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Improving Sales Force Performance Through Mobile Applications

José Filipe da Fonte Domingues

Report of Project

Master in Informatics and Computing Engineering

Supervisor at FEUP: António Coelho (Eng.)

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Approved in oral examination by the committee:

Chair: Eugénio de Oliveira (Doutor)

External Examiner: Paulo Sérgio Almeida (Prof. Dr.)

Abstract

Sales forces represent both a direct link to sales and expenses of sales organizations and therefore have high impact on companies' profitability. Technology advances have allowed organizations to acquire and implement information systems capable of improving their sales teams' performance, but the labor world has evolved from the confines of the office and sales professionals now require access to colleagues, customers, and suppliers, on the go.

The scope of this project is to identify which efficiency and effectiveness improvements handheld devices applications can offer or will be capable of offering to sales forces. To achieve this goal we will begin by taking a look into Sales Force design, to understand the concepts, people and processes involved.

Further on we will present some of the existing Sales Force and Mobile Sales Force Automation solutions to see how this issue is being addressed. We will proceed by analyzing some emergent technologies with potential to improve sales teams' performance such as Location-based Services and Unified Communications. Then, we will assess the key technologies involved in mobile applications and we will end this project's research by taking a brief look into mobile trends to understand how communication infrastructures, mobile devices and services will evolve in the next years.

We will then start designing a new mobile Sales Force Automation. We will introduce and converge concepts, we will try new approachess, and we will merge all these ideas to design it. Alongside we will discuss some development and implementation details, and finally, we will present this work's conclusions and future development.

Resumo

As Forças de Venda (Sales Force) constituem uma ligação directa tanto para as vendas como para as despesas de organizações e têm portanto um grande impacto nas suas rentabilidades. Avanços tecnológicos permitiram que essas organizações adquirissem e implementassem sistemas de informação capazes de melhorar o desempenho das suas equipas de vendas, no entanto o mundo do trabalho evoluiu dos limites do escritório e agora os profissionais de vendas requerem acesso a colegas, clintes e fornecedores, onde quer que estejam.

O âmbito deste projecto é identificar que melhorias em termos de productividade e custos as forças de vendas podem ou poderão vir a obter através de aplicações em dispositivos móveis.

Para cumprir este objectivo começaremos por estudar os conceitos, as pessoas e os processos envolvidos nas Forças de Vendas.

Posteriormente analisaremos algumas soluções Sales Force e Mobile Sales Force Automation existentes no mercado para compreendermos como é que este assunto está a ser abordado por outras entidades. Depois vamos analisar algumas tecnologias emergentes com potencial de melhorar o desempenho de forças de vendas tais como Serviços baseados em Localização (Location-based Services) e Comunicações Unificadas (Unified Communications), e depois apresentaremos um enquadramento tecnológico. Terminaremos a etapa de pesquisa deste projecto analisando algumas das tendencias associadas à mobilidade para podermos compreender como é que as infraestruturas de comunicações, os dispositivos móveis e serviços deverão evoluir nos próximos anos.

Procederemos então à fase de desenho de uma nova aplicação móvel capaz de melhorar o desempenho de forças de venda. Iremos introduzir e convergir conceitos e tentaremos novas aproximações, e no final agregaremos todas essas ideias. Posteriomente serão discutidos algum detalhes de implementação, e por fim, apresentaremos as conclusões deste trabalho e o desenvolvimento futuro.

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José Filipe da Fonte Domingues

Contents

CONTENTS

List of Figures

LIST OF FIGURES

List of Tables

Abbreviations

API	Application Programming Interface
B2B	Business to Business
B2C	Business to Consumer
CDC	Connected Device Configuration
CE	Compact Edition
CF	Compact Framework
CLDC	Connected Limited Device Configuration
CRM	Customer Relationship Management
FP	Foundation Profile
GPRS	General Packet Radio Service
GPS	Global Positioning System
IDE	Integrated Development Environment
IM	Instant Messaging
IP	Internet Protocol
MSFA	Mobile Sales Force Automation
OS	Operating System
PB	Personal Basis
PBX	Private Branch Exchange
PDA	Personal Digital Assistant
PP	Personal Profile
SFA	Sales Force Automation
SIP	Session Initiation Protocol
SOAP	Simple Object Access Protocol
UC	Unified Communication
UMTS	Universal Mobile Telecommunications System
VOIP	Voice Over Internet Protocol
VPN	Virtual Private Network
XML	Extensible Markup Language
WM	Windows Mobile
WS	Web Service

Chapter 1

General Introduction

1.1 Introduction

Sales forces represent both a direct link to sales and expenses of sales organizations and therefore have high impact on companies' profitability. Sales Force management has been discussed for many decades however, with increasing market competiveness sales organizations are, more than ever, feeling the pressure to meet sales targets or grow revenues and profits.

Technology advances have in the last years allowed organizations to acquire and implement information systems capable of improving their sales teams' performance and profitability, but the labour world has evolved from the confines of the office and sales professionals now require access to colleagues, customers, and suppliers, on the go. With the advent of mobile computing devices and wireless broadband networks new automation and management possibilities arise for sales forces to improve their work even more.

The scope of this project is to identify which efficiency and effectiveness improvements handheld devices' applications can offer or will be capable of offering to sales forces. To reduce the span of the project we will particularly focus on field salespeople and Mobile Sales Force Automation systems.

This project was developed at Novabase S.G.P.S. from February to July 2008 and it represented an effort made together with the Faculty of Engineering of Porto University.

1.1.1 Novabase

Novabase is the largest Portuguese company developing information systems solutions, one of the most successful in the Portuguese economy during the last 20 years, and is currently expanding internationally. With a business volume over 300 million Euros in

2007, Novabase is among the 500 companies in Europe with higher growth rate, and is currently employing over 1650 people.

Novabase promotes innovation. From business intelligence to multi-channel solutions, from Digital TV to contactless payment systems, and VoIP solutions, Novabase has always been able to develop innovative projects in its core business activities.

Among its technological solutions we can highlight Customer Relationship Management, Enterprise Resource Planning, Enterprise Document Management, Enterprise Order Management, Business Process Management, Corporate Performance Management, Supply Chain Management, Business Intelligence, Learning Management, Performance & Talent Management, Service Oriented Architectures, IP Multimedia Contact Centres, Security and Quality Assurance.

This project was developed at the Advanced Custom Development department, at Novabase's headquarters in Lisbon, which is responsible for custom client software requests. Its target customers are major banking, telecommunications and industry companies, and the public administration.

1.1.2 Project

In order to add value to its information system solutions and customers, Novabase is interested in expanding its Customer Relationship Management system to mobile terminals, by specifically designing and integrating a mobile Sales Force Automation application capable of helping field salespeople prospect and manage customers.

Novabase's pretentions include a deep analysis on Sales Force issues and solutions, and on emerging concepts such as Location-based Services, Unified Communications, Mobile Banking Payments and Mobile Barcode Generators, to identify possible integration benefits, and documented findings.

This analysis should end with the development of an application prototype capable of demonstrating competitive and innovative features, and enhanced tools. Even though a few requirements were suggested, such as multilingual support and specific development technologies, no restrictions or impositions were made, leaving us with complete development freedom.

1.2 Motivation

Despite all the recent advances in mobile technologies and sales force management tools, mobile solutions for sales teams still have a long way to go before sales organizations can be fully happy with them.

Only recently mobile devices appeared in our day to day, and shorter is the time from which they started to be used as a work tool other than phone calls. On the other hand

software development technologies for mobile device applications seem not to have accompanied the rapid proliferation and advance of mobile devices, demonstrating a serious lack of features when trying to develop more advanced applications. However, this increasing interest in mobile technologies is pressuring mobile platform developers to increase device capabilities and development kits.

We are now standing at the beginning of a mobile revolution and it feels like the perfect time to take a step further into mobile applications development. Development support has increased, as well as development options. Mobile device's native programming language usage is decreasing, as object-oriented programming languages and web development, (which are a lot easier and faster to deploy), are rapidly increasing.

On the other hand wireless network technologies are becoming more available and efficient, giving developers the ability to take advantage of the internet on mobile devices, allowing not only bigger amounts of transferred data but also new IP services.

Even at SFA solutions, which have gained a fairly consistent consensus on what features they should provide, there are new possibilities to explore with the advent of more advanced mobile devices. Services are converging and made available to mobile users, new technologies are emerging or being adopted from desktop to mobile devices, and sales companies are always looking for the next solution capable of improving sales productivity and effectiveness.

1.2.1 Objectives

The main goal of this project is to understand how sales forces' performance can be improved through mobile applications development and to develop a prototype application capable of demonstrating the acquired conclusions. To achieve this goal it will be necessary to make a thorough analysis of sales forces design, and to analyze the current state of the art on mobile and sales force solutions, as well as future trends on these subjects.

Smaller goals have been set to ensure that the most important aspects would be addressed. Regarding sales force's design will be necessary to understand the role of sales force in connecting to customers and customers' needs, what are the phases of sales processes and its activities, how sales are managed, conducted and controlled, what are the used communication channels and how reporting is made, and what are the different sales roles and responsibilities. It will also be necessary to understand how sales forces have changed during time, the impact of technology on that change, and finally how to achieve efficiency and effectiveness on sales processes.

The review of existing sales force application solutions will focus on the capacity they have on addressing and resolving sales force needs, the tools and features they provide to users, and the user roles taken into account. We will also assess the availability of

upgrades and extra modules and then compare the overall differences between the various solutions.

The last step of the process of examining sales force issues consists in studying ways of implementing a mobile SFA solution, from the languages and environments for software development, to the study of available mobile devices on the market. With this analysis we expect to obtain a comprehensive and detailed picture of sales force environment, allowing not only to understand how the existing solutions address today's needs but also understand in what way future trends may solve still unsolved needs.

After understanding available technological capabilities we expect to be able of architecturing an application capable of combining the best of the existing solutions with the best developed solutions, which after optimisation can become a viable option for the current market of Mobile Sales Force Automation Applications.

However, there are many aspects that need particular attention.

1.2.2 Challenges

One of the key challenges of Mobile Sales Force Automation (MSFA) applications is to improve its usage. Since a great majority of SFA solutions are Web-based and MSFA solutions are faced as extensions of those applications, they have also become Web solutions. Current mobile Web solutions force users to navigate complex application menus and memorize difficult commands, and combined with the devices' small screens, sales professionals find these applications too painful to use. On the other hand today's wireless networks are unreliable, resulting in incomplete coverage, high latency and frequent disconnects. These limitations have not been considered in the design and development of current wireless MSFA solutions. In addition, querying capabilities are often limited to small sets of predefined reports created by the user or the system administrator while in the office, which is due to the difficulty of porting complex reporting wizards onto tiny wireless web interfaces [Gro07].

Current trends also suggest that buyers are looking beyond functionalities. Product roadmaps and product lifecycle management are emerging as important parameters in sourcing decisions. Support for offline functionality, openness, flexibility, usability and workflow are critical to gain end-user adoption, which is very important, since another great challenge is to effectively sell MSFA applications to the sales organizations.

Finally, any features beyond the default MSFA features capable of overcoming the value of existing solutions can make a difference when it comes to sales organizations' adoption. There is currently a unique opportunity for anyone who develops this kind of software to be successful, and all that it needs is nothing but a good analysis of current needs, a good judgement of potential, and to emerge with a visionary idea.

1.2.3 Expected Results

By the end of this project it is expected that the analysis made on the several subjects presented before, allow obtaining a more detailed and comprehensive view of the current and future mobile device solutions' ability to improve sales forces performance. Furthermore it is expected that the developed prototype can demonstrate good practices and possible innovations in this area. Despite the time allocated for its development being relatively short, it is also expected to have a partially functional application capable of attracting potential stakeholders interested in financing the continued development of this application.

1.3 Structure of the report

The remainder of this Project will be organized as follows:

In Chapter 2, *State of the Art.* we will start by making a revision about the most important aspects of Sales Force, including sales processes, go-to-market strategies, account and sales management, and sales force structure. Then we will make a review on existing Sales Force Automation systems, their features, benefits and known issues. We will also take a look into a few Mobile Sales Force Automation case studies to understand sales companies' interest in these systems. We will then review a few emerging concepts such as Location-based Systems and Unified Communications, and next, we will present the technological framework, taking special attention into Symbian and Windows Mobile development environments, as well as .Net Compact Framework and Java Micro Edition programming languages, and existing handheld device's properties. Finally, we will take a look into mobile trends, such as market, wireless network, handsets and platforms, service, business, security and social trends.

In Chapter 3, *A New Mobile Sales Force Automation* we will start with a problem analysis. We will take a closer look at some design issues such as targeted users, sales structure, interface restraints and synchronization rules; and we will redefine our problem. We will then present our design of a Mobile Sales Force Automation system. Finally, we will take a closer look at the system's architecture and we will analyze, one by one, all the features it should provide.

In Chapter 4, *Mobile Sales Force Automation Development* we will describe the development details of our mobile Sales Force Automation application. We will start by describing some technological decisions and then we will present our application's architecture. Finally, we will present all the developed features, one by one, providing useful details.

In Chapter 5, *Conclusions and Further Work* we will take a look into our project's results and in order to obtain some conclusions. We will then discuss our major findings and difficulties, and finally we will provide some considerations about future development.

Chapter 2

State of the Art

This chapter describes the state of the art. It will present the many different concepts addressed during the project and the solutions available or under development in this area of study.

2.1 Introduction

In order to understand how Sales Force performance can be increased it's necessary, first of all, to understand the concepts, people and processes involved. From a general perspective it's easy to realize that a company is composed of different employees in different departments with different objectives and activities. The same principle is applied specifically to sales teams. To allow mobile technologies to be useful, they should be thought and designed for users with a specific profile, and should consider the roles they play and people they interact with. There are many universally accepted processes and other empirically obtained for Sales Force design, and it's precisely on those processes that the Introduction to Sales Force will focus.

Until very recently there were no mobile solutions for Sales Force management and automation. On the other hand the existing mobile solutions ultimately represent an extension to mobile terminals of already existing desktop solutions. Thus it is necessary to study existing Sales Force Automation applications since usually a group of functionalities provided by them are now integrated into Mobile Sales Force Automation applications. By studying both Sales Force and Mobile Sales Force Automation applications it's intended to understand how different companies developing this kind of software addressed the problem and proposed to solve it, which gaps have been identified and which solutions are still under development.

Many technologies which are not related to this issue in concrete have recently emerged and may represent good options to integrate into existing solutions. Despite the large number of SFA solutions they do not seem to vary much among themselves, and the concept of Sales Force Automation is closing down to new concepts and features. A major premise of this project is that it really is possible to make Mobile Sales Force Automation applications with new concepts and features that meet the objective of improving the performance of sales teams, in terms of costs, in terms of processes, or in terms of communication and collaboration. Those new concepts will also be addresses in the state of art.

A technological framework has then been developed to assess key technologies and evaluate the advantages offered by each of these technologies. Furthermore it will also be useful to understand the limitations of each technology and how any implementation could be conditioned or should be reconsidered in the light of these limitations.

Finally by the end of the chapter will be presented a study on mobile technological trends. It is very important to understand how communication infrastructures, mobile devices and mobile services will evolve, and how users are expected to react to market changes.

2.2 Introduction to Sales Force

Sales Force is the team of employees responsible for the sales on a company. They represent the companies direct contact with customers and they are the company's main resource consumers, therefore they are directly related with the company's profitability. Their impact on the company is increasing as markets become more competitive and customers are demanding more attention to their needs.

While technology advances have increased Sales Force tools and productivity, on the other hand, sales process and structure design, go-to-market strategies, sales force management and customer management are still sales companies most important success factors.

2.2.1 Sales Process

According to [AAZ04] "a sales process is an organized flow of all the activities that need to be accomplished so that a company can successfully do business with a customer", and according to [Lew] those activities should be "a systematic chain of events that is measurable, repeatable and sustainable". Still, it is not unanimous which activities a sales company should have because it varies depending on the company and the sales market.

To better understand the purpose of each activity the sales process is divided in different phases. Both [AAZ04] and [Int] identify five phases: customer prospecting, qualified customer prospecting, sales proposal, sales consummation and customer retention.

In the first phase sales companies try to find entities (leads) potentially interested in their products and services. Salespeople should gather as much information on their leads as possible since the more information they have, the better they will be capable of assessing their needs, and then, they should send them product and service information. According to [Inc] there are two kinds of leads, sales leads and marketing leads. While marketing leads come from marketing lead generation processes such as trade shows, direct marketing, advertising or online marketing, sales leads are the most likely to be performed by the Sales Force, mainly through cold-calling to potential customers that meet a particular demographic criteria.

In the second phase, qualified customer prospecting, salespeople try to establish leads' trust to gather further information about their business and needs. They should clearly assess what customers want and then they should cooperate with the customer to solve their problems by "demonstrating company and product capabilities, and comparing the offering with the competition" [AAZ04].

The third phase, sales proposal, is where the Sales Force has a direct and more important involvement in the sales process, and it represents the last negotiation phase. Customers and salespeople set the last business details, including financial and credit information, target dates, and they formally consume the business by writing down the proposals and documentation.

In the fourth phase, sales consummation, sales companies must fulfil the signed agreement by delivering and installing the products, and training customers. It also includes financial activities such as sending and collecting bills, providing credit, collecting initial payments, or handling product returns. This phase should also be seen as a great opportunity to achieve customer satisfaction, and it is therefore important that sales companies meet their customers expectations.

The fifth and final sales process phase, customer retention, in an ongoing phase because "every contact the customer has with a company and its products is a chance for the company to shine" [AAZ04]. Since during the previous phases customers are focused in a specific deal, this phase is particularly important after consummating deals. Salespeople should maintain a business relationship with customers by constantly assessing their needs and introducing new products, as well as providing customer service and ongoing training. The ultimate goal is to attract customers to maker new orders.

2.2.2 Go-to-market Strategy

Go-to-market strategy encompasses the products and services a company has to offer, the channels the company uses to connect with its customers, and the way salespeople are organized and the roles they play to sell and provide customer service.

"Customers have different needs and preferences and it's up to the selling company to evaluate those preferences and deliver efficient and effective solutions to them" [AAZ04].

2.2.2.1 Selling Channels

Sales companies may have a few different channels available to execute their selling process. They can have Direct Sales, Sales Agents, Distributors, Retailers and Advertisement or Catalogues. Different kinds of sales channels have different levels of efficiency and effectiveness. By providing different kinds of sales channels, companies spread their selling risks because customers of different demographic groups usually use different selling channels [JS04].

Channels such as direct sales forces favour customer relationships because "they involve a lot of personal, often face-to-face interaction between buyers and sellers" [AAZ04] which "improves customer satisfaction and loyalty, resulting in lifelong customer relationships" [JS04]. Therefore, as it has been previously stated in the Sales Process, sales forces are the most viable channels for qualifying leads and selling. They have an increased ability to assess customers' needs and propose deals, and they are also more sensitive to customers' concerns, and therefore they are the most efficient channels to handle complex products, custom needs and the most important accounts.

It is also important to understand the role of the other sales channels such as Advertising, Online Sales or Telesales. These channels perform routine activities at low costs giving sales forces more time to handle the important tasks. These activities include ordering products from the internet, providing customer support, billing and collecting payments, or order tracking. Since "there is no human element; staffing costs are lower; since there is no physical element, there are no facility costs; and since there is no paper element, there are no administrative costs" [JS04]. [AAZ04]

2.2.2.2 Sales Roles

Defining the Sales Force roles can be a hard task, but setting a sales team with the right roles is the first step to achieve productivity. Sales forces can have generalist salespeople responsible for all kinds of tasks, or specialized salespeople that focus on subsets of the companies' markets, products, or activities. While generalists can be very efficient, specialized salespeople are more effective, and companies use them to provide increased customer service. [GTM]

Like the selling-channels, sales roles can focus on efficiency or effectiveness. Product specialists, technical specialists, markers specialists, account, strategic and global account managers, hunters, farmers, strike force, launch force, win-back specialists, end-user specialists, marketing liaisons and job sharing are efficiency-focused sales roles. On the other hand, sales assistants, service consultants, customer service specialists, telechannels, part-time salespeople, independent salespeople and generalists are effectiveness-focused sales roles, generally assigned to cover sell easy-to-understand products, or perform routine selling tasks.

It is very important that the different specialized salespeople work together in coordination. Customers don't want to work with too many different salespeople from the same company, and in addition productivity may decrease if the company's sales processes aren't both agile and perfectly integrated. [AAZ04]

2.2.3 Account Management

Account managers are salespeople responsible for customer accounts. As the primary point of customer contacts, customers can inclusively see them as the company itself. Account managers are usually generalists who have a wide knowledge of the company's capabilities and offers and they are faced with the responsibility of coordinating customer projects and developing new sales prospects and customers. As generalists they are, they often require specialists to provide them additional or specific information about products or technical issues. Activities performed by account managers include identifying leads and opportunities, assessing needs and negotiating contracts, and converting other companies' customers to their customers. [AAZ04]

Different customers have different impact or importance in sales companies. It is important to ensure that companies build strong and productive ties to their most valuable clients, that customers' voice is heard and taken into account, and that both customers and companies have the most effective win-win relationship. These accounts are managed by strategic account managers or global account managers which often lead sales teams composed of account managers and specialists of different functions and geographies, working together to respond to the diverse and complex needs of their customers. Activities performed by these kinds of account managers include a lot of planning and strategy to maximize opportunities with each customer, and coordinating and coaching their teams to ensure the best results. [Eff] [Par06]

2.2.4 Sales Force Management

Salespeople are managed by Sales Managers, to whom they report their work. They are usually experienced salespersons who have succeeded as sales representatives and therefore are familiarized with the company's sales processes. Like the strategic account man-

agers their role is more important than regular salespeople because they are responsible for ensuring that their teams fulfil the company's customers needs and achieve established goals.

Sales managers' main activities require a lot of people leading and management and are usually called to solve critical situations. Their experience has given them a broad understanding of businesses and they can provide their teams a clear vision of the company's strategy. They are also responsible for a lot of financial management to meet the company's budget, including asking salespeople to present their expenses and revenues as well as motivating their teams by rewarding their performance. [Alb]

In some companies sales managers are also responsible for selling, especially in small companies, where they can provide a quality service that is unmatched by other salespersons. In those cases they are usually responsible for the company's major accounts or key customers. Still, while customers appreciate experienced managers involved in their businesses it is important that sales managers don't forget their main role which is managing their team, or they may be wasting their efforts on someone else's role. [AAZ04]

2.2.5 Sales Force Structures

Sales force structure is related to every person in a selling organization. It defines what responsibilities or roles each person has, the number of management levels, the number of direct reports per manager (span of control), and the working relationships between every salesperson. By defining its structure, companies are defining its sales strategy. Since it also influences how flexible the sales processes can be, it is very important that information systems are capable of supporting the company's structure. [AAZ04] [EL]

2.2.5.1 Coordination

Coordination is related to a company's working relationships between salespeople and sales teams. It encompasses all the company's departments including marketing, finance, supply chain, research and development, and more. By coordinating the different sales organization's activities and people, sales forces will increase their ability to meet their goals. [EL]

Coordination structures can take different forms. In the simplest form, salespeople report to their direct sales manager, and those first level managers report to their direct second level managers, and so on. More complex forms include geographical reporting, product-based reporting and market-based reporting. Reporting and coordination must also take into account salespeople's level of independence and specialization, and allow collaborative and communicative structures. [AAZ04]

2.2.5.2 Span of Control

Span of control refers to the number of subordinates a sales manager has. The average number of salespeople for each sales manager is usually ten, but it varies from company to company. While low numbers of direct reports increase effectiveness, higher numbers make it harder for managers to give each salesperson the attention they need.

Span of control also refers to the number of management layers. Fewer levels mean that each manager will have more direct reports, and again it reduces the company's costs while managers are able to spread their intensions more directly. On the other hand, increased numbers of layers increase the company's expenses, but each manager has fewer direct reports and they have more time to coach and assist their teams. [EL] [AAZ04]

2.3 Sales Force Management Systems

Even though they are both integrated in a single Sales Force Automation system, mobile and desktop Sales Force Automation applications have quite different purposes. In addition mobile devices have limited capabilities while desktop applications run on powerful machines. Therefore, in the mobile version we are only to expect a small subset of the desktop version's features.

Since they have different purposes we have decided to analyze them separately.

2.3.1 Sales Force Automation

Sales Force Automation Systems (SFA) are information systems that automatically record all the stages in a sales process, and are frequently combined with a marketing information system, in which case they are often called Customer Relationship Management (CRM) systems.

High user adoption, a complete suite of tools, and powerful customization to support any sales process make it a good choice for sales representatives, managers, and executives. SFA includes contact management, sales lead tracking, sales reporting and forecasting, order management, product knowledge, and many other features. They also allow deep customization of user profiles and company processes.

SFA provides companywide integration among different departments in order to deal fast and efficiently with customers independently of sales representatives' location, with fast, online offline access, or via mobile devices. Managers can maximize team productivity through the managed data and executives can get advanced accurate information. It is used by companies around the world to help grow revenues, increase customer satisfaction, and reduce expenses.

2.3.1.1 Features

A few of the top market Customer Relationship Management - Sales Force Automation solutions have been deeply analysed, such as Netsuite's [Net], Entellium's [Ent], Salesforce.com's [Sal], SAP's [SAP], Siebel's [Sie] and Microsoft's [Mica] solutions. Instead of analysing separately each one of them, all the features made available by the different software companies have been considered as a hole, so that a holistic vision could be achieved. Another important aspect to notice is that Sales Force solutions are in most cases a part of a CRM solution so it was made an effort not to confuse features or tools designed for sales force with features or tools intended for other company areas, such as marketing, human resources or customer services.

- Account and Contact management

Account Management provides a comprehensive, 360 degree view of customers, including personal information, service history, order management, interactions, and account profile. To achieve a more integrated account and contact management, parent-child relationships between accounts can be defined to support complex organizations with multiple subsidiaries or divisions.

It is also possible to define all the people at the company involved in managing each account, along with their respective roles. Since all information can be accessed online and content permissions can control who can see each specific data, salespeople can track and view all customer history in one place, including marketing campaigns, sales opportunities, customer service cases, and all interactions. And to match each specific salesman way of doing business, displayed information can be customized in views.

By enabling to acquire deep knowledge of every account and contact, collaboration is facilitated across the organization, and it helps to build and maintain strong, lasting customer relationships.

- Activity management

Activity management allows creating tasks and activities, schedule joint meetings (events), and set up activity templates for frequently or automatically assigned tasks. It also allows salespeople to schedule and set reminders for appointments and other activities for themselves and other users, which helps keep sales representatives with different sales roles organized and working together so customers can receive the attention they need.

Sales managers can also generate sales activity reports to get a holistic view of the organization's sales activities for better performance management. In addition, activity management maintains a historical record of all activities (complete and pending) related

to an account, contact, or opportunity, to ensure that representative's are fully informed about customers' history in every single interaction they have.

With Activity Management salespeople can better manage the organization's sales processes, resulting is greater control over routine activities, the elimination of redundant tasks, and adherence to internal sales processes.

- Asset management

Asset management is about tracking which products each customer has purchased. By knowing precisely which products customers have purchased and installed, and by tracking which competing products they are using, sales companies can broaden the view of sales opportunities.

This feature allows sales representatives to get immediate access to detailed information about each purchased item, including serial number, quantity, purchase date, replacement date, and so on, providing them an insight into product renewal opportunities, and alerting them to issues their customers may be having with a particular product.

- Document management

Document management provides instant access to the most recent versions of the company's sales and marketing documents and materials, including product brochures, presentations, images and other, based on department, role, type, or other criteria, anytime, anywhere and always up to date.

Document management enables consistent and effective communications by providing a common document repository and keyword search, to help users find exactly what they are looking for. Through online access sales representatives can easily view a document or send it as an attachment directly from the search results page.

- Forecasting

Global forecasting capabilities give organizations clear visibility into their sales pipelines and products and service demand trends. Accurate forecasts of revenue and demand help sales forces close more deals, increasing profits and aligning expenses with revenue growth.

Customizable forecasting allows choosing any methodology and view sales pipeline data and employee performance by timeline, manager, territory, individual sales representatives, product line, product unit, expected close date, and many other parameters, providing companies critical visibility into future product and service demand trends for better business planning.

- Incentive and commission management

Incentive and Commission Management enables sales forces to track customer records and sales transactions and calculate and pay commissions to all sales users on a deal. Sales teams have many specific roles managing and closing deals and this feature allows users to specify each salesperson's role on a deal and automatically get numbers on their shares.

Incentive and Commission management is a simple, accurate way to maintain and track commissions, providing good information intelligence to understand how well the team is performing or which specific products and services are best sellers. In addition it enables sales managers to set goals and estimate commissions for the entire team.

Another important benefit from this feature is incentivize the sales force by providing full visibility to employees' commission reports and forecasting their earnings on their personalized real-time dashboard.

- Lead management

Lead Management allows sales forces to prospect inquires, route qualified leads and get instant access to the latest prospects. It can also be integrated with online lead prospecting and automatically capture leads from the company's website, or share specific leads with other users. It is also possible to import business leads from offline sources, such as trade shows, seminars, and direct mail, and eliminate manual data entry.

Leads can also be automatically converted to accounts and sales opportunities, with mechanisms to notify field sales representatives when deals are assigned to them. Lead Management can also establish lead qualification processes to make sure all sales reps use the same consistent methodology, and it's possible to customize distinct qualification processes and page displays for different business units or product lines.

- Opportunity management

Opportunity management enables sales teams to work together to close deals faster by providing a single place for updating deal information, tracking opportunity milestones, and recording all opportunity-related interactions.

With opportunity management is it possible to analyze the sales pipeline to quickly identify and eliminate any bottlenecks in the sales cycle or determine the cause of downgraded sales opportunities. It is also used to track the competition and key competitive issues on each deal to better understand competitive trends and emerging threats.

Opportunity-related data includes decision makers, partners, customer communications, and all other custom information unique to the company, gathered from leads, opportunities, contacts and all account activities.

- Order management

Order Management allows creating quotes, proposals, and product configuration. It minimizes sales forces' paperwork, enabling them to focus their efforts on selling, on

ensuring that customers get deliveries on time, and boosting customer satisfaction and long-term loyalty. Orders' history are kept and managed within a single repository providing a useful information for the marketing strategies and selling opportunities.

With this order management capability sales managers can also see booked orders in forecasts, greatly increasing its reliability, predictability and accuracy. It also gives access to up-to-date order information allowing customers to check order statuses in real time via the customer center, or the company's website.

- Product catalogue

Product Catalogue module enables organizations to centrally manage product catalogs and price books while giving sales representatives easy access to the precise product and pricing information they need, wherever they are.

All company's products and services are managed through a master list, and grouped into product families, even if they are included in multiple price books or sold in multiple currencies. Powerful search and filter tools are also available to make it easier for users to find the price and product information they need.

Price books provide sales forces with the ability to manage different customer pricing depending on the customer profile and importance to the company. In addition price books can support product promotions and promotion code tracking.

- Reporting

With customizable reports, sales managers and executives have instant access to the real-time data and analysis they need to run the business effectively. Sales analytics tools help managers analyze sales pipelines, perform win-loss analysis and create historical trend analyses, with benchmarks and critical metrics from sales, marketing and customer services.

Dashboards provide instant access to a consolidated, real-time view of sales data, which can be customized so that everyone gets exactly the information they need depending on their roles and responsibilities.

There are many packaged reports for everything from leads to accounts to help companies discover the wealth of stored information, but it is also possible for companies to customize their own reports to analyze specific needs for their business.

- Partner management

Partner Management provides tools to manage the channels used in partner relationships. It not only delivers visibility to the company's direct and indirect sales channels, but also makes life easier for business partners. They can easily access leads, accounts, and contacts, collaborate on deals, and locate all the information they need in order to be successful.

Partner Management tools provide channel managers a global vision and give partners the resources they need to sell more effectively and avoid channel conflicts. With customizable reports and dashboards, partner program managers and executives can easily access the channel information.

- Territory management

With sales territory management capabilities, sales managers can easily define, administer, analyze, and change sales territories to match the organization's needs.

Territory management enables setting up lead queues and lead assignment rules to automatically route leads. The complex business rules can be set up according to multiple criteria, including geography, product area, vertical industry, or timing, then they can be applied to each of the organization's territories. It is also possible override territory assignments from one sales representative to another according to the changing needs of their organization, to improve the company's productivity and efficiency.

- Microsoft Office Integration

Advanced Microsoft Office integration allows salespeople to build account plans, proposals, quotes, contracts, and many other documents, using MS Word and importing and exporting report data from Excel documents.

Templates are also available for commonly used sales documents so salespeople can painlessly create them without retyping or needing to copy and paste. Using Microsoft Outlook it becomes simple to access, save, or share reports in a familiar format, through the organization's channels.

Microsoft Outlook allows salespeople to communicate with customers but also synchronizes address books and activity calendars. Email templates are available for sales representatives to save time when they're writing to customers, and they also ensure that communications are accurate. To create high impact and professional-looking emails, it is possible to insert company branding and graphics into the templates, and attach relevant materials from the document library.

By navigating accounts or leads it is possible to easily add contacts to the list of recipients for outgoing email messages. In addition search tools are also available to improve communication management.

- Data quality Management

Data quality assurance is critical, especially when the information in question has to do with customers and prospects. The company's databases need to have valid data, and to be free of duplicate contacts, accounts, and leads. Data Quality Management provides data entry validation rules and custom error text, as well as tools to de-duplicate redundant contacts and merge fields, to create a single, accurate record for each unique contact.

It is also important for data distribution and synchronization among users, wherever they are and whatever device they are using. Data Quality Management provides effective commit and update tools capable of revising and managing data before being updated to central or local databases.

- Desktop and mobile

Sales Force Automation solutions provide both desktop and mobile capabilities for sales representatives. They support disconnected laptops and wireless PDAs so that traveling representatives are never out of touch with their critical data.

Mobile Sales Force applications only provide subsets of features provided by desktop applications due to device communication and processing restrictions. Nevertheless, mobile applications are designed to operate on offline mode and synchronize with remote databases.

2.3.1.2 Benefits

The previously described features of Sales Force Automation systems bring a lot of benefits to the sales companies. A study on benefits claimed by Sales Force Automation developers to improve sales forces performance, and the review of a few case studies conclusions, allowed us to identify and group benefits into two major groups: improved effectiveness, improved efficiency, and improved feedback.

The target users for these improvements include sales representatives, sales managers and sales executives. Both sales representatives and sales managers will supposedly improve work effectiveness and efficiency, since SFA solutions provide instant access to critical data through quick and cheaper channels, and therefore, saving valuable time that can be used for critical activities. As to sales managers and executives, SFA solutions provide accurate intelligence information. Automated mechanisms capture and handle the company's sales data without requiring extra effort from its employees. Through report and forecasting features managers and executives have real-time feedback from all the company's activities, allowing them to quickly adapt the company's sales strategy, including marketing.

- Improved effectiveness

One of the most important effectiveness improvements is a result of the process standardization provided by the SFA systems. It helps salespeople share the company's sales processes independently of their selling methods, and it gives managers and executives more control over the company's sales processes and strategy, speeding up decision-making and adoption. In addition, different parts of the firm, particularly marketing, production, and finance are more coordinated, increasing global productivity and revenue.

This process standardization can also make training a lot easier for new salespeople, and supervisors will have higher control over their trainees. Instead of having to write-out different sales documents and having to print them out and personally deliver them, salespeople can fill-in prepared forms and use the company intranet to transmit the information. Therefore, coaching and management response time will be greatly reduced and managers will become more alert and agile.

But this companywide integration can also improve daily routine task efficiency. Non-selling activities such as reports, requests and order writing, travel time, internal meetings, product-in-stock verifications, discount authorizations, or information sharing, will require less of salespeople's time. Since they will have more time for selling activities, it is obvious that it will also result in increased productivity.

Sales Force Automation solutions extended to mobile terminals also have major impact on effectiveness improvements, considerably increasing the previously stated benefits. Salespeople will be able to accomplish tasks faster and wherever they are, since they are carrying automated tools with them and do not have to wait to go to the office to update or commit information. Mobile device SFA applications also provide alerts, automatic notifications and fast access to co-workers and customers, making sure salespeople don't forget any important tasks and improving team selling in the field.

Less important is the Sales Force Automation's ability to improve sales staff morale, since they are aware of its benefits. They reduce the amount of record keeping and rate of closing, and that's what moves salespeople.

- Improved efficiency

Companies spend a lot of money investing in information systems, and therefore, expect efficiency improvements to reduce the total cost of ownership and maximize profitable revenue growth. This can be achieved by reducing expenses, by optimizing business processes, and increasing productivity.

Sales Force Automation systems can reduce communication costs. By having real-time access to information through different communication channels, communication efficiency will increase and salespeople will have less need of establishing expensive phone calls. In addition, collaboration will improve and there will be less travel expenses.

Many other costs can be reduced by automated sales and customer support. Customers can self search and order products and check the state of their or orders without the need of qualified expensive salespeople. The same principle applies to salespeople, since SFA systems allow them to fulfill many tasks without the need of expensive specialized people, that other way would not be possible.

Cost reduction benefits can also result from business optimization by shortening the sales life-cycle and the costs of redundant tasks. Instead of accomplishing goals through

many interactions, salespeople can optimize the value delivered with every single interaction, and therefore, provide better service for fewer costs.

Through SFA productivity tracking tools, sales force have access to many performance measures such as revenue per sales person, revenue per territory, margin by customer segment, margin by customer, number of calls per day, time spent per contact, revenue per call, cost per call, ratio of orders to calls, revenue as a percentage of sales quota, number of new customers per period, number of lost customers per period, cost of customer acquisition, expected lifetime value of customer, percentage of goods returned, number of customer complaints, and number of overdue accounts. This will increase the sales person's vision of the value of the customer and will also allow him to optimize his efforts and expenses.

2.3.2 Mobile Sales Force Automation

Our study of mobile Sales Force Automation applications revealed that even though they were designed for salespeople in the field, they did not have any special feature in addition to all the features provided by the desktop SFA version. We got the idea that mobile versions were not taking advantage of their mobility; they were mere extensions of desktop Sales Force Automation versions.

Instead of reviewing once again the available features, we have decided to analyze some case studies of companies that have decided to acquire Mobile Sales Force Automation systems. We were looking for the reasons that led those companies to take that decision, we wanted to know their expectations and if they were achieved.

2.3.2.1 Case Studies

We have analyzed a few case studies of companies that have invested in mobile Sales Force Automation systems to understand the challenges and needs of those companies, and how those systems have fulfilled their needs. We focused on three case studies from different industries: Hermans Group case study [Nok06], Gund case study [IBM03], and Alcatel-Lucent Technologies case study [IBM08].

While Hermans Group markets and distributes home entertainment products like CDs, DVD videos and computer games, Gund is the oldest soft toy company in America, and Alcatel-Lucent Technologies help promote wireless services to the business community.

Hermans Group was struggling to provide updated inventory data to employees quickly enough to allow them to place orders without including items that were out of stock, and its field sales representatives faced delays in obtaining updated customer information, including the latest order history. Gund has always seen technology as mean to provide the best tools and support to its sales team so when handheld devices first came to market Gund studied its potential benefits. Like Hermans Group, Gund sales people needed

up-to-date customer information in the field, information about product stocks, as well as a tool that allowed them to take orders on the go. Likewise, Alcatel-Lucent needed their sales representatives to have immediate access to customer and offer updates. They were returning to their desktop computers at the end of the day to enter data about their clients, prospects and orders into de system, and since it was not always possible to do it, information arriving to its sales executives was frequently out-of-date.

We can see that these three companies' needs are mostly related to the increased mobility of their workers, and the critical need of a handheld tool capable of providing real-time access to its companies. However, depending on the time they chose to look for a solution, they have taken different approaches. Gund's eager for emerging technologies has made it start developing its own mobile SFA system together with IBM. By the time Hermans Group and Alcatel-Lucent decided to invest on a mobile system, the market had already many different available solutions. Hermans Group chose Nokia's Intellisync Mobile Suite, and Alcatel-Lucent switched to Salesforce.com CRM application running on AT&T BlackBerry devices. And this was a relevant strategic decision because by making a deal with AT&T, Alcatel-Lucent was not only acquiring a mobile information system, but it was also negotiating wireless access to information from a trusted partner.

These companies' solutions included the deployment of central and local databases, synchronization capable of providing all the relevant up-to-date information their sales representatives needed on the field, and integration with their existing information systems. Among the many different features made available by these solutions we can find different combinations of the features previously presented in section 2.3.1.1.

More important than evaluating how successful were the adopted solutions, it was important to understand the companies needs and interests, however, in all these three case studies the companies were satisfied with the results. Hermans Group was able to reduce its out-of-stock orders and customer service was improved, providing salespeople with more time for selling. In addition, the system was easy to use reducing the number of IT support calls, the number of administrators, and therefore reducing operational costs. Gund sales associates are now getting real-time updated customer information. They have access to their customer's entire buying history, as well as access to their customer's business profile or open shipments. Finally, Alcatel-Lucent sales teams were more collaborative, they were able to easily place calls or send emails directly from the accounts contacts, and again, they had access to critical customer data via wireless, which provided the most current information about a client before a meeting or a simple phone call.

2.3.2.2 Known Issues

There are a few issues related to wireless and mobile technologies that represent major constraints to its adherence. Major issues include usability difficulties, poor wireless

access and device limitations. All these issues decrease mobile applications' efficiency and users satisfaction because salespeople do not want applications that require too much effort to use.

The main usability issues are related to lack of proper information display, complex and slow access to information, and lack of security. Handheld devices' small screens do not allow a satisfactory display of information and mobile applications usually have complex menus to supposedly offer easier application navigation. Not only these menus make it hard to get the desired information but they also take too much time to process and load. In addition, SFA applications require a considerable amount of work input data as well as access to customized data display, and it is also difficult to port wizards into mobile applications.

General lack of security on mobile devices is another sensible issue. Information represents great value to sales company's strategies and competitive advantages, and their customers data must also be confidential. If this privacy cannot be assured in mobile applications it may be a risk that some companies may not want to take. On the other hand integrating SFA systems with other information systems is another relevant difficulty. To avoid replicated information and to provide access to all the companies information it is advisable that all the companies information systems are merged, and that can be quite difficult since information systems are usually customized to each company.

Insufficient wireless bandwidth is another important issue. Current wireless networks are unreliable, they provide poor coverage and high latency. Mobile applications users demand real-time access to information, achieved through wireless access, and if it is not available, if it's slow or if they suffer frequent disconnects, they will be reluctant to use them. In some countries wireless networks may not be available at all, and this is particularly worrying because mobile SFA applications require continuous maintenance and information update. Another important issue related to wireless access is the current price of wireless data transfer which can represent considerable expenses to the sales companies.

Main hardware device limitations are related to power consumption. Powerful devices and mobile applications have a lot of energy consumption. It not only requires that users keep their devices charged but constant recharges reduce battery life, and if devices run out of battery it can have serious impact on their work. That is the problem of fully depending a company's sales representatives on a mobile device application. [Fon04] [BH] [Gro07]

2.4 Emerging Concepts

In this section we will present two emerging technologies for mobile devices: Mobile Location Sharing Systems and Unified Communications. In order to understand if they

could be used to improve Sales Force performance, we will analyze their potential, existing solutions and technical details.

2.4.1 Location-Based Services

Location Based Services (LBS) are business and consumer services accessible with mobile devices through the mobile network and utilizing the ability to make use of the geographical position of the mobile device.

These services offer the possibility to users or machines to locate other persons, machines, vehicles, resources and also location-sensitive services, as well as the possibility for users to track their own location.

Location Based Services cut across many mobile classes of services since they add the feature of placement to these. The request for location can be originated from the client himself and from another entity such as an application provider or the network. However, location information itself does not provide a good service, but if location information can be combined with content there are possibilities to create useful services. Location information can be used as the following ways: [SSE06] [JCBT03]

- As a filter

When a customer is searching for a particular service, he can typically restrict results of search with parameters like service type, opening times, etc. Automatic positioning can be an effective tool for intelligent search because it makes it possible to offer only results that are close enough to the customer's location.

- As a pointer

Location information can be used as a pointer in tracking services. The simplest example is showing the location of the customer as a dot on a map.

- As a definer/launcher

In services like tracking it would be possible to create buffers that would initiate different kinds of notices/alarms when the target is out of defined area. If for example a transport vehicle has gone out of a pre-defined route there would be an automatic notice/alarm for the transportation control centre.

There are three basic types of location-based services: pull, push and tracking. [JCBT03]

- Pull Services

In the case of a pull service, a customer makes by himself a request for LBS. When making this request he/she gives permission for his/her position to be given because without that location information the request for service cannot be completed.

For example, the customer sends a request for local weather forecast by SMS to the service number 1234. To offer local weather forecast, a Service Provider has to know from where the request was made. By the basis of the customer's location information the Service Provider will send as a reply a forecast for the area from where the request was made.

- Push Services

The push services differ from the pull services on the point that the request for service is not technically made by the customer but by the Service Provider. In these cases the customer must give permission for the Service Provider to send information to his mobile phone.

For example, the customer has registered himself to a weather service and set up a profile on which he requests local weather forecast every morning at 08:00am. To send the forecast of the right area to the customer, the Service Provider has to know where the customer is at 08.00. Because the customer has allowed positioning every morning for weather service, the operator will tell the Service Provider where this customer is at the time of service request.

- Tracking Services

The idea for that type of service is that someone (person or service) asks for a location of the mobile terminal (person, vehicle, fleet, etc). As in the pull and push cases the assumption is the customer has given the permissions which allow particular persons or services to track him.

For example, a cycling team has signed up on the service to keep better in touch with each other. Every member of the team has given permission to be tracked by the other members. When the team is on the training round, individual team members might choose optional routes to where the others are at the moment. They may set up a connection to the tracking service and make the request of the positions of those who aren't yet at the meeting place.

2.4.1.1 Mobile Location Sharing Systems

Social network services and location-based services are two of the fastest growing technologies for mobile devices, but few solutions are using both. While location-based services, as previously described, allow users to benefit from location-awareness independently of space and time, social networks use software to build online social networks for

communities of people who share interests and activities or who are interested in exploring the interests and activities of others. Merging these two concepts results in Mobile Location Sharing Systems.

Existing Solutions

Wizi Wizi [Tim] is a mobile application developed by Timebi, a portuguese software developer company, which claims that Wizi is the world's largest location sharing and free traffic network. Wizi has been recognized internationally and has been inclusively awarded with an EU funding to explore its potential.

Wizi makes use of location-based services to provide information to both private contacts and public communities. In the first case, by allowing users to build their own network of family members, friends or business colleagues, users can exchange information about their location more precisely and without needing to make phone calls. On the second case, Wizi allows users to create and join private or public communities and share information, pictures and movies, about interesting places or traffic conditions among others. Wizi provides the following tools:

- **Routing** - Users can easily set meeting places without knowing address names and send them to other users, which can ask the application to trace a route from their actual location to the meeting point. It is also possible to trace routes directly to other users or estimate the time of arrival based on current movement rate. The application allows users to easily turn on or off the ability of other users to find them, guaranteeing their privacy.

- **Places** - Wizi community helps building a huge database of restaurants, monuments and many other interesting places. Those places can be private or public and rated based on their utility and user satisfaction. Wizi also intends to be the largest free real time traffic network, allowing users to contribute with pictures and movies to the database so that other users can judge what roads to take.

- **Messages** - As a social network its indispensable to allow users to exchange messages among themselves. They can be exchanged via application or SMS, depending on the speed users want the receivers to read the message.

- **Flashes** - These are the quickest and simplest way a user can use to communicate its position with other users. They define a status meaning that a user can set his/her status to "Working with client X, do not disturb" allowing other users to see his status and realizing, for example, that phoning this user may not be appropriate. Pictures can also be attached to user's status.

- **Settings and Utilities** - The current version relies on the essential settings, that is, user identification and what kind of information he/she wants to be provided. Utilities allow users to set their position using GPS or manually, depending on their claims and desired precision.

In conclusion, Wizi's innovative concept has already gathered support and interest from Blackberry and Microsoft. Its location-based services are not reduced to terminals equipped with a GPS receiver since they also use basic positioning methods, seen in detail in the next section 2.4.1.2.

For now it is available for Windows Mobile, Symbian S60 and Blackberry operating systems, being the Windows Mobile one the most advanced versions. Wizi is free to download and use, and its constant development means that new features are still to come or being improved.

2.4.1.2 Wireless Location Technologies

This section will introduce available wireless location technologies [SWY08].

- **Basic positioning methods**

  Dead reckoning (DR) - Dead reckoning is the process of estimating one's current position based upon a previously determined or fix position, and advancing that position based upon known speed, elapsed time, and course.

  Proximity sensing: Cell Identification (Cell-ID) - Considers the location of the base station to be the location of the caller. The accuracy depends on the known range of the particular network base station serving the handset at the time of positioning.

  Trilateration: signal strength analysis and Time of arrival (TOA) - The network uses the absolute time of arrival from a certain base station to the mobile phone to calculate it's position

  Multilateration: Time difference of arrival (TDOA) - The network determines the time difference to more than one station and therefore the distance from each base station to the mobile phone.

  Triangulation: Angle of arrival (AOA)- The mechanism locates the mobile phone at the point where the lines along the angles from different base stations intersect.

- **Satellite positioning systems**

  Global Positioning System (GPS) - Utilizing a constellation of at least 24 Medium Earth Orbit satellites that transmit precise microwave signals, the system enables a GPS receiver to determine its location, speed, direction, and time.

Galileo - Galileo is a planned global navigation satellite system, being built by the European Union (EU) and European Space Agency (ESA) as an alternative and complementary to the U.S. Global Positioning System (GPS)

Assisted GPS - A largely GPS-based technology, which uses an operator-maintained ground station to correct for GPS errors caused by the atmosphere/topography. Assisted-GPS positioning technology typically falls back to cell-based positioning methods when indoors or in an urban-canyon environment.

- **Positioning in 3G networks**

  Mobile-based technologies: Cell-ID, time advance - Mobile-based or handset-based technology requires the installation of client software on the handset to determine its location. This technique determines the location of the handset by computing its location by cell identification, signal strengths of the neighboring cells or the latitude and longitude, if the handset is equipped with a GPS module. The calculated location is then sent from the handset to a location server. The main disadvantage of this technique is the necessity of installing software on the handset. It requires the active cooperation of the mobile subscriber as well as software that must be able to run on different operating systems of the handsets, such as Symbian or Windows Mobile. One of the proposed alternatives is the installation of embedded hardware or software on the handset by the manufacturers. However, the obvious difficulty of convincing different manufacturers to cooperate on a common mechanism and to address the cost issue means that this has not made any significant advances. Another difficulty would be to address the issue of foreign handsets that are roaming in the network.

  Network-based technologies: TDOA, AOA - Network-based techniques utilize the service provider's network infrastructure to identify the location of the handset. The advantage of network-based techniques is that they can be implemented non-intrusively, without affecting the handsets. The accuracy of network-based techniques varies, with cell identification as the least accurate and triangulation as the most accurate. The accuracy of network-based techniques is closely dependent on the concentration of base station cells, with urban environments achieving the highest possible accuracy. One of the main challenges of network-based techniques is the requirement to work closely with the service provider, as it implies the installation of hardware and software within the operator's infrastructure. Often, a legislative framework would need to be available to safeguard the privacy of the information.

  Mobile-assisted technologies: A-GPS, AFLT, OTD- Mobile assisted are hybrid-based techniques, which means they use a combination of network-based and mobile-

based technologies for location determination. One example would be Assisted-GPS, which uses both GPS and network information to compute the location. Hybrid-based techniques give the best accuracy of the three but inherit the limitations and challenges of network-based and handset-based technologies.

2.4.2 Unified Communications

Unified communications may be described as the unification of presence, real-time communications and near-real-time communications into a single user experience.

This potentially includes the integration of fixed and mobile voice, Short Message Services (SMS), voice-mail, fax, audio, video and Web conferencing, e-mail, instant messaging (IM), Voice over IP (VoIP), business applications and "whiteboarding", into a single environment, offering the user a more complete but simpler and more effective experience. It also supports accessibility based on the preferred method, location of the recipient and its availability, in real time.

- How it works

Based on IP technology and Session Initiation Protocol (SIP), a single address reaches several devices simultaneously or intelligently routes voice and data messages to the best suited communication device based on a user's profile. For example, unified communications technology could allow a user to seamlessly collaborate with another person on a project, even if the two users are in separate locations. The user could quickly locate the necessary person by accessing an interactive directory, engage in a text messaging session, and then escalate the session to a voice call, or even a video call within minutes. Unified communications could enable that worker to access a real-time list of available expert colleagues, then make a call that would reach the necessary person, enabling the employee to answer the customer faster, and eliminating rounds of back-and-forth emails and phone-tag.

- Why it's emerging

With an increasingly mobile workforce, businesses are rarely centralized in one location. A typical communications challenge facing many organizations is an inability to reach co-workers reliably on the first try. Even though communication tools have proliferated, the fact that employees are become increasingly mobile makes collaborating with co-workers more difficult by the day. In addition, according to [PB07], the average organization is using over six different types of communication and five communication applications. Even though more tools should lead to easier co-worker access, if the devices are not properly integrated the net effect can be counterproductive. These internal communication obstacles lead to missed deadlines and critical delays over time, and it has real economic impact. [ST08]

- Benefits

The benefits of UC become particularly attractive as mobile work forces grow common. With unified communications, organizations improve employee mobility, enhance workforce collaboration and productivity among employees, customers and suppliers, and reduce costs by speeding decision-making, reducing travel expenses and improving client retention and satisfaction. In addition, future plans for Unified Communications applications strongly suggest that this technology will not only bring operational efficiencies but also provide a real source of competitive advantage in the long run. [Inc06]

- Mobile Unified Communications

Mobile unified communications is a special case because up until recently, mobile communications for most users has been largely independent infrastructure, services and devices provided by licensed mobile operators or carriers. These large networks and systems have been isolated from the enterprise, connected only by the public telephone network.

As employees roam on and off the office, they are demanding consistent capabilities for making phone calls, sending text and email messages, and accessing contact lists and unified message inboxes. More recently, heightened competition in mobile email services and innovation in devices have stimulated market demand for better display, battery, user interface, third-party software integrations and faster, more secure and lower cost data capabilities to both the campus Wi-Fi network and the mobile operator's network.

The advent of quickly proliferating high-speed Wi-Fi networks, 3G cellular capabilities and Smartphones, are a huge motivator underlying mobile unified communications. Wi-Fi devices in the campus have several advantages since they leverage the existing enterprise-managed Wi-Fi environment and don't attract monthly bills from mobile operators. Dual mode Wi-Fi also enables executives and salespeople to participate in nomadic work-at-home or work-at-hotel calls and conferences over IP networks, where cellular coverage might be too expensive due to roaming, where the signal strength is low, or where the participants or topic require more stable, quiet or private communications.

With mobile unified communications the customer satisfaction is higher. Since employees are more accessible, they spend less time waiting and have more time to do their jobs, resulting in shorter cycle times. [BT07] [Con06] [Inc06]

- Challenges

Device interoperability issues affect the cost of user training and limit feature interactions to only a subset of target users, since not all devices support the same operating system and third-party development programs. This results in lack of interoperability, increasing support costs and reducing feature transparency across the devices.

In addition, extending enterprise telephony features into the mobile environment as part of a mobile unified communications solution requires, for most implementations, a degree of integration with the enterprise IP PBX system. Many enterprises are not homogeneous in their choice of telephony brands, by virtue of different strategies over time, mergers and acquisitions, and long life-cycles of original purchases. Thus the complexity of integrating multiple approaches to mobile unified communications may also contribute significantly to higher implementation costs. [BT07]

2.5 Technological Framework

This technologic framework presents the current available development options for mobile applications using Symbian and Windows Mobile operating systems. We will also compare .Net Compact Framework and Java 2 Micro Edition development frameworks and environments, and we will finally assess the current capabilities of handheld devices.

2.5.1 Operating Systems

- Symbian

Symbian OS is a proprietary operating system, designed for mobile devices, with associated libraries, user interface frameworks and reference implementations of common tools. Symbian is currently owned by Nokia, Ericsson, Sony Ericsson, Panasonic, Siemens AG, and Samsung.

The native language of the Symbian OS is C++, unfortunately, it has a steep learning curve since it requires the use of special techniques that can make even relatively simple programs harder to implement than in other environments.

There are multiple platforms based upon Symbian OS that provide an SDK for application developers wishing to target a Symbian OS device - the main ones being UIQ and S60.

Symbian C++ programming is commonly done with an IDE such as Carbide.c++, an Eclipse-based IDE developed by Nokia, and Borland C++ IDE.

Symbian OS development is also possible on Linux and Mac OS X using tools and techniques developed by the community, partly enabled by Symbian releasing the source code for key tools. A plugin that allows development of Symbian OS applications is also available in Apple's Xcode IDE for Mac OS.

Java ME applications for Symbian OS are developed using standard techniques and tools such as the Sun Java Wireless Toolkit (formerly the J2ME Wireless Toolkit). Over time the Java ME platform has been divided into two base configurations, one to fit small mobile devices and one to be targeted towards more capable mobile devices like Smartphones and Pocket PCs. The configuration for small devices is called the Connected

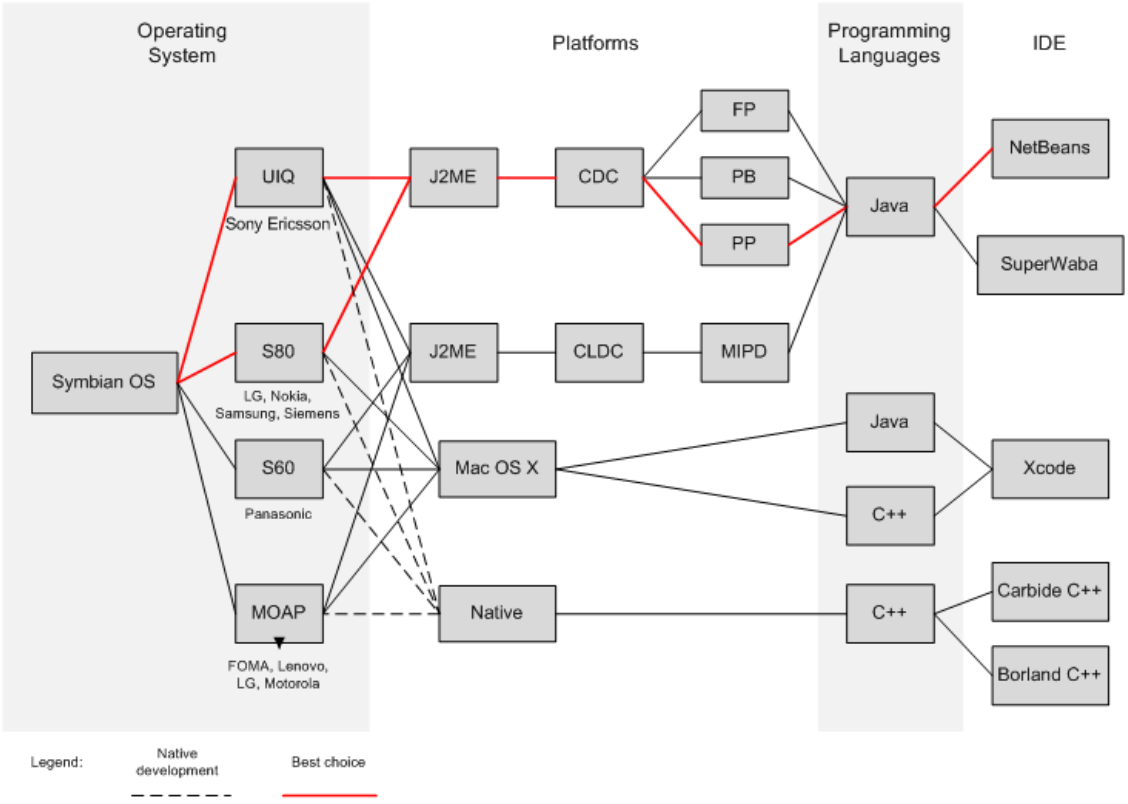

Figure 2.1: Development options for Symbian

Limited Device Configuration (CLDC) and the more capable configuration is called the Connected Device Profile (CDC). Both CLDC and CDC applications can be created with NetBeans, and other tools such as SuperWaba can also be used to build Symbian programs using Java.

- Windows Mobile

Windows Mobile is a compact operating system combined with a suite of basic applications for mobile devices based on the Microsoft Win32 API. It is designed to be somewhat similar to desktop versions of Windows, feature-wise and aesthetically. Devices that run Windows Mobile include Smartphones and Pocket PCs.

The most current name of Windows Mobile intended for use on Pocket PCs is officially ”Windows Mobile 6 Professional” for devices with mobile phone capabilities and ”Windows Mobile 6 Classic” for devices without mobile phone capabilities. The Pocket PC was the original intended platform for the Windows Mobile operating system. These devices consisted of both standalone Pocket PC devices without mobile phone capabilities, and those that included mobile phone capabilities. Smartphones, originally designed without touchscreens to be operated more efficiently with only one hand, has its current version named as ”Windows Mobile 6.1 Standard”.

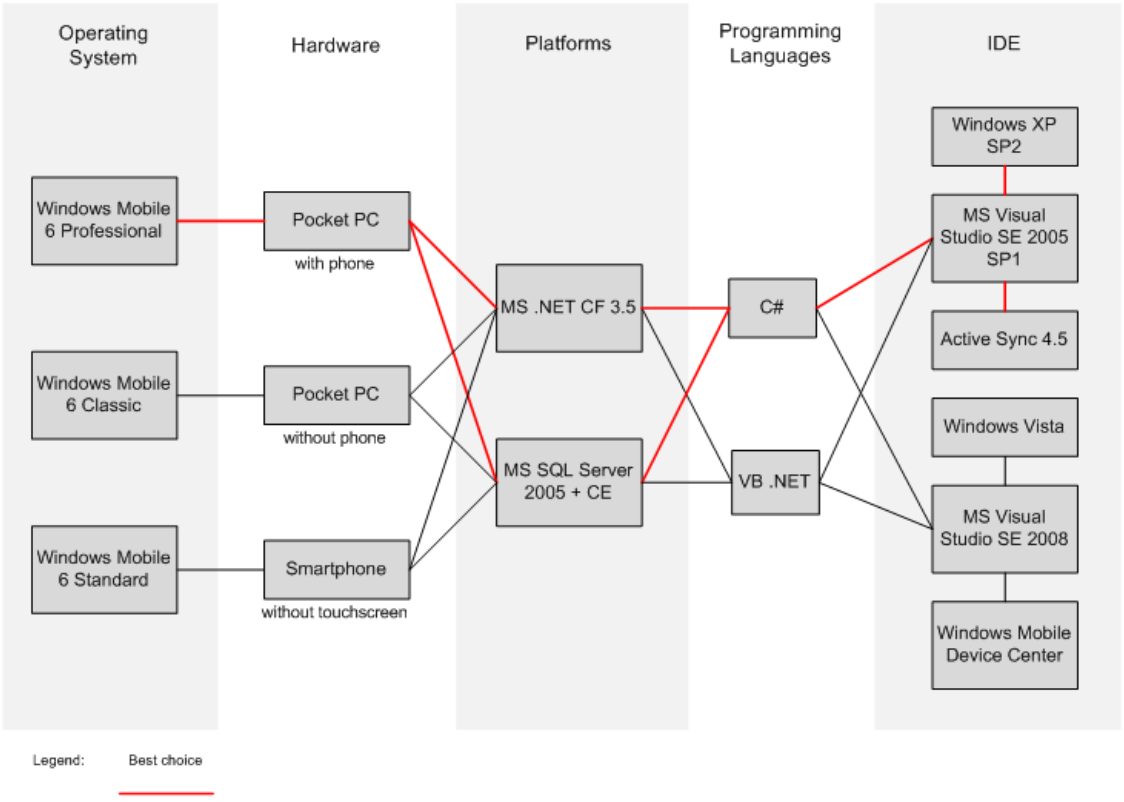

Figure 2.2: Development options for Windows Mobile

The Microsoft .NET Compact Framework is an integral component on Windows Mobile devices that, together with Microsoft SQL Server Compact (SQL CE) enables to build and run managed applications, and use Web services. It supports Visual Basic and Visual C development but does not currently support C++ development.

Microsoft's Visual Studio development environment is the main Integrated Development Environment (IDE) for Windows Mobile applications. Applications can also be tested through Visual Studio or be deployed to real mobile devices using ActiveSync, a synchronization program that enables mobile devices to be synchronized with desktop PCs. Its latest version is ActiveSync 4.5 for Windows XP, which has been replaced by the Windows Mobile Device Center for Windows Vista.

2.5.2 Frameworks

.Net Compact Framework is a lightweight version of Microsoft's .Net Framework that contains a subset of its standard libraries. Due to device limitations only the necessary .Net Framework libraries are available for mobile application development. Like .Net CF, J2ME is a specification of a subset of the Java platform aimed at providing a certified

collection of Java APIs for the development of software for handheld devices. [Suna] [Micb]

Table 2.1 shows the main differences between .Net CF and J2ME CDC and CLDC. A quick analysis reveals that they differ especially in terms of data storage, Web Services', communication, and location APIs.

	.Net Compact Framework	J2ME CDC	J2ME CLDC
User interface	Rich subset of Windows Forms	Rich subset of AWT, vendor-specific UI libraries	MIDP liquid crystal display UI, subset of AWT, vendor-specific UI libraries
Database API	Subset of ADO.Net, DataGrid	Rich subset of JDBC	Vendor-specific JDBC-like APIs
Mobile database	SQL Server CE	IBM DB2 Everyplace, PointBase, Oracle9i Lite	Vendor-specific relational implementation over RMS, Oracle SODA
Remote database	Any ADO.Net compatible	Any JDBC compatible	Vendor-specific JDBC-like API bridge
XML API	Build into ADO.Net and other standard APIs	Third-party tools (standards coming soon)	Third-party tools (standards coming soon)
Web services	Built-in	Third party (standards coming soon)	Third party (standards coming soon)
Web services tools	Integrated with VS.Net	kSOAP plug-ins for leading IDEs	kSOAP plug-ins for leading IDEs
Email and PIM (personal information manager)	P/Invoke Outlook APIs	JavaPhone and third-party APIs	Upcoming PDA Profile and third party
SMS	P/Invoke device SMS stack	Wireless Messaging API	Wireless Messaging API
Instant messenger	P/Invoke MSN (Microsoft Network) and other IM client APIs	Third-party APIs for most IM clients	Third-party APIs for most IM clients
Cryptography	Third-party APIs	JCE (Java Cryptography Extension) and third-party libraries	Third-party libraries
Location API	APIs provided by carriers	Third party (standards coming soon)	Third party (standards coming soon)

Table 2.1: .Net CF and J2ME main differences

While .Net fits a range of very similar mobile devices of higher capabilities, Java can support applications from the first to the most recent generations of Smartphones. The configuration targeting resource-constraint devices like mobile phones is called the Connected Limited Device Configuration (CLDC). It is specifically designed to meet the needs for a Java platform to run on devices with limited memory, processing power and graphical capabilities. The configuration targeting larger devices with more capacity and network-connection is called the Connected Device Profile (CDC).

On top of the different configurations Java ME platform can also specify a number of profiles defining a set of higher-level APIs that further define the application. A widely adopted profile to combine the CLDC is the Mobile Information Device Profile (MIDP), providing a complete Java application environment for mobile phones and other devices with similar capabilities. As for CDC there are three different defined profiles: the Foundation Profile (FP), the Personal Basis Profile (PB) and the Personal Profile (PP). [Sunb] [Sunc] [Sund]

Another relevant issue are the major limitations of J2ME CLDC in comparison with the other two APIs, already expected due to its target device capabilities. Since this package of libraries would not be able to deploy the most basic features that a Sales Force mobile application would require, this possibility is quickly discarded from the development options. [Sune]

In terms of user interface both .Net CF and J2ME CDC provide a rich subset of libraries. As in terms of database management there are also quite similarities even though there is a big difference here. While Microsoft provides a wide development environment by developing SQL Server and SQL Server CE with ADO.Net libraries for full database synchronization, Java still depends on third-party libraries for full database management, making it more complex to develop.

The same happens with XML tools and Single Object Access Protocol (SOAP) services, a protocol for exchanging XML-based messages over computer networks, being fully supported by Microsoft's development environment, while Java requires third-party tools and plug-ins for complete support. This represents a huge limitation.

In terms of email and messaging services management both libraries have satisfactory communications integration and support. On the other hand none has yet provided acceptable security when communicating. Cryptography APIs are available mostly through third-party options, and they are still the best option to ensure some level of privacy.

To accomplish the integration of Location-based services into the Mobile Sales Force application, GPS and other location technologies need API support. The latest versions of .Net CF provide easy development of device location applications, while on the other hand standards are still being achieved for Symbian J2ME developers.

2.5.3 Handheld Devices

Even though the term Smartphone has recently been adopted as referring to all sophisticated handheld devices, handheld devices are still being grouped into different categories based on their characteristics, such as integrated telephone, touchscreen, internal memory and wireless networking support.

Pocket PCs are handheld devices running on Windows Mobile integrated with touchscreen. Since some Pocket PCs also had integrated telephone, with the advent of Windows

Mobile 6 Microsoft dropped the name Pocket PC in favor of a new naming scheme. Windows Mobile Classic for devices without telephone and Windows Mobile Professional for devices with integrated telephone.

Smartphones do not have touchscreen at all but on the other hand they all have telephones. They are mostly known as mobile telephone. The most recent generation has approached Smartphones to Pocket PCs capabilities, presenting similar interface quality, higher processing speed, and hardware support for wireless and location features.

Table 2.2 shows the main differences between these two types of handheld devices. [Micc] [Sym].

	Pocket PCs	Smartphones
Operating System	Windows CE, Mobile	Windows (CE, Mobile), Symbian OS, Blackberry OS
RAM Memory	64Mb - 128MB SDRAM	64Mb - 64Mb SDRAM
ROM Memory	256Mb - 1Gb	64Mb - 256Mb
Integrated Mobile	Optional	Yes
Touchscreen	Yes	No
Screen Resolution	QVGA (240 x 320) to VGA (640 x 480) 65k TFT Colors	QVGA (240x240 - 800x400) to VGA (176x220) 65k TFT Colors
CPU	320 MHz - 806 MHz	200 MHz to 620 MHz
Keyboard	No, Soft e Full QWERTY	Numeric, Soft e Full QWERTY, AZERTY
3G Suport	-	Optional
Wireless LAN	Yes	Optional
Wi-Fi	Optional	Optional

Table 2.2: Pocket PCs and Smartphones characteristics

Enterprise applications such as Mobile Sales Force Automation require good device performance to achieve employee adoption. Device performance means perceptible screen display and fast access and response from applications, as well as the ability to connect to company networks via wireless. For all these reasons Pocket PCs are the right devices for enterprise applications.

2.6 Mobile Trends

In this section we will analyze some trends around mobile technologies. The perspective of additional services, development options and improved device capabilities in the near future helped us understand if there were any particular issues we should pay attention to. Still, predicting what customers will buy, and how they will think and spend their time, is hardly an exact science.

2.6.1 Market

The mobile industry has just achieved 2 billion subscribers in the world and by the end of 2011 is it expected that there will be 3 billion mobile subscribers; the mobile industry will be shipping approximately 1.5 billion handsets a year and by the end of 2012 it will generate over a trillion dollars in revenue per year.

The demand for handsets is huge, but the market is consolidating and becoming very competitive. Several market players from different backgrounds attracted by the huge economic potential of this industry are becoming more widely involved in mobile technology and services, increasing market complexity. As a result, mobile devices prices will fall bringing sophisticated functionalities to new audiences, being corporate devices a small minority.

Handsets were dominated by manufacturers like Nokia and Motorola, however, 3G operators such as Vodafone, are now developing handsets. On the other hand network services were traditionally the job of cellular operators but new types of operators are emerging offering wireless broadband services. Corporate software and services were traditionally sourced from enterprise software companies such as IBM and Microsoft, which now face competition from mobile device manufacture companies. In addition web portals and services, such as Google and YouTube, are either developing their own mobile products or forming mobile alliances with handset manufacturers and network operators. [Tec07] [Jon07b] [Jon07c]

2.6.2 Wireless Network

Our future will involve many different types of wide-area wireless networks, although coverage and latency will remain a challenge for wide-area mobile applications in the U.S. and Europe through 2012.

Network coverage and bandwidth is expected to continue to increase although no single network type coverage will be complete, even in a single region. However, the availability of multiple networks will provide alternatives and many future devices will support multiple network types. Latency will remain more unpredictable and above wired broadband levels, and likewise costs will also exceed wired systems.

There will be many types of wide-area wireless networks. Cellular networks are evolving through 3G and 3.5G with goals of a few megabits and the evolution will continue through 3.75G and an eventual 4G, which probably won't arrive before 2012. Metro wireless broadband is also being delivered through several technologies including Wi-Fi and mesh Wi-Fi, expecting a wireless broadband experience that is approximately equivalent to a slow fixed broadband link. [eS03] [Jon07b] [Tec07]

2.6.3 Handsets and Platforms

The handset market will continue to grow, with devices evolving fast. The most successful handset vendors are Nokia, Motorola and Samsung who own nearly 65% of the market, which are being pursued by a pair of challengers such as Sony Ericsson and LG. Together the top five manufacturers own more than 80% of the market.

Smartphones which are handsets with an operating system such as Symbian, Windows Mobile or Linux, can support complex installable applications. These are becoming more common and by 2010 they will represent approximately 60% of the marketplace.

From an enterprise perspective, through 2010 the leading smartphone platforms will be Windows Mobile and Nokia ESeries. Windows Mobile is a consistent platform available from a range of hardware manufacturers while Nokia ESeries offers a range of handsets with a consistent software platform designed for enterprise use. Nokia has recently announced that its new corporate structure is very consumer-oriented, which may indicate a reduced future focus on enterprises. On the other hand, Microsoft Windows Mobile may struggle in the consumer space. [Jon07b] [Jon07c]

2.6.4 Service

Although mobile network operators often seem to lack a clear insight of their strategic vision, there are two major types of service trends. Content innovators believe that the future requires unique mobile content, so they are buying into media businesses. Aggregators won't create content but may source and package it from creators. They also realize that much future content will come from the Internet, so their aim is to make it as accessible as possible, given the constraints of mobile networks and devices.

Many content innovators are expected to fail, but bundling and convergence are two services expected to succeed. Bundling is when an operator sells multiple services on a single contract and convergence is when the operator provides services that cross multiple bearers, increasing functional overlap with consumer electronics, imaging and entertainment devices.

It's not obvious that there are consumer reasons for convergence apart from cost saving and the simplicity and convenience of a single bill, but a few services such as VoIP and Instant Messaging are becoming increasingly viable on mobile devices and will be tactical through 2009. [eS03] [Jon07b]

2.6.5 Business

Mobile business is growing up, and its next generation labeled as "mobile business 2.0" is starting to emerge and will evolve over the next five years.

Mobile business will likely evolve from Web business using simple interactions to substantially a different concept, with a new architecture and infrastructure. It will be highly proactive, attempting to identify and exploit brief moment of need opportunities, and capable of exploiting innovative interactions such as expression recognition, voice control and ”point to query. Future handsets will increasingly incorporate innovative interface technology such as electronic compasses, accelerometers, touch screens and the GPS, and those sensors can be analyzed to provide indications of behavior and mood.

From 2009 to 2011, 50% of enterprises will undertake projects to consolidate their mobile software platforms and half of enterprise IT organizations will be spending more than 5% of their budgets on mobility. They will need an infrastructure that is truly device independent and capable of improving operational efficiency. Case studies and surveys suggest the most-effective applications of mobility will combine mobile workers with time-sensitive information, integrated within the established IT infrastructure. An important note to retain is that many technologies have, in the past, been introduced and have found acceptance in consumer markets, only to be ignored by enterprises. If history repeats itself, important technologies that will have an impact on enterprises in the future, are being ignored. [Jon07b], [Tec07] [AG] [Jon07a]

2.6.6 Security

Security is achievable, but not yet trivial. Mobile devices are used in a more uncontrolled manner than desktop PCs, and therefore, they are more vulnerable to a wide range of threats. As they become more sophisticated and capable of accessing the Internet, they will become more vulnerable.

Good security tools are available for remote device wipe, storage encryption, VPN, authentication, and many other processes, however, a unique solution is unlikely to be available before 2010, because the convergence of mobile security and mobile device management is incomplete.

On the other hand the growth in mobility demands organizations to establish formal device management and support policies. This means that it’s unrealistic to expect consumers to install and support security software on their own devices. Secure devices must be provided and managed by the corporation. The goal is to support safe access to a limited set of corporate applications on potentially unsafe devices. Techniques such as thin client will be important, and risky devices or functions will be locked out. User training will also be essential. Mobile e-mail is likely to be the biggest area of contention. [AG] [Bow] [Jon06]

2.6.7 Social

New social behaviors will emerge as users find new ways to collaborate and communicate. This will increase the adoption of mobile technologies, and products and services will interoperate under different technologies. Globalization will also demand for multilingual and multicultural products and personalization capable of matching users' values and attitudes. Other working trends, such as the blurring of work and leisure, will be supported by wireless "always on" and collaboration tools.

Another social trend is related to the use of location information systems, previously discussed in section 2.4.1.1. These systems will be used on a daily basis as a personal, business or political tracking tool.

Families will adopt toys with embedded location technologies to monitor their children at home or outside, and so will schools and other public institutions. Mobile workers will be forced into traceability, through coercion or incentives. Vehicles used in transportation will be routinely tracked, and increasingly, workers will accept monitoring as a condition of employment in exchange for convenience, lower costs and safety.

Although the previous examples may present opportunities, they can also represent potentially dangerous situations in terms of individual rights, freedom limitations and, eventually, a threat to democracy conditions. The importance of location will probably result in location spoofing, as a crime and a service, posing personal risks. In addition, and although carriers may provide location-blocking services, some governments may force them to provide location data, implement unauthorized access to individual data repositories, or track citizens.

It will be a global challenge to both explore mobile potentialities and handle social responsibilities. [eS03] [Bow]

Chapter 3

A New Mobile Sales Force Automation

In this section we will present our approach to Mobile Sales Force Automation applications.

3.1 Problem Analysis

After analyzing the different subjects of study we acquired a global vision that allowed us to redefine our initial goals. We were confronted with many different decisions we had to make in order start designing our concept of Mobile Sales Force Automation (MSFA). This section describes precisely which aspects have been taken into account and how we have decided to proceed.

3.1.1 Users

Our analysis of Sales Force allowed us to understand that companies have many employees with different roles and not all of them work out of office. Our first step was then to identify which sales roles could potentially improve its performance through mobile applications.

We came up with the conclusion that sales representatives and sales managers should be the targeted users, and that the system should support account managers, product specialists, technical specialists, markets specialists, hunters and farmers.

3.1.2 Structure

After selecting the targeted users we had define the application's sales structure. That is we had to design a system capable of supporting user interaction and collaboration. So, we started by analyzing how each of the targeted sales users interact among themselves.

We concluded that the system should support hierarchic relationships. This means that it should be possible to set different levels of management. Each sales representative can be managed by several sales managers, and each of those sales managers can have many superiors; each sales manager should have control over the accounts of the people they are managing. This means that a user at the bottom of the pyramid would only have access to its own accounts, and a user at top of the pyramid would have access to all the company's accounts. Disconnected pyramid branches such as different departments should not be able to share their information.

This decision took privacy issues into consideration, but device's processing capabilities were also a major decision factor, and we can now understand why we didn't include sales executives as targeted users. While it is possible for account managers to efficiently manage a few accounts, and for their managers to efficiently manage a few team's accounts, it is not possible for a sales executive to manage all the company's accounts on a handheld device. It would be too much information to store, it would be too slow to process, and there would be too many data fields to display on a small screen.

3.1.3 Interface

It was precisely because handheld devices have small screens that we have considered to redesign mobile Sales Force Automation application's interface. On the other hand, handheld devices cannot support customized controls; it would slow down the application. We were then forced to try to achieve interface improvements mainly by displaying the right information at the right time. We came up with the following ideas.

Mobile application's menus usually display items in sequence, using scroll bars to scroll up and down. Even though devices have touch screens we find it hard to have the perception of which items are available. Therefore we have decided that features should be grouped in tabs of similar context.

The same exact concept should be used to display content's data fields. An account, for example, should present the company's name, address and website; but it should also present the company's industry, number of employees and annual revenue. Therefore instead of presenting all these data fields in a single panel and having to scroll down to select and edit them, they should be grouped in two tabs: company's personal info and company's business info. And with a single click the user should be able to see all the account's information.

Our study of Sales Force has also revealed an obvious detail: sales organizations may be spread among many different countries and its employees should be able to display contents in their main language. Therefore, mobile Sales Force Automation applications' interface should be designed to dynamically display all its information, including menus, items and messages.

As we have previously said, it is important to display the right information at the right time. Sometimes, knowing which is right at a certain time is a very subjective issue; what may be useful to a user may not be useful to another user. Therefore, we have concluded that some of the application's interface should be customizable by users.

Another relevant aspect that we have identified when studying mobile applications was related to the difficulty users have with data input. Handheld devices only have small keyboards and they are not standard in all devices. The most common input method is using the touchscreen and it can be quite hard to write long sentences. Therefore, mobile SFAs should reduce the number of data input fields as much as possible, and it should also provide a lot of information in combo box controls. The concept is to reduce as much manual data input as possible and replace it by "click to select" information.

3.1.4 Update

One of the most important features of Sales Force Automation should be to provide users with real-time information and support collaboration. It can only be achieved through data synchronization and update, but it requires particular attention.

It must be taken into account that companies spread in many countries are working at different times. Therefore, the system should be managed using a global time, usually set by the central server. In addition, users may be traveling to different countries and they should be able to manually set their current time zone.

But there is another important aspect that must be considered: synchronization incoherencies. The system should, for example, warn users if they are updating information with older versions, or prevent date time inconsistencies.

3.2 Architecture

Even though we only intended to design the mobile terminals of a Sales Force Automation system, the mobile application had to be designed taking into account that it makes part of a wider system in which it must be integrated.

All the Sales Force Automation system information is gathered in a central server. This information includes everything from company related info to client related info, and it can include data from other information systems to prevent repeated information and improve the company's knowledge.

The system can be accessed on office computers, laptops and handheld devices. While office computers use the local area network (LAN) to access the central databases, laptop and handheld devices are also using out-of-the-office wireless channels such as GPRS or 3G. Using the Internet and connecting through a virtual private network (VPN), which

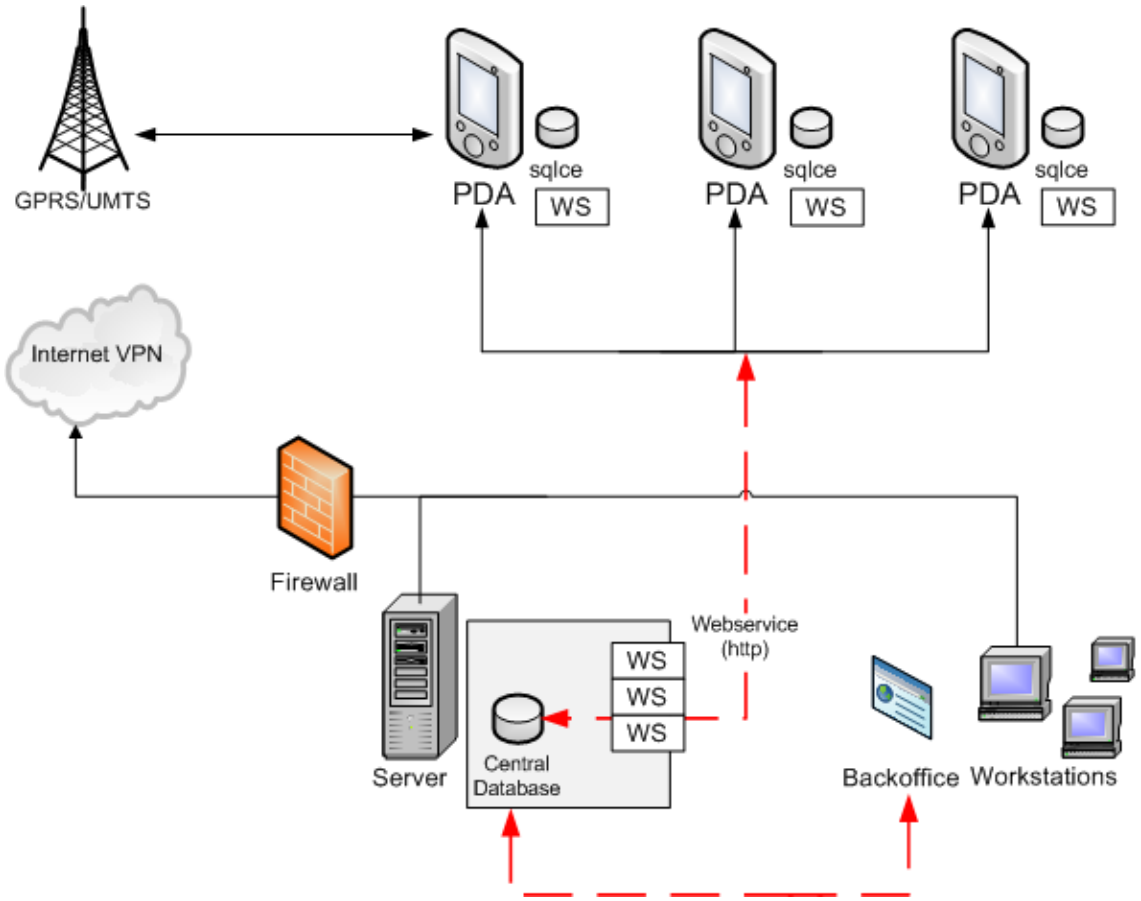

Figure 3.1: Architecture of a Sales Force Automation system

provides a faster link to the enterprise network and increases security, the Mobile Sales Force Automation application can commit or update the latest information.

However, databases will not be accessed directly by the device, they will be accessed via Web services. Web services are frequently just Web APIs that can be accessed over a network and executed on a remote system hosting the requested services. This is an efficient method of accessing databases, improving the time of response, preventing multiple instant accesses (to cause unwanted behaviours), and improving security.

Handheld devices, which are using the Mobile Sales Force Automation application, need to have local databases to support information. In our example, local data is stored by SQL Server Compact Edition, which provides built-in synchronization capabilities with the central database.

As we said, mobile terminals only represent a small group of end terminals. The major group is represented by office workstations. Office workstations also need to synchronize with the central database and it is done through a common backoffice that is then used to present information to users.

3.3 Features

In this section we will thoroughly describe the different features a Mobile Sales Force Automation should cover. Many of these features already exist in current mobile SFA applications and are standard in almost every available SFA solution. The reason why these features have become so popular it's because they actually work. These features include content management and agenda.

Nevertheless, we have tried to introduce new approaches to some of the existing features to see if we could achieve any improvements, and we came up with a few interesting concepts. They include "Content Views", "Account History", "Contact Display", "Easy Dial" and "Product Information". These concepts are new to mobile SFA and they were an achievement.

But our studies on Location-based Services and Unified Communications have also allowed us to design new features. They belong to the new designed "Communications" and "Services" modules, and the most important features are the "Unified Inbox" and the "Maps" service.

3.3.1 Contents Module

Contents are the most important concept in Sales Force. They represent all the customer-related business information. Leads are created when a customer is prospected and it allows salespeople to judge the potential of the customer and to establish contact with it. When a potential customer has evolved to an effective customer its Lead can be upgraded into Account. From this moment customers are handled differently and will now require special attention.

Customers usually make one of three sales approaches: they present salespeople with a business opportunity; they require salespeople to analyze their needs and suggest products and services; or they go straight into business because they already know what they want to buy. These three different possibilities are considered in Opportunities, Price books and Products, and Sales features.

As we have discussed before, one of the greatest challenges in mobile SFA applications is to provide adequate display of content information. To try to solve that problem we have come up with a new solution, Content Views, a special feature designed to specifically present content information.

3.3.1.1 Accounts

Accounts represent the customer's information, and are identified by the company name. Each account has an account owner, a salesperson responsible for its management. In addition, an account may have many salespeople involved with different roles.

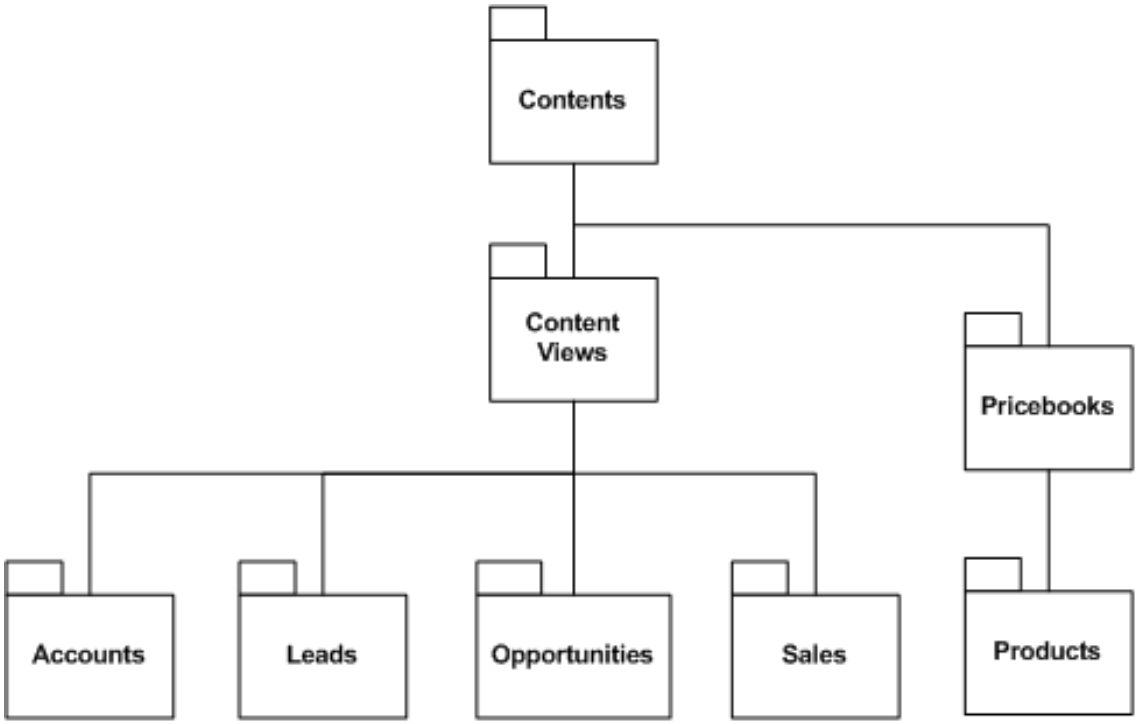

Figure 3.2: Diagram of Contents

Accounts should provide two major groups of information: the company's personal information and the company's business information. The company's personal information includes the name of the company, addresses and its contacts. They allow account managers to establish contact with the customer and to send documents and bills. The company's business information on the other hand has information needed by the account managers to evaluate the customer's profile. This information includes the industry type, number of employees, annual revenue and any additional descriptions.

Accounts are seen as the "file case" of customer. Every request, service, delivery, opportunity, sale, etc, related to the customer should be put inside the "file case". This means that accounts will be the reference for every account-related activity.

- Account History

One of the biggest challenges in Sales Force Automation, as we previously discussed, was the lack of customer history, which has proved to be critical for a successful customer service. We have come up with an innovative solution that takes advantage of handheld devices' capabilities.

Handheld devices with integrated phone and email are most used to establish communications with colleagues and customers. If the handheld device is used for all those communications why not use it to keep a record of each of those communications and their subject?

This feature should be capable of recording every account iteration such as account creation, list of old sales and delivered documents, it should also keep record of every conversation and sent email to colleagues or customers, and it should also be able to keep record of any task or event related to an account, such as making a report or having a meeting with a customer.

Storing all this information can be very important to sales organizations. This is not only useful for account managers to have quick access to a customer's history, but it prevents accounts from being neglected since. Alarms can warn account managers that a certain account is being "dead" for too long, and account reports can give sales managers important information to set sales strategies.

3.3.1.2 Leads

Leads represent prospects, possible customers, and are very similar to Accounts. But unlike them, Leads should now provide three major groups of information: the company's personal information, the company's potential and the lead status. The company's personal information, once again, is critical for lead managers to establish contact with the company. The company's potential-related information should include the type of industry, the number of employees, the company's annual revenue, and any other useful information. Finally, the lead status information should provide information about how the lead is being handled. It should describe if the lead has already been contacted, if it's on standby, if it's qualified for business or not, and it should also provide information on the lead's next steps.

3.3.1.3 Opportunities

Opportunities represent the possibility of selling. Opportunities occur when a customer presents a public offer to buy products, when it asks directly the company for a proposal, or when the company's intelligence senses that a customer may be interested in making a certain deal.

Opportunities should provide two major groups of information: the opportunity status, and the products involved in the deal. Information related to the opportunity status is important for salespeople to understand the opportunity stage, its potential, its duration, and it should also store the opportunities' next steps. The information about the products involved in the deal is also important to the salespeople. It allows them to study possible discounts and make valuable proposals, and keep a record of the customer needs.

3.3.1.4 Price books

Price books are used to categorize products by price. Different customers need different attention depending on their value to sales organization. While regular customers are

usually offered standard prices, major customers and re-buyers are offered more competitive prices and special discounts. Therefore, organizing products by price books is very efficient.

In addition, price books are also used to categorize products by type. Instead of mixing the different products and simply arranging them alphabetically, products are categorized by type, function, or any other variable. This makes it a lot easier for salespeople to search products.

3.3.1.5 Products

Products should provide salespeople a quick access to the company's products. It should not only provide salespeople product references such as product identification code, price and description, but it should also provide real-time information of the products in stock.

Product creation and management should be designed to be done in an office desktop not in a mobile device. Salespeople don't need to be able to create products away from the office and it's not even their role to do it. They need access to product information to show to their customers and they need to be able to quickly create and send budgets.

The mobile SFA application should support these features.

- Product Information

What we have introduced into the way product management is done, is the wide support for a variety of products and the simpler way which products are presented.

A sales person should be able to sort products in lists by name and price, and each product could also have an attached thumbnail. It should also be possible to see the product's details and description.

In addition, each product's characteristics should be dynamically arranged into tables. This would allow creating products with infinite combinations of characteristics.

Products should also have associated accessories. It would greatly improve sales peoples' sales to have access to the accessories of every product they sell. By listing the product's accessories in tables and proving images and additional information to customers they can increase the chances of selling additional products.

Finally, sales people should also be able to check each product in stock and get information of order and delivery times. Therefore, information related to product suppliers and the company's stores and storehouses should be available when consulting a product.

3.3.1.6 Sales

Sales include two types of information: customer's orders and old sales. Salespeople should be able to select products and add them to an order. In first instance, it should be possible to simulate budgets, make discounts, and send them to customers via email

or print them at the office. Then, if customers are happy with the proposal it should be possible to process the order.

An order should include each selected product's amount and price, and it should be possible to set different delivery dates for each product, as well as specify if product assembly is required.

Orders should then be sent to the company's order processing department, where the order is effectively processed. In addition, orders should keep a record of its status until they are delivered to customers. It would improve customer service and process effectiveness, since a customer could be able to see its orders statuses. Finally, each account manager should also be able to see the sales history of its customers in order to provide useful information for future businesses.

3.3.1.7 Content Views

Content View is another concept adapted for mobile SFA applications. All the contents we have previously discussed, excepting for products, use this feature to display information.

Since handheld devices have limited display areas, it is important to use those areas to display the really important information. On the other hand, important information is a very subjective concept since different users have different needs. The solution is to allow users to set their own display preferences, and it can be done using Content Views.

Content views should include three types of information: the view name, the filter criteria and the fields to display. The view name should identify the kind of information to display, for example "Portuguese Accounts". The filter criteria should allow users to set rules on the contents they want to be displayed. Following the same example, a user could set a rule such as "Billing Country equals Portugal". Finally, the user can specify which account fields he wants to be displayed, for example, "Account Name, Billing City, Industry and Annual Revenue".

The result would be a new view named "Portuguese Accounts" that would only present Portuguese accounts displayed in a table with columns "Account Name, Billing City, Industry and Annual Revenue".

Each user can set many different views for each content type. Depending on the information the user wants to be displayed at a given time, he can select the corresponding view. By interacting with the table in which the information is displayed, the user can take a closer look into the selected content, edit it, attach notes, add opportunities, associate activities and many other actions.

3.3.2 Agenda Module

The Agenda plays a very important role in selling activities. It should provide three features: Contact management, Activity management, and Note creation.

As we have just seen, contents such as Leads and Accounts have some contact channels associated with them, such as the company address, phone number, email and website. Still, they only represent the first contact with the customer. Each lead, account, opportunity and sale may have many different intervenient. All those people's information and contacts are stored in the Agenda, more specifically in the Contact management. In addition, as we have previously discussed, contents can be managed by many sales persons with different roles, and those people's information and contacts also need to be managed at the Agenda.

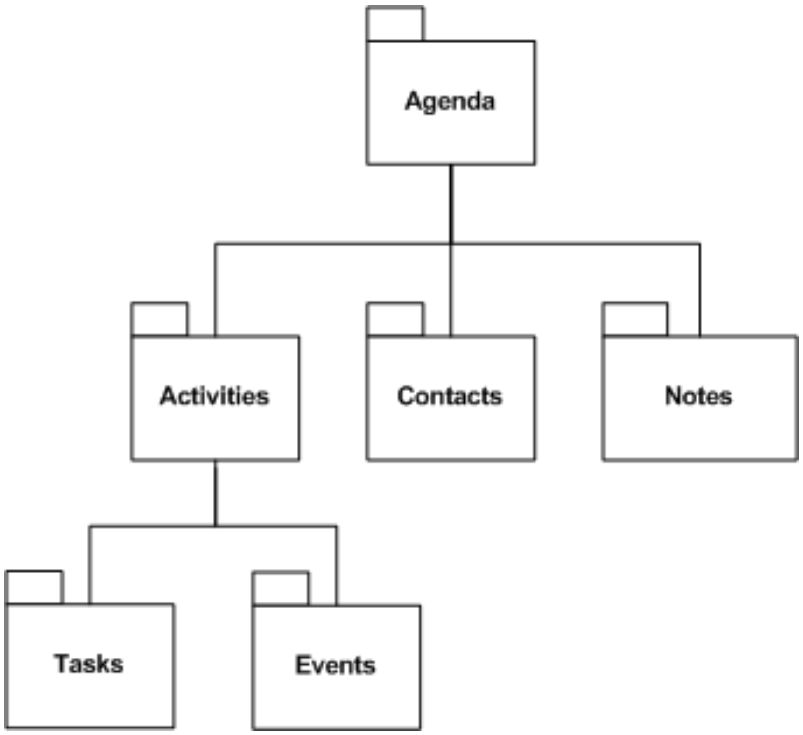

Figure 3.3: Diagram of Agenda

An account manager may manage many different contents, and it may be quite difficult for him to remind which tasks each content requires. In addition, a sales manager may require his direct sales representatives to do a specific task or join a certain meeting. Activity management is used by the Sales Force precisely to help them manage their tasks and events, and increase customer satisfaction.

Finally, notes are also very useful to salespeople because they allow them to quickly write down thoughts and concerns. Each content may have associated notes, and those notes can be made available to all the users managing the same content. Although it is a very simple concept, is also very useful.

3.3.2.1 Contacts

Contact management is very important to the Sales Force. Both customer contacts and co-workers contacts should be managed. There are many possible approaches available for the design and implementation of the Contacts module. Still, we have again seized this opportunity to introduce new concepts.

- Content Display

Contacts should be sorted in two possible ways: by name, and by company. A salesperson may need to search the phone number of a person he knows by name, and therefore like a traditional contact list, it should allow the salesperson to alphabetically display contacts by name.

But since salespeople deal with a lot of customers it may become difficult to know the name of every contact. Then, it should also possible to sort contacts by company. But we have also realized that salespeople may have many contacts in big customer's companies, and therefore it would still be difficult to remember each contact's name. To solve this problem we have introduced the concept of displaying each contact's role and department associated with its name. The global idea is to provide users with the best search and display methods, as well as provide them a more explicit description of each contact.

- Easy Dial

We have also designed a feature to facilitate the way salespeople start communications with contacts. While a few customers only provide a mobile phone number and email, some customers provide address information, a couple of mobile phones, email and the assistant's phone number. But when a user searches a customer's contacts it should only be presented with the possible communication channels available to that contact. And that's precisely what Easy Dial is all about. When a user selects a contact, he should be able to click on any channel and the application should automatically start the communication.

This means that if a salesperson clicks to send an email, the email form should automatically be presented with the recipient field already filled in by the email of the selected contact. The same happens when calling a contact's assistant. The system should automatically provide an indication that the contact has an assistant, and when selected, it should provide the assistant's name. Therefore, with two simple clicks the user gets to know the contact's assistant name and to start dialing a conversation with him/her.

3.3.2.2 Activities

Activity management is also very important to the Sales Force. Salespeople use it to schedule their daily tasks and events. Tasks include calling a customer, writing contracts,

prospect customers and many other routine activities. Events, on the other hand include meetings, presentations and having dinner with customers.

These two types of activities are very similar in terms of the information they should provide. They should both provide a description of the activity, a due date, and a reference to the content to which the activity is related. They should also have reminders to alert users of upcoming due dates.

The main differences between tasks and events, is that tasks should also contain information about the tasks status and priority, while events should contain additional information about the event organization, such as a confirmation number, the event address, or the duration of the event.

Activities should be displayed in two ways: in a calendar, marked with due dates, and in tables. It should be possible to sort activity tables by dates, accounts, by task status or priority, and it would be important to display each activity's remainder time to the due date.

- Delegate Activity

We have introduced a collaboration feature to the mobile SFA activity management to delegate activities. A sales manager should be able to easily delegate activities to its subordinates. While it is usually done through phone calls, we have thought of a cheaper and efficient way of delegating tasks using the mobile SFA application.

A sales manager could start by creating a new activity as if it was for himself. It would insert the activity description and additional data, and then it should have access to an activity delegation form. This form should have all the manager's subordinates and he/she should be able to set all the intended recipients of the activity.

The recipients could be informed of the activity they were delegated by two ways: when connecting to the internet and updating data, they would receive an indication that their manager has given them a new task or has invited them for a new event; or if the activity had high priority the manager could have set the application to send them a SMS to inform them to quickly update their activities because they have just been delegated an important one.

3.3.2.3 Notes

Note creation is a simple feature. Notes are used by users to add additional information to contents or to remind them of important details, and the each Note should be shared among all the users managing the Content to which the Note belongs.

Notes only require a small number of data fields, such as the Note creation owner and date, the note description and the Content to which the Note is related to.

3.3.3 Communications Module

This communications design brings another new concept to mobile SFA. Traditionally, only phone calls and SMS are available for handheld device users. Recently, Email and Instant Messaging have been added to the available options, and increased internet access will quickly make VoIP, Video Conference and Whiteboarding also available in mobile devices. As we can expect it can be quite difficult for a user to manage each of these communication channels in a different inbox.

This is where our concept of Communications management comes to life. Instead of managing separately each communication channel, the mobile Sales Force Automation application should provide a Unified Inbox capable of managing communications by Content or Contact. This means that a salesperson can quickly check each account-related messages, emails and voice mails, with a single interface without needing to manually sort each of his messages.

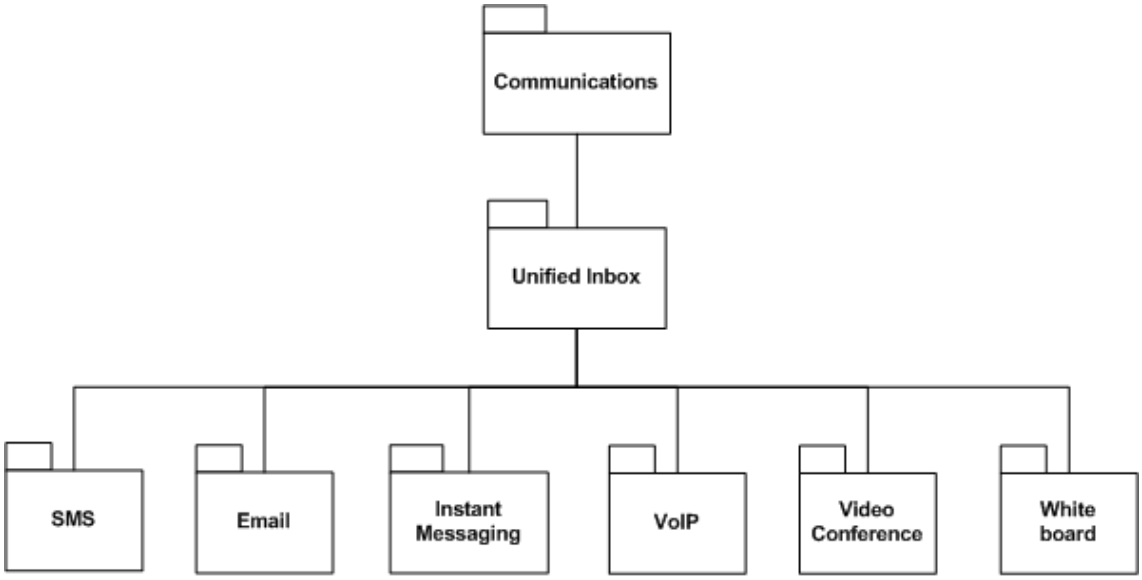

Figure 3.4: Diagram of Communications

But these Communications features are not only about the unified management, they are also about the new channels made available for the salespeople. Instant Messaging as a professional channel is a very recent concept, voice over IP (VoIP) in mobile devices is also a recent concept, and video conference would really increase the value of communications.

3.3.3.1 SMS and Email

SMS and email are very familiar message channels. They are used respectively send real-time information and personalized information. While SMSs are used to deliver short

messages, emails are used to deliver more detailed information; they can include images and graphics, and even be attached with additional documents.

They should both be integrated into a unified inbox and sorted not only by received date, by mostly by the Content they are related to. But unified inboxes may not always be available in mobile SFA applications. A good solution would be to use MS's Mobile Outlook to manage them. Outlook Mobile can manage emails and SMSs in inboxes and it also provides a rich user experience. It would be easy to integrate with the mobile SFA application and it would provide users with email and message templates.

- Message templates

Message templates can save users a lot of time, especially on handheld devices. A mobile SFA application should provide many different message templates, including budget and report templates ready to be sent to customers. This feature should stimulate salespeople to send emails to customers more frequently, and customer satisfaction would likely increase.

3.3.3.2 Instant Messaging

Instant messaging (IM) is a very used communication channel and its starting to migrate into mobile applications. Unlike SMS, IM provides real-time text-based communication, which means that two or more users can have a real-time conversation at low cost. In addition, it guarantees a good level of privacy. While a voice conversation could be heard by strangers, a text conversation would be a lot more discrete.

A mobile SFA application should then provide this feature specially to allow salespeople to communicate among themselves.

3.3.3.3 VoIP

Voice over IP conversations are very cheap, but current lack of broadband wireless networks reduce the range of its usage. Still, there is particular situation in which VoIP would be a very effective way of communicating: when salespeople are the office.

At the office, companies should have internal wireless networks available for salespeople to connect and synchronize. At that moment all the phone calls could be made using VoIP instead of the telephony, saving many costs.

VoIP will increase its benefits even more when internet providers come up with always-on wireless broadband services. This would drive VoIP into mass adherence, not only inside the company's network, but everywhere.

3.3.3.4 Video Conference

Of all the communication channels included in this module, Video Conference will probably be the latest to be integrated into mobile applications. It does not only require advanced devices but it also requires better wireless broadband than the other IP-based communication channels.

Even though it may take some time to be available to mobile SFA applications, it should be integrated as soon as it is available. It is the closest form of communication to person-to-person talk, since it provides voice and video, and it also seems to shorten the distance between the intervenient. It would then be a very efficient way of communicating with colleagues and customers, and its costs will become cheaper and cheaper.

3.3.3.5 Whiteboard

Whiteboarding is another form of real-time communication, but instead of using text it uses drawings. Two or more users could connect to the internet and start a whiteboard session.

Whiteboarding can be very helpful at explaining processes. By using the handheld device's touchscreen, users should be able to start drawing and its draws would be seen by every user connected to the session. Another important feature would be to converge VoIP and Whiteboarding, allowing users to talk among themselves while drawing, to increase perception.

3.3.3.6 Unified Inbox

As we have previously referred, Unified Inbox is a very important emerging concept, which we have decided to bring into mobile SFA applications. Still, the project's limited amount of time did not allow us to fully design it. Nevertheless, we have been able to identify its main characteristics and expected performance improvements.

A Unified Inbox should be every communication channel's inbox. First of all it should store and manage every email, message, instant message record, and voice mail. Then, it should also be capable of organizing all that mail by sender, by Content or by any other useful criteria. It would greatly decrease the time salespeople spend managing mail, and therefore it would improve their efficiency.

3.3.4 Services Module

Our study on mobile technologies had a particular focus on emerging technologies and services. We have concluded that there is a huge potential in adding new features to the existing mobile SFA applications, and a few we have identified are related to Location-based Services and Mobile Banking Payments.

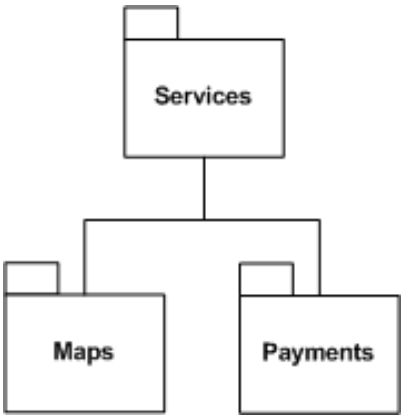

Figure 3.5: Diagram of Servies

Due to limited time we have focused our efforts on location-based services, represented by the Maps service. Still, mobile trends let us expect many new services such as mobile payments, and all those services should be integrated in this module. Services ultimately represent any tool capable of provide additional productivity enhancements.

3.3.4.1 Location

This feature was one our best mobile SFA application achievements and therefore it will have increased focus. Its main goal is to increase salespeople's performance by providing useful information and tools obtained through location-based services.

The Location module should provide three types of services: user location, team location and address location.

- Locate Contact

The user location service should allow a salesperson to locate a colleague by displaying its location on a map. Map display options should also be available to users. They should be able to zoom in and out the located user and they should also be able to navigate the map. Reverse-geocoding services should also allow the application to display the address of the location the user is at. This would provide a better reference to the user's location.

This service would greatly improve the process of arranging meetings between users. It should allow users to trace routes to colleagues and provide estimated times of arrival.

We have all experienced the feeling of a friend or colleague being late to a meeting. At a certain time we had to call him to know where he was, how much time he would take to arrive. With this service, for a price cheaper than a phone call, users should be able to know where a contact is and how much he will approximately take to arrive.

- Locate Team

This service can also be very useful to sales managers. It should allow them to know the real-time location of their teams of sales representatives, giving them a wider understanding and control over their teams, and therefore increasing their ability to take actions.

All team members' location should be presented in a map, represented by markers, and it should be possible to easily understand which user each marker represents, as well as easily interact with it by centering the map on its position or zooming in and out.

- Locate Address

Another service that should be made available is the ability to locate and represent an address in a map. This service should use geocoding to get the address's coordinates and then present it on the map.

Since customer's addresses are available in their Content data, this service should also be able to automatically locate a customer address on the map.

This would allow managers to know the proximity of his team of representatives to a certain customer and which sales representatives could get there faster. The service should allow the display of salespeople's by range or number. For example, a manager could "ask" the service to locate the closest five users to a customer's location, or all the users in a range of 5 kilometers to the customer's location.

This service would not only increase efficiency by increasing time of response and the quality of the sales strategy, but it would also lower the costs of communication. Instead of having to call every sales representative, possibly interrupting them, managers can save costs and still have access to real-time data.

Since sales managers also spend a lot of time at the office this service could also be integrated in a desktop SFA application, providing them an even more holistic view of their teams, and access to even more advanced features.

3.3.5 Reports Module

Reports provide sales people with very important information on its businesses and business possibilities. This information is mostly used to evaluate business strategies but it is also used to evaluate Sales Force performance. Reports usually display information in text, tables and graphics.

Even though reports are very useful, it is not viable to provide all the kind of reports usually available to desktop SFA applications. Mobile reports should only provide a small subset of those reports, those potentially useful to sales people out of the office.

We have identified two main categories of reports: reports of past businesses and reports of potential businesses. The first ones are mainly focused on Accounts and Sales, while the second ones are mainly focused on Leads and Opportunities.

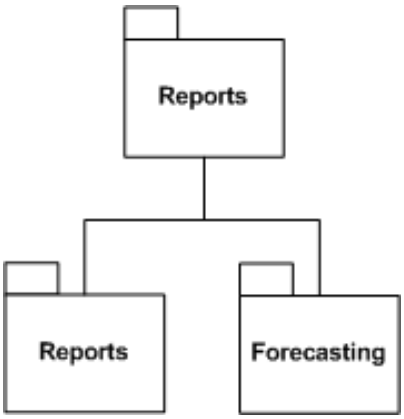

Figure 3.6: Diagram of Reports

3.3.5.1 Reports

Reports are used to handle business information and provide statistics. Reports should be capable of pointing out neglected accounts, most successful sales, and many other indicators. They are important to salespeople because they allow them to understand the consequences of their actions so they can increase their sales.

3.3.5.2 Forecasting

On the other hand, Forecasting is used to provide statistics of businesses in course. It should provide information about opportunities, orders in course and leads. Salespeople should be capable of estimating the value of current businesses, their commissions and other productivity indicators. They are important to salespeople because they allow them to understand how far they are from their goals so they can maximize their efforts.

3.3.6 Settings Module

Every system needs to provide settings to improve usability adjustments, user preferences and system configurations. All those settings should be grouped into this module.

Defining which settings are made available to users is a very hard task. First of all it is not always obvious which features an application is missing, and secondly custom configurations may bring undesirable complexity. Therefore we recommend any developers to keep configuration an open issue during all the application development.

Still, we have identified at least four types of settings that should be standard in any mobile SFA application: User, Activity, Update and Location Settings. The first one represents both user's personal info and preferences; the second is related to task and event reminders; the third one is used to set the Location service's settings; and the fourth one allows users to set its update preferences.

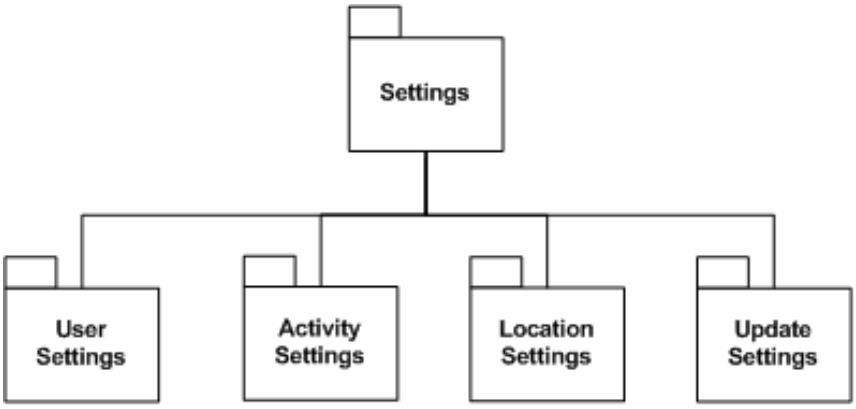

Figure 3.7: Diagram of Settings

Unlike the previous modules, the Settings module should be by itself an interface for the different settings types. While other modules include different features, this module includes only one feature, settings, which have been grouped into different sets for faster access and better comprehension.

Every system needs to provide settings to improve usability adjustments, user preferences and system configurations. All those settings should be grouped into this module.

Defining which settings are made available to users is a very hard task. First of all it is not always obvious which features an application is missing, and secondly custom configurations may bring undesirable complexity. Therefore we recommend any developers to keep configuration an open issue during all the application development.

3.3.6.1 User Settings

User Settings should have two purposes: keep the user's personal information and its preferences.

User's personal information should first of all identify it on the system. Each Content managed by a user should have its reference, allowing other users to easily understand who is managing what. Those references (name, alias, employee number) and user additional information are set in User Settings. It should also include all user contacts to allow other users to be able to communicate with it. In addition, personal information should also deal with login data such as username and password.

User preferences should allow users to set at least the following data: culture preferences and reminders preferences. Culture preferences include system language and time zone. Users should be able to set different display languages, and by setting their current time zone they will ensure that data is kept consistently among different countries.

3.3.6.2 Activity Settings

Activity Settings purpose is to remind salespeople of their tasks and events. Each user should be able to turn on and off activity alarms and to set alarm preferences such as sound volume and tune, or silence mode.

It should also allow specific settings for tasks and events. Task settings should include how much time a user wants a reminder to warn him before a task's due date. Event settings should include the specific date and time which a user wants to be warned about an upcoming event.

3.3.6.3 Location Settings

Location Settings should be an extension of some of the settings provided by the Location service. Instead of a user having to run the Location service just to change his settings, he could simply access them at the Location Settings.

This is where users set if they want other users to be able to locate them or not. They should also be able to set rules to automatically do it. It should, for example, be possible to set location-tracking service on during weekdays from 10h to 19h, and tell the system to automatically turn it off at any other time.

3.3.6.4 Update Settings

Update Settings are related to system's data synchronization between the local and remote databases. We have also seen that this synchronization can be done by connecting through a wireless network or to a desktop. Since there are different costs associated with the different ways of data synchronization it is important to let users set their preferences.

It should include the ability to set automatic updates on and off at log in or logout, to set automatic updates when using desktop synchronization, or using reminders to warn users when data update hasn't been done for a specific amount of time.

Chapter 4

Mobile Sales Force Automation Development

In this section we will describe the development details of our mobile Sales Force Automation application.

4.1 Technological

There are two main considerations about the technical development of this project. First of all we did not intend to develop a full Sales Force Automation system with functional desktop and mobile terminals. The focus was on the mobile application, which means we theoretically had no development constraints or restrictions. That is, we did not have any desktop application preventing the development of any architecture or tools. Therefore this represented a great opportunity to explore the newest concepts and technologies. Secondly, there was another advantage in using recent technologies. Besides the fact that they allow, in potential, the development of more advanced tools, there are less people using them, which means that the end product will be more likely to get attention from the market.

Therefore we concluded that we were going to develop an application to run on Windows Mobile 6 Professional. We developed our application using .Net Compact Framework APIs and we used Microsoft's SQL Server Compact Edition to support our local database. ADO.Net APIs were also used to handle data access. Our central database was, on the other hand, supported by Microsoft's SQL Server 2005 and accessed through Web Services developed using Visual Studio 2008. We used Active Sync 4.5 to synchronize the mobile device and test our application, and finally, we have decided that Pocket PCs would be our targeted devices.

4.2 Database

This section will describe the design of the remote and local databases developed for the Mobile Sales Force Automation application.

As described in Chapter 2, a mobile SFA application is a simple extension of a company's information system to mobile terminals. Handheld devices limited processing capabilities state that the local database should only contain the necessary subset of the central database tables. Since we didn't have any SFA system already implemented and our time was limited, we used the same database design for the remote and local databases. Therefore, our main thoughts were focused on general indispensable classes and a database design that would allow our previously designed workflow and collaboration processes.

We will now take a quick look at the designed database available in Appendix B. In Appendix A can be found some domain variables that will only take fixed values.

- User

User represents all the MSFA system users, or salespeople. User should support the users personal and business information, including identification, contacts, business role, and login. All this data can be editable at User Personal Settings.

Login It is important to keep a record of all users logins and this is kept at this table. That way, sales managers can see if their sales representatives are using the MSFA system and how frequently they are using it.

User/Manager User/Manager allows users to set their sales manager / sales representative relationships. It also allows the system to understand content access permissions. Sales representatives only have access to their contents but sales managers also have access to all the sales representatives they are managing. By establishing these relationships the system can identify who has access to which contents.

Setup This table is responsible for saving the users preferences. We have previously identified culture settings, activity settings and update settings but many more can be added to this table or similar tables.

- View

View represents all the Content Views a user can have. As we have previously discussed a view allows users to set which contents they want to sort, and which content fields they want to be displayed. The following tables, together, will constitute a user's Content View.

Column This table represents the many content data fields. ContentTypes can be Accounts, Leads, Sales, etc. ContentIndex allows the system to identify the order of each content field. For example, the field ”Account Owner” has the Type ”Account” and Index ”1”.

View/Column This table represents which columns (data fields) are going to be displayed in a Content View, and the order of display of those columns. For example, the View ”Portuguese Accounts” can have columns ”Account Name” as first column and ”Industry Type” as second column.

Filter This table represents which contents are going to be sorted. For example, the View ”Portuguese Accounts” should have the Column ”Country”, Operator ”Equals”, Value ”Portugal”.

- Activity

Activity supports all the common data fields of Tasks and Activities. It includes the description of the activity, its due date, and information about the account or lead the activity is related to.

Task Tasks represent the simplest activities, therefore we have only identified additional information about its priority and status.

Event Events on the other hand represent meetings, therefore we have also identified additional information about its duration, location and contacts.

- Content

The table Content is common to all contents. It stores information about content creation and edition, including dates and users. All content-related information including accounts, leads, sales and opportunities can then be presented in reports and forecasting.

User/Content As we have previously described, contents can be managed by different people. This table identifies which users are responsible for which contents and which roles each user has in each content.

- Account

An account represents a customer, therefore it contains customer data, but it represents a company, not a person. Its information includes company name, company contacts and additional information such as industry, type, annual revenue or employees.

- Lead

Leads are very similar to accounts but instead they represent prospects. Likewise it includes company information, but in addition it also includes information about the lead, such as lead status, rating or source.

- Contact

This table stores all Contacts communication channels. It includes several telephone and mobile numbers, emails, addresses, assistant phones, etc. To provide a better understanding of who each contact is, information about each contact role is also stored. In addition, all contents can have associated contacts. For example, ”Mr. John Doe” which is a ”Sales Manager” at ”Company X” can be associated with an ”Order Y”.

PhoneCall and Email The Account History feature previously described in section 3, was supposed to keep a record of all communications established between a salesperson and a customer. These tables are used precisely to keep record of those communications. By associating a phone call or email, with an account/lead/sale/opportunity, and a contact, when a user checks its account/lead history he will get information about that account/lead phone calls or emails. For example, at 20/08/08, user ”X” phoned contact ”Y” about account ”Z”, and they talked about ”Arranging a meeting”.

- Opportunity

Opportunities are related to possible businesses. Therefore this table stores information about the account to which the opportunity is related and additional opportunity details such as the duration of the opportunity, current stage, probability and next step.

Opportunity/PricebookProduct An opportunity is also related to a certain product or service. This table states exactly which products are being associated with the opportunity. Since products are stored in price books (as we will describe next) and the same product can be in different price books, it is important to state which products in which price books are associated with an opportunity.

- Sale

Sales represent business orders. Like opportunities, this table stores information about the account to which the order is related. Additional data fields should be defined depending a company’s order procedure, however we have included the total price of the order and a description, which allows users to add custom notes.

Sale/PricebookProduct Again, like opportunities, products or services are associated with an order. This table states which products from a certain price book were ordered. In addition, associated with each product is an amount, a discount and a delivery date. For example, Sale ”X” can include ”5” Products ”Y” from PriceBook ”K”, with a discount of ”10%” to be delivered by ”20/08/08”.

- Product

Products data fields can also vary from company to company. Still, product name, product code, standard price and product description should be available in every product.

ComposedProduct/SimpleProduct Products can be simple products or composed products. For example, a motherboard is a simple product, but a computer is a product composed of many simple products. In case a motherboard needs replacement, a user can search the computer and see which was its default motherboard.

AccessoryOfProduct Simple products can also be accessories of products. This allows a user to quickly show its customers which accessories each product has available.

- Price book

Price books are used to group products and they should include a name that clearly identifies which products they provide, and a description.

Pricebook/Product Although price books can be used to group products by type, they are mainly used to gather products by price. Therefore this table states which products belong to which price books, and which price each product has in each price book.

4.3 Developed Features

We will now present the features we have developed in our Mobile Sales Force Automation application. We will start by generally describe the developed features but we will also analyze small details and implementation options.

Figure 4.1 shows the main menu of application. We can see that our features are grouped in tabs of similar context: Contents, Agenda, Communications, Services and Settings. We have used this approach to the majority of our interfaces because it provides a clear and appealing description of the available tools. We have also used the exact structure of features described previously in chapter 3 even though our limited development time only allowed us to implement a few. They will be now described.

Figure 4.1: MSFA Screenshot - Main Menu

4.3.1 Contents Module

Because all contents such as Accounts, Leads and Opportunities are very similar, we have decided to focus on a single content type and try to maximize its usability, displayed data and creation process. Accounts are the most important and complex content type, so we have chosen it to test our concepts.

Products are also a very important content type because salespeople need to be able to quickly consult them or show them to customers. In addition, products are very distinct from other contents; they would require a different approach. Therefore, we have also tried to test a few concepts on products and price books.

In this module we will also describe how we developed concepts such as Account History, Content Views and the Fast Input.

4.3.1.1 Accounts

All Contents have very similar structures, they only contain data fields, and those data fields are grouped by context. Figure 4.2 shows an account creation form, and all other content creation forms should be similar to this.

A few mobile SFA applications that we were able to test have chosen to display information in a single panel instead of grouping data fields in tabs. Since contents have many data fields, those applications had to integrate side bars to allow users to scroll up and down. We have chosen to take a different approach, we used tabs, and we are quite happy with the result because this design increases both perception and usability.

Let's take a closer look at content creation. A user should navigate from tab to tab and fill the different data fields. Then, it should only have to press Save or Cancel at the Menu, and the information would be stored locally. It is a very simple concept. But saved contents can also be edited, and in that case all the previously saved information should already be filled in.

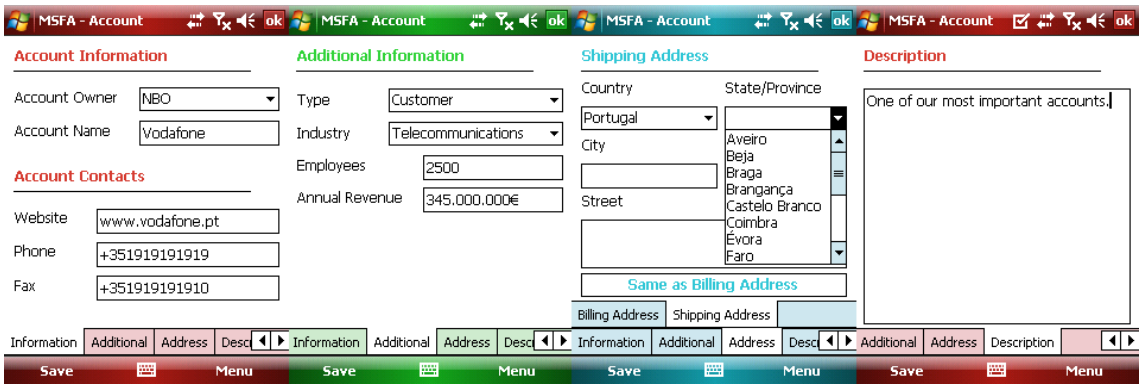

Figure 4.2: MSFA Screenshot - Create/Edit Account

- Fast Input

This concept was designed to reduce the amount of routine information a user has to fill in handheld device. We have currently used it to ease address input but it can be used in many other data input fields.

Let's take a look into the third screen of Figure 4.2. Address information is a very common data input field in Sales Force. Accounts have addresses, Users have addresses, Leads have Addresses, Deliveries have addresses, and many other features require address input.

We came up with the idea of creating a XML file capable of storing country's estates, provinces and major cities. That information would then be presented in combo boxes, and users would only have to select the country, estate and city items from the combo box instead of having to write them manually. Its flexible structure allows users to expand the available countries without having to change a single line of code. They would only have to request a XML update for a certain country, and it would automatically be recognized by the MSFA application. Currently, Portuguese and Spanish provinces and cities are stored in the XMLfile.

But there is also another smaller improvement that we have provided to users. Accounts have two different address fields: billing address and shipping address. Most of the times these addresses are the same, but they still have to be set to allow process automation. To prevent users to set two addresses that may be the same, we came up with a clone button that automatically clones the first input address.

4.3.1.2 Content Views

As we have previously discussed, Content Views represent a concept brought from desktop applications to mobile applications. Users can create many different views for each content type, depending on the information they want to be displayed. The first screen

presented in Figure 4.3, shows how contents are displayed to users. They are displayed in customizable tables. The three remaining screens in Figure 4.3 show how those tables (views) are created.

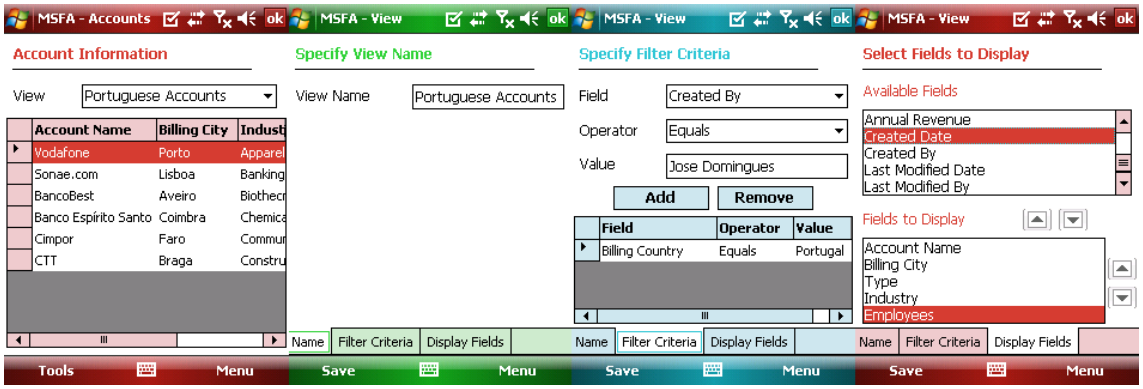

Figure 4.3: MSFA Screenshot - Create Content View

A view is identified by its name, and it should be a suggestive name. In this example the view is named ”Portuguese Accounts” because we only want to display Portuguese accounts created by ”Jose Domingues”.

The second step is to choose the filter criteria. Filter criteria defines which contents are going to be displayed. In this example we can see that two criterions have been set: ”Billing Country Equals Portugal” and ”Created By Equals Jose Domingues”. These criterions will ensure that only Portuguese accounts created by Jose Domingues will be displayed.

The third step is to set which data fields we want our accounts to have displayed. In this example we have selected ”Account Name”, ”Billing City”, ”Type”, ”Industry” and ”Number of Employees”. We can now understand what information is being presented in the first screen on Figure 4.3: Data fields account name, billing city, type, industry and number of employees of all the Portuguese accounts created by Jose Domingues.

4.3.1.3 Account History

Account History is one of the concepts we have also redesigned taking into account the communication capabilities of handheld devices. Its interface is displayed in Figure 4.4

Every action related to a certain account is stored by the MSFA. It includes account creation, account editing, conversations with customers, sent documents, sales and many other actions. All these records are available to users in the Account History.

Records can also be sort by type or date. It is possible to display records of actions occurred only during the last week, month or year, and it is also possible to display, i.e., only records of old orders.

Figure 4.4: MSFA Screenshot - Account History

Records have image thumbnails, subject and date. While thumbnails provide users an unmistakable reference to the type of action, the subject and date allow users to get a glance of what that action was about. In addition, when an item is selected, users are linked into the related record if it's still stored in the local database. For example, if a user selects a task, and the task is still stored, he will be linked to that task's information.

4.3.1.4 Price books and Products

We have previously discussed our concerns in terms of product management. We wanted to be able to support as many products as possible, to organize products by categories, to get real-time information on products, and to provide a good user interface. Figure 4.5 and Figure 4.6 describe how we tried to achieve that.

Figure 4.5: MSFA Screenshot - Price book, List of Products, Accessories and Stock

In Figure's 4.5 first and second screens we can see how price books were developed. Price books have two fields: name and target customers. In this example the available price books are targeted for regular clients, old clients and mass buyers. After selecting a

price book, a list of product categories is made available to the user. This is an efficient way of sorting products because it saves time.

After selecting a product category a list of those products is displayed, by name, or by price, and there is also an available search field. When a product is selected it is possible to add a product to an order, to see the product's details and to see the product's accessories. Product accessories are listed at the last screen of Figure 4.5.

Figure 4.6: MSFA Screenshot - Product Details and Product Images

First screen in Figure 4.6 shows the product's details screen. From that screen it is possible to have access to additional product images, product accessories, to real-time stock information, and to a detailed table of product characteristic. In Figure 4.6 we can also see some of those features.

- Product Thumbnails

We have decided to introduce thumbnails in many of our data list. Handheld devices have small screens and when listing items it becomes very hard to differentiate them. Since thumbnails provide a unique perception we wanted to try them. Each thumbnail requires a small amount of memory and they can be stored in portable memory cards. We expected thumbnails to slow down the application but they turned to be a good surprise because we aren't feeling any delays. Still, we are considering displaying thumbnails in real-time instead of loading them at the beginning. But it's certain that thumbnails have been a good choice.

4.3.2 Agenda Module

Agenda is probably the module with higher potential of seeing its efficiency increased through optimization. Contents and activities have long been managed but again, handheld devices' limited screens make it harder to manage. We identified two possible ways of doing this: integrating them with Pocket Outlook or designing them from scratch. In

this case we have chosen to develop it from scratch, but we are also trying to integrate it with Pocket Outlook.

4.3.2.1 Contacts

Our contact management is separately managing colleague contacts and customers' contacts. In both cases it is possible to sort contacts by name or account, and we have also introduced a salutation field (Mr., Prof., Dr.). In addition, whenever a contact is selected, is presented its department and role. As we can see in Figure 4.7, Antonio Sousa belongs to Vodafone and he is a "Team Manager" at the "Public Relations" department.

Figure 4.7: MSFA Screenshot - Contacts

While Figure's 4.7 first screen shows contacts being displayed by name, its last screen shows contacts being displayed by company. When displaying contacts by company it is also specified (through the thumbnail) if the company belongs to a Lead or an Account. This display provides a better view of customers and it was a major achievement, but it has more.

- Fast Dial

As we have previously discusses in chapter 3, this feature was designed to make it easier to establish communications with a contacts. When selecting (and pressing) a contact, a context menu shows up a displays the available contact channels. In Figure's 4.7 second screen we can see that we can establish communications with the contact using its mobile number, office, home, other and its assistant's number. The context menu where a contact's numbers are presented is generated dynamically, which means that it will only show and provide direct link to the available communication channels.

In addition, SMS and email are integrated with the device's Pocket Outlook. This integration in described in section 4.3.3.1.

4.3.2.2 Activities

Like Contacts, Activities could have been integrated with Pocket Outlook or designed from scratch. Again, we have chosen to design it from scratch. On the other hand we aren't as satisfied with the final result as we are with contact management; therefore we are also trying to integrate it with Pocket Outlook, and we will present both solutions.

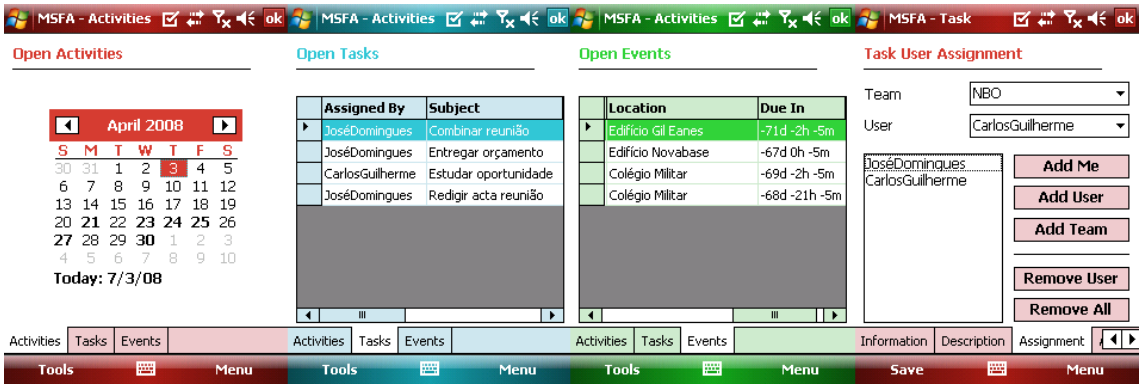

Figure 4.8: MSFA Screenshot - Activities

Our custom design, showed in Figure 4.8, presents three tabs of contents. A calendar (with bolded due dates), a table of tasks and a table of events. As we have previously seen in database design tasks and events have very similar data, and therefore they are presented in similar tables. Its main fields are "Assigned by", "Subject" and "Due In"; in addition, tasks have a "Status" and "Priority" fields and Events have a "Location" field. It is also possible to sort and filter activities by due date and by status. Finally, we have also implemented remote activity delegation, which allows managers to create and delegate messages to its teams.

The reason why we were not very happy with the result was because we found it hard to configure activity reminders. By integrating activities with Pocket Outlook, we gain not only already implemented reminders, but we also expect to get improved performance. In addition, we also think that increased application integration with Windows Mobile and Pocket Outlook would increase user adoption to activity management.

4.3.3 Communications Module

Since designing a Unified Inbox, previously discussed in chapter 3, would require an amount of time that we did not have, our main concerns related to communications focused on SMS and Email integration with Pocket Outlook. Pocket Outlook provides a quite satisfactory management and it also allows users to have more than a single email account.

4.3.3.1 Email and SMS

This was a very easy and interesting integration to do. It allows users to search contacts in our designed Contact module and easily redirect them to an already open (with already filled recipient) email or SMS form.

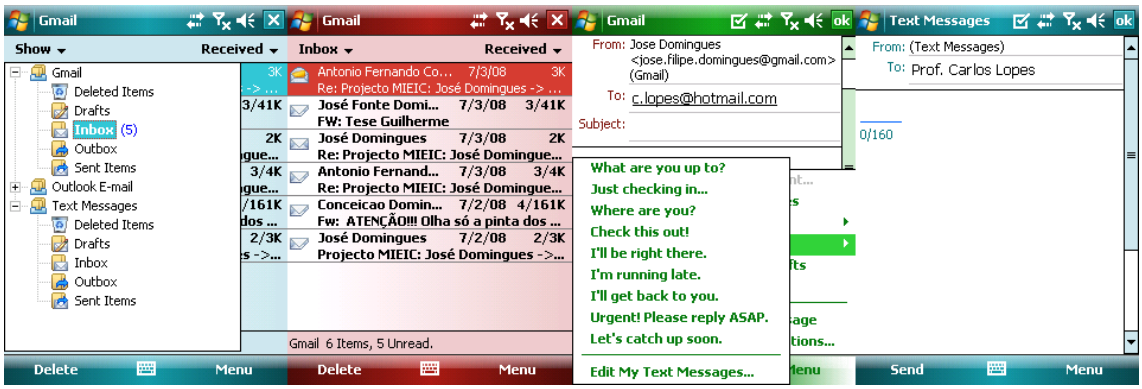

Figure 4.9: MSFA Screenshot - Outlook Email and SMS Integration

Figure 4.9 shows, in sequence, how messages are managed in inboxes and lists, how SMS and email forms look like, and how it is possible for a user to select a message template. There isn't much to add to this integration. All the hard work is being done by Pocket Outlook and all this user interface was provided by it. It reminds us that sometimes the better solution is the one that is already available.

4.3.4 Services Module

This was the module we invested most time with. When we saw the potential of location-based services we quickly understood that this is where we had to put our efforts.

4.3.4.1 Location

- Architecture

This service is the result of converging Pocket Outlook, GPS and Google Static Maps, and it is available for desktop and mobile terminals. Figure 4.10 describes how it works.

When a user wants to locate a colleague, the first step of the process is to send an SMS request to that colleague's device. If users are using the desktop application to locate the colleague the SMS is sent through a SMS gateway.

When the SMS arrives, the receiver's Pocket Outlook automatically detects the location request, and starts processing it. This process is transparent to the user. He doesn't realize that he just received a location request; it is all handled by the Pocket Outlook. When Pocket Outlook indentifies the request, it "wakes up" MSFA. MSFA will request

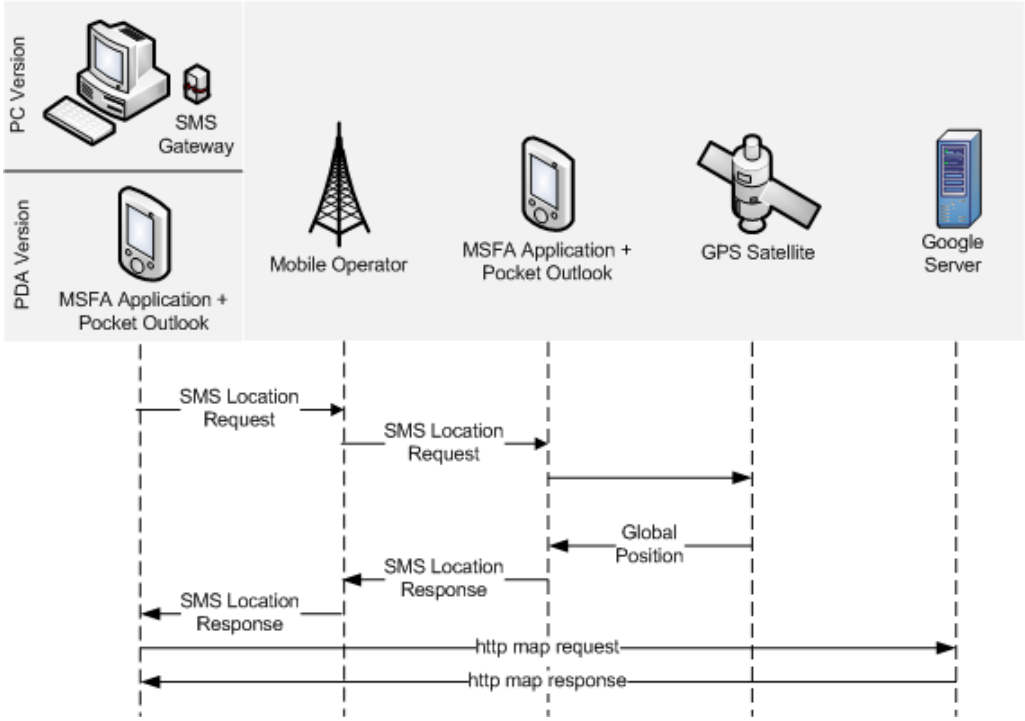

Figure 4.10: Sequence Diagram of the Location Service

for global position using Windows Mobile API which is capable of controlling the device's internal GPS. When the global position is returned, MSFA builds the response SMS and "tells" Pocket Outlook to send it back.

The user who asked for the colleague's location now has its global positioning, but it still needs to display it in a map. Connecting to the internet, the MSFA application sends an http map request to the Google servers, and Google servers answer by sending back an image of the map. This map is then presented to the user.

- Services

In chapter 3, we identified three major location services: user location service, team location service, and address location service. We will start by describing how we developed the first.

The user location service allows a user to display a colleague's position on a map. A user is able to go to its contacts list, select a colleague, and prompt the service to display its position. The second screen presented in Figure 4.11, presents an example of a located contact displayed in the map. Since Google Maps API provides 20 levels of zoom, we have designed a menu where the user can select a zoom level without knowing its number, but it is also possible to zoom in and out one level at a time.

The last two screens presented in Figure 4.11 show how the team location service's information is displayed. A user should be able to see all his colleagues displayed in a

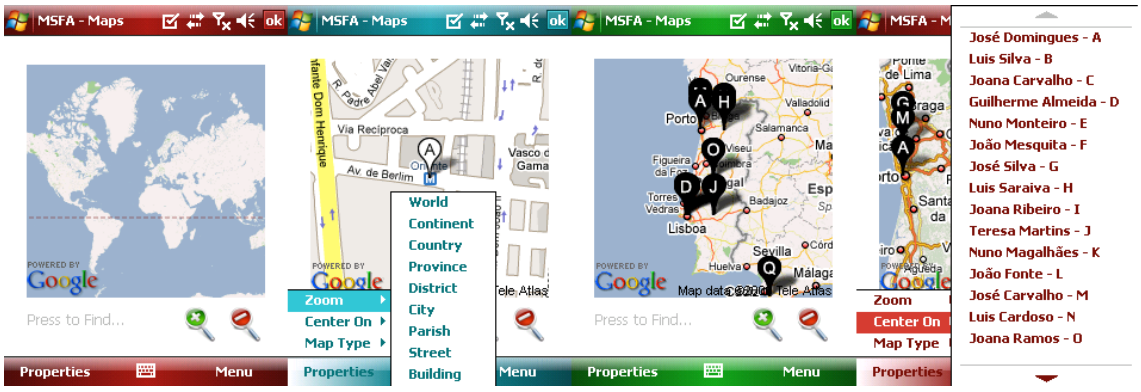

Figure 4.11: MSFA Screenshot - Locate User and Locate Team

map and represented by a marker and a letter. To have a better idea of which person is represented by each marker, we provide a menu where all the users are associated with its markers. Finally, it is also possible to center the map on each user by simply selecting its name.

Figure 4.12 presents the last location service, the address location service. Using a Geocoding service provided by Google or Yahoo, it is possible to insert an address and get its global position. That position is then presented in the map. This can also be used to locate a customer's address. Then, the user can prompt the service to display the closest users to that location, and their distance.

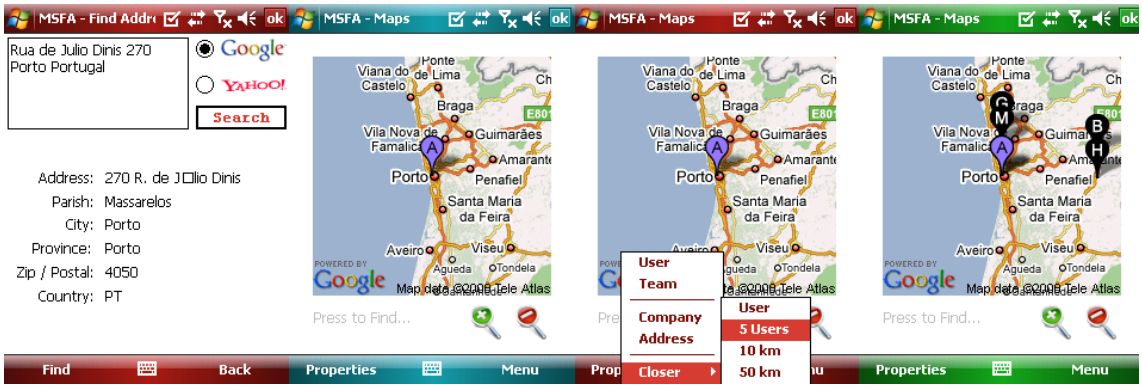

Figure 4.12: MSFA Screenshot - Locate Address and Find Closer

We are very happy with the achieved results. From the moment the service gets the response with the position of a person, the map display is done so fast, that it's hard to believe that the images are being sent in real-time from a server. In addition, we are pleased with its usability. We have been able to make it do exactly what it needs to do, display exactly what it needs to display, and still have an appellative interface.

- Desktop Location Service Application

Our interest in location services did not end with the previously described solution. We have also tried to develop a small application in Flex using the Google Maps Flash API. We wanted to achieve an integrated location service for mobile and desktop applications so both sales managers at the office or in the field could manage their teams. Figure 4.13 provides a screenshot of the developed desktop application.

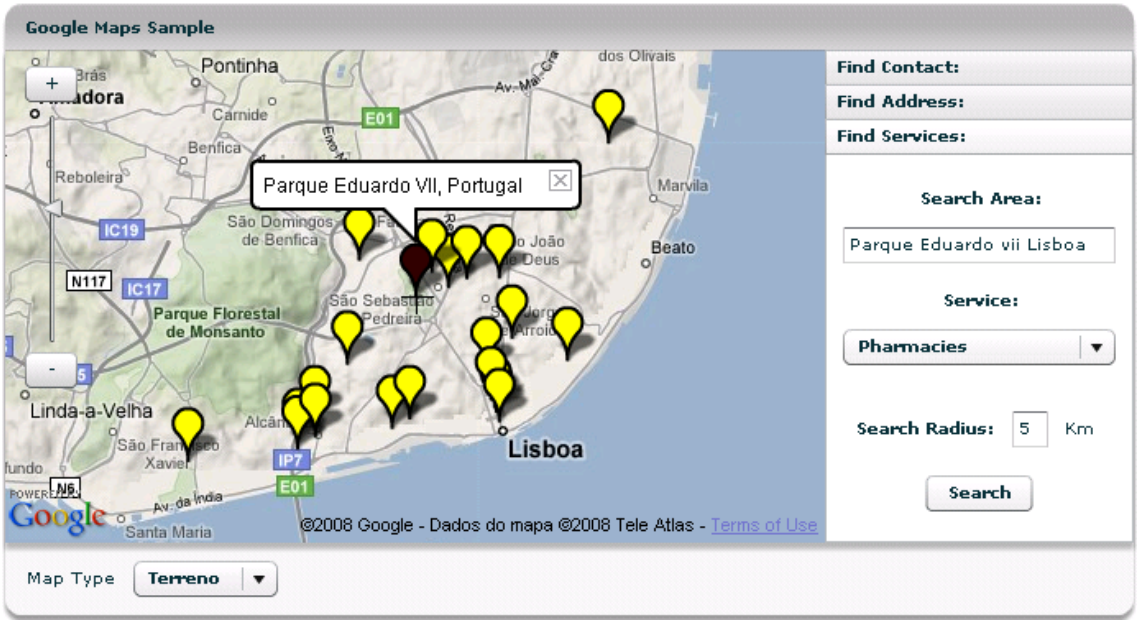

Figure 4.13: Desktop Location Service Screenshot - Find in Range

The main advantage of the desktop application is that instead of using the Google Static Maps API it uses the Google Flash API, which is more complete, even though it is about two months old. We have tried to develop the same services available in the mobile application but we tried to improve user interface and available tools.

Chapter 5

Conclusions and Future Work

A Mobile Sales Force Automation application (MSFA) is part of a wider information system usually owned by sales organizations, the Sales Force Automation system (SFA). These systems include desktop and mobile applications capable of sharing data by synchronizing with the company's network.

Our study allowed us to conclude that MSFAs should be targeted for field sales representatives and sales managers because their work activities are the most probable of improving its efficiency and effectiveness through mobile applications. In addition, we also concluded that this system should be capable of representing the sales company's structure, and therefore, should allow content sharing between salespeople and its managers.

MSFA purpose is to record all the stages of the sales process and help salespeople increase their productivity. We have identified the following groups of features that a Mobile Sales Force Automation application should provide: Content management, Agenda, Communication channels, Services, Reporting and Settings. We have looked closely into each of these concepts and we came up with the following conclusions.

Content features should manage customer information, product information and business information; they should include Account management, Lead management, Opportunity management, Product management and Sales/Order management. On the other hand, Agenda features should manage the information salespeople need to serve customers, including Contact management and Activities management.

Report features should include Reporting and Forecasting. All the previously described information handled by Contents and Agenda should be analyzed closely by salespeople, and that's exactly what reports should do.

Communication and Service features in MFSA systems have been our major contribute to this project, and are the result of converging Unified Communications and

Location-based Services into mobile applications. While Communication features should be capable of handling all the application's communication channels and providing a unified inbox for all kinds of mail, Service features should include any additional features to improve salespeople's performance.

In this report we have not only described which features we think that a MSFA application should comprise and which improvements each feature should bring to sales forces, but we have also described how we developed our own Mobile Sales Force Automation application.

Our application's developed features include Account management, Product management, Contacts management, Activities management, Email and SMS integration with Pocket Outlook, a Location-based Service, and User Settings. We also introduced a few new concepts such as Account History, Content Views, Easy contact Dial and Dynamic Interface Display, and finally, we focused our efforts in developing a consistently integrated mobile and desktop Location-based Service.

5.1 Conclusions

We wanted to be able to improve Sales Force performance through mobile applications and this project allowed us to identify all the major Sales Force Automation concepts, features and solutions capable of doing it.

Our suggested MSFA approach was designed taking into account efficiency and effectiveness improvements. We expected that already existing features would help sales representatives on the field improve its productivity, and out study confirmed it, but we did not expect to introduce so many successful concepts.

Content Views revealed to be a very efficient method of displaying information because they allowed users to save time. They are very easy to create, are completely customizable and have showed good processing performance.

We are also pleased with the Account History feature. It demonstrated to be able to recreate a panoply of customer-related activities and communications. Although we were not able to get a direct performance improvement we believe that it would increase salespeople's productivity.

Our Product management feature was also an achievement. It provides an efficient way of organizing products by prices and categories, and an appealing user experience. Product thumbnails and additional images have increased the user's perception of available products and allow them to present customers with appealing information and a fast link to accessories.

Our approach to Contact management also became one of our most successful achievements. The ability to sort contacts by name and company has proved to be very a very

efficient form of displaying contacts. In addition, our Easy to Dial concept has proved to be a very intuitive method of establishing conversations.

Another successful concept introduced to mobile applications was the Dynamic Language display, which allowed all the application's text fields to be loaded in different languages from a XML file. It proved to be even more efficient that we expected because it is capable of processing language faster than we expected and it is possible to insert new languages in a very simple way.

Finally, our Location-based service, which represents our best achievement. We are very pleased with this feature because it has a huge potential to integrate mobile applications. Our developed desktop and mobile applications allowed us to test our concept and they will for sure increase Sales Force performance.

5.2 Future Work

The goals for this project did not include the development of a fully operational Mobile Sales Force Automation, it was simply an analysis on many different mobile concepts. Therefore, it is not certain how this work will evolve.

On the other hand there are still many emerging concepts to analyze and evaluate to understand if they have the potential to integrate a mobile Sales Force Automation application or any other mobile application. Those concepts include Mobile Banking Services and Mobile Codebar Generators.

Regarding the developed features there are still a few issues that we would like to see improved. First of all we would like to see both Contacts and Activities integrated in Windows Mobile's Contacts and Calendar, we would go a little bit further and use Windows Mobile's native language. The idea would be to integrate Contacts and Activities into Windows Mobile's Pocket Outlook, and redesign Pocket Outlook to meet our processes. This would certainly have an outstanding result.

We are also looking forward to continue developing the mobile Location-based Service. Google Static Maps API is lacking of services and we would like to try developing a mobile web application using another Google Maps API, capable of setting routes to locations, or provide map navigation.

But there are still many other concepts and features we would like to see designed, improved of developed. The problem is that this project involves many subjects and it is very hard to say which should require our focus. We would suggest anyone interested in mobile information systems or applications to contribute to these findings depending on its goals.

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Appendix A

Mobile Sales Force Automation Variables

Some of the Mobile Sales Force Automation variables defined in Appendix B have fixed values. This appendix contains the values those variables can take.

Table Lead

- *Salutation*
  Mr.
  Ms.
  Mrs.
  Dr.
  Prof.
  Eng.
- *Lead Status*
  Contacted
  Open
  Qualified
  Unqualified
- Rating
  Hot
  Warm
  Cold
- *Lead Source*
  Advertisement
  Employee Referral
  External Referal

Partner
Public Relations
Seminar - Internal
Seminar - External
Trade Show
Web
Word of mouth
Other

- *Industry*

Agriculture
Apparel
Banking
Biothecnology
Chemicals
Communications
Construction
Consulting
Education
Electronics
Energy
Engineering
Entertainment
Environmental
Finance
Food Beverage
Government
Healthcare
Hospitality
Insurance
Machinery
Manufacturing
Media
Not For Profit
Recreation
Retail
Shipping

Technology
Telecommunications
Transportation
Utilities
Other

Table Account

- *Type*
  Analyst
  Competitor
  Customer
  Integrator
  Investor
  Partner
  Press
  Prospect
  Reseller
  Other

- *Industry*
  Agriculture
  Apparel
  Banking
  Biothecnology
  Chemicals
  Communications
  Construction
  Consulting
  Education
  Electronics
  Energy
  Engineering
  Entertainment
  Environmental
  Finance
  Food Beverage
  Government

Healthcare

Hospitality

Insurance

Machinery

Manufacturing

Media

Not For Profit

Recreation

Retail

Shipping

Technology

Telecommunications

Transportation

Utilities

Other

Table Opportunity

- *Type*

  Existing Business

  New Business

- *Stage*

  Prospecting

  Qualification

  Needs Analysis

  Value Proposition

  Identifying Decison Makers

  Perception Analysis

  Proposal/Price Quote

  Negociation/Review

  Closed Won

  Cosed Lost

Table View

- *Operator*

  Equals

  Not Equal To

  Starts With

  Contains

  Does Not Contain

  Less Than

  Greater Than

  Less or Equal

  Greater Than

  Greater or Equal

  Includes

  Excludes

Appendix B

Mobile Sales Force Automation Class Diagram

This appendix contains the Mobile Sales Force Automation class diagram described in Chapter 4

Filter
-Operator : string
-Value : string

Setup
-UserId : int
-RemindersActive : bool
-RemindersSound : bool
-RemindersEvents : string
-RemindersTasks : Date
-PasswordQuestion : string
-PasswordAnswer : string
-UpdatePreferences : string
-UpdateAutomatic : string
-UpdateReminders : string
-Timezone : string
-Language : string

View/Column
-Column Order : int

View
-View Name

Column
-ContentType : string
-Index : int

User/Content
-Role : string

Notes
-NoteId : int
-Text : string

Lead
-Company : string
-Company Phone : string
-Company Email : string
-Company Fax : string
-Company Website : string
-Industry : string
-Number Employees : int
-Annual Revenue : double
-Company Street : string
-Company City : string
-Company Province : string
-Company Postal Code : string
-Company Country : string
-Lead Status : string
-Lead Rating : string
-Lead Source : string
-Description : string

{Content Type: Account, Lead, Sale, Opportunity}

User
-UserId : int
-Username : string
-Password : string
-User Type : string
-Name : string
-Alias : string
-Email : string
-Title : string
-Company : string
-Department : string
-Division : string
-Role : string
-Mailing Street : string
-Mailing City : string
-Mailing StateProvince : string
-Mailing ZipPostalCode : string
-Mailing Country : string
-Active : bool
-Phone : long
-Mobile : long
-Employee Number : string
-Last Login : Date

User/Activity
-ReminderDateTime : Date

User/Manager

Contact
-Salutation : string
-First Name : string
-Last Name : string
-Department : string
-Role : string
-Phone : long
-Mobile : long
-Email : string
-Fax : long
-Home Phone : long
-Other Phone : long
-Assistant : string
-Assistant Phone : long
-Mailing Street : string
-Mailing City : string
-Mailing StateProvince : string
-Mailing ZipPostalCode : string
-Mailing Country : string
-Other Mailing Street : string
-Other Mailing City : string
-Other Mailing StateProvince : string
-Other ZipPostalCode : string
-Other Country : string
-Birthdate : Date
-Description : string

Content
-ContentId : int
-TeamId : int
-CreatedBy : int
-Created Date : Date
-Last Modified By : int
-Last Modified Date : Date
-Active : int

Activity
-ActivityId : int
-Assigned by : string
-Subject : string
-Related to Type : string
-Related to Name : string
-ActivityDateTime : Date
-Description : string
-ContactName : string
-ContactRole : string
-ContactPhone : string
-ContactEmail : string

Login
-LoginId : int
-LoginDate : Date
-SourceIP : string

Account
-Account Owner : string
-Account Name : string
-Phone : long
-Fax : long
-Website : string
-Type : int
-Industry : int
-Employees : int
-Annual Revenue : double
-Billing Street : string
-Billing City : string
-Billing StateProvince : string
-Billing ZipPostalCode : string
-Billing Country : string
-Shipping Street : string
-Shipping City : string
-Shipping StateProvince : string
-Shipping ZipPostalCode : string
-ShippingCountry : string
-Description : string

PhoneCall
-PhoneCallId : int
-PhoneCall Date : Date

Email

Task
-Status : string
-Priority : string

Event
-Duration : Date
-LocationName : string
-EventStreet : string
-EventCity : string
-EventStateProvince : string
-EventZipPostalCode : string
-EventCountry : string
-OtherContactName : string
-OtherContactRole : string
-OtherContactPhone : string

Category/Attribute

Product/Attribute
-Value : string

Attribute
-AttributeId : int
-Name : string
-Type : string

Store
-StoreId : int
-Store Street : string
-Store City : string
-Store StateProvince : string
-Store Country : string
-Store Phone : string
-Store Fax : string
-Store Email : string

Category
-CategoryId : int
-Name : string
-ParentId : int

Store/Product
-Stock : int

PriceBook
-PriceBook Name : string
-PriceBook Description : string
-Active : bool

Product
-ProductId : int
-Product Name : string
-Product Code : string
-Standard Price : double
-Product Description : string
-Active : bool

AccessoryOfProduct

Sale/PriceBookProduct
-Amount : int
-Discount : double
-Delivery Date : Date

ComposedProduct

SimpleProduct

Sale
-Total Price : double
-Sale Description : string

PriceBook/Product
-PriceBookProductId : int
-Price : double

ComposedProduct/SimpleProduct

Opportunity
-Opportunity Owner : string
-Opportunity Name : string
-Type : string
-Close Date : Date
-Stage : string
-Probability : int
-Next Step : string
-Opportunity Source : string
-Description : string

Opportunity/PriceBookProduct
-Amount : int