WebC-Contacts –
Collaborative Management of Contacts

Raul Mesquita
Instituto Superior Técnico
Universidade Técnica de Lisboa
raulmesquita@gmail.com

ABSTRACT
Everyone has contacts from other people in different systems, and many times, some of these contacts are repeated. Some contact management systems can integrate and import contacts from others systems. These systems cannot resolve some of the management problems of these contacts, and only a few can import contacts from social networks.

Users may wish to share their contacts with others, or create shareable lists of contacts. This is very common between family members and friends. Within companies where there is also a need to share lists of contacts with some company or team members.

Most of the contact management systems are not prepared to allow users to share their contacts with other users in the system, which makes these systems inappropriate for companies. These systems need to have different permissions for different users, so that these users can manage and use shared lists of contacts.

In this work we analyze some of the most used contact management systems. This study resulted in some features that allowed the WebC-Contacts application implementation, by extension of the WebC-Entities toolkit in the WebComfort platform. The intent of this application is to allow its users to create and share contacts groups, to allow collaboration between users in the management of these shared groups and to solve some of the limitations of the contacts management systems studied.

Author Keywords
Contact Management Systems; Social Networks; Contacts; Collaboration

1. INTRODUCTION
Nowadays almost everyone has contacts spread out in a number of systems. These systems can be email accounts, address books or social networks. In order to consult or edit a contact it is necessary to look for it in all the different systems. There is a need to join or merge all these contacts into a single system in order to facilitate the searching and/or editing process. Each contact may have lot of information associated with it. The information that users typically wish to keep are home phone numbers, job or cell phones, fax number, address and instant messenger contacts [1].

For many employers it is important that their employees stay in contact and have relationships within the organization. These activities are essential for a successful career and for the achievement of business objectives [2]. The success of many organizations depends to a great extent on a contact management well organized, where data are always available to be used. A contact management system improves relations between customers which in turn fosters business growth [3].

Sometimes in organizations there is a need to share contacts or create shared contacts lists only accessible to a selected group of team members or employees. Most of the available contacts management systems available do not have this feature.

In order to adapt a contacts management system to satisfy the needs of a specific company or companies, it must allow for different users to have different permissions to manage and use shared lists of contacts. Google Apps applications like Google Docs or Google Calendars are good examples of applications that allow the collaboration between users with different permissions [4].

Distributed companies have organizational problems in work management. Project teams and different departments have to work together virtually separated by time, space and culture distance [5]. As a result they are required to put their trust in applications that allow collaboration between many users. Nowadays, collaborative systems are becoming very common. These systems, as for example Wikis, blogs and social networks, which allow the creation of communities or changing data collaboratively [6].

Social Networks are becoming quite popular all over the world. Facebook and MySpace have reached 500 million users [7] [8]. Some of these users use social networks as a contacts management system. The use of these systems inside organizations is also increasing, particularly by new employees [7]. Social Networks provides employees better ways to establish relationships between them [2]. These systems make the discovery of new members with particular skills or work experiences that could be relevant for new projects easier.
Problem Identification

Most people have contacts spread out through different systems, and often these contacts are repeated. There is a need for a system that allows contact integration when they are imported from the maximum number of systems possible, with the purpose to join or merge all contacts into a single system. Importing Contacts from social networks is a feature that is not common in contact management systems in the market, but has become an important feature for many users, since many of these users have most of their contacts on social networks. Thus, the import of contacts from social networks should also be implemented [9] [10] [11].

Sometimes users want to share their contacts with other people, or create shared contacts lists in companies or with family and friends. It is necessary that the system to be used supports the collaboration between different users in the creation and management of shared contacts lists. The system should allow different roles with different permissions to edit contacts and manage the contacts lists [9] [10] [12]. We have not found any system with this features.

In this work we study some contact management systems and we try to solve some of the challenges experienced by users with contacts distributed through many systems including social networks. We try to find the means to allow users to share contacts with others. These studies will identify the requirements for the WebC-Contacts implementation in the WebComfort platform.

This paper is structured in six main sections. In Section 1 we describe the context and problems that we tried to resolve, as well as the structure of the paper. Section 2 presents related work that we consider relevant for this research. Section 3 presents the requirements of the WebC-Contacts application. Section 4 describes the implemented system’s architecture. Section 5 describes the WebC-Contacts evaluation process. Finally Section 6 presents the work’s conclusions, as well as future work to be developed.

2. RELATED WORK

People use contact management systems and social networks to manage their contacts. In this section we study some features of these systems as well as functionalities from collaboration systems to help users who have contacts in many systems and want to merge all their contacts into a single system or want to share their contacts with others.

Social Networks and other collaborative systems

Social Networks sites are becoming very popular. Facebook and MySpace reached 500 million users in August 2008. These two social Networks are amongst the ten most visited websites in the Internet [8]. In February 2009 Facebook had more than 150 million active users, was the biggest social network in the world and the biggest site for sharing photos in the Internet. Users use social networks sites to share and find contents and disseminate information. Some of these sites provide social links, like professional networks and contacts (LinkedIn, Facebook, MySpace) and others allow the sharing of contents (Flickr, Youtube) [13].

Most of the social networks allow their users to create or join groups. Some groups have restrictions to join or in the use, others do not [14].

Some social networks sites created development platforms that are open to the community. These platforms allow any programmer to make applications that use the social graphs as a base. These new applications increased even more the traffic of these websites. When Facebook invalid source specified, launched their applications development platform in May 2007, it suffered a growth of 30% in traffic [8]. In July 2008 there were 35000 applications created in these platform.

LinkedIn invalid source specified, is a social network that focuses on the professional information of their users, encouraging them to create an abbreviated curriculum and establish links to other users [15]. This social network is very useful for companies looking for new employees, for those looking for a job, consultants or vendors.

Nowadays, the use of collaborative systems is very common. These systems include Wikis, blogs and social networks, and provide the means to create communities or change data collaboratively [6]. There are many well known applications that allow collaboration of their users like Google Docs.

Some research over computer supported cooperative work (CSCW) revealed the importance of groupware in collaborative systems [6] [9]. This information allows members of the group to coordinate their work having in consideration what has already been done by the group, what is being done and what will be done in the future. Groupware allows the user to get common knowledge and with that decide his actions to achieve the objective of the group.

All these new collaborative technologies are turning modern work into a social process, but as a consequence, it’s becoming a challenge for workers to maintain the knowledge and manage all this connections [16].

Google Apps is a set of Google Web applications that consist of communication and productivity tools that enable collaboration between multiple users [4].

The Google Apps have tools that facilitate the import of data from other applications. Contacts, calendars, documents and sites can be easily imported. The calendar can be shared with individual users or groups from Google. There are four levels of
permissions for shared calendars with specific people. Each level includes the capabilities of the previous level. Some public calendars can be searched. A user can ask to see a calendar of another user; the latter must accept the request, making the calendar available in the calendar list of the user making the request.

The Calendar Application has the ability to synchronize your information with other calendar programs such as Microsoft Outlook. This requires that these programs be able to export your data to CSV. Likewise, the application can export your information to be used in other applications, or as a PDF document.

Google Docs or Google Documents is a suite of Google Apps, which includes a word processor, spreadsheets and presentations software. All documents are stored on Google servers and are available anywhere in the world with Internet access. Google Docs enables multiple users to collaborate on editing a document in real time. The strongest point of Google Docs is the ease of collaboration. It is possible that more than ten editors change the same document simultaneously. The owner of the document sets out the share permissions. Other users may be invited as collaborators or viewers. Collaborators can edit the document and invite other users. The document owner can set another user to take his place, delete the document or simply remove the document from the list of documents.

**Google Fusion Tables** is a management and integration information service that allows the collaboration of multiple users and multiple organizations [12]. This service allows its users to import data originating from spreadsheets, CSV and other formats bigger than 100MB. This system allows multiple ways to view information such as graphs, maps and timelines. The integration of data from various sources is supported by the joining of multiple tables that may belong to different users. Users can keep the information private, share it with a selected group of employees or make it public. Users can control with whom to share information. Although the original owners of the data may export it, they may restrict other users from doing the same. Fusion Tables allows users to easily share data with others, even if they are not in the same organization, and join data from multiple sources. A user can invite collaborators to only view a table, or so they can update it. You can also invite employees who can contribute with their own columns to a table, getting the different users write permissions in the columns that belong to them. In addition a user can decide to make a set of public data, which allows anyone to view and comment on these data.

**Contact Management Systems**

There are a lot of contacts management systems in the market with different features that allow users to manage their contacts.

**BatchBook** is a system that allows its users to follow their business, personal contacts, social network contacts and share them with the rest of the team [17]. It is possible to create new contacts or import them from other systems. Users can create personalized fields, to keep additional information that is important about their contacts.

**Google Contacts** [18] allows the user to import and export contacts from CSV files, print a page of contacts, edit details about contacts and organize contacts in groups [19]. This system has a tool that allows the union in a single contact of duplicated contacts. It is possible to unite all duplicated contacts in a single operation.

**Microsoft Outlook** is an email client application known and used by many users. This system has some features that make it an indispensable application for some users like task management, contact management, and calendar [20].

Most contacts management systems support the import and export of contacts from/to Microsoft Outlook.

**ZohoCRM** is a tool that allows companies to manage their relations with clients from all departments in a single system [3]. It facilitates the work and communication between all departments that have relations with clients. This System allows the management of contacts online.

With this tool users can keep communication information about clients, reunions, calls, emails and interaction from web sites, and enable this information to be easily used.

Users can synchronize contacts, tasks and calendars between ZohoCRM and Microsoft Outlook.

**Plaxo** is a system that helps people to be in touch and maintain their contacts lists actualized, automatically synchronizing contacts data from friends [21]. Users can decide with who they want to share their contact information. Contacts are private to each member, so it is impossible to search from friend to friend. This feature is what differentiates Plaxo from the social networks [22].

This system allows users to import contacts from social networks like LinkedIn or other contacts management systems.

**Analysis of different Contact Management Systems functionalities**

After having studied all these contact management systems and social networks, we compared some of these systems and analyzed some of their functionalities. The systems compared were Plaxo, ZohoCRM, Microsoft Outlook, BatchBook and Google Contacts. Only one Social Network has been analyzed, Facebook.

Most of the functionalities compared between the different systems were based on an existing study [23], but other functionalities were added: contacts importation from social networks, removal of duplicated contacts, contacts search and collaborative management of contacts.
This analysis provided requirements for the WebC-Contacts application.

<table>
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<th>Plaxo</th>
<th>ZohoCRM</th>
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<th>BatchBook</th>
<th>Facebook</th>
<th>Google Contacts</th>
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Figure 1 – Analysis of different contact management systems functionalities

3. **WEBC-CONTACTS – CONCEPTION**

**Domain Model**

What follows is the WebC-Contacts domain model.

A user can have access to many contact groups. Each user with access to the contact group has a function in that group. A group of contacts can be accessed by many users. There are different types of groups with different access levels. Each contact group has a type of group. A group of contacts consists of many contacts. A contact can be a person or an organization. There may be a relationship between two contacts.

Users can have one of the following roles in a group of contacts: creator, administrator, manager or visitor. The creators and administrators can perform administrative actions in the contacts group, invite new users to the group, and manage the group of contacts. Managers can manage the group of contacts and visitors cannot make changes in the group; they can only view the group information. These roles were based on the sharing permissions used by the “Google Apps” studied in the previous chapter, more specifically on the permissions used by the permissions used by Google Calendar and Google Docs [4].

The different types of contact groups available are: public, private and semi-private. Public and semi-private groups can always be found in the research and any user can request access to public groups. In semi-private groups users can request access, but are dependent on the access request being accepted by a group member. The private groups cannot be found in the research, and the only way to have access to these groups is to be the creator of the group or receiving an invitation from members of the group. The different types of groups were also based on Google Apps and Google Fusion Tables [4] [12].

Invitations contain information about the user that creates the invite, the destination user, the contact group and the role that the destination user will play in the user group.

Requests for access to groups contain information about the user who requested access, and about which group of contacts. Later, when members of the group accept the access, they decide what role the user will have in the group.
Actors

To accomplish this project it was necessary to create different actors with different roles that set the permissions of each user to realize actions. Next are presented the different actors.

Anonymous – This actor represents all the unauthenticated users of the system. These actors can only do the registration / authentication on the application and other basic interactions.

WebC-Contacts Administrator - This actor represents the application administrators. These users can configure some attributes of the application, like, create and edit relationship types and types of organizations or edit import types.

WebC-Contacts User - set of users registered and logged in the WebC-Contacts application. All WebC-Contacts Users have a profile page where they can perform various actions, including creating groups of contacts.

WebC-Contacts users may have different roles in a contact group. For this reason it was needed to define four new actors in a hierarchy.

Group Visitor - This actor represents a user registered in the application that only has permissions to view the contacts data associated with a contact group.

Group Manager - This actor can perform all the visitors actions in a group of contacts and also manage and edit contacts in the group.

Group Administrator - Administrators of a group of contacts have the same permissions of managers and can also administrate the group of contacts.

Group Creator – This actor represent the users that create a group of contacts. It has full permissions on the group, in other words, it can perform all the actions of administrators and even delete the contact group.

Use Cases

There were identified many use cases in this project. They were grouped by functionality to be easier to understand them.

Contacts Groups Administration – Only group creators can delete them. Group Administrators can create invites, accept access requests and change roles of users in the group.

Contacts Groups Management – Group managers can add new contacts to the group, import contacts from other systems, delete contacts, export contacts to other systems, manage duplicated contacts and edit contacts.

View of group contacts – Group visitors can view all the contacts in the group and print these contacts information.
**Search for contact groups** – All WebC-Contacts users can search for contacts groups and request access for contacts groups.

**WebC-Contacts Settings** – WebC-Contacts administrators can edit relation types, edit the original system import types and edit organizations types. Any WebC-Contacts use can create and edit new import types.

**Additional Requirements**

It was necessary to add some additional features to the application:

The application should allow creating, editing and deleting contacts.

Users should be able to create, edit and remove contacts groups. Contacts should be created and imported to contacts groups. It should be possible to share contacts groups with other users. Users should be able to send invites to other users and search for contacts groups.

It should be possible to import and export contacts from many systems. The system should allow users to create new import types.

Users should be able to send e-mails to their contacts from the application. There should be an anti-spam mechanism for people to use if they don’t want to receive more emails from the application.

When importing contacts to the application, the system should verify if the contacts already exists in the system to avoid duplicated contacts. There should be a mechanism to detect and allow users to manage duplicated contacts.

This application should allow the utilization by a single user or many users in a group, so it can be useful to companies. All users in a group should have access to the information created, edited or imported from group members.

WebC-Contacts should support Metadata to allow its users to keep important additional information about their contacts.

It should be possible to search for contacts by name or email.

The application should allow its users to create and manage their contacts in different groups, so its easier to organize all contacts.

4. **WEBC-CONTACTS – IMPLEMENTATION**

**WebComfort and WebC-Entities**

WebC-Contacts application was implemented by extension of the toolkit WebC-Entities over WebComfort platform. WebComfort [24] [25] [26] [27] is a content management system being developed by SIQuant [28] using Microsoft ASP.NET 2.0. This platform provides tools and mechanisms to manage contents, structured and not structured. WebComfort allows managing users, permissions, access control and supports multi language. This platform is extensible, allowing the addition of new modules or toolkits. One of these toolkits is WebC-Entities [29] that were the start point for the development of WebC-Contacts. On the original version, WebC-Entities allowed entities management. Users could create, edit and remove entities. It was possible to create relationships between two entities.

**Components**

The application WebC-Contacts is composed by several components: modules, pages, WebC-Contacts API classes, and Utils classes. Modules and pages depend on WebC-Contacts API classes and Utils classes. Utils are classes that contain methods used in many pages and modules. WebC-Contacts API classes encapsulate all the interactions with DTOs (Data Transfer Objects). DTOs manage all the interactions with the database.

The most important components of the application are described below.

**Modules**

**UserProfile** is a module where users can make many actions like: create new groups of contacts, manage their groups of contacts, view and edit contacts, manage import types, send email to contacts, export contacts to other systems or change their profile image. Users can also accept invites from other users to contacts groups in this module. Many of these actions are realized in their own page from this module.

Users can search for contacts groups in **UserContactGroups** module. Only public and semi-private groups can be found. If users don’t have access to a group found in the search system, they can request access to that group in this module too.

**Pages**

**ManageContactGroup** is a page where users can manage a group of contacts. In this page users can view and edit contacts from that group. Create or import new contacts, delete contacts and export contacts. It is also possible to send emails to contacts, manage duplicated contacts in the group or change the group image. In this page creators or administrators of the group can change the roles of other members of the group. These users can also invite other users to the group or accept request from other
users. The invites can be sent by email.

**ImportContacts** page allows users to import new contacts for the application for one contact group. Users can import contacts from many systems like a CSV file from Microsoft Outlook, Thunderbird, Google Contacts, Yahoo or Windows Live Messenger. It is possible to import contacts from social networks like LinkedIn or Facebook. To import from LinkedIn users have to first Export their connections in this system to a CSV or VCard file [30]. To import from Facebook it is necessary to use the ExportFriendsInfo application [31] in Facebook to export all contacts to a CSV file first. Users can import contacts from a VCard or a XLS file (Excel). There is an example of a XLS file ready to be imported in [32]. Users can also import contacts from CSV files based on the new import types defined by the user. In this page users can set relationships between the imported contacts and organizations in the same contact group. It is possible to choose to import only contacts without invalid data or it is possible to import persons with invalid data. Invalid data includes contacts without name, without email or emails without “@” character. When a contact is imported it is verified if it already exists in the system in the same contact group. If contact with the same email is found, but all data aren’t exactly the same, the application tries to merge both contacts into one if it is possible.

**ManageImportTypes** and **EditImportType** page allows users to manage, create and edit new import types for the application.

In **ExportContacts** page users can export all their contacts to a CSV, VCard or XLS file.

In **ManageDuplicated** page users can manage its duplicated contacts found in a contact group. The application runs some algorithms to find if there are duplicated contacts in the contact group. First it is verified if there is more than one contact with the same email. If it is true, then we have a duplicated contact, because it is impossible two have two persons with the same email. Then it verifies if there exist conflicts of name and primary phone number. Next the system checks for conflicts by name and secondary phone. Lastly it verifies if there is more than one person with the same name. This test can find conflicts that do not correspond to duplicated contacts but it will finish ambiguities in users contact lists. The system then presents the user with the duplicated or conflicting contacts for selection. At this point the user needs to make the selection for the correct contact and decided whether or not they are truly duplicated. The user can make changes to one or both conflicting contacts and either save the two contacts or merge the two into a single contact with the shared information from the conflicting contacts.

**EditPerson** and **EditOrganization** pages allow users to create and edit persons and organizations. Both pages work the same way. It is possible to create or edit contacts data, create or edit additional information fields, and manage relationships between this contact and others in the same contacts group. Users can add a photo to the contact information. The information that a user can keep from a contact are name, email, NIF, phone1, phone 2, fax, url, address, address continued, postal code, company, job, comments [1]. If the user wants to keep additional information he can save it in the additional fields.

**ViewPerson** and **ViewOrganization** pages allow users to view all the information about a person or an organization respectively, including additional fields and relationships. **PrintPerson** and **PrintOrganization** pages allow users to print the same information for persons and organizations respectively.

In **SendEmail** page users can send emails to their contacts.

The most important components of this application are **UserProfile** module and **ManageContactGroup** page, it’s in these components that users will make most of their actions on the application. These components also give access to the other important pages of the system.

### 5. EVALUATION

After the implementation of WebC-Contacts application it had to be tested. To evaluate this system, we created a guideline with some test cases and a questionnaire. The purpose for these tests is to try and to understand the application functionalities acceptance by different users when they performed some tasks, and confirm their thoughts as to the use of the application and its difficulties. The application was online [33] and a guideline was sent to the users. In this guideline it was explained to the users the functionalities of WebC-Contacts and there were some tasks for the users to perform in the application. At the end of the guideline users were asked to answer an online questionnaire.

**Tasks Performed**

Before starting the tests, users have to be authenticated in the application, and so we asked users to register and log into the system.

Create a private contact group – We asked users to create a private contact group with a name of their choice.

Inviting other users to manage the new contacts group – in this task, users had to invite other people has managers of the new group. The invites should be sent by email.

Creating and Importing Contacts for the contacts group – Users were asked to import contacts from the LinkedIn social network to the new group of contacts. They were given a CSV file exported from that system so they could complete this task. Users also had to create a person contact in the group.
Managing duplicated contacts – Users were asked to manage duplicated contacts in the new group of contacts.

Searching Groups of Contacts – In this task, users had to search for a public group of contacts and request accept for that group. After that they should view a contact of that group.

Searching and editing a contact – In the last task, users should search for a contact, view and edit this contact, adding new custom fields.

Questionnaire
After performing the test cases, users were asked to answer a questionnaire [34] where it was request to classify the application by various criteria. Users were asked how often they used contacts management systems. After that they were asked to classify the application in general and if they had difficulties in realizing any task, the time taken to realize all the tasks and what functionalities they liked most and liked least. In the end users were asked to classify all the tasks by time taken and degree of difficulty. Users could write comments or suggestions if they wanted.

Results and Conclusions
In total 27 persons tested the application. Most of them were colleagues, but some friends and family members tested too.

Most users that tested the application had never used a contacts management system or used them rarely. These users had more difficulty in understanding the functionalities of WebC-Contacts application and spent more time in the tasks. The functionalities users liked less were searching and editing contacts and importing contacts. Importing contacts difficulty were classified as intermediate by 30% of the users and 50% classified it as taking some time to realize. For these reasons we have to improve the search of contacts and make the importation of contacts more intuitive and faster. Managing duplicated contacts was the functionality that users liked most but most of them classified the difficulty level as intermediate, so this functionality should also be improved. Some users had some difficulties with the user interface. It should also be enhanced in order to provide users a better experience with the application.

6. CONCLUSION

Final Considerations
Today there are many contact management systems in the market, with different users and different features. WebC-Contacts application pretends to solve some of the problems from these systems. The main objectives of this project were to solve contact integration and importation from many systems, even from social networks and the collaboration between many users in creating and managing shared groups of contacts.

The contact integration problem was solved by the compatibility and importation of contacts from many systems and from LinkedIn and Facebook social networks.

To solve the collaboration problem WebC-Contacts allows the creation of contact groups where contacts are imported and created. These contact groups can be shared with other users. It is possible to invite new users to the contact group and give them different permissions or roles to edit contacts and manage the contact group. These features make WebC-Contacts adequate to companies.

If we compare the WebC-Contacts system with the others studied in the related work we can see that this application allows users to perform generally all the features considered in this analysis but the collaborative management of contacts feature was only found in this system.

Some of these functionalities were tested by the users in the tests of the application.

Most users found the application useful, and the idea of enabling collaborative management of contact groups innovative and interesting.

WebC-Contacts implementation in WebComfort was facilitated by the features of this platform. This permitted the implementation of the features proposed.
Future Work

Although this work has met its objectives, it does not mean that it is not possible to make improvements in the WebC-Contacts application. Based on the test results it can be observed that some of the features may be improved. For the most part these improvements can be based on the suggestions brought forward by the users that tested the application.

The results also show that the concepts of collaborative management of contacts used in this study can be applied in other systems with serious chances of success.

7. REFERENCES


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<tr>
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Figure 3 - Analysis of different contact management systems functionalities


19. GOOGLE Contacts Standalone. Available at: <http://mashable.com/2009/05/05/google-contacts-standalone/>.


34. WebC-Contacts Questionnaire. Available at: <https://docs.google.com/spreadsheet/viewform?formkey=dFJmaWhrM3BvSDJfMGVRRnBDZy13akE6MQ>.