impact on business success. Modern CRM systems offer an increasing number of intelligent automatisms that allow continuously improving and optimising the relationships of a company with its customers. For example,

- Rule engines determine or propose treatment of individual customers based on their current or previous behaviour;
- Smart algorithms predict fraud, customer satisfaction, or future profitability. These predictions allow employees to adapt their interaction with their customer.

CRM systems making more and more use of such Customer Intelligence mechanisms reach high degrees of sophistication. The development of adequate control and reporting mechanisms for Customer Intelligence, however, lags far behind. What is the current situation in the market? Usually, systems don’t record follow-up activities resulted from a particular intelligent mechanism, for instance, whether customer buys after getting a product recommendation. Most CRM systems do not even track or count the application of Customer

Intelligence mechanisms so that it is not known how often a particular rule or prediction function was used or which results it produced with what frequency.

In this master thesis, prerequisites and requirements for measuring success of Customer Intelligence mechanisms will be investigated. Research will be done based on the specific example of cross-selling mechanism, as it is available in mySAP CRM Marketing and Analytics solution.

Selling additional products or services to the customers a company already has is referred to as cross-selling. For example, while a visitor browses information of a digital camera in a web shop like Amazon, messages like “better to buy together with the following camera case”, or “customers who shopped for that camera also shopped for……” often pop up. Cross-selling technique is widely used in the business world, especially popular in retail and financial services. It is available through both channels of Internet Sales (ISA) and Customer Interaction Centre (CIC) in mySAP CRM. Cross-selling rules are generated based on former transactional sales data using the data mining technique - association analysis. It is available in the Data Mining Workbench in SAP BW. However, the benefits for the customer to use this feature are hard to measure.

1.2 Objectives

The major objectives of this thesis are to:

- Define the requirements for success analysis: What are the key questions that need to be answered in order to evaluate success of cross-selling rules and to improve their effectiveness? Which levels of success control are relevant? Which are critical?
- Determine prerequisites within business processes and infrastructures for success analysis: Which data has to be tracked by the CRM system? Which processes are easier, which are more difficult to track?
- Suggest deployment strategies for success evaluation of cross-selling mechanisms: How could reporting for success monitoring of cross selling look like? How does the need for analysis influence the design of operative business processes? Which alerting mechanisms or adaptive automatisms may be required?

1.3 Project Overview

An IT based business model is a multi-layered architecture.

The first step to build an application is to define the business requirements and objectives. Then the underlying business process is designed to achieve the goals. The success in building these top two layers largely rely on expertise and experience in the business domain. The layer below is the functional components that support the processes from the IT perspective. The functional layer is independent of the process layer meaning that one function can be used to support different processes and one process can be realized by using different functional components. The fourth layer is the IT-system including technologies, tools, architectures and so on. Besides these four layers, some other factors need to be taken into account as well, such as staff, culture and organization. They normally play an indirect, but sometimes also critical role in the success of business.

Figure 1 shows the project tasks on each layer:

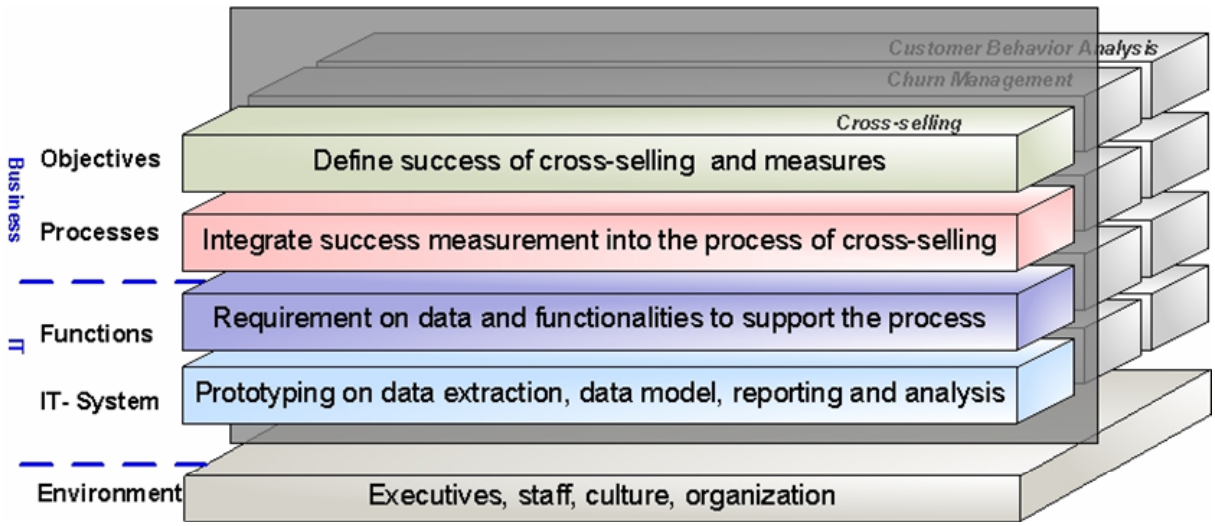


Figure 1: Project overview

Vertically, the thesis analyzes the business and IT layers from top-down but excluding the environmental factors, due to the restrictions on time and resource. For the cultural influence over cross-selling, please refer to the articles “Cross-selling Expectations Meet Reality”[2] and “Trend: Cross-Selling”.[3]

[2] See: Michael Bradford (2003)
[3] See: Jeffery Rothfeder (2003)

Horizontally the thesis is focused on one of the data mining applications in mySAP CRM, namely cross-selling.

Even though some references and literature with SAP background will be used, the content and the ideas of the thesis will be SAP-independent and reproducible with other software solutions.

Table 1 shows the outline of each chapter:

CHAPTER	OUTLINE
Chapter 2	♦ Introduce the theoretical background of Customer Relationship Management, Data Warehouse and Data Mining, both in general and in the context of SAP software.
Chapter 3	♦ Review on performance measurement methodologies in theory. ♦ Propose a model for cross-selling to define “success”. ♦ Describe the criteria to evaluate the quality of KPIs.
Chapter 4	♦ Design a closed-loop process with integrated success analysis. ♦ Describe four general cross-selling steps. ♦ Identify the challenges for success measurement.
Chapter 5	♦ Elaborate the prototypical implementation in CRM and BW. ♦ Exemplify reports on success analysis.
Chapter 6	♦ Give the conclusions on the project work. ♦ Evaluate the results and discuss the improvements. ♦ Outlook.

Table 1: Thesis Outline

Chapter 2
Theoretical Background

This chapter introduces three technological areas related closely with Customer Intelligence: CRM software, data warehouse and data mining. The introduction is limited to what is necessary to develop a theoretical understanding for the success measurement of cross-selling.

2.1 Customer Intelligence Initiative

"Any customer can be satisfied. The challenge is whether this can be done in a way that is economically feasible for the enterprise. The challenge of balancing these imperatives is the essence of customer relationship management (CRM)." – Gareth Herschel, Gartner[4]

Two foremost challenges for businessmen in the twenty-first century are fierce competition and rapid change, each amplifying the other. What if you, your managers, and employees could easily understand key performance drivers to help guide business decisions? What if you could reliably predict which customer would buy what, when? What if you knew which customers would be most profitable, what offers to give to each prospect, how to optimize pricing and packaging, how to retain profitable customers and how to turn low-value customers into high-value customers? Customer Intelligence is a learning process, through which companies adapt their business strategy as a result of the insight obtained from their customers. Customer Intelligence is part strategy, part analysis, and part technology. It encompasses a wide range of solutions, from data gathering and data warehousing to personalization and analytic application. Ultimately, Customer Intelligence provides companies with the ability to understand the value of their customer relationships.

[4] Gareth Herschel is a research director in Gartner Research.

2.2 mySAP Customer Relationship Management

2.2.1 Background

Founded by five former IBM employees in 1972, SAP AG is the world's third-largest independent software supplier. It is regarded as the world leader in providing collaborative business solutions for all types of industries and for every major market.[5]

mySAP CRM is a part of the mySAP Business Suite. mySAP Business Suite is a suite of business applications and the integration platform to enable companies to manage the entire value chain across business networks.

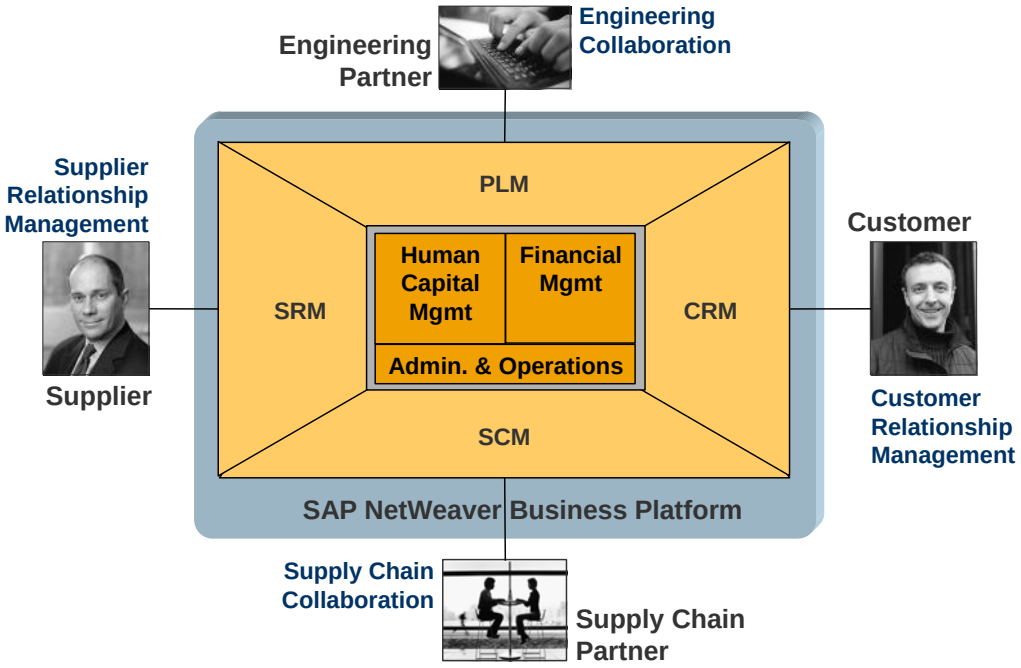


Figure 2: mySAP Business Suite[6]

mySAP Business Suite consists of the following SAP solutions

- mySAP CRM (Customer Relationship Management)
- mySAP SCM (Supply Chain Management)
- mySAP PLM (Product LifeCycle Management)
- mySAP SRM (Supplier Relationship Management)
- mySAP HR (Human Resources)

[5] See: www.sap.com
[6] See: www.sap.com/solutions/business-suite/index.aspx

- mySAP FIN(Financials)
- mySAP Mobile Business
- SAP NetWeaver

Based on the technology foundation powered by SAP NetWeaver, the suite combines business applications (CRM, SCM, R/3 Enterprise, etc.) into a more adaptive business. All applications are built on the SAP Web Application Server. Common development, administration and security environments are used across all applications.

2.2.2 Solution

2.2.2.1 Solution Overview

Today's complex customer problems require a deployable CRM solution that can directly address specific challenges regardless of where or when they occur in the cycle of interacting with, selling to and servicing the customers of an organization.

mySAP CRM supports end-to-end processes with industry-specific capabilities and enables modular deployment.

Figure 3: mySAP CRM Solution Overview[7]

[7] See: www.sap.com

mySAP CRM offers functional capabilities in the core areas of Marketing, Sales and Service with Analytics that are directly embedded into the primary interaction channels with which organizations engage their customers. The four interaction channels are channel partners, field, interaction centre and e-commerce. In addition,

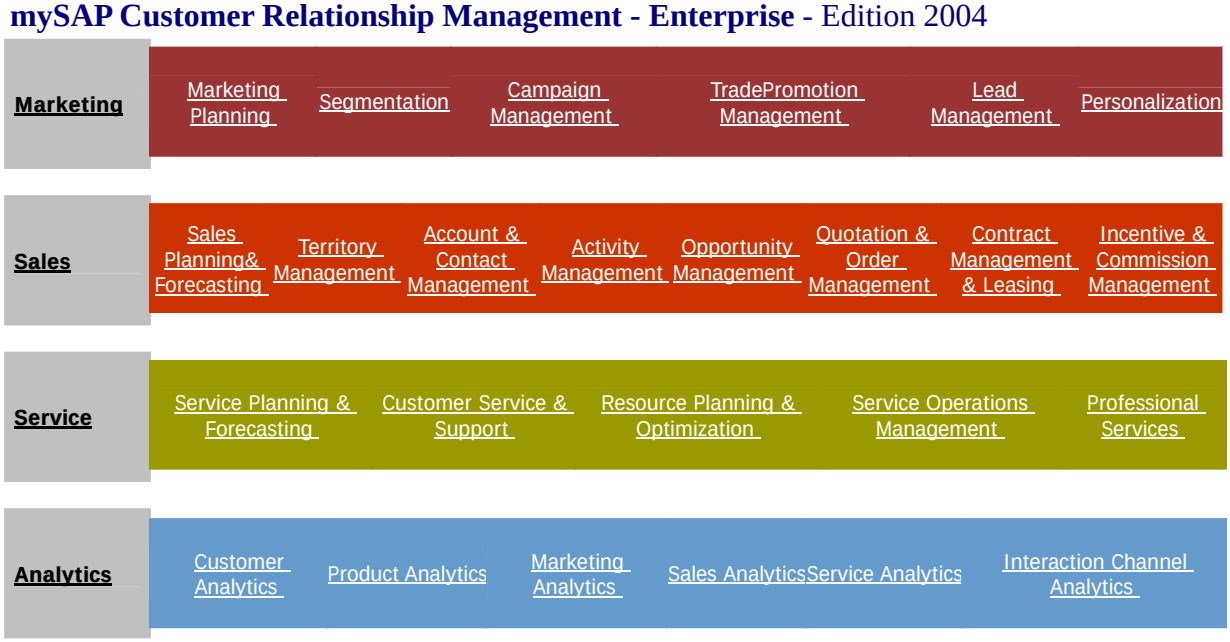
- mySAP CRM is built on an open and scalable technology platform
- The SAP Customer Service Network helps to quickly implement mySAP CRM and supports the ongoing optimization of the solution environment.

2.2.2.2 Solution Map

The solution map offers a holistic view of mySAP CRM solution from both the "business" and "technology" perspective.

The first figure shows the SAP solutions in the four core business areas. Marketing, Sales and Services are also referred to as Operative CRM.

The second figure shows the technical solutions. The portal is the information delivery framework for all applications, be they SAP or non SAP. Mobile business applications in each solution are built on the mobile infrastructure to drive business mobility. The integration broker and Business Process Management provides process centric integration for SAP and non-SAP systems within and beyond enterprise boundaries based on open standards such as XML, Java and web services standards.



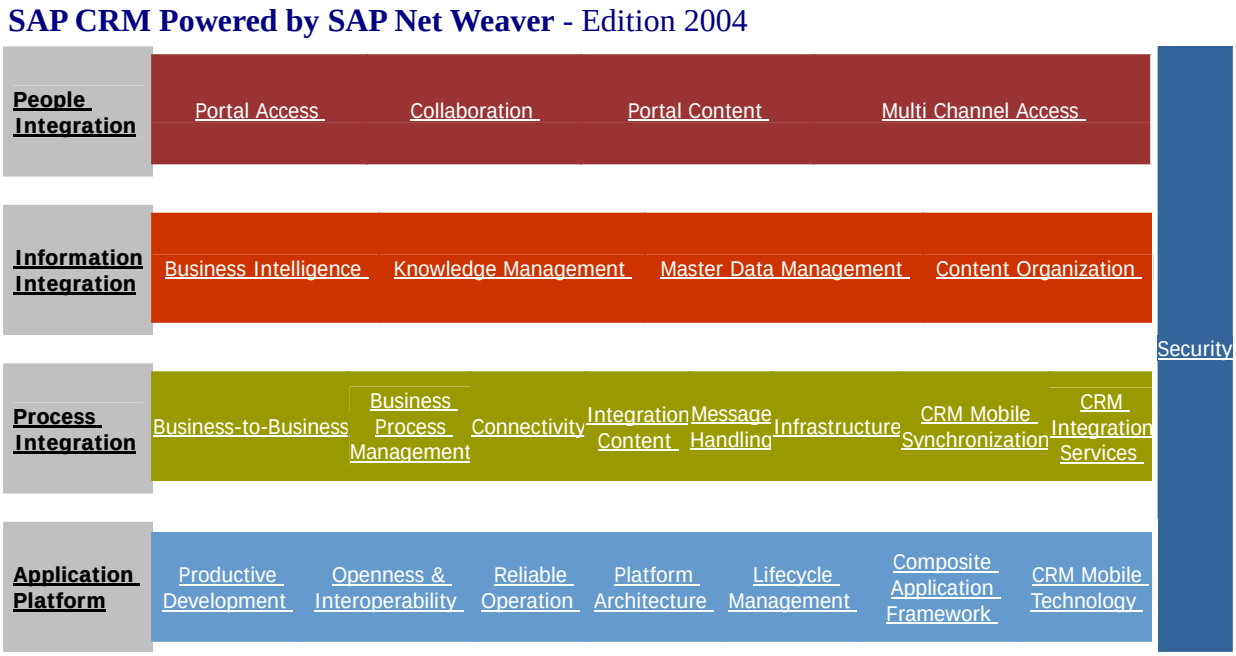


Figure 4: mySAP CRM Solution Map[8]

2.2.3 Analytical CRM

2.2.3.1 Position and Roles

Analytical CRM is an integrated process in mySAP operative CRM. The analysis is not only done afterwards, but some operative processes use real-time analytical results to empower the users to make informed decisions. For instance, using mySAP aCRM a company may want to create a target group of customers that have low satisfaction (satisfaction and loyalty analysis) and/or are likely to leave (churn management). The initiative can be further enhanced by identifying those customers in the target group that have high profitability potential (customer life time value analysis). Based on their recent behaviour (behaviour modelling) and propensity to respond to certain offers (cross selling analysis), a targeted marketing campaign can be initiated, executed and optimized (RFM campaign optimization), helping to retain these valuable customers.

[8] See: http://www50.sap.com/businessmaps/DEE27EBB1D564D8C800231FE6D54325D/

The impact of CRM Analytics is reflected in every phrase of customer life cycle. It helps

- Acquiring the right new customers
- Growing the relationship and selling more to the right customers
- Lengthening the relationship with the right customers
- Finally, achieving this while spending less in marketing, sales, and service

The following areas are supported with analytical functions:

- Customer and Product Analytics
- Marketing Analytics
- Sales Analytics
- Service Analytics
- Interaction Channel Analytics

2.2.3.2 Architecture

Figure 5 depicts an architectural view of Analytical CRM:

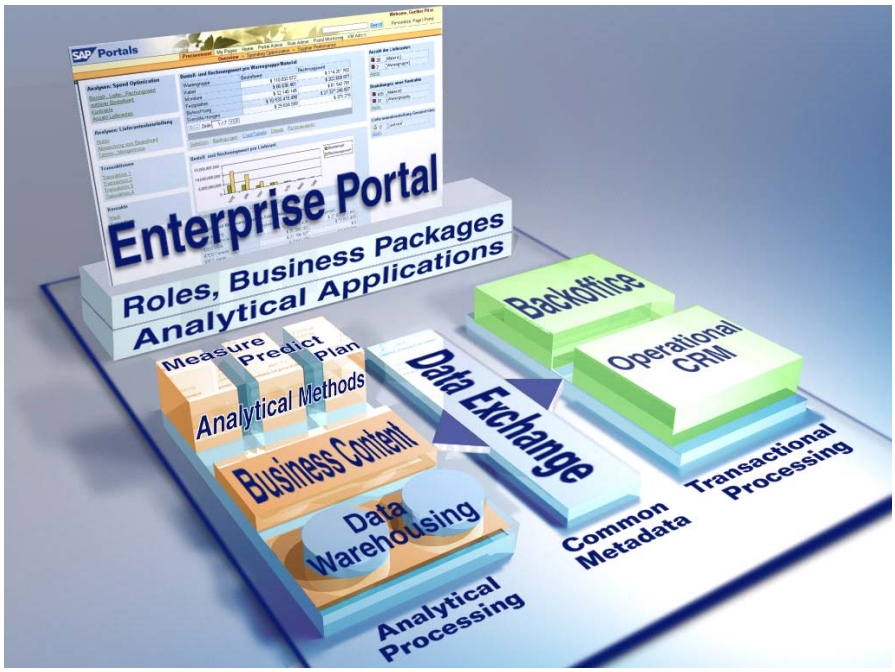


Figure 5: CRM Analytics Architectural View[9]

[9] See: SAP AG (2002): CR900 Analytical CRM p. 2-19

Operative CRM and Analytical CRM have common metadata, which enables frequent data exchange and synchronization between the two parts. Operative CRM stores data in transactional databases, while Analytical CRM stores data in data warehouse.

Business Content is predefined information model (metadata) in SAP BW in contrast to the client-defined metadata. Information model refers to the relation and communication among different information objects in BW, and also the flow of data among those objects. Business Content is specially delivered by SAP for rapid deployment. The details of data warehouse will be introduced in the following pages.

SAP offers general analytical methods like clustering, scoring, association analysis and etc. Using different analytical methods, company can measure its Key Performance Indicators, predict customer behaviour and its impact on profits, and make opportunity planning, campaign planning or trade promotion planning.

Portal integration together with strong web publishing functionality supports easy distribution of information. Pre-packaged analytical applications cover all relevant business questions relating to CRM.

2.2.3.3 Process

Applications in Analytical CRM have five general steps to increase value for users:

Capture data → Measure → Predict → Plan → Deploy:

- Capture all relevant customer information from different sources and integrate it into a customer knowledge base.
- Measure and monitor the relevant Key Performance Indicators to assess the success of the business.
- Uncover hidden patterns and trends that impact the business, and apply these learning to predict future shifts in customer behavior.
- Plan clear objectives for the business and coordinate the resources in order to achieve the goals.
- Deploy analytical results to optimize the operational processes and empower the employees to make informed decisions.

2.3 mySAP Business Information Warehouse

2.3.1 Features and Roles

Data warehouse, as its name demonstrates, integrates and standardizes information within enterprises and outside of enterprises. Compared to OLTP database, it has special features:[10]

- Subject-oriented: Data is organized into subject areas in an organization, such as customer, material, transaction and so on.
- Integrated**:** The data from various subject areas should be rationalized with one another.
- Non-volatile: Data in a data warehouse is historic data and not updated.
- Time-variant: The values of data found in a data warehouse are accurate and relevant only to some moment in time.
- Created for the purpose of management decisions**:** OLAP reporting engine and data mining techniques are built on data warehouse to offer analysed information to decision makers.

SAP Business Information Warehouse (BW) is the central data warehouse in the world of mySAP.com. It performs two different roles:

- Data recipient: Data from mySAP.com components is transferred to SAP BW, prepared and provided for analysis. This could include plan data from SAP Strategic Enterprise Management (SAP SEM), activity journals from SAP Customer Relationship Management (SAP CRM) as well as controlling information from SAP R/3.
- Data provider: SAP BW functions as a data source by providing prepared data to mySAP.com components. Examples include CRM Analytics for Mobile Sales or requirement key figures for the cross-plant SAP Advanced Planner and Optimizer (SAP APO) ATP check.

[10] See: McDonald, Wilmsmeier, Dixon and Inmon (2002) pp.4-5

The SAP BW is integrated into an Enterprise Portal. The Enterprise Portal allows you to access applications from other systems and sources, such as the Internet or Intranet. From a single entry point, you can access structured and unstructured information, such as business data from data analysis as well as Knowledge Management content.

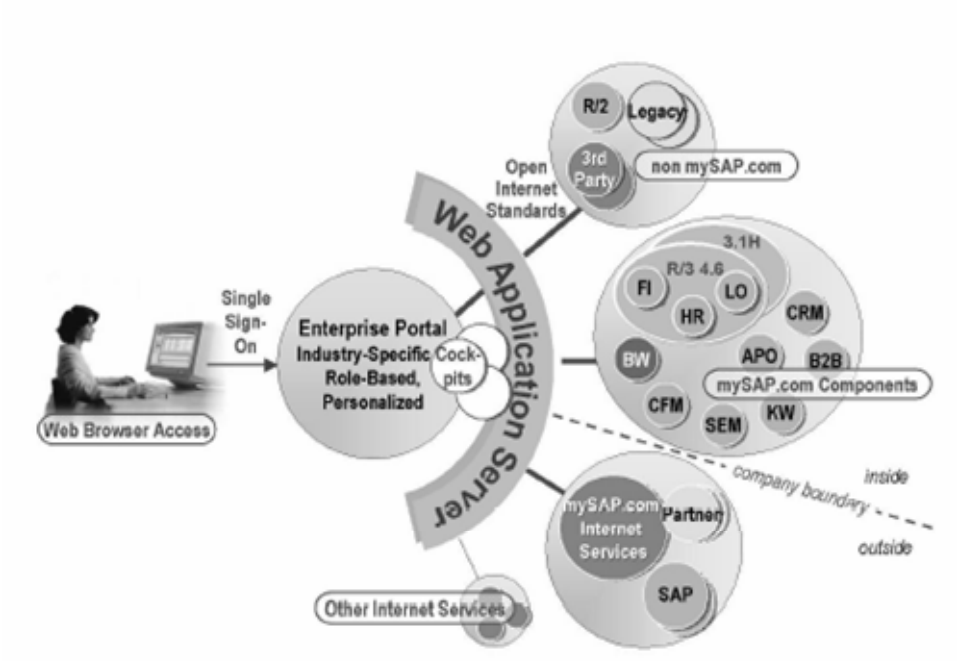


Figure 6: Integration of SAP BW into the Enterprise Portal[11]

2.3.2 Architecture

In principle, SAP BW architecture can be divided into three layers, source system, SAP BW Server, SAP BW OLAP:

- Source Systems

  A source system is a reference system that functions as a data provider for SAP BW.

- SAP BW Server

  The central administration area on the SAP BW server not only features a Staging Engine, which controls the data loading process, as well as processing and preparing its data, it also features SAP BW databases which store master-, transaction and metadata.

  The Administrator Workbench is responsible for organization within SAP BW, in

[11] See: SAP AG (2003): BW310: Data Warehousing – mySAP Business Intelligence p. 18

other words, the control, monitoring and maintenance of all data procurement processes. Within Administrator Workbench to you can manage and control all relevant SAP BW objects and processes, define all relevant information objects, plan load processes using a scheduler, and monitor them using a monitor tool.

- SAP BW OLAP

  The Online Analytical Processing- (OLAP-) processor allows you to carry out multi-dimensional analyses of SAP BW data sets. It also provides the OLAP tools with data via the BAPI, XML/A or ODBO (OLE DB for OLAP) interfaces.

The figure shows a physical and logical division between data staging in the source systems, data storage and management, and analysis.

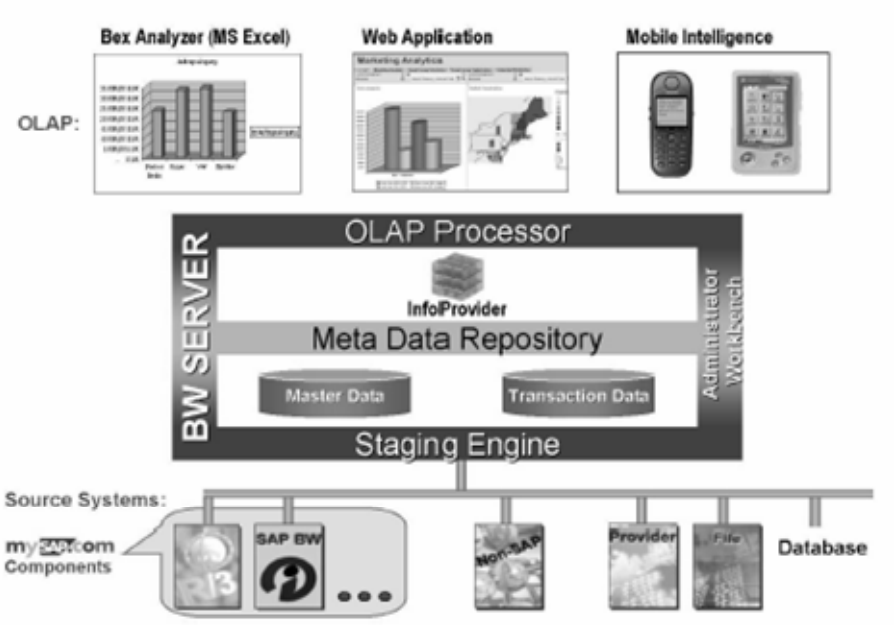


Figure 7: Three-Layer Architecture of SAP BW[12]

2.3.3 Multidimensional Data Model

The design of data warehouse begins with a data model. The classic data warehouse model is called “star schema”, in which multidimensional information is linked together to a fact table by foreign-key relationship. “Fact” refers to the key figures like sales, volume and etc.

SAP BW star schema is an improved variant of the traditional one.

[12] See: SAP AG (2003): BW310: Data Warehousing – mySAP Business Intelligence p. 11

- The classic star schema

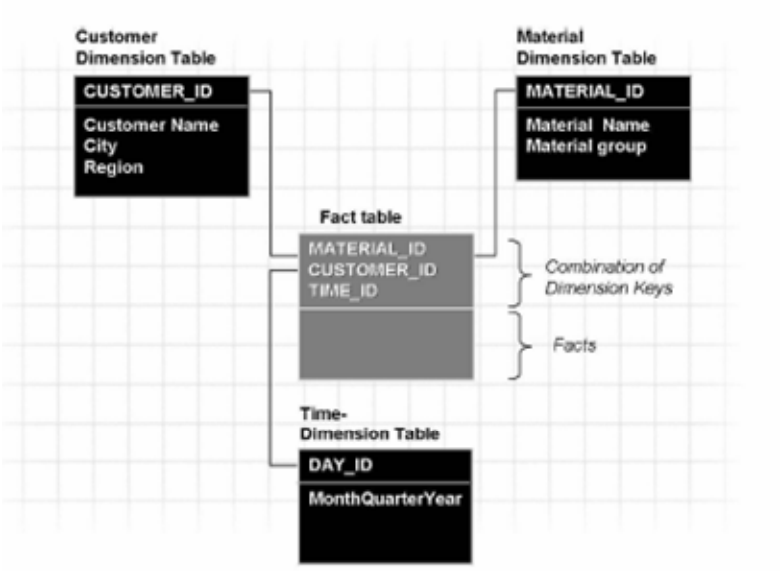


Figure 8: The Classic Star Schema[13]

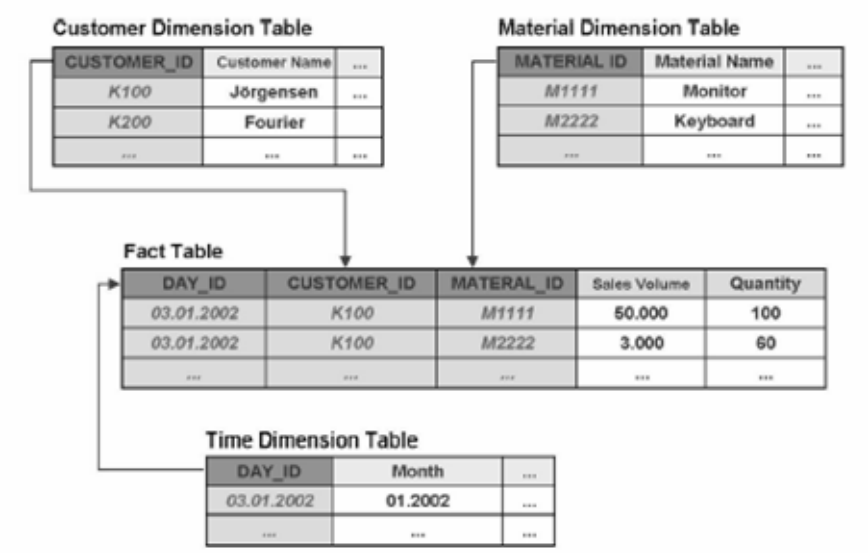


Figure 9: Classic Star Schema: Sales Example[14]

[13] See: SAP AG (2003): BW310: Data Warehousing – mySAP Business Intelligence p. 26
[14] See: SAP AG (2003): BW310: Data Warehousing – mySAP Business Intelligence p. 29

- The SAP BW star schema

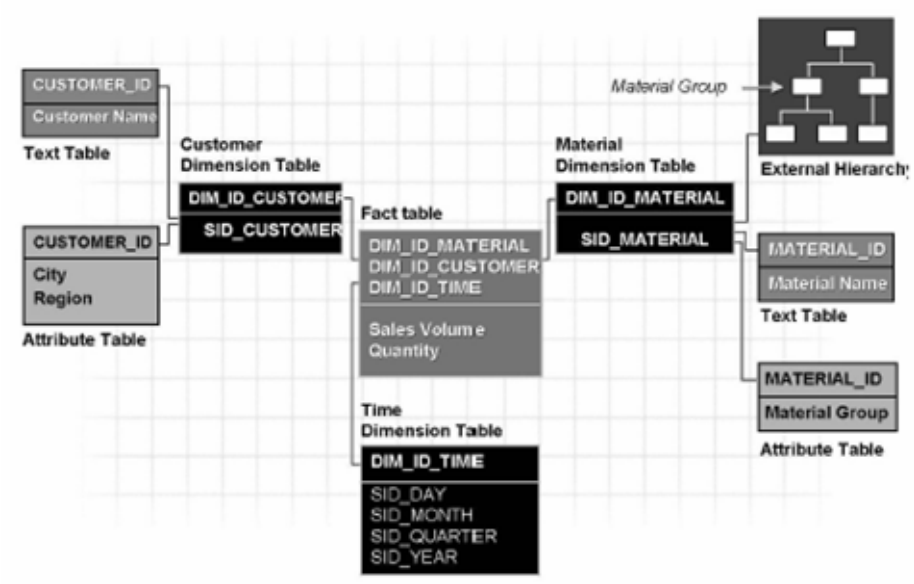


Figure 10: The SAP BW Star Schema[15]

Compared these two schemas, we find that dimensions in SAP BW Star Schema not only consist of dimension tables, but also contain master data and SID tables. The improved star schema has advantages over the classical one:

- Firstly, the use of automatically generated INT4 keys I (SID keys, DIMID keys) enables faster access to data than via long alpha-numeric keys.
- Secondly, the excavation of master data from the dimension tables using the SID technique enables the following modelling possibilities:
  - Historizing dimensions
  - Multi-lingual capability
  - Cross-BasisCube use of master data (shared dimensions)
- Last but not the least, the query performance is improved here as aggregated key figures can be stored in their own fact tables.

[15] See: SAP AG (2003): BW310: Data Warehousing – mySAP Business Intelligence p. 31

The smallest unit in the data model is called InfoObject. InfoObjects are the smallest available information modules in SAP BW. These can be uniquely identified with their technical name. InfoObjects are subdivided into characteristics, key figures, units, time characteristics, and technical characteristics (such as request numbers). They are used throughout the system to create structures and tables. These enable information to be modelled in a structured form in SAP BW. As components of the Metadata Repository, InfoObjects contain the technical and specialist information for master- and transaction data in SAP BW.

InfoCube is another important object in the multi-dimensional data model in SAP BW. It describes a self-enclosed dataset for a business area from a reporting view, that is, for the reporting end user. Queries can be defined and/or executed in the basis of an InfoCube.

2.3.4 Data Extraction, Transformation and Loading

One of the most important and difficult aspects of data warehouse development is the movement and conversion of data from the operational or legacy source environment to data warehouse, as the primary data is often in varied formats.

Recent technology uses ETL (extract/transfer/load) software which automatically creates the interfaces needed to bring the data into the world of data warehouse.

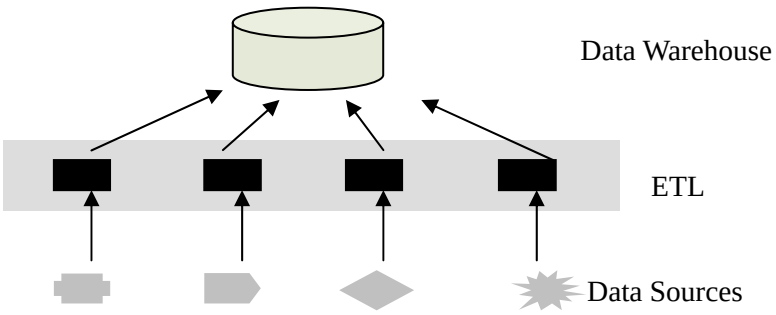


Figure 11: ETL Software

The following figure provides an overview of SAP BW objects in the context of data extraction, transformation and loading.

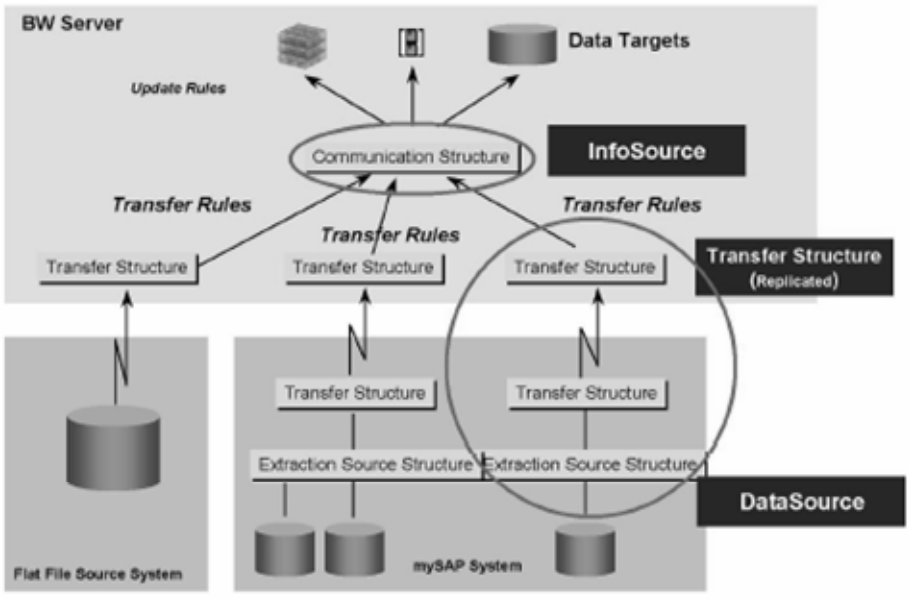


Figure 12: The DataSource and InfoSource Data Flow[16]

- A **DataSource** describes the data supply for a source system in the form of field structures. The DataSource consists of the extraction source structure (all fields provided) and the transfer structure (selection of fields from the extraction source structure). The DataSource is replicated in SAP BW.

- An **InfoSource** is a set of logically associated information. The communication structure is the field structure in which the information is stored.

- **Transfer rules** transform data from several transfer structures, if necessary, into a Communication Structure.

- **Update rules** transform data from a Communication Structure into one or more data targets.

As you can see, in order to integrate and collect data into data targets (InfoCube, InfoSet, etc.) from different source systems, you need to coordinate the whole logic of the data flow, defining from bottom-up all meta objects, such as DataSource, Transfer Rule, InfoSource and Update Rule.

[16] See: SAP AG (2003): BW310: Data Warehousing – mySAP Business Intelligence p. 118

2.3.5 Business Content

SAP is the only infrastructure provider that offers broad and diverse Business Content developed by SAP and its partners' network. Business Content refers to the predefined information model (metadata) in BW in contrast to the client-defined metadata. This content shortens the development cycle for customers and reduces the cost of integration projects.

Business Content consists of the following objects:

- SAP and non-SAP extractors
- DataSources (extraction structures)
- InfoObjects
- InfoSources
- InfoProviders (for example, InfoCubes and ODS objects)
- Queries / Workbooks
- Templates (Web-based reporting)
- Roles

Business Content can do the following:

- Be used without any adjustments
- Be adjusted by means of enhancements
- Serve as a template for customer-specific objects

2.4 Data Mining

2.4.1 Definition and Process

"Data Mining is the process of extracting valid, useful, unknown and comprehensible information from data and using it to make business decisions."

The key issue in this definition is that the information that data mining tools are able to generate is useful and unknown.[17]

[17] See: IBM Redbook (2001): p. 24

Data mining is an analytical process to find trends within large databases. It uses quantitative business models to:

- Identify patterns and relationships that are "hidden" in historical data.
- Enable prediction of future behaviors and values.

To generate new information, you must follow a complete process that runs from a business problem definition to the final deployment of the results that are generated.

The following figure shows this process:

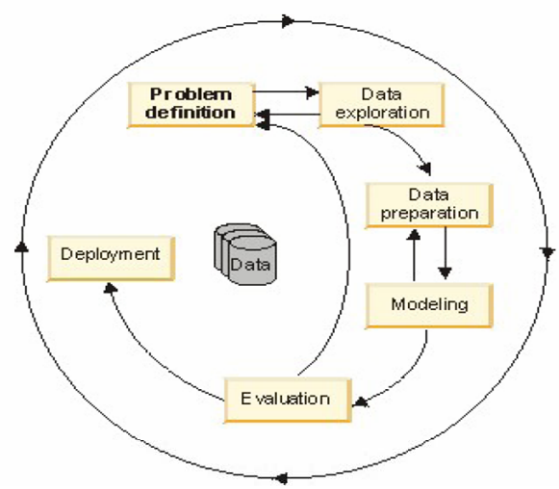


Figure 13: Data mining process[18]

- Problem definition

  Defining the business problem is the trickiest part of the successful data mining. A necessary part of every data mining project is the close communication among data mining experts, business experts and domain experts. In the problem definition phase, data mining tools are not yet required.

- Data exploration

  Domain experts understand the meaning of the metadata. They collect, describe, and explore the data. They also identify quality problems of the data, for example, missing values or outliers. A frequent exchange with the data mining experts and the business experts from the problem definition phase is vital.

[18] See: IBM DB2 Developer Domain p. 10

In the data exploration phase, traditional data analysis tools, for example, statistics, are used to identify any quality problems.

- Data preparation

  Domain experts build the data model for the modelling process. They collect, cleanse, and format the data because some of the mining functions accept data only in a certain format. They also create new derived attributes, for example, an average value.

  In the data preparation phase, data is tweaked multiple times in no prescribed order.

  Preparing the data for the modeling tool by selecting tables, records, and attributes, are typical tasks in this phase. The meaning of the data is not changed.

- Modelling

  IT professionals apply various mining techniques to build models because different mining functions can be used for the same type of data mining problem. The data mining experts must assess each model. A frequent exchange with the domain experts from the data preparation phase is required.

- Evaluation

  IT professionals and domain experts with management skills evaluate the model by using visualization tools. If the model does not satisfy their expectations, they go back to the modelling phase and rebuild the model by changing its parameters until optimal values are achieved. When they are finally satisfied with the model, they can extract business explanations and evaluate the following questions:

  - Does the model achieve the business objective?
  - Have all business issues been considered?

  At the end of the evaluation phase, the data mining experts decide how to use the data mining results.

  The modelling phase and the evaluation phase are coupled. These phases can be repeated several times to change parameters until optimal values are achieved. When the final modelling phase is completed, a model of high quality is built.

- Deployment

  Depending on the mining function applied, IT professionals can either apply the model to new data or export the results into database tables or into other applications, for example, spreadsheets.

2.4.2 Techniques

Following techniques are available in Data Mining Workbench in SAP BW:

- Regression
- Decision Tree
- Clustering
- Association Analysis
- ABC Classification

This overview provides a high-level description of two data mining techniques that are applied in the context of cross-selling: Clustering and Association Analysis

Clustering is a method of grouping together characteristic values, such as customers, based on attributes associated with the individual members. The degree of association between members is measured by all the characteristics specified in the analysis.

Usage Examples:

- Segment customers into homogeneous groups
- Classify products
- Route optimization

Association Analysis uncovers the hidden patterns, correlations or casual structures among a set of items or objects.[19]

A typical application of the association analysis is the Market Basket Analysis, which is a modeling technique based on the theory that, if you buy a certain group of items, you are more likely (or less likely) to buy another group of items.

[19] See: SAP AG (2002): SAP Online Help – Association Analysis

Let us take the example of a retailer who applies the Market Basket Analysis function to the dataset of sales transactions. The dataset contains, among other information, the details of items purchased in each transaction. The set of items a customer buys is referred to as an itemset, and market basket analysis seeks to find relationships among the items purchased. The itemsets that occur frequently are referred to as large or frequent itemsets.

An itemset can be of the order of 100,000 or more items. Each item occurring in a transaction constitutes a record. Hence, a transaction containing 10 items would have 10 records in the transaction data. The output of the association analysis function is a list of relationships in the form of Association Rules.

Typically, the relationship will be in the form of a rule: IF {beer} THEN {crisps}

The probability that a customer will buy beer and crisps is referred to as the support for the rule. *Support* (or prevalence) measures how often items occur together and expresses this as a percentage of the total transactions. The conditional probability that a customer will purchase crisps is referred to as the confidence. *Confidence* (or predictability) measures how dependent a particular item is on another.

Each rule has *leading items* (beer) and *depending items* (crisps).

Consider the following example:

- 500,000 transactions in total
- 25,000 transactions contain crisps (5 percent)
- 15,000 transactions contain beer (3 percent)
- 10,000 transactions contain both crisps and beer (2 percent)

In this example, beer and crisps occur together 2 percent of the time (calculated as 10,000/500,000 in percent). So the support is 2 percent, which can be expressed as: “People buy crisps and beer 2 percent of the time.”

Because 15,000 transactions contain beer and 10,000 of these transactions also contain crisps, the confidence for this rule is 66.67 percent (10000/15000 calculated as a percentage). This can be expressed as: “When people buy beer, they also buy crisps 66.67 percent of time.”

The inverse of the above rule would be, “When people buy crisps, they also buy beer”.

The confidence of this rule is 40 percent (10000/25000 calculated as a percentage). For this rule, we can say: “When people buy crisps, they also buy beer 40 percent of the time.”

Let us assume that only two items were bought. Hence we can deduce that:

- People buy crisps 5 percent of the time.
- People buy beer 3 percent of the time.

In the example, 5 percent for crisps and 3 percent for the beer are the expected confidence (support of the dependent items). This gives rise to a new terminology Lift.

Lift is a measure of the strength of an effect. Lift measures the difference between the confidence of a rule and the expected confidence. Simply put, it is the ratio between the confidence and the expected confident or support of the dependent items.

For the rule “When people buy beer, they also buy crisps 66.67 percent of the time”, the confidence is 66.67 percent and the support of the dependent item (that is, crisps) is 5 percent. The lift for this rule is therefore 66.67 divided by 5 = 13.34. This can be expressed as: “When people buy beer, they are 13 times more likely to buy crisps than when they do not buy beer.”

The support and lift for a rule and its converse rule would be the same. Only the confidence would differ.

To summarize association analysis:

- Inputs: (1) database of transactions (2) each transaction is a list of items (purchased by a customer in a visit)
- Outputs: all rules that correlate the presence of one set of items with that of another set of items. E.g. 98% of people who purchase tires and auto accessories also get automotive services done

Usage Examples:

- Create a Market Basket Analysis (How to manage the stock of the market?)
- Group different products by affinity (Attached mailing in direct marketing)
- Create readily-understandable rules describing customer buying behavior
- Organize web pages in order to optimize user accessibility

Chapter 3

Success Measurement

In the previous chapter, the technological background needed in employing cross-selling was described. Bearing the initial task in mind - How to measure the success of cross-selling? Whether the gained benefits in business worth the efforts of investment? - It is natural to come up with some principle questions as following:

- How to do performance measurement?
- How to define the success of cross-selling?
- How to choose success measures that are aligned with the company's strategic objectives for cross-selling?
- Are they good measures?

This chapter contains the analysis on the first layer of the business model, which is proposed in the first chapter, namely, the business objectives and success measures of cross-selling.

3.1 Measure Performance from Different Perspectives

Any rational investment should bring benefits to enterprises. Performance measurement is essential, because it

- provides feedback to guide change in a project;
- provides baseline information for assessment;
- is a diagnostic tool to identify areas for improvement and set priorities;
- and is a basis for communication.

There are different methods of measuring performance. The following three opinions are presented from different perspectives and with different focus of application.

3.1.1 Project View

Usually company uses Return On Investment (ROI) to measure the success of a project.

Expected ROI should be a major determinant in evaluating options and making decisions about which architectures to employ, which vendors to choose, which projects to pursue and how they should be prioritized. Additionally, some companies measure their managers on the success of their projects and bonuses are often tied to the ROI of those projects. These managers want their projects to be fairly and fully represented and measured.

The ROI calculations are fairly straightforward and should include the cost of capital and the risk associated with the project. The specific ROI metric used (break-even analysis, net present value, internal rate of return) should focus on the calculation favoured by the CFO and should be the method the organization uses to prioritize its other projects.[20]

However, it is very difficult to measure ROI in data mining. Firstly, data mining projects are different from typical IT development projects, in the aspect of on-going control. Data mining project has two important phases: “model development” and “deployment”. In the phase of model development, creativity and innovation are essential parts. Due to the spiral nature of the “mining” activity, additional cycles may be necessary in order to satisfy the objective, or answer the problem statement. This characteristic provides many challenges to the project manager in terms of managing cost and schedule performance and customer expectation. Deployment is the other critical success factor. A data mining model can be completely successful in terms of conducting all of the modelling processes correctly, and even so, yield no usable business results. Companies must have a tangible means of measuring the improvements expected in the real business world.

For more information on calculating ROI on data mining projects, please refer to the articles “Predictive Analytics and ROI: Lessons from IDC’s Financial Impact Study”.[21]

[20] See: Sid Adelman (2003)
[21] See: Henry D. Morris (2003)

3.1.2 Business Process View

In the perspectives of business process, the two main dimensions of success are efficiency and effectiveness. According to “Using Benchmarking Metrics to Uncover Best Practices”, there is a “Measure Framework”, namely four main categories of metrics to assess performance at the process level:[22]

- **Cost effectiveness** measures tell how well companies manage cost.

  E.g. customer service/call centre: cost per call, cost per reported complaint

- **Process efficiency** gives insights into how well procedures and systems are supporting the operation.

  E.g. customer service/call centre: first-call resolution rate

- **Cycle-time measurements** deal with the duration required to complete a task.

  E.g. customer service/call centre: average time to answer, average time to resolve complaint

- **Staff productivity** provides insights into how much output each agent has produced.

  E.g. customer service/call centre: calls per representative

This framework provides a comprehensive view of the business process. For example, measures can be developed to assess performance in all aspects of customer service, including cost management per call, quality of service, and labour cost. The importance of comprehensive measures becomes particularly evident where measures are in conflict. For example, normally an investment in technology to improve the operational process will have negative impact on cost in the short-term, but payoff in the long-term. On the contrary, a reduction on costs may harm service quality, which leads to unhappy customers and ultimately impact revenue. Management should avoid misinterpret the measures.

3.1.3 Subject Area View

The third approach is to focus on the key figures in a certain subject area, like sales promotion, R&D or financial reports. Taking CRM as an example, the measure framework can be

[22] See: Emma Skogstad (2004)

oriented to the whole customer life cycle.

The customer life cycle starts with reaching the target market and progresses towards an established loyal customer base. Of course, along the way, many individual customer life cycles are cut short by abandonment and attrition.

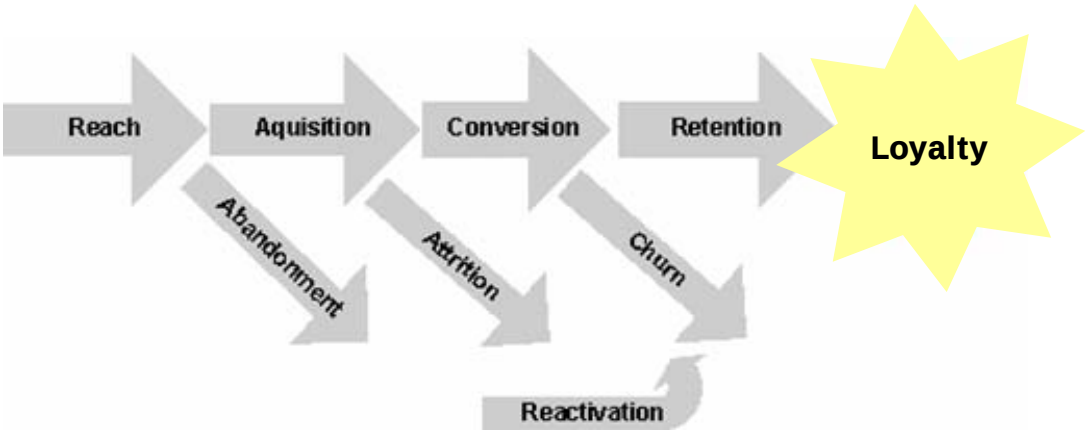


Figure 14: Customer Life Cycle from Introduction to Loyalty[23]

Research shows that many companies track multiple components of the customer life cycle and in each phase they develop a set of key figures to evaluate their success:

- **Reach**: claim someone's attention or awareness

  E.g. In a web shop, the percentage of visitors that click and read the advertising banner to the total number of visitors within a certain period

- **Acquisition**: gain customer participation and interaction, and bring them into your sphere of influence

  E.g. Response rate, Attrition rate

- **Conversion**: turn them into a registered and/or paying customer

  E.g. Conversion rate, Churn rate

- **Retention**: keep them as a customer

  E.g. Retention rate

- **Loyalty**: Turn them into a company advocate

  E.g. Customer Satisfaction Degree, Customer Lifetime Value

[23] See: Matt Cutler (2000) p. 26

In conclusion, there are quite a lot of theoretical study in the area of performance measurement and controlling.[24] Apart from those, there are other approaches, such as KPI analysis[25], score balanced card, which are applied in evaluating the performance of the business. It is often useful to use more than one measure because one by itself provides a limited picture. However, which method to apply depends on the business requirements as well as the available data.

3.2 Development of Success Measures of Cross-selling

3.2.1 Success Model of Cross-Selling

The fundamental task of success measurement is to define the "success". What do we expect to achieve by using cross-selling in CRM?

The goal of CRM is to maximize the values for both customer and company sides:

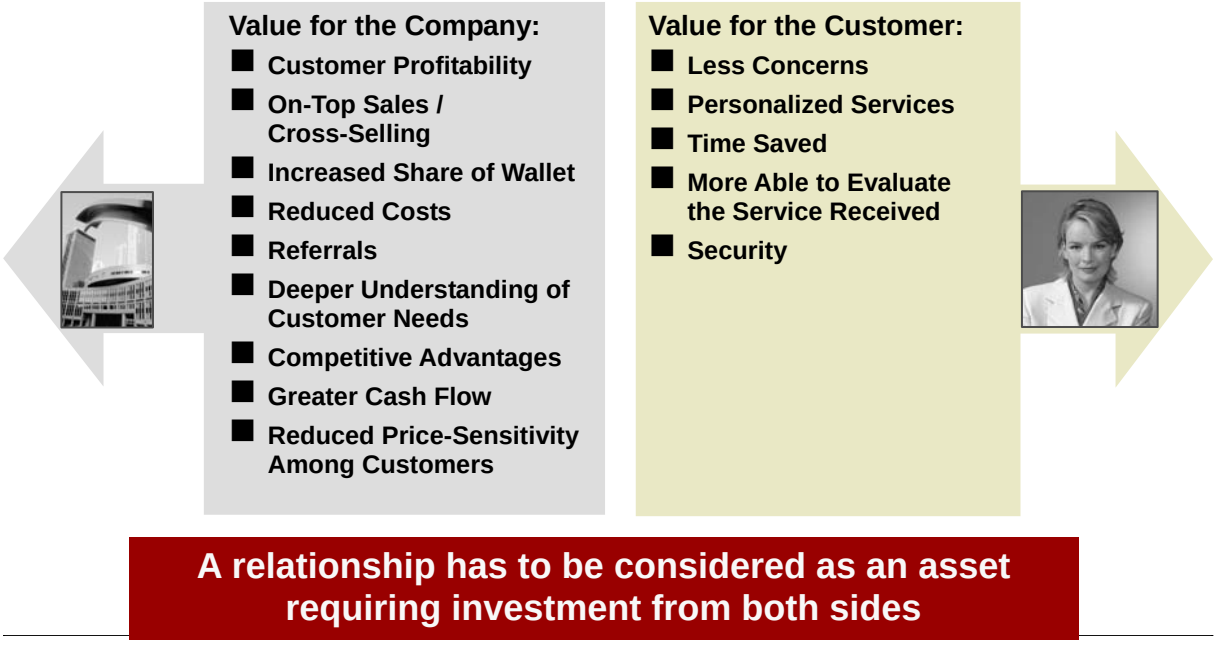


Figure 15: CRM Maximizes the Values for Both Customer and Company[26]

The investment in data mining is expected to realize the marketing goals. However, the focus of goals varies from business to business and from period to period.

[24] See: Fabian Kamm (2003), Jim Turner (2003), Anonymous (2001)
[25] See: Terry Callahan (2003), Emma Skogstad (2004)
[26] See: SAP AG (2003): mySAP Overview Presentation – CRM Analytics (Release 4.0) p. 8

If the three theoretical methodologies introduced in the last section are summarized and applied to the practical problems, a model of success measurement for cross-selling is developed and demonstrated as following:

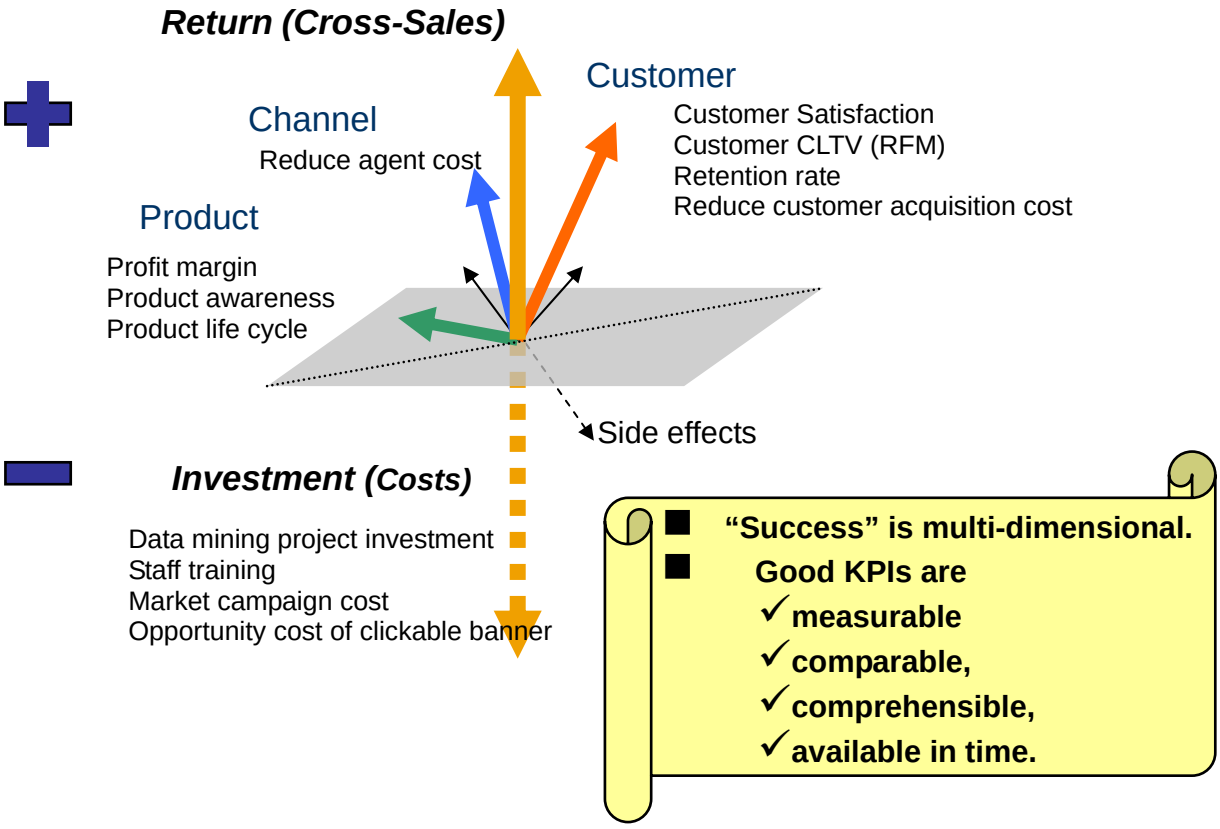


Figure 16: Cross-selling Success Model

The model has two levels of information: Firstly, the impact of cross-selling is viewed in two dimensions: return and investment. Secondly, multidimensional business objectives interweave and support each other and finally contribute to a better bottom line.

- What are the potential returns of cross-selling?

  Simply speaking, company wants to achieve greater cross-sales than the investment that is incurred to apply cross-selling. However, is cross-sale the only index of success? There are a set of KPIs that might be influenced by cross-selling as well. For example, what is the influence of cross-selling on customer satisfaction? Does cross-selling increase the product awareness? Does it improve the customer retention rate? These goals usually support each other, but on the other hand, they can also be conflicting. For example, to increase customer satisfaction will finally increase cross-sales, but not

necessarily a must. A better quality service is often costly, and may contribute negatively to the bottom line.

- What are the costs and side effects?
  - Fixed cost: initial investment in data mining, training
  - Variable cost: personnel costs in the call centre; telephone cost (not always); the efforts to maintain the rules; etc.
  - Hidden cost (opportunity cost)
  - Other side effects

  Customers can get the cross-selling messages in the web shop, as the case for Amazon, or get the proposals through emails or leaflets by post or in the shops，or get them from the agents working in the call centre. What might be the hidden costs of different channels?

  - People may think to add an additional banner in the web shop for the purpose of product recommendation costs nothing. However, if the economic concept of “opportunity cost” is taken into account, then as the space on the screen is limited, the place of holding this product proposal banner can be replaced by another advertisement, which also brings benefits to sales. Therefore, an improper cross-selling proposal doesn’t really cost nothing.
  - Similarly, E-mail is a very cheap channel for contacting customers. There is almost no monetary cost for sending an email. If the channel is so cheap, why don’t we just send messages to all online customers? However, it is still important to target Email effectively, because customers, who might read one targeted email message, are less likely to read 30 random messages. And perhaps more importantly, customers who have given their permission to be contracted by email will change their minds and withdraw their permission to be contracted if they begin receiving too many off-target messages.
  - At a call centre, cross-selling from an operations point, adds length to the time of a call and makes other callers wait longer. Proposing a product to one customer on phone is on the other hand missing the chance of giving information to other

customers. Therefore you need to know how much cross-selling you want to do, when to do it, how much extra capacity it takes, and so forth.

The success model doesn't directly define the success, but it provides a way of thinking helping each company to find out its own solutions. The key message in this model is that: Cross-selling is a marketing technique that is applied to achieve different business goals. It also influences the return and cost in multi-dimensional ways. Each company is supposed to pursue its own goals. Thus, there should not be a standard success definition that fits all companies.

3.2.2 Attributes of Good Measures

What indicates success and what can be measured are two different problems. In practice it is not possible to take all multiple measures in each field that are identified. Firstly, collecting data is time consuming and costly. It is important that organizations have a clear sense of how the data will be used before starting the collection process. Secondly, data is not always clean and available in the system.

Good measures should meet the following criteria:

- Available

  Data should be available in time in order to ensure timely analysis. However, some data is even not able to trace. Especially in cross-selling process, human interaction plays an important role. Some sort of information, such as the reason that customer reject the proposal, is not easy to record or they are even unknown.

- Comprehensible

  It is important to let the analysts or users to perceive the fact behind the numbers. Simply knowing that the campaign response rate is 0.5 will not help an organization improve its performance. It doesn't account for respondents who don't qualify. Instead the data should be analyzed in order to discover what factors within an organization are responsible for performance gaps and then identifying key practices for improvement.

- Comparable

  When measures are interpreted, it is important to identify the driving forces for the change excluding other elements. For example, if starting from December, a web shop launches a cross-selling market campaign, and the sales variance between November and December of a certain proposed product is compared. Does the increase in sales show the success of this cross-selling campaign? As we know, the Christmas shopping trend plays an important role in December. The increase can hardly explain the effectiveness. It would better to compare the revenue of December with that of last year. Moreover, not only sales revenue, but also sales volume should be reported, as the revenue is the multiple of price and volume. Difference of revenue over two periods due to change in price should be excluded. Similarly when the sales variance is compared in two shops, with one of them applying cross-selling, then the place, decoration of the shops and the competitor responses should also be considered.

- Measurable

  Qualitative measure, such as customer satisfaction, is harder to compute, but worth the effort, because they are helpful in an overall analysis. Nevertheless, they need to be presented and visualized in an easy and apparent way. For decision-makers, a sales increase of 1 million dollars is much more direct than an increase of customer satisfaction from good to very good. Moreover, some measure is hard to calculate with degree of certainty and moreover, it is hard to use. Take the Customer Lifetime Value (CLV) as an example, it is often considered as an attractive and comprehensive measure. CLV is calculated based on the model of RFM: recency, frequency and monetary. Simply put, customer, who buys more recently, more frequently and more valuable has higher Customer Lifetime Value. However, the calculation model of customer lifetime is based on critical assumptions about how long a customer will continue a relationship with the company.[27] “Just because I spent 100 euro last year doesn’t mean I will spend 100 euro next year”, “you are spending 100 euro with our company every year, but also spending 500 euro with one of my competitors.” What does CLV really tell? A customer who has bought a lot of merchandise but not lately and a customer who has bought some merchandise lately, which one is better in terms of CLV? This is the problem with this measure.

[27] See: Anonymous (2003)

3.2.3 Success Measurement Strategy

This section describes the process of developing a success measurement strategy based on a concrete scenario.

Suppose a retailer company using mySAP CRM intends to launch a cross-selling market campaign through CIC and ISA.

The first step is to choose KPIs that are aligned with the strategic corporate goals. These goals may include:

- Driving sales leads and revenue
- Increasing customer retention or loyalty
- Reducing operative costs (inventory, advertisement, etc.)
- Building brand reputation

Besides quantifiable measures, it may want to know what qualitative or opinion-based factors impact performance, such as customer and employee satisfaction.

Although each goal is often achieved through the combined efforts of many marketing activities, specific aspects of each goal that are influenced by cross-selling should be defined. Taking sales order for example, before launching the campaign, several cross-selling rules can be tested with selected target groups and be determined which gains the best attraction. Once the launch campaign is in full swing, it’s possible to measure the frequency of a product being proposed and those who accept the proposal. By tying proposal messages to website sessions and then monitoring web site or recording customer call centre inquiries, it’s possible to track which orders are driven by cross-selling. The cross-selling cannot take complete credit for resulting sales, but it can show a direct correlation between effective proposals and order increase. Operational ties between cross-selling and sales are important financial indicators that CEOs and CFOs understand and relate to.

Secondly, evaluate the measures against the criteria discussed before. The development of a system of KPIs makes sense for the automatic steering of activities and processes. It makes the analysis of the inter-dependency of measures more transparent. However, the quality of the figures depends very much on the quality and the understanding of the underline information system. The interpretation of existing data can be difficult. In cross-selling, besides the commercial measures indicating the improvement on business, there are also

technical parameters related with data mining: support, confidence and lift.

Thirdly, be prepared to be analytical. Although metrics are useful, it is important to also look at the facts behind the numbers. Simply knowing that cost per full-time agent is higher than the industry average, for instance, will not help an organization improve its performance. Instead, the data should be analyzed to discover what factors (e.g., management practices, systems, and organizational structure) within an organization are responsible for performance gaps and then identifying key practices for improvement.

At the corporate level, it is more than just a case of ensuring that the cross-sale is increasing, but also that it is achieving the bottom-line improvements anticipated in the business strategy. The challenge is to be able to answer the question from the board - "yes, cross-sell is up but why is profitability still lagging?" Marketing manager needs to understand how various inter-related performance indicators - such as customer churn, cross-sell ratio, and product margins, etc. - impact on the bottom line. Appropriate actions can then be taken to refine the strategy.

In conclusion, a good success measurement strategy should be able to measure the cross-selling successes by defining the marketing goals up front, aligning them with corporate objectives, and understanding the business users’ perception and interests. A quantitative assessment combined with qualitative analysis is able to provide a holistic view of measurement. At the same time, analysts should track marketing activities to identify emerging trends so that they can interpret the results correctly.

Chapter 4

Processes and Functionalities Analysis

After discussing how to develop a success measurement strategy, this chapter focuses on the analysis of the second and third layers of the business model, that is, to define a closed-loop cross-selling process with integrated success measurement. The purpose of analysing the processes and functionalities is to find out the possibilities of tracking, collecting and storing the meaningful data, which can later be transferred to SAP BW for analysis. In the following sections, firstly, the process with integrated success measurement is described in four detail steps. In the next three challenges of the success analysis for cross-selling are identified.

4.1 Introduction on Cross-selling

Cross-selling is based on a data mining model that uses association analysis to perform a statistical analysis of transaction-based product data and determine similarities in the sales patterns of different products. It allows you to establish, for example, whether a given product is always sold in combination with another product or several other products. In order to provide personalized recommendations, these lists are generally assigned to a target group or marketing profile, thereby matching particular products to the most suitable customers.

Knowledge about such relationships between products opens up new opportunities in the way companies arrange their product offering. They can then place the products concerned adjacent to each other in the catalogue, on the supermarket shelf, or in the web shop, or conduct advertising campaigns aimed specifically at promoting these products. Furthermore, cross-selling enables them to determine the buying behaviour of specific customer groups or to draw up analysis on the basis of selected sales outlets or specific geographic areas.

4.2 Process Overview

SAP offers a generic cross-selling solution. The following picture shows the details.

The first layer, business objectives, is discussed in the previous chapter. This chapter analyses the processes steps and functional components that support the process. Just to make it clear, the difference between the process step and functionality is: as mentioned before, process is from business objectives and functionality is a concept in IT domain. One sort of functionality can be used to support more than one process. Such as market segment is not only used in cross-selling, but also used in calculating customer value.

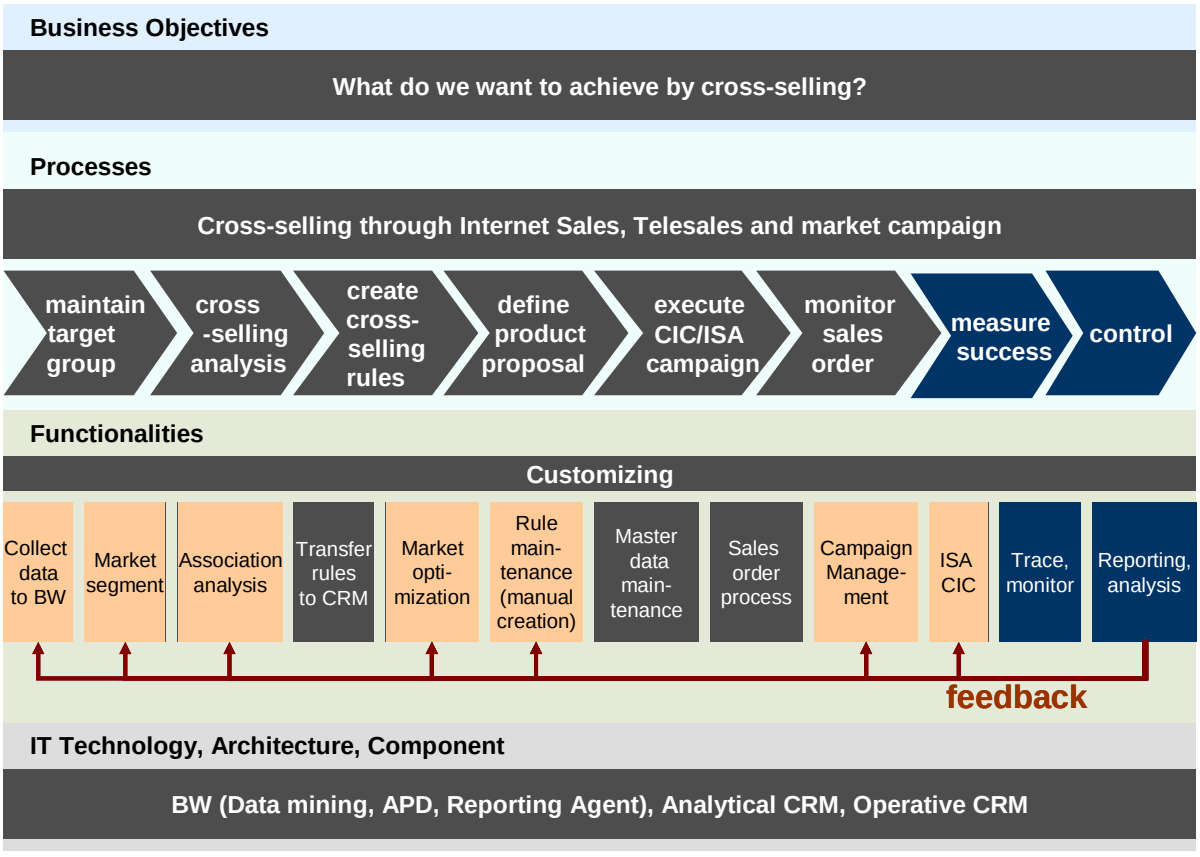


Figure 17: A Closed-loop Process of Cross-selling

In mySAP CRM, with proper customizing, cross selling happens after a customer orders one or more products and then triggers the system to generate one or more proposed products. In ISA customer has access to the whole list of proposed products, while, in CIC customer gets the proposal from the agent, who has the access to the list and transfer the message to the end

customer. In the second case, it can be that the agent only chooses one of the products from the list.

The grey and pink blocks are the existing process steps and functionalities in the SAP solution. A closed-loop process should also include measuring and controlling. The blue blocks on the diagram demonstrate the missing part in the current mySAP CRM solution and clearly show the significance of this thesis work in completing this cycle. The reporting results provide decision-makers useful information and should be fed back in order to optimize the process and control the system. The pink blocks are the potential functional modules to be improved by the reporting results.

4.3 Four Process Steps

In mySAP CRM, besides cross-selling, there are other methods of product proposals: Up-Selling, Down-Selling, Top-N product lists, accessories and product proposals with campaign reference. Before the cross-selling product proposal can be triggered at ordering time, the product proposal schema need to be correctly customized. “Method Schema” is a flexible customizing tool for combining various proposal methods (function modules) that make up the prerequisites for generating product proposals in CIC and ISA. The individual function modules determine products according to a range of criteria and combine these to make product proposals. Some examples of method schema:

- Crossing-selling
- Offers with campaign reference
- Cross-selling/Up-selling/Accessories with target group reference
- Cross-/Up-/Down-selling/Top-n list/Accessories for global rules

The customer can also program his own function modules and combine these to make individual method schema.

After customization, the closed-loop process is carried out in four steps:

- Step 1 – Identify cross-selling opportunities
- Step 2 – Prioritize cross-selling efforts

- Step 3 – Execute product proposals
- Step 4 – Measure and control

4.3.1 Identify Cross-selling Opportunities

According to the general data mining process discussed in the second chapter, the following picture presents the mining process of cross-selling:

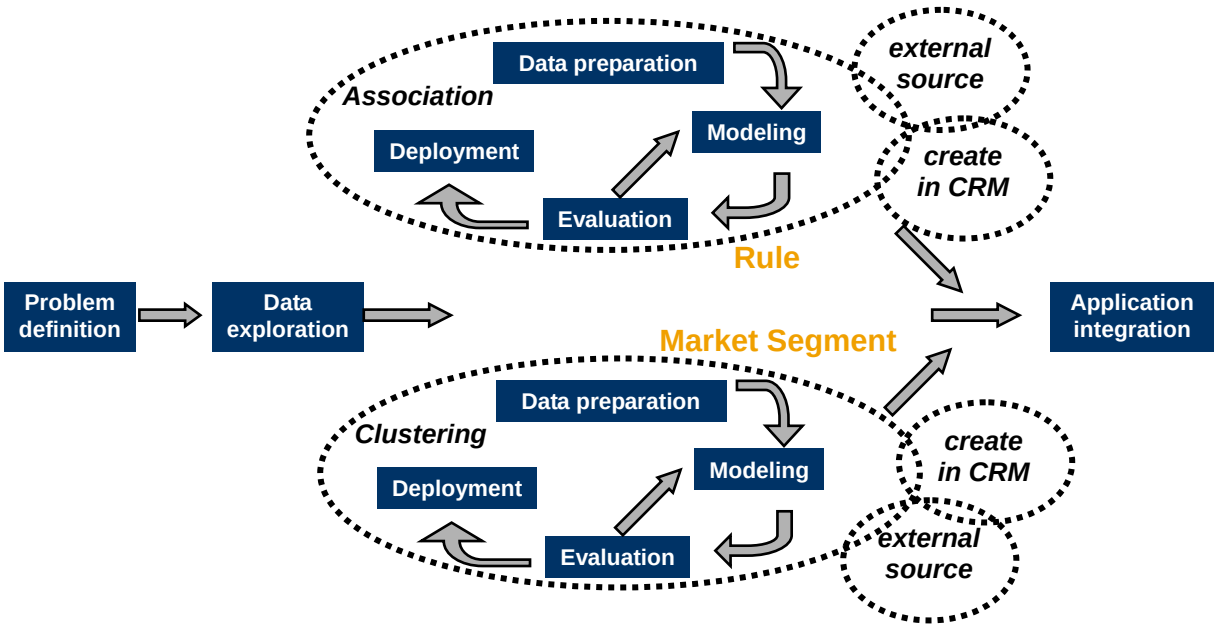


Figure 18: Identify Cross-Selling opportunities

A cross-selling opportunity can be described as “propose baby skin care to family having kids that bought baby clothes”. Two sort of information are determined with the help of data mining techniques in SAP BW: market segment and association rule. They are transferred into CRM system for generating cross-selling rules.

- Create market segments

  To enable selective marketing, customers are segmented into different target groups on the basis of certain shared marketing-relevant attributes (for example: age, occupation, hobbies, income and so on). Target groups are created with reference to specific marketing activities, for example, an Email marketing campaign intended to introduce

a new product or a telephone campaign targeted at your most profitable customers. You can use profiles to combine the required selection criteria and then set up your target groups.

Market segments are determined in SAP BW using the data mining technique: clustering, which segments data automatically into clusters, and are then transferred into CRM. Besides, customers can also be segmented manually in CRM system or imported from external systems.

- Generate association rules

  Similarly, most cross-selling rules are determined in SAP BW and then transported to CRM. They can also be created manually in CRM system or imported from other systems. The data mining process of association analysis is discussed in detail:

  - Data preparation:

    It is essential that the data used to train the data mining model is representative of the range of customers to whom the products are to be recommended. For instance, the data used to develop the recommendations came from a sample of 8000 customers with above-average spending data and comprised eight weeks of product-level transactions data. Other questions needed to be considered are: Is there enough data about products and customers? Which level of product differentiation is necessary (propose a specific product item or a category)?

  - Modelling:

    To create an association analysis model, firstly to specify the data source of training data and then to define the model parameters, for example, to specify the number of leading and dependent items of a rule, to specify minimum value of Lift, Support and Confidence. Modelling parameters can limit the number of total determined rules and to improve their quality.

  - Evaluation:

    Sample groups can be chosen to test whether a model is effective:

    - Model Group: A group of customers chosen based on the results of the data mining model, who get the marketing message

- Control Group: A group of customers chosen at random, who get the marketing messages
- Hold-out Group: A group of customers chose at random, who do not get the marketing message

Compare the test results of different sample groups, for example, we can get the following table. It shows that applying a segmented cross-selling strategy can raise the response rate by 0.4%. But the effects of using cross-selling against not using it is much more obvious: 0.3% over 0.05%

	Response rate
Model group	0.7%
Control group	0.3%
Hold-out group	0.05%

Table 2: Controlled Test of Cross-selling Model

- Deployment:

  It is important to note that the recommended list, by design contains no products previously purchased by this customer.

- Define cross-selling opportunities

  Cross-selling rules are defined in terms of the relationship between leading products and dependent products. The rules can further be defined as a global rule, a target group-based rule or a profile-based rule.

  The following figure shows the interface of maintaining cross-selling opportunities in CRM:

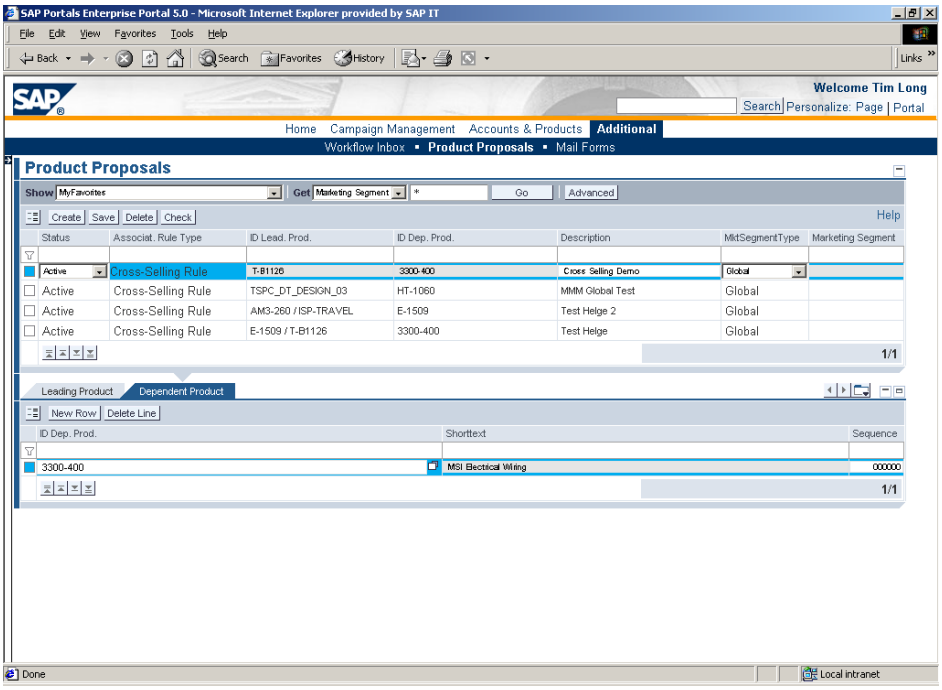


Figure 19: Maintain Cross-Selling Rules in SAP GUI

4.3.2 Prioritize Cross-selling Efforts

Rules generated from data mining are of hundreds or thousands. Many of the cross-selling opportunities identified can simply be ignored because the efforts required to deliver them is too great. That is not to say that they should not be considered at a future time, but for now there are easier and quicker options. Those options that remain can then be assessed and prioritized on a more formal economic approach consisting of potential revenue set off against the investment required and ongoing servicing costs.

Normally, in retail industry, rules are prioritized by lift, support and confidence, that is, rules with highest lift will be applied first. However, as mentioned before, cross-selling is a means to achieve multi-dimensional aims. The efforts should be adjusted to the business objectives and also to capacity constraints of the business. In the following example, rules with acceptable lift, support and confidence are further ordered by inventory, profitability and volume planning. The product with biggest stock will be firstly proposed. When inventory level is the same, the more profitable product is proposed.

Cross-selling Optimization

Time	Q2, ending
Data Mining Model	
Lift	>50
Inventory	>100000
Profitability	>10%
volume planning	

inventory	profitability	volume planning	Proposed Product	LeadingProduct	Support (S)	Confidence (S)	Lift (S)
300,000	30,00%	30000	0002015110	0000121043	0,0066667	44,443	847,743
		2000		0000121485	0,0066667	16,667	272,640
		200		0000121487	0,0166667	42,223	835,573
	20,00%	30000	0000122222	0000311455	0,0033333	3,810	39,967
	20,00%	2000		0002015373	0,0066667	5,557	14,073
200,000	45,00%	200	0000121322	0002016356	0,0033333	14,813	73,603
100.000	12,00%	766	0000200010	0000911277	0,0033333	11,110	63,213

Figure 20: Prioritize Cross-selling Efforts

Prioritizing cross-selling efforts answers the question of how to make best use of the rules and how to effectively apply the rules in the context, namely to the right customer at the right time and place in a right manner to achieve optimal benefits. Optimization is a critical process that directly influences the final results. However, in mySAP CRM the functionality is quite limited.

4.3.3 Execute Product Proposals

With a prioritized list of segmented cross-selling opportunities, the business case can be built on different channels.

The user interface of product proposal on different channels is also different. The following screen shot shows the interface for CIC Windows Client. Users of this application are the agents in the call centre. The right pane of the screen displays the interface of maintaining a sales order. In the right lower corner, the information of the products ordered is displayed. Select the product, press the “Product Proposal” button, and then a product proposal list will appear on the left. The first product in the list is a cross-selling proposal. Besides, you find up-selling and accessories. As mentioned before, the types and the order of recommendations are defined in customization. The agent reads the proposals, but he or she may not propose all the products in the list to the customers on the phone. Instead he may choose one or some according to the situation. If a customer agrees to order the proposed product, then the agent will type the name of the product into the order list. As you can see, to add a product into the order is totally human behaviour. The system cannot automatically tracks and recognizes the direct linkage between the orders and the cross-selling proposals.

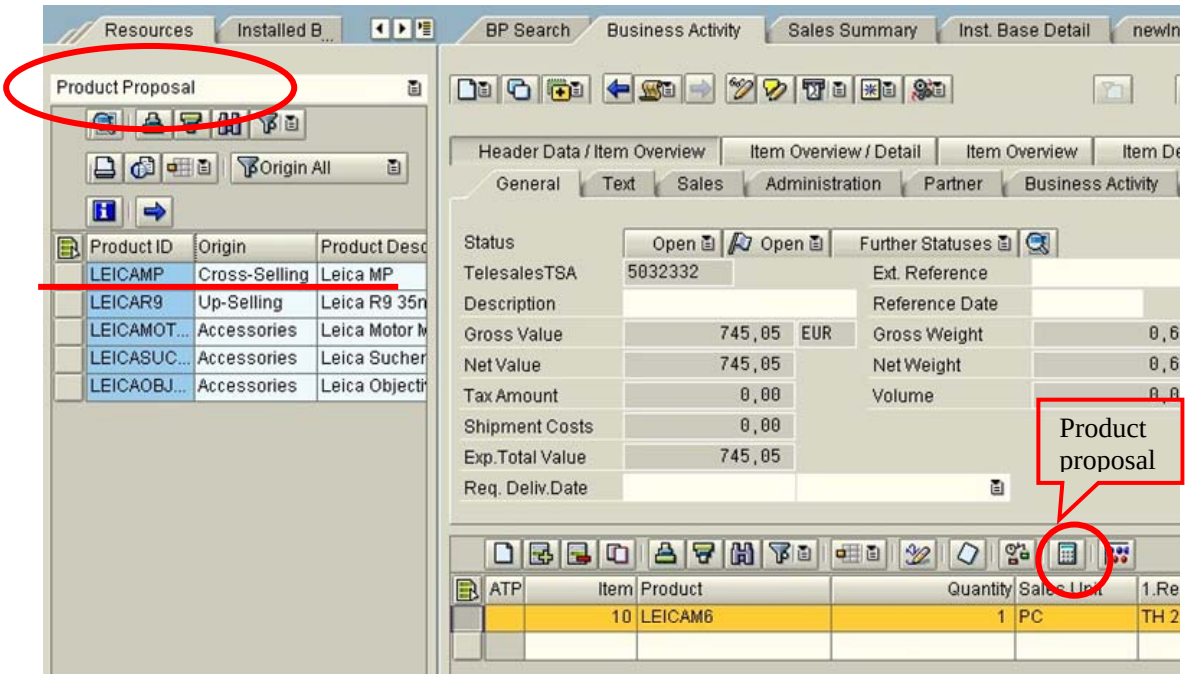


Figure 21: Execute Cross-selling in CIC – WinClient GUI

The CIC Web Client application enables call agents to work online. The cross-selling proposal is implemented differently here. Proposals are not triggered when the “Proposal” button is pressed, but when product description is displayed. In the right upper part of the following screen shot there is information about “Additional Products for LEICAM6……” The proposals are displayed here. If a customer agrees to order it, the agent can select the product and press “Add to Cart” button. In this way the system has the possibility to track the information that this order originates from the product proposal. However, the functionality is not implemented in the current system. And if the customer doesn’t order the product immediately, but calls a few days later again, which is quite normal, the agent is likely to type the product name directly into order rather than pressing “Add to Cart” button. In this way, the linkage between proposal and order is also lost.

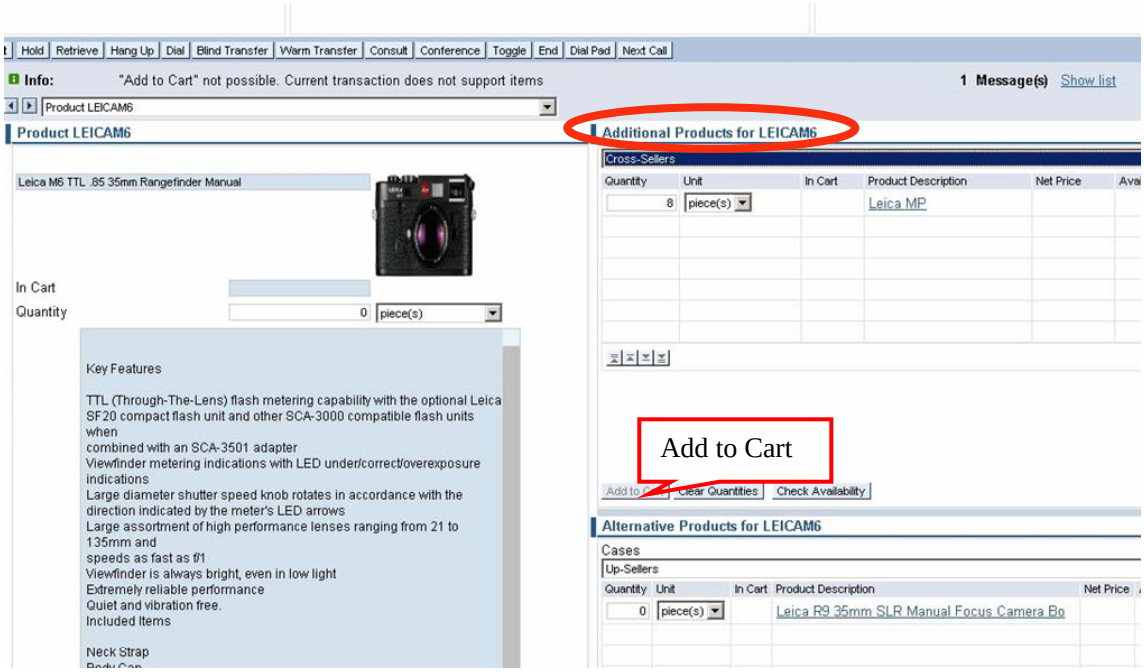


Figure 22: Execute Cross-selling in CIC – WebClient GUI

The third picture shows how proposals can be deployed in a web shop. Customers here do not depend on the call agents, but they have full information of the proposals.

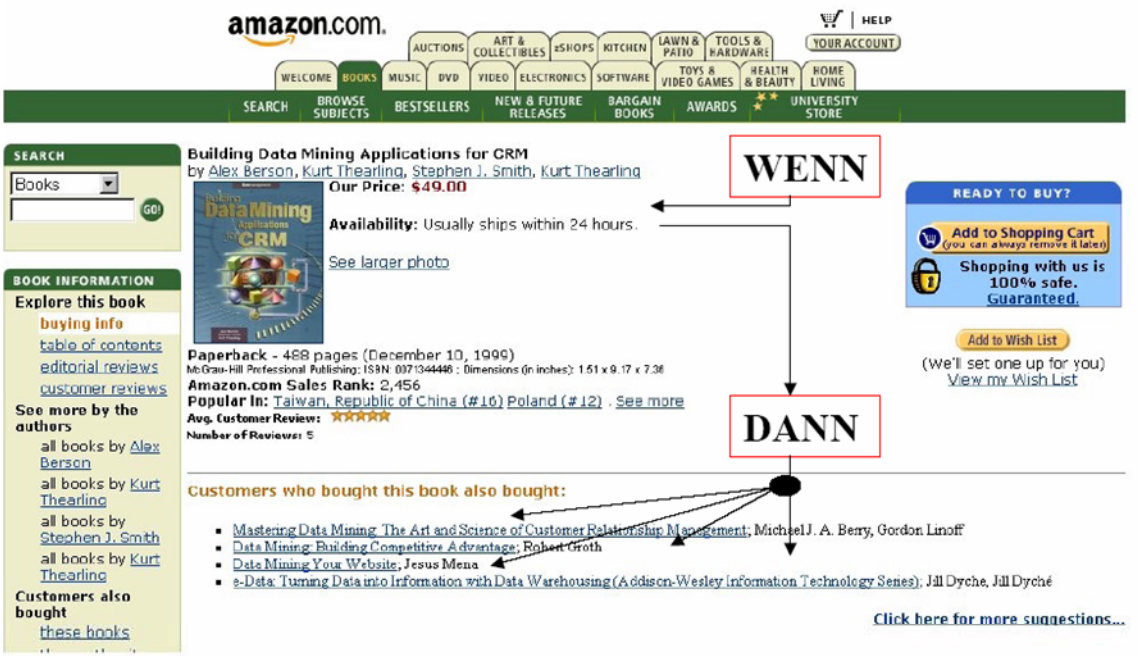


Figure 23: Execute Cross-selling in ISA

The comparison among these three different channels of deployment demonstrates that the more direct interaction with the end users enables more feasibility and probably more accuracy in tracking and recording the data, as the process is highly automated instead of being intervened by human factors.

4.3.4 Measure and Control

Measuring and controlling is the last step in the closed-loop of cross-selling process. There are many objects worth being monitored:

- Cross-selling rule: The change of parameters (lift, support and confidence) of the rules over time indicates the change of the quality of rules. Ineffective rules should be taken out from the active system.
- Proposal: when, where and to whom a proposal happens is the basic data for analysis.
- Sales order: ordering is the direct consequence of proposing. Therefore, the ordering information of a proposed product is most interesting in the context. However, it is also one of the most difficult tasks to identify the cause-and-effect linkage. This will be discussed in details in the next section.
- Follow-up activities: besides ordering, proposal may cause a series of other follow-up activities, such as extending the browsing time of customers in a web-shop, inquiring call agents for more information, etc.
- Cost: cost is always a critical factor in analysis and evaluation. Cost is hard to trace in the system, but statistical data such as average time for proposing a product on phone, can still give us some insight. An intricate question is whether the efforts to tracing the cost data are cost-effective themselves.
- Staff: call agent is an indispensable chain in the process. His/her efficiency and effectiveness doubtlessly influence the success. It is also possible to develop measures assessing their performance.

In order to do a full coverage of success analysis, the following information is a must. Theoretically it is possible to trace all information of 1, 2, because they are all facts. However, after the system is examined, only part of the information of 1, 2 are able to be traced easily in practice, while some others are too costly to get. Information of 3 is only possible to trace with certain limitations and assumptions.

1. Who gets which proposals, when and where?	
Known	Which proposal is generated for which customer and when?
Hard to Get	Where this customer gets the proposal (only web shop ID available, information incomplete in other channels)?
Unknown	Whether this customer really gets the proposal. (In call center depending on agents)?
2. Who orders and finally buys which products, when and where?	
Known	Who orders which products, when?
Hard to Get	Where the order is made (the identification of call center, or web shops)?
Unknown	What is the following status of the order, whether it is delivered or billed?
3. Whether the buying behavior is influenced by the product proposal? If yes, how?	
Known	Whether the customer immediately orders after getting the proposal?
Unknown	Why the customer doesn't order although getting the proposal? How long does the customer react to the proposal? What are the impacts on customers besides ordering (any side-effect?)

Table 3: Data Requirement on Success Measurement for Cross-selling

With the measuring and controlling step marketing manager is able to evaluate the contribution of cross-selling to the business aims, to identify the factors that influence the success and to improve the cross-selling strategy.

The measuring results can be further fed back into the process. In SAP BW, using the tool Reporting Agent, one can define exception reporting. Exception reporting is made up of three

functional areas: The exception definition, the online evaluation of exceptions, and the evaluation of exceptions in background processes.

Exception definition allows you to determine the objects that are critical for a query, both online, and in background processing. In online results that fall outside a set of predetermined threshold values (exceptions) are highlighted in colour. In background processing mode, the result is displayed in the alert monitor, and logged in the exception log. If exceptions do occur, it is possible to trigger a follow-up action in the Reporting Agent. For example, a mail is sent to the person responsible or inefficient rules are automatically deactivated.

4.4 Challenges in Success Analysis

Based on the process and function analysis above, three challenges are summarized:

4.4.1 No Optimal Solution for All

Challenge 1: There is no optimal cross-selling solution for all.

The diversity of cross-selling process depends on different industries, sales channels and customer base. For example, customers in supermarkets are not identified. It is unknown which products they already bought. They are likely to buy the same product repetitively and the relationship is rather short-term. While in financial services customer information is well-recorded. They are not likely to have the same services twice and the relationship is long-term. Specific business problems determine the definition of the success, the practical process as well as the measuring and reporting requirements. Therefore, there is no optimal cross-selling solution for all.

4.4.2 No Hundred Percent Accuracy

Challenge 2: No hundred percent accurate success measurement

Cross-selling is a marketing technique, which hopefully leads to more orders and sales, and finally will achieve more profitability. Is it the success we expect? The following two

interesting questions will help you to see the depth of the problem.

- Does an order after a proposal always mean success?

  If there is a following order after the proposal, it is hard to say whether the ordering is a successful sign. The order might result from the reduced price. It might be that the customer will buy this product anyway even the product is not proposed. In more sarcastic case, it might be that the customer had planned to buy a more expensive product if without receiving the proposal.

- Does no order always mean failure?

  Imagine you are recommended to buy a digital camera online, will you buy it after five minutes of thought or will you more likely browse the information, compare with other products and log into to the web shop again afterwards if you think it is really an interesting product? Admittedly, the second buying behaviour is also a case of successful cross-selling, while the system probably regards it as “no order” and failure. It is hard to track the following-up responses of the customers with uncertain time lag, not even to mention asking directly “Did you buy it, as we proposed it?” The situation is not easier in call centres. Cross-selling is a science as well as an art. No one doubts that the attitude and skills of the agents have direct impact on the success of proposal. Customers may reject the proposal, because they dislike the agent, but not a fault of the cross-selling rules.

  In a word, it is difficult to identify the direct cause and effect. The level of accuracy we measure is determined by the cost we are able to afford.

4.4.3 Human Interaction

Challenge 3: Human interaction plays an important role in cross-selling

Cross-selling process is not a wholly systematically automated process. From initiator, practitioner to the receiver, three kinds of human interaction are critical.

- Marketing analysts / managers

  Hundreds of cross-selling rules are generated in data mining workbench in SAP BW

and later transferred into CRM system. Marketing managers or analysts are able to maintain the rules in CRM and activate the rules they want to deploy for the coming period. They decide which rules to use according to their business experience and understanding.

- Call agents

  As already mentioned call agents transfer the message of proposals selectively to customers on the phone. They may ignore all the proposals displayed in the SAP software and tell nothing to the customer if they feel the customer are not in the mood to buy or they will propose a printer to a desktop-buyer without asking the system to show the proposed list, because after many times they remember the rules by heart. It is not economical to ask the call agent to type into the system the information about their proposals and the feedback of the customer, in spite of the theoretical feasibility. Moreover, the way they recommend is also a critical factor.

- Customers

  It’s hard to predict customer behaviour. It’s easier to predict the behaviour of market segments. We can say, for example that on average how many customers will react positively to cross-selling, but if we try to predict how many proposals a specific customer will accept, it’s a more difficult forecasting problem. If we try further to ask why they response in that way, it is even more impossible to know. Human beings are not always rational and explainable.

Chapter 5
Prototyping

This chapter provides a prototyping solution. After depicts the data flow in and between the systems, the design of implementation in SAP CRM and the data model in SAP BW, a few exemplary reports are explained.

5.1 Data Flow

The process involves three systems, namely, BW, CRM and R/3(Sales and Distribution). Cross-selling rules are generated in two ways: manually create or have them determined in the business information warehouse using data mining techniques. These rules are then imported into CRM using BAPIs, which act as an interface between CRM and the external system. At the same time rules created in the data mining workbench can be extracted to CRM Cross-selling Analysis cube for reporting. All rules including cross-selling, up/down selling, top-N product list and accessories, are stored and maintained centrally in CRM system. Through a common functional module – *CRM_PP_GERNERATE*, rules are used in either Customer Interaction Centre or Internet Sales. *CRM_PP_GERNERATE* functions according to the predefinition set in the customizing tool - “Method Schema”.

If customers order products after proposals, the orders are stored in CRM and also replicated to R/3. An order can later be modified, cancelled, billed or delivered. If it is finally paid by the customer, then cross-selling has realized its business effect on the financial numbers. However, even if the order is not closed due to variable reasons like product unavailability or payment delay, in the context of evaluating cross-selling, it is still considered to be successful, because the failure of selling the product is not due to cross-selling technique, but some other reasons. Based on this assumption, it is more meaningful to observe and trace the order than the sales.

But practically it is easier to get sales data than order data, because sales revenue is an unchangeable fact, while order is dynamic and will undergo different statuses. Moreover, the increase in sales revenue is more telling and attractive than the increase in order volume. When an order is successfully closed, it is later extracted to Sales Orders cube in BW for further analysis. The following figure shows the overview of the data flow in the process of product proposal (Cross-selling):

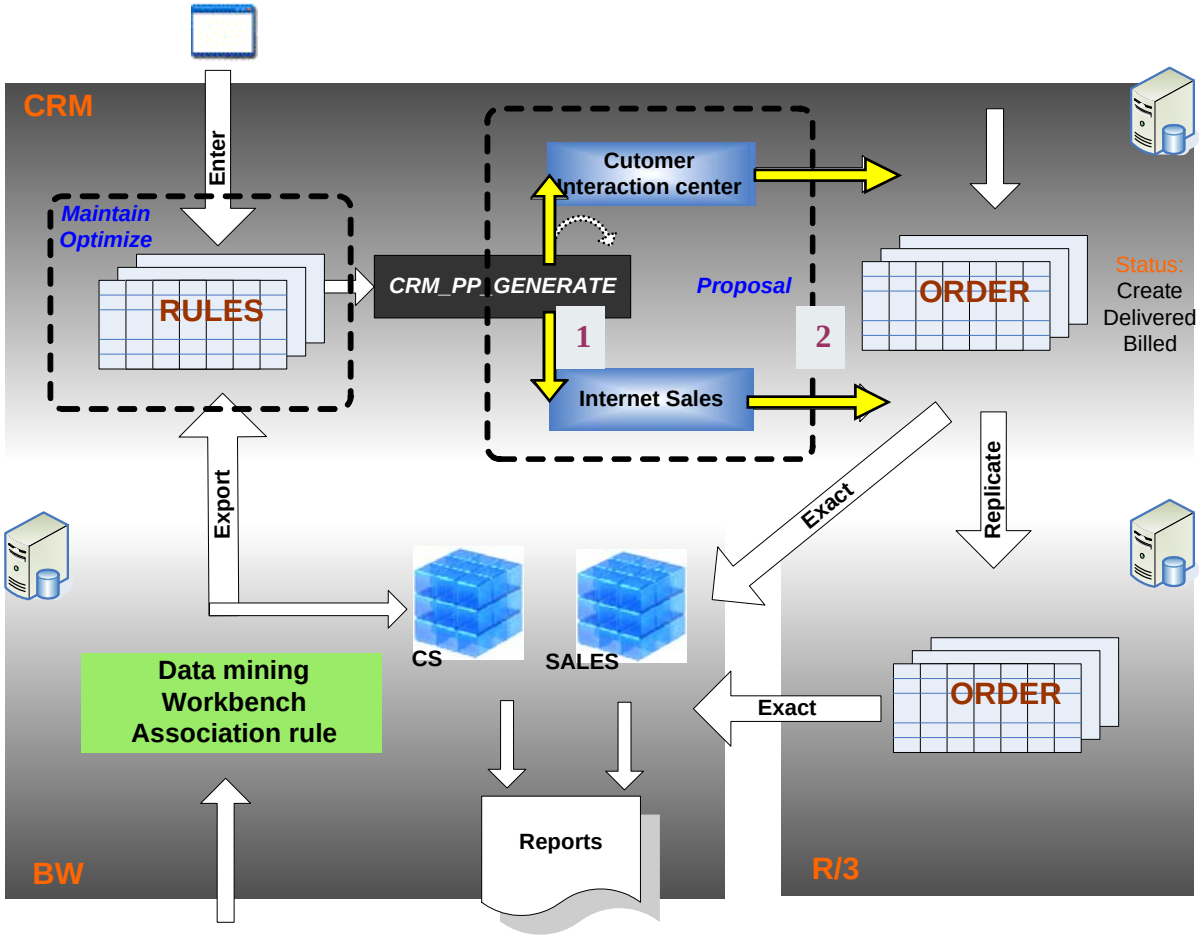


Figure 24: Data Flow of Cross-selling Process

5.2 Data Gathering

The next step is to collect the data that is needed for measurement. According to the above picture three most important objects, cross-selling rules, cross-selling proposals and sales orders are possible to be recorded down. Cross-selling rules are stored in the Cross-selling Analysis cube. The arrows in yellow mark the point where the other two objects can be monitored.

1. When the proposals are generated in the function module: *CRM_PP_GENERATE*, it is possible to log all the proposal information including rules, customers, sales channel, etc.

2. The way of recording sales orders is different, as the processes of executing product proposals are to some extent different by channels. Take CIC as an example, when an agent enters a product to the order, there is no way for the system to identify whether it is a proposed product or not. But under certain assumptions it is possible to infer whether the ordered item has been proposed recently based on the logged information in the first step. The following prototyping is based on the scenario of CIC.

A database table *ZCRMPPLOG* is created for the purpose of logging data. The structure and sample data of *ZCRMPPLOG*:

client	Event GUID	PP_Prod GUID	BP GUID	Rule GUID	TG GUID	Shop ID	PP_timstp	Order GUID	Order_timstp
700	E1	P1	C1	R7	T3	S1	2003120101000000	O1	2003120101020304
700	E1	P2	C1	R4	T3	S1	2003120101000000		
700	E1	P1	C1	R3	T3	S1	2003120101000000	O1	2003120101020304
700	E2	P3	C2	R1	T1	S1	2003120103000000	O2	2003120103051200
…	…	…	…	…	…	…	…	…	…

Table 4: Structure of Logging table

At proposing time

The data of the left fields are filled out when proposals are generated from the function module *CRM_PP_GENERATE*. The logging program is an independent ABAP functional module, which is flexibly plugged into the application by being customized in “Method Schema”. The logging program is able to be switched on/off.

Every press on the button of “Product proposal” causes a proposal event (Event). Different types of proposals are generated, filtered and sorted out according to the priority of association rules customized in the Method Schema. In this table, all types of proposals are recorded including cross-selling, up/down selling and etc.

In one proposal event, several rules (Rules) may take effect simultaneously. In the following scenario:

- Shopping Basket contains Product A and B
- Proposed Basket contains Product C, D and E

Three cross-selling rules work at the same time:

- Rule 1: A → C
- Rule 2: B → D
- Rule 3: A, B → C, E

In one event, one proposed product (PP_Prod) may appeared in the logging table twice due to two different rules as in the case of Product C, while since the customer doesn't care where the proposal stems from, the product appears only once in the UI. Every proposal is logged with a timestamp (PP_Timstp) with milliseconds.

There is more than one business partner (BP) for each business transaction defined in SAP system. Here means the sold-to-party of this transaction. Target Group (TG) and Web-shop (Shop) are also recorded if the information is available. As the table stores proposals that may be generated and deployed in different SAP systems, GUID is used instead of normal ID to avoid repetition.

At ordering time

In CIC Windows Client, each operation on the order object can cause an event. For the purpose of linking order and proposal, one new event is implemented, which is triggered whenever an order item is saved. This ABAP functional module is plugged into the application by being customized using Event Handler Mechanism. For more information about the definition and customization of the Event Handler Mechanism, please refer to the SAP Help on the transaction *CRMV_EVENT*. In this program the logging table is browsed and searched after this event is triggered. If the order item appears in the table within certain time latency, for example two hours, then a probable cause-and-effect between proposal and order is identified. The two fields on the right (Order and Order_timstp) are updated.

In CIC Web Client and Internet Sales the event logic applies but with different implementation.

The prototyping solution fulfils the requirement of tracking and gathering transactional data in CRM efficiently with minimum interference on the operative side. Nevertheless, based on concrete customer implementation of mySAP CRM, there are several points needed to be paid attention in real customer projects:

- Firstly, to ensure that the proposal logged in the table is the one that results in the order, additional information may be needed like BP, Sales Channel, or System Username, etc. to uniquely identify the transaction in time and space.

- Secondly, the time latency between proposal and order should be defined based on different business situation. Within which time period a direct cause-and-effect relationship is recognized is rather a business issue than a technical problem, although it may influence the way to maintain the table for performance reason.

- Thirdly, performance issue is a critical concern. As the event is triggered rather frequently and the logging table grows fast especially in online case, to limit the table content within a reasonable size and to expedite the reading, writing and searching operations on the table require further development efforts.

The implementation on the operative CRM system is finished by exporting the table structure of *ZCRMPPLOG* as a data source for BW. The next step is to design and create the data target in BW for loading and storing the data from the logging table.

5.3 Data Modelling

In BW modelling, all the objects and rules that are needed for data extraction, transformation and loading are created. First of all, an InfoCube, whose attributes corresponds to the fields in the log table *ZCRMPPLOG* is created.

InfoCubes are made up of a number of InfoObjects (characteristics and key figures) and is structured according to the star schema. This means there is a (large) fact table that contains the key figures of the InfoCube. The characteristics that logically belong together (district and area, for example, belong to the regional dimension) are grouped in a dimension and they are stored in several (smaller) dimension tables.

The fact table and dimension tables are both relational database tables. They are linked to one another via abstract identification numbers (dimension IDs), which are in the key part of the particular database table. As a result, the key figures of the InfoCube relate to the characteristics of the dimension. The characteristics determine the granularity (the degree of detail) at which the key figures are kept in the InfoCube.

PP_ANALYSIS cube is designed with adherence to the design criterion. Dimensions such as BP, Proposed Product, Sales Order, etc. are independent of each other. The dimension tables remain small with regards to data volume, which is desirable for reasons of performance.

The characteristics are supplied with data from the CRM system. Three key figures (Rule Counter, Proposal Counter and Order Counter) are filled at loading time by being calculated based on Updating Rules.

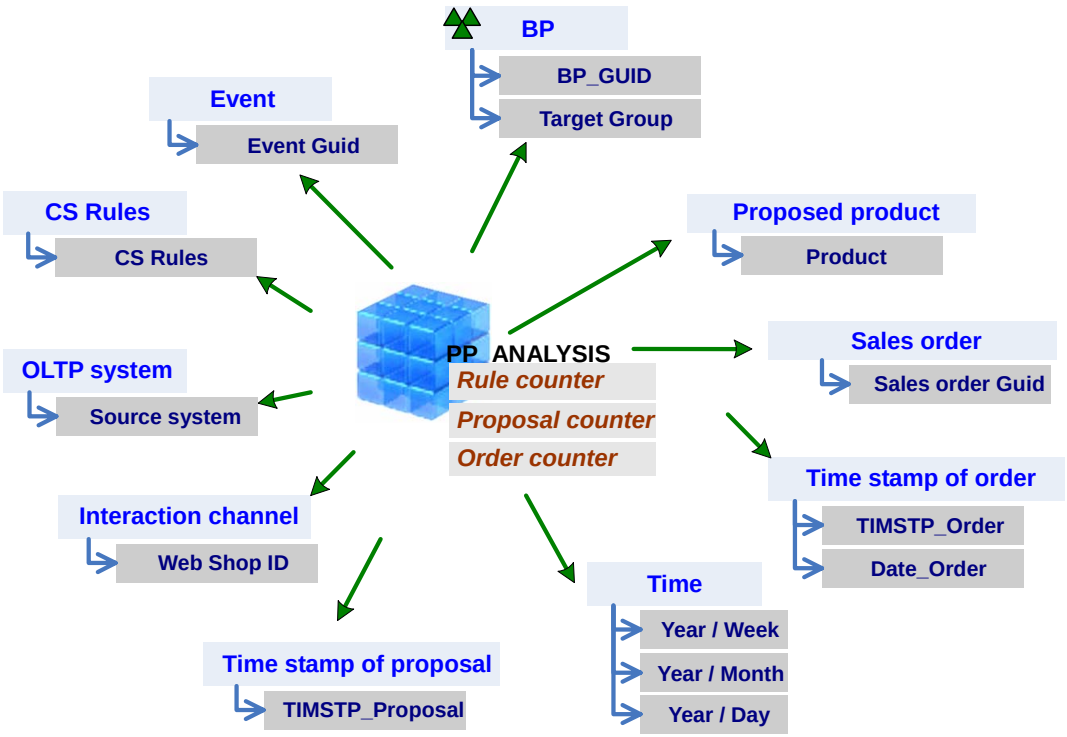


Figure 25: Multi-dimensional Data Model of Cross-selling Analysis

5.4 Architecture

The following figure demonstrates the overall architecture of the success analysis:

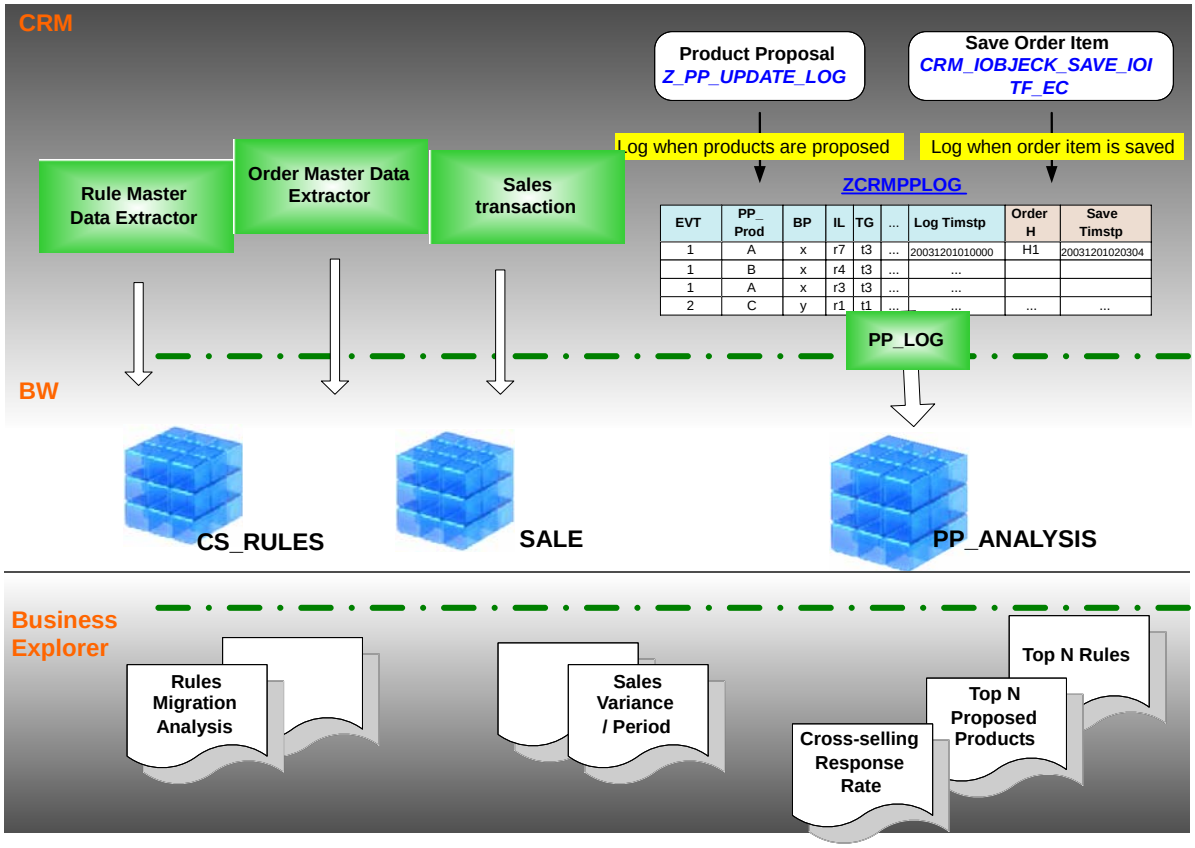


Figure 26: Architecture of Implementation

Several extractors are defined in CRM to extract master data and transactional data from CRM side. Three cubes provide the data for evaluation in queries for the success analysis. Cross-selling Rules Analysis cube and Sales Orders cube are delivered by Business Content. PP_Analysis cube is created especially for the purpose of showing different reports on cross-selling. The attributes of PP_Analysis correspond to the fields in the log table *ZCRMPPLOG*.

An InfoCube with data is not yet ready for reporting. The next step is to define queries on top of cubes in the Business Explorer - Query Designer. By selecting and combining InfoObjects (characteristics and key figures) or reusable structures in a query, we determine the way in which the data in the cube is navigated through and evaluated.

The following figure shows how the rule migration analysis is done. Sales Order cube (0CSAL_C03) provides the training data to the data mining model of association analysis. The generated rules are stored in *Cross-selling Rules Analysis* cube (0CRM_CXS). The cube is loaded whenever the association model is retrained. Based on this cube it is able to compare the rules generated by sales order data over different time periods in order to see the developing trend of the rules. Reports are displayed in the form of Excel tables or Web Template.

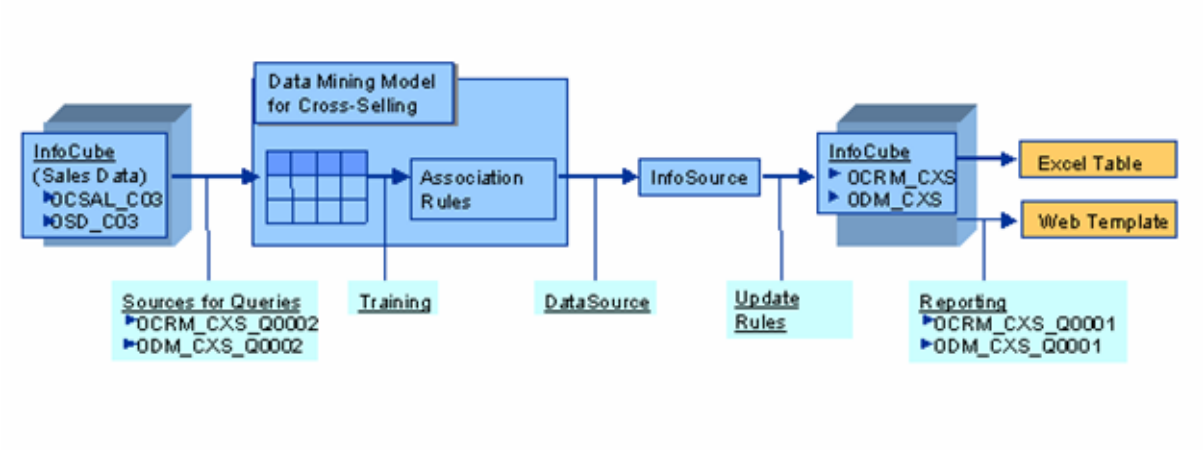


Figure 27: Data flow of Rule Migration Analysis

5.5 Reporting

The data, displayed in the form of a table, serves as the starting point for a detailed analysis for answering a variety of questions. Here are some exemplary reports:

I. The first report compares the change of lift over two association analyses. At the end of each time period, you can retrain the data mining model with the transactional sales data from the previous period as the input. Monitoring the change of lift over time provides us with the information about the effectiveness of rules. If the deviation of lift throws an exception, the system can be triggered to de-active the rules and inform the responsible analysts to take action.

Cross-selling Rules Migration Analysis

Calendar Day	
Cross-Sell. Analysis	
Data Mining Model	
Key Figures	
Leading CRM Product	

Dependent CRM Product	

Data Mining Model	ZCRM_COMP

Leading CRM Product	Dependent CRM Product	Lift for Analysis 1	Lift for Analysis 2	delta
0000121043	0002015110	393,363	454,380	61,017
0000121322	0002016356	73,603		-73,603
0000121485	0002015110		272,640	272,640
0000121487	0002015110	472,037	363,537	-108,500
0000122222	0000311455	39,967		-39,967
0000122222	0002015373		14,073	14,073
0000200010	0000911277		63,213	63,213
0000200242	0000401061	1,133		-1,133
0000200242	0000411933	23,303		-23,303
0000200258	0000601007	1,813		-1,813
0000200258	0001001613	3,280		-3,280
0000200258	0002015358	2,050		-2,050
0000200271	0000201096		245,420	245,420
0000200488	0000200490		335,453	335,453

Table 5: Report 1 – Cross-selling Rules Migration Analysis

II. At the end of each time period, a statistical report is shown on the frequency of using a rule. For the most frequently used rules, it is possible to optimize their deployment and performance.

Top N Rules

Calendar Year/Month	
logging time stamp	
Product	
BP Ref.GUID	
product proposal eve	
Key Figures	
Cross-selling rule	

		Counter			
Cross-selling rule	**Product\Calendar Year/Month**	12.2003	11.2003	10.2003	Overall Result
18	Hard Disk "Computer	321	199	234	754
16	Pump PRECISION 100	240	280	174	694
15	Harddisk 2149 MB / S	200	211	232	643
11	Configurable House	123	168	231	522
14	70CD7D3DE2CA444AE100	42	169	183	394
17	84CB3C3F7AB76858E100	211	121	32	364
19	84CB3C3F7AB76858E100	35	42	123	200
26	Pump PRECISION 100	69	45	42	156
21	Configurable House	55	56	32	143
Overall Result		1.296	1.291	1.283	3.870

Table 6: Report 2 – Top N Rules

III. This report shows the most frequently proposed products over two time periods (P1 and P2). It can be drilled-down by business partner and by rule.

Top N Proposed Products

Calendar Year/Month	
Cross-selling rule	
BP Ref.GUID	
product proposal eve	
Key Figures	**Proposed Times - P1; Proposed Times - P2; Delta**
Product	

Product	Proposed Times - P1	Proposed Times - P2	Delta
Hard Disk "Computer	234	321	87
Pump PRECISION 100	206	309	103
84CB3C3F7AB76858E100	155	246	91
Harddisk 2149 MB / S	232	200	-32
Configurable House	263	178	-85
Overall Result	1.090	1.254	164

Table 7: Report 3 – Top N Proposed Products

IV. This report shows the sales variance across two time periods on product base. It is assumed that in the first period (P1) there is no proposal used on this product and in the second period (P2) there is. Both order quantity and order value are compared to show the effects of cross-selling.

Sales Variance per Proposed Product

Employee Responsible	
Sold-To Party	
Calendar Year	
Calendar Year/Quarter	
Calendar Year/Month	
Calendar Year / Week	
Calendar Day	
Key Figures	
Product	**Harddisk 2149 MB / SCSI-2-Fast**

Product	Value - P1	Value - P2	Delta (Val)	Qty - P1	Qty - P2	Delta (Qty)
Harddisk 2149 MB / SCSI-2-Fast	416.825,50 EUR	1.234.681,85 EUR	817.856,35 EUR	1.142 PC	3.086 PC	1.944 PC
Overall Result	416.825,50 EUR	1.234.681,85 EUR	817.856,35 EUR	1.142 PC	3.086 PC	1.944 PC

Table 8: Report 4 – Sales Variance per Proposed Product

V. This report shows the response rate of cross-selling proposals. For example, the first entry shows that the product “Configurable House” has been proposed 522 times, 323 of which lead to order. The response rate is 61.88%.

Cross Selling Response Analysis

Source System	
web shop identifier	
Target group	
Calendar Year/Month	
Key Figures	
Cross-selling rule	
Product	

Cross-selling rule	Product	Counter	success PP counter	cross-selling response rate
11	Configurable House	522	323	61,88%
14	70CD7D3DE2CA444AE100	394	233	59,14%
15	Harddisk 2149 MB / S	643	265	41,21%
16	Pump PRECISION 100	694	255	36,74%
17	84CB3C3F7AB76858E100	364	100	27,47%
18	Hard Disk "Computer	754	198	26,26%
19	84CB3C3F7AB76858E100	200	32	16,00%
21	Configurable House	143	12	8,39%
26	Pump PRECISION 100	156	6	3,85%
Overall Result		3.870	1.424	**36,80%**

Table 9: Report 5 – Cross Selling Response Analysis

Analyzing data on the basis of multi-dimensional data sources (OLAP reporting) makes it possible to analyze several dimensions at the same time (like, for example, time, business partner, and product). Any number of variance analyses can be carried out. A large number of interaction options, such as sorting, filtering, swapping characteristics or local calculations allow flexible navigation through data for the runtime. The data can be displayed in graphics (for example, bar charts or pie charts). In addition, using exception reporting, we can establish those objects that deviate from the normal values or are critical, send messages automatically (through background processing in the Reporting Agent) about deviating values by email or SMS, or calculate the values at a glance in an alert monitor.

Chapter 6
Conclusions

Chapter 5 has described the prototype implementation and exemplified several reporting results. In this chapter, the conclusions of the project work are summarized and the significance and implementation of the projects are evaluated. Some improvements are to be given.

6.1 Conclusions

As indicated in the beginning, many cross-selling initiatives have relied on CRM technologies. However, the success of cross-selling requires a balanced business design which focuses on strategies, processes, data and technologies. Logically this thesis based its analysis on these four key areas.

The most important conclusions of this project work in the four areas are to be summarized:

- The “success” of cross-selling is defined by each company based on their business objectives.
- The success measurement is a crucial and automated chain in the closed-loop cross-selling process.
- The reporting results of cross-selling can be fed back to the system to improve the overall efficiency and effectiveness.
- The implementation of success measurement for cross-selling on project bases for mySAP CRM is feasible under certain assumptions.

6.2 Evaluation

The master project did not try to answer the question, “how to carry out successful cross-selling”, but it proposed a prototyping solution as how to measure the success. The meaning of this project is to demonstrate the usefulness of data mining to marketing. This demonstration by showing tangible benefits to the customers would justify the purchase of data mining software and the hardware on which to run it. Though the project was done in the context of SAP CRM software, the methodology is also applicable to similar analytical applications.

All the project requirements that were set on the start were fulfilled successfully and on schedule. Before the project was finished, few colleagues in the development team of Analytical CRM had ever thought of the possibilities of adding success measurement of data mining functions into their current solution. SAP CRM is a giant application with close dependency on other SAP applications. And “Order” is one of the most significant and complicated components in the CRM development framework. The type of “Order” is defined by business activities (purchase, sales, service, etc.), channels (telephone, internet, email, etc.) as well as many other variables. Each type has its own features, therefore any communication with “Order” is considered to be a horrifying task. It might influence the functions and performance of the application to a larger extent and a tiny change must be coordinated with other functional modules. The prototyping implementation found out a way to log the order information with the hope of minimum influence over the existing application. However, the operations on the logging table in CRM are needed to be optimized in performance, enriched in functionalities and also strictly tested with large volume of data in real projects.

The pros and cons of the project work can be evaluated in short:

Pros:

- Successful and on time fulfillment of the project.
- Comprehensive research in both technology and business fields
- Flexible implementation in complicated software environment
- Efficiency in self-learning and development

Cons:

- Weak in testing the functions with large volume of data.
- Weak in performance optimization.

6.3 Outlook

Cross-selling is both art and science. The art of cross-selling has to do with timing, empathy, presentation and relationship skills of the cross-sellers. But there is a science to this business as well. Data mining techniques are clearly important in this environment, especially with the exploding of internet shops and e-commerce. The trend will have a profound impact on the data mining technique. On one hand, it raises new requirement on personalized and one-to-one marketing. On the other hand, it prepares favourable platform for data mining in terms of collecting large volume of transactional data with ease. The demand on success measurement will be potentially large, while the implementation tends to be easier as the process will be more automated and companies will have more awareness in tracking and collecting their data.

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http://help.sap.com

http://www.crmcommunity.com

http://www.crmgroup.com

http://www.data-warehouse.com

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