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# Customer Relationship Management

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# Customer Relationship Management

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# Abstract

**The emergence and growth of the Customer Relationship Management (CRM) trend is fueled by the dramatic increase in competitive pressure experienced by today's leading companies. In order to stay ahead of the competition, companies are increasingly turning to their customers as a means of securing their future competitive edge. Both the value of the individual customer and the development of personalized relationships with them have made CRM a top-three topic in boardrooms around the world.**

**In contrast to the existing commercial CRM software products which more or less represent „island solutions", i.e. just cover single aspects of CRM, we emphasize a comprehensive approach. This comprises serving the customer throughout the entire Customer Relationship Life Cycle, providing an integrated view of customer information, and marrying customer-centric processes with the enterprise execution system.**

**In this paper, we investigate the Customer Relationship Life Cycle and carve out the major business scenarios to be supported by a CRM solution geared to market requirements. Moreover, we highlight important technical requirements and propose a flexible, performant, and scaleable client-server architecture for mobile sales and service which is currently implemented as the heart of SAP's CRM solution.**


# 1 Introduction

For years, companies have focused on improving the efficiency of internal processes in order to reduce costs. Step by step, they have automated more and more of their internal business functions: from accounting and general ledger, to production planning and scheduling, HR management and payroll automation, just to name a few.

In the next phase, companies realized that all automated areas should be linked together, because automation of individual business functions had already proved so advantageous. This interlinking of automated areas brought even more breakthrough benefits to the table.

Recently, companies are focusing on the last non-automated realm of their business functions, the customer-centric roles of their operations. The goal is to offer the customer appropriate services, products, and supporting functions during the entire *Customer Relationship Life Cycle*. Companies must start by considering their customers' needs and must understand how they change and evolve over the course of the relationship from awareness and evaluation, through sales, and into ongoing service. Equally important, however, it is to find ways how to move the customer smoothly through the cycle and bring the customer back to the initial awareness and evaluation phase for cross-sales, up-sales, upgrades, and follow-on sales opportunities (see Fig. 1).

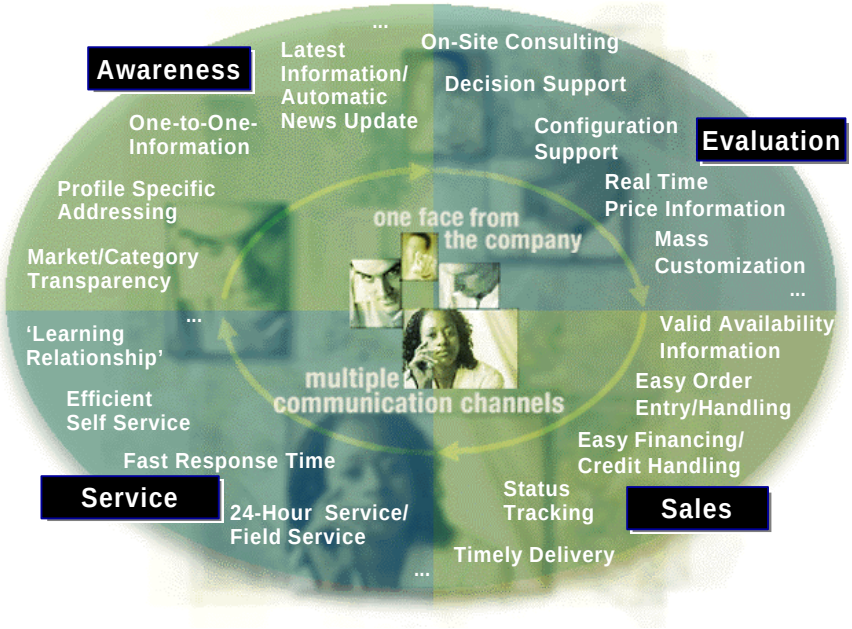


**Figure 1: Customer Needs during the Customer Relationship Life Cycle (SAP 1998a)**

As in the past, companies initially automated individual customer-centric roles such as the sales representative, the technical service engineer, or the customer service center. Each of them needs different tools and applications to communicate with the customer and to collect customer information (e.g., a laptop, a handheld device, a phone, a customer database or a database with the service history of a customer). This process created "islands" of vital customer information inside each individual customer-centric business area. It quickly became harder to manage these "islands" and to consolidate the crucial information from across different business areas.

Today, customers expect that all areas of the companies they interact with share the same information and have consistent processes. For example, placing an order by phone should be possible without having to recap his customer history to the telesales agent. This is why companies have to consolidate their "islands" of information and form a base from which all users can share the same customer information.

Just as the business automation wave taught us in the past, companies have also realized that they need to couple their newly automated business areas with those already automated, i.e. customer-centric processes and applications with the enterprise execution system. For example:

- A sales representative can achieve much greater customer satisfaction by configuring and pricing solutions correctly and on-the-spot with a system that is fully integrated with the warehouse and manufacturing. Correct configuration

and pricing are achieved thanks to up-to-date synchronization with the enterprise software systems.
- A mobile user may carry out an online Available-To-Promise (ATP) check on the head office's system to guarantee a quantity and delivery date.
- Customer orders placed through Telesales or through a self-service Web site are routed automatically to the enterprise's order execution system where they then trigger the appropriate workflow (e.g., a supplier is asked to deliver product parts).

It is evident that even successful CRM software implementations cannot survive in the long-term without the support from other automated areas of the company (for instance, the Enterprise Resource Planning (ERP) system). The ultimate goal is to have a consistent set of applications to support processes between customers, the enterprise, and also other business partners such as dealers, distributors, service providers, and suppliers. Harmonizing customer-centric business areas (e.g., marketing, sales, and service) with mainly internal ones (e.g., logistics, financials, and HR) is therefore essential for CRM.

In summary, we identify three main challenges for CRM:

- Serving the customer throughout the entire Customer Relationship Life Cycle
- Providing an integrated view of customer information
- Marrying customer-centric processes with the enterprise execution system

In this paper, we will not discuss all these points in great detail, but will concentrate on selected facets. Nevertheless, we will take a look at both the business and the technical aspects of CRM.

## 2 Customer-Centric Business Scenarios

Companies have to align their business scenarios with the needs of their customers within the Customer Relationship Life Cycle. There are a number of different business users who play customer-centric roles within a company, including marketing managers, sales representatives, and support staff.

If we aggregate the business scenarios, we can identify three main customer-centric functional groups within a company: marketing, sales, and service. Each of these groups has a number of related business users/roles depicted in Figure 2 which handle all customer interactions. They are the key constituencies of Customer Relationship Management and therefore are responsible for customer satisfaction. Each role needs tailored software tools to efficiently and effectively address customer needs during the entire Relationship Life Cycle. Only highly specialized, workplace-related, and user-friendly tools can enable them to deal with customer scenarios (the way that customers expect and demand). The sales representative, e.g., needs a mobile and interactive tool storing the latest sales information, while the customer support agent needs an easy-to-handle and fast solution to work on customer requests.

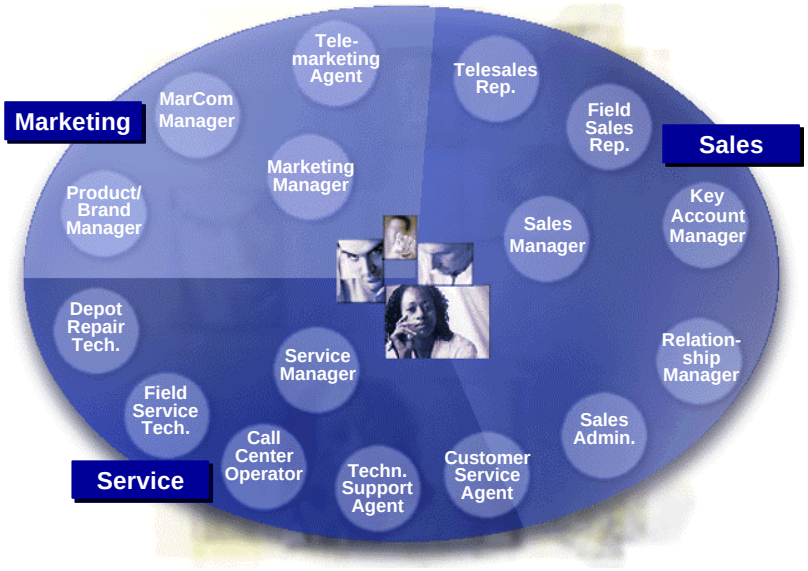


**Figure 2: Business Roles within the Customer Relationship Life Cycle (SAP 1998a)**

## 2.1 Marketing

Efficient marketing puts companies in a better position to attract and retain the most profitable customers and identify appropriate products and pricing strategies for targeted customer segments. The marketing part of a CRM solution should therefore support at least the following fields:

- *Marketing analysis and database marketing* – helps product, brand, and marketing managers to identify and target the best potential customers, prospects, and market segments using criteria such as: demographics, revenue, past purchasing behavior, or installed base.
- *Forecasting* – predicts sales figures and, therefore, can be used to determine manufacturing and service requirements for new products. Forecasts can be based on results of market analyses, segmentation analyses, and historical benchmarks for similar products.
- *Pipeline* – gives product and brand managers real-time visibility into the sales pipeline so they can respond quickly to sales shortfalls or windfalls.
- *Campaign management* – provides support for planning, executing, and measuring the effectiveness of all marketing campaigns by telephone, mail, fax, and e-mail.

## 2.2 Sales

Sales within CRM comprise all business functions to cover the full sales cycle of its sales organization, from lead qualification through opportunity management, quotation management, order entry, and tracking of the order fulfillment process to after-sales activities that lead to new opportunities. Different types of sales have to be supported by a CRM solution depending on the way customer interaction takes place – whether face-to-face in the field, telesales, or unassisted sales via the Internet. The main goal is to focus on key customer satisfaction and factors that influence sales success; e.g., on-time and complete delivery.

More precisely, we identify the following main fields of action:

- *Telesales* – includes customized order-entry functions to support fast data entry and to enable telesales representatives to make quick decisions about what to offer the customer and about how to respond to their requests. It should further include an efficient order proposal mechanism based on what is already known about the customer, such as earlier buying patterns and last orders. Based on this information the telesales representatives can offer specific promotions to certain customers as well as exploit cross-selling opportunities. Telesales functions are ideally embedded in a call center environment.
- *Mobile Sales* – expands the relationship cycle to the sales force. A mobile sales force needs access to all the information helping it to approach the customer or prospect and discuss the product offering. This includes a marketing encyclopedia to present the product or even compare it to competitive products. A sales representative should be able to track and plan all customer interactions to ensure an efficient sales cycle. This requires immediate creation of correct quotations and confirmable orders on a laptop, i.e. at the customer's site, including configuration, pricing, and delivery information.
- *Electronic Commerce* – enables Web-based sales. Customers and prospects can browse through the product catalog and create their own virtual shopping basket. All details needed for an order, such as prices and confirmed dates and quantities, should be available. Further features of Electronic Commerce are, e.g., notification by e-mail for order confirmation, order tracking, and support of different methods of payment including invoicing credit card payment.
- *Sales Orders* – no matter how a sales order comes in – whether through the mobile sales force, the Customer Support Center, the Internet, or through EDI – the business processes and policies behind it have to be the same. This includes internal company policies e.g., credit checks for a specific customer and customer-specific promotions.

## 2.3 Service

Today, global customers demand round-the-clock support from knowledgeable experts who can solve their problems quickly and efficiently. In addition, more customers are basing their selection of products on the level and quality of support provided by the vendor.

Service is an integral part of customer life cycles and requires a comprehensive set of functions that have to operate in full synchronization with every other aspect of a business. Essential business functions are as follows:

- *Repairs and Returns* – encompasses the authorization of material returns and the progress monitoring of depot repair services from the initial customer call to final billing. Immediate access to information on parts availability and advanced shipment of parts is one of the major characteristics of service logistics.
- *Mobile Service* – information and functionality for the service technicians onsite.
- *Service Agreements* – tight link to contractual commitments like customer service contracts, service level agreements, and warranties. Automatic entitlement checks should be carried out at the time of logging a call and automatic escalation (e.g., by e-mail or by paging the supervisor) be triggered if the system notices a missing action on a task.
- *Service Execution* – different services require different service execution channels. Needed is a range of system options from a simple service call which is logged, managed, and monitored as a service notification, to a sophisticated installation service which will be managed by a project management system.

# 3 Enabling Technology for Mobile Sales and Service

The underlying technology of an unique CRM software solution mainly has to deal with the consolidation, analysis, presentation, and distribution of structured as well as unstructured information and to support virtually all possible communication channels. Moreover, the architecture has to be flexible in order to cope with the frequently changing CRM requirements, provide open interfaces to guarantee interoperability, and be capable to scale up from small to very large number of user bases. Relevant techology issues are:

- data and knowledge warehousing
- consideration of geographical and temporal information (GIS, cf. Figure 3)
- data mining
- access and update mechanisms for mobile users
- telephony integration (phone, mail, fax, email)
- call center
- Inter-/Intranet capabilities including e-Commerce
- adherence to interoperability standards

For most of these topics mature stand-alone solutions already exist and the task is primarily to bring them together in a harmonized way, to refine and tailor them. In this chapter we focus on the innovative part of an integrated CRM solution, namely a reliable, performant, and scaleable middleware architecture connecting mobile users in sales and service to a consolidated information base as well as the enterprise's back-office systems. The architecture we are presenting currently will be at the heart of SAP's CRM solution (SAP 1998b).

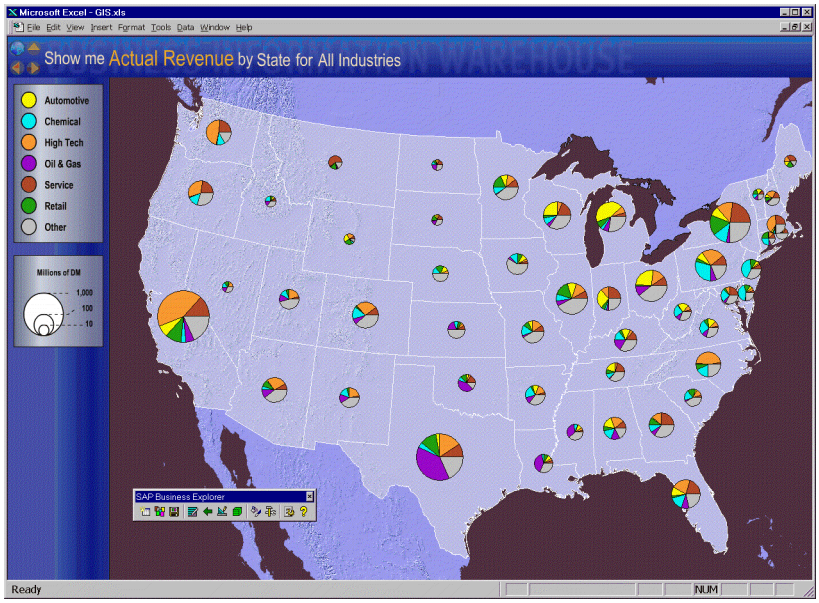


**Figure 3: Geographical Marketing Information**

## 3.1 Technical Requirements

Before we discuss the architecture of SAP's future mobile sales and service solution in greater detail, we take a closer look at several business drivers that significantly influenced it.

- The need to allow *offline work* of sales representatives or service staff. Very often sales and service people do not have a means for directly communicating with a back-end server. The necessity to run offline at any particular location further implies that the mobile client not only deals with the presentation and visualization of some information computed at a server backend but that the client itself needs to be a full-blown system featuring a database, business processes and business objects.
- The need for *consolidated information* that results from a synchronization of the various mobile clients to ensure that the sales reps and service staff work in synch.
- The need for an *user interface* tailored to the end-users requirements. Just the size of the sales force in the field implies that the usage of this solution must be so easy that the training requirements for the sales representatives are minimal.

- The need for *integration with a business backbone system* such as SAP R/3, e.g., once orders have been taken in the Mobile Sales solution, order fulfillment has to be managed and executed by a business backbone system.
- The need for *bi-directional information flow*. On the one hand, e.g., imagine a sales rep who has identified a new customer or a new sales opportunity that has to be distributed among the sales force. On the other hand, a revised pricing policy or new product information has been created within a central department and needs to be distributed among the mobile force of the organization.

## 3.2 System Architecture Overview

It is clear from the requirements discussed in the previous section that a *hub architecture* where multiple clients (e.g., the laptops and notebooks of the sales and service forces) might be connected to a central server is advantageous. This server accommodates the central data storage unit and the distribution middleware for the mobile sales and service applications. Data from all mobile clients is consolidated in a *Consolidated Database* (*CDB*) and is replicated to the clients according to predetermined replication rules whenever they are connected via phone, the internet, or a corporate network. In-office users, however, are supported too, and data might be exchanged with an Online Transaction Processing (OLTP) R/3 as well as other external systems.

This architecture in depicted in Figure 4. Solid lines mark permanent network connections while dotted lines represent temporary (e.g., dial-up) connections.

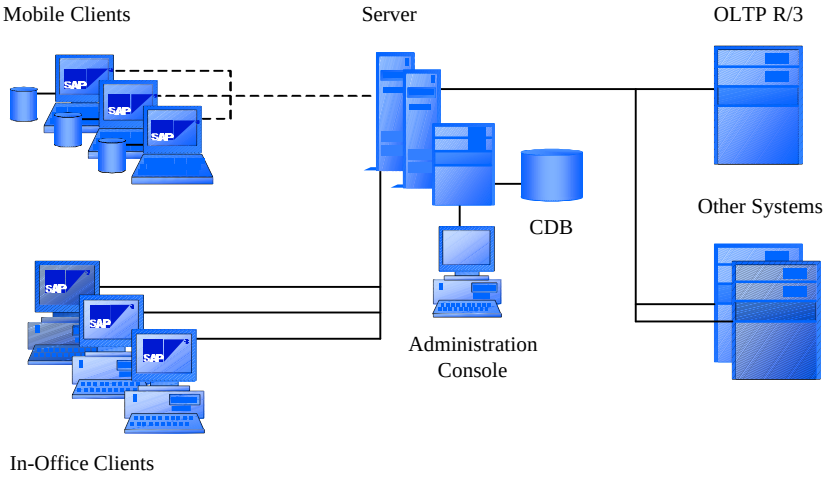


**Figure 4: System Architecture for Mobile Sales and Service**

The obvious advantage of this architecture is the ability to centrally consolidate and control the information throughout the entire sales or service organization and simultaneously minimizing network traffic.

## 3.3 Middleware

As already indicated in the previous sections, the mobile sales and service solution is heavily based on a flexible and efficient middleware that can handle the message flow between the various devices.

As shown in Figure 5, the server middleware consists of inbound and outbound queues for client communication, a central control unit, various services, and interfaces to external systems, and so-called adaptors.

- The *Message Warehouse and Flow Control* (*MWFC*) encapsulates the central middleware logic. It is responsible for the exchange of the correct business objects and information between the server and its clients and controls the message processing on the server. Inbound and outbound messages are queued to ensure their delivery in the right order. Transmitted data is automatically compressed and encrypted. Furthermore, MWFC controls services and adapters needed to process messages according to predefined control flows stored in the repository. It performs load balancing of work processes, is responsible for object locking, and performance optimization.

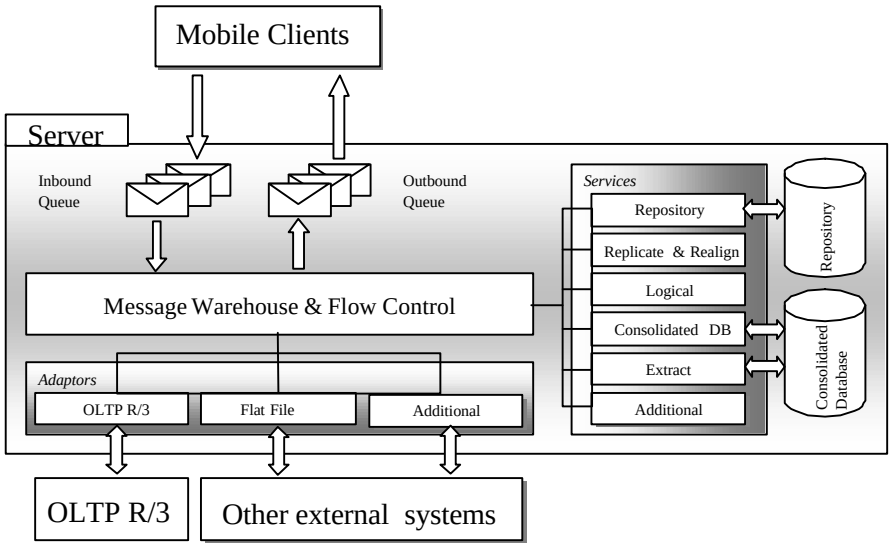


**Figure 5: Server Middleware**

- All components of the server, for instance, the consolidated database and the repository, are fully encapsulated and exclusively accessible via dedicated *services*: The *Consolidated Database (CDB) Service* and the *Extract Service* are

responsible for data exchange with the consolidated database. The *Repository Service* provides all meta information needed for the message processing such as control flows and versioning information. Data distribution to the clients is handled by the *Replication and Realignment Service*. Besides different replication rules, a publish and subscribe mechanism is also provided. Functions like key mapping and generation, data structure mapping, and basic error handling are provided by the *Logical Services*.

- *Adapters* serve as interfaces to external components such as, e.g., an OLTP R/3 system and a data warehouse. The *SAP R/3 OLTP Adapter* connects a single OLTP R/3 system to the server. Data and customizing information can be downloaded from the OLTP R/3 for an initial filling of the CDB. Later, incoming data from the Mobile Sales sides is uploaded to and only modified data downloaded from the OLTP R/3 (Delta Download). The *Flat File Adapter* is the most general way to connect to non-R/3 systems. Files in CSV format (Comma Separated Values) are exchanged, and data and structure mapping is performed.

The architecture is extensible in the sense that it is easily possible to add extra services and adapters if necessary.

In order to get a better feeling about how this middleware really works let us finally go through a typical messaging process:

1. A user creates or modifies a business object and saves it on his laptop (e.g., an order object).
2. A message containing the new information is created and entered into the outbound queue of the mobile client.
3. During the next dial-up of the user, the message is automatically transported by the messaging system to the central server's inbound queue.
4. The MWFC unit picks the message out of the inbound queue and starts a workflow.
5. Several services and adapters are called depending on the message type, e.g., data is downloaded to the OLTP R/3 system or information is exchanged with other external systems.
6. After the workflow is processed successfully, the *Replication and Realignment Service* is called to distribute consistent data to all clients who should be informed about the modifications. Corresponding messages are generated and entered into the server's outbound queue.
7. The outbound messages are delivered to the clients immediately (in-office clients) or during their next connection (mobile client). The initiator of the process (2.) receives an additional message acknowledging that his modification has been processed successfully.

Note that this is just one typical processing flow. E.g., if a new order is created within the OLTP system this triggers an automatic upload into the server and the forwarding of order replicates to all clients.

# 4 Conclusion

Over the last few years, new ideas and concepts (e.g., "*Customer Orientation*," "*Customer Asset Management*," and "*1:1 Marketing*," to name a few) have increased the company-wide awareness that customers are one of the most crucial success factors in the growth of a business. In order to ensure their leadership tomorrow, companies have to address the efficient and effective management of customer relationships today.

The vision of Customer Relationship Management presented in this paper is currently realized in the course of SAP's CRM initiative. We are convinced that the whole customer service area will be a key positioning area for the Enterprise Resource Planning (ERP) market for the years to come.

Future applications have to be built with the idea in mind of managing relationships with customers in a consistent way. Every time the system relates to a customer, an opportunity arises to collect additional information in the data warehouse to analyze customer patterns and set up individual customer relationships.

# Literature

SAP (1998a): SAP CRM Initiative – New Dimensions in Customer Relationship Management. White Paper. Walldorf 1998.

SAP (1998b): Technology for the Mobile Sales Force. White Paper. Walldorf 1998.