Organizational Social Networking using SNARE

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Abstract. A social network represents a set of social entities that interact through relationships like friendship, co-working, or information exchange. Social Network Analysis studies the patterns of relationships among social entities and can be used to understand and improve group processes. The arrival of new communication tools and networking platforms, especially the Web 2.0 Social Networking Services, open new opportunities to explore the power of social networks inside and outside organizations. In this paper we present SNARE (Social Network Analysis and Reengineering Environment) a common platform to extract, discover, instantiate, and analyze social networks and that is able to create and support social or professional communities. Starting from the definition of a social network model that allows the representation of social networks containing a set of social entities, relations, roles and properties, several applications are developed. SNARE was used to discover these social networks by automatic analysis of defined surveys with different inferences. Social networks can be used to create active communities with customized personal and public spaces. Based on two case studies we explore how people used SNARE to discover and customize social networks and use these communities to easily find information about peers and possible interesting connections.

Keywords: Social Networks, Social Network Analysis, Social Networking Services, Collaborative Communities, Web 2.0

1. Introduction

This paper describes SNARE (Social Network Analysis and Reengineering Environment), a platform to discover, extract, manage and analyze social networks inserted in an organizational context. We start by understanding which platforms and tools represent main influences in social networks in information systems, paying special attention to its use in organizational contexts and the social networking services phenomena in section 2. Section 3 develops the social network model developed identifying main concepts related to social networks as social entities, relation types, roles and instances, properties, and surveys, while in section 4 are explained platform general architecture and high-level design. Finally section 5 evaluates SNARE’s use in two case studies and is presented a brief conclusion and future work directions in the seventh section.
2. Motivation

Social Networks are not a new concept, in fact its study started around the 1930’s influenced by work done in the fields of sociology, anthropology, mathematics, networks, and graph theory [1]. However, the introduction of computational methods opened new opportunities for the use of social networks by allowing the analysis of larger datasets. Generally, a social network is defined as a set of actors and the relationship(s) defined among them and is used to represent a set of social entities that interact through relationships like friendship, co-working, or information exchange. Social Networks can be found wherever relations among social entities are present and its study can be valuable to understand general structure and group processes.

Social Network Analysis (SNA) represents a method for achieving analytical results about almost any group interaction. Different measures are defined to analyze network cohesion, density and dimension, and to individually analyze each actor importance and influence in the social network [1]. SNA can be used in different areas like general organization improving [2], economy [3], health [4, 5], politics [6] and marketing [7] and in different academic fields. However, SNA applied in organizational engineering, named Organizational Network Analysis (ONA) represents its major application, helping in evaluating the connections between employees, or groups like departments and functional areas inside organizations [2]. Namely, ONA can be helpful by supporting partnerships and alliances, by understanding common integration aspects and behaviors. Moreover, it can analyze the integration between networks, strategy and core processes, determining key members in the network and depicting how people really interact inside the organization.

To perform SNA is necessary to define measures that can be compared between actors or networks. Measures in SNA can be distinguished between the ones that evaluate the entire network or only a specific node [1]. In an individual level the most analyzed measure is centrality, which evaluates the actors’ position in the network and can be interpreted as the prominence of an actor in the social group. In a network level it is important to understand how the network is structured.

One of the most exciting phenomena about Web 2.0 [8] are Social Networking Services. These websites provide ways of creating and customizing communities of people that can expose personal content in the web and can easily share it with their contacts. Usually, it is possible to register, or be invited and afterwards upload personal information and photos, join groups of people and connect to other contacts that are friends, or share the same interests. There are hundreds of different Social Networking Services (SNS) oriented to a more entertainment context or to a more professional context. SNS as Myspace.com, Facebook.com, Friendster.com, and Hi5.com have million of active members who use default communities features and customized applications to interact and connect to known people and interesting new contacts. However, SNS can also be used in a more oriented professional context. LinkedIn [9] is a website where people can post their professional experience, share and connect with others with the same interests or professional background, or even same company.

Organizations already understood the power of this concept and start to use it inside their walls by creating internal systems to support organizations’ communities or by adapting existing systems to mimic common social networking services features.
By other side, nowadays panoply of software exists to capture, build, visualize, manage and analyze social networks, however most of these tools do not reuse or join this set of features, disallowing the built of richer social networks that can be extracted from common information systems, server logs and knowledge repositories or built by the contribution of organization’s members. Ucinet [10] is probably the best-known software package for the analysis of social network data [1], but other applications as Pajek [11] and Netminer [12] also implement common SNA algorithms outputting most common SNA measures and using network visualizations algorithms as Kamada-Kawai [13] and the Freuchterman-Reingold [14] to produce graphs distributing actors according to their importance. Netvis [15], Network Round Table [2, 16] and network genie [17] belong to a set of platforms which main scope is to gather information from surveys and to automatically export them to most common software for SNA. Other kind of systems proposes to gather information from a large collection of data and tries to identify and disambiguate social entities and understand the links between them and also their strength, periodicity or probability like for instance the SONAR platform [18].

We believe that enabling all these features and capabilities (Figure 1) in a single platform can be achieved by the development of a rich application core, able of being extended to support the gathering of social networks in different contexts and sources and its posterior adaption to other requirements and goals. Therefore, we propose SNARE (Social Networking Analysis and Reengineering Environment) a platform to extract, discover, instantiate and analyze social networks in different organizational contexts.

3. SNARE Overview

SNARE joins in a single platform, capabilities to create social networks adapted to organizations’ context, allowing managers to create communities and survey organization about internal relationships questions (Figure 2). Managers, external consultants, sociologists and employees can use different features to achieve defined goals, as to find others in the network,
analyze cohesion measures, identify brokers and isolated actors and study hypothetic reorganizations effects.

SNARE is composed by different applications sharing the same social network model: SNAREServices is a services core where other applications connect; WebSNARE is a web application that work as a front-end to explore most of SNARE’s features, SNAREExplorer is a java application used to visualize and analyze the social networks created and SnareETL is responsible to connect to common information systems sources and extract, transform and load entities and relations.

![Figure 2 - Snare Scope](image)

The SNARE’s social network model [19] handles multiple social networks containing different entities playing different type of relations in different time occasions and that can be dynamically extended with custom properties. Important concepts included in the model are (1) social networks, (2) social entities, (3) relations and roles, and (4) properties.

A social network as stated by literature is a set of social entities related by relationships. Social networks can be private (entities are inserted by managers) or semi-public and public (members can join automatically or by manager’s authorization). Each social entity in the system can be associated with one or more social networks. Social entities can be persons, groups of persons, other organizations or organizational entities and external entities. Relation types must be associated with social networks: a school’s social network contains relations related to teaching; an enterprise’s network contains relations related with hierarchy, collaboration and support. These types of relations define the kind of relation instances that can be maintained in the network. Relation roles are defined in relation types and characterize the entities that play a relation. Relations can have plenty of roles and each role can be performed by one or more entities. Its directionality is defined also with roles, each role can be a sender, a receiver or both. A relation instance represents a relationship between two or more entities playing a certain type of relation in a defined time occasion. Additional dynamic properties that extend basic information and provide more characteristics can be added to the relation type and be filled with a correct value in a relation instance. These properties are joined in property sets that can be shared between social entities, relations or social networks or being used only by some of these entities. A property belongs to one or more property set and has a defined privacy policy: some
properties can only be seen and edited by some social network’s managers, others can only be visible to its owner and most of them can be seen by everyone in the social network.

Surveys are also part of this model: they are used in order to infer relationships and properties directly from the answers of the questions. Surveys are defined by managers and can contain different types of questions: questions with open answer do not infer any information; questions with close answer are questions with a defined set of answers, usually related with social entities in order to infer relations between who is answering and who is present in the answer; closed answers can also be expanded, allowing who is answering to define a new answer; questions with rank answers allow that member choose a set of answers and define a rank for each of it. Questions can have hierarchical answers, allowing inferring more than one relation or property from an answer and they can be joined in groups to separate different contexts. Each defined answer to a question can have an input filter and an output filter. An input filter relates the answer with some entity present in the systems and makes it easy to define an answer to a question: some filters are used to select a set of answers, as all the persons in the network, or all the persons from a defined group, or only a selected person. Output filters are used to infer other information from the answer as some property of the relationship found or even an own property.

4. **SNARE Architecture and High-level design**

SNARE is developed following Service Oriented Architecture (SOA) [20] and provides a common core able of being extended by other applications to perform gathering and analysis of social networks (Figure 3). This option drives us to build a unique application to social network management that present a set of benefits: (1) Reusability, SNARE can be easily extended without the need for redefine core concepts; (2) System heterogeneity, using web services to expose SNARE functions give us the possibility to develop applications in different languages, systems and locations, maintaining common data and taking advantage of technology adaption to different needs and goals; (3) Abstraction, this kind of architecture eliminates the dependence of core layer implementation; (4) Data transparency, all information produced by web services is in plain text xml that can be parsed by most programming languages and understood by human observation; (5) Safety, services are accessed only by authorized applications permitting to customize access to different modules based on needs and permissions; (6) Loosely coupled design, features are grouped in web services with same functionality scope permitting applications to use only the necessary services. Figure 3 represents the general SNARE architecture and the dependencies between different applications.
SNARELib can be seen as the real SNARE core where all the business entities that relate with the database and all the functions to manage this information are presented. SNARELib is a code library (.dll) developed in C# that can be included by other projects that want to use SNARE core functionalities, and contain three different packages that use the lower layers: Data Abstraction Layer (DAL) on the bottom, then Business Objects Layer (BO) and Business Abstraction Layer (BAL) on the top.

SNAREServices is a web service application developed in C# that imports SNARELib and basically constructs web services to all relevant methods that we want that third parties application use and adapt their return type to a web service perspective. It is composed by three web services that join methods by different scope and their probable use by other applications.

WebSNARE works as an application front end, allowing a wide range of features as: (1) Social Network Management, by creating social entities, relation types, relation instances and dynamic properties to enrich this kind of entities; (2) Organizational survey, by allowing members to answer to complex surveys from where relations can be extracted to build a social network, (3) Community creation, by allowing members to have personal profiles, define relations among them and share content in private and public spaces.

WebSNARE is developed on top of WebComfort, a Content Management System (CMS) initially developed at Information System Group, and currently used in different academic and commercial applications [21, 22]. WebComfort has built-in features such as user management and role association, page creation with customized access, and a rich set of usable modules as announcement management, image galleries, menu creation, calendars, and document and link management. This CMS can be extended with the definition of new modules that add new features and functionality to the system and can interact with application using a defined API to manage users, roles, and tabs or change general features and navigation. Modules can be grouped in toolkits that can be easily installed in different deployment instances. In order to extend WebComfort for adapting to SNARE, a set of new modules is developed to allow access of different organizational actors to social networks. WebSNARE interacts directly with
SNARE Services use the retrieved data to show different information in the platform and to save modifications on social networks’ content. Different modules are accessible by different roles: social entities can be created and edited by managers, but are visible to all members; relation types are created by managers but can be instantiated by members; properties are present in many places in the application, and according to privacy policy, they can be visible or edited by different actors; surveys are defined by managers and can be filled by members who must answer to the different questions, allowing a posterior automatic analysis performed by managers or consultants. Members can interact among each others in social networks where the community package is enabled. Personal profiles are created to every member, who can browse and customize them, and can define their privacy options hiding or showing different parts of their profile. Members can connect among others, choosing the relation that joins them. When people became connected can track their contacts updates, understanding their new connections and activities. Groups are used to join entities in a defined space where members can interact, invite others, or perform join requests. These spaces can be used to model departments, communities of practice, teams or classes, making it easy to them to connect and share content.

5. Evaluation

SNARE was used in two case studies where its benefits, features and capabilities were tested and evaluated. These two experiences had different final goals and distinct features were used in order to correctly handle requirements. Both of these case studies also helped us in correcting software and interface problems and improving general application quality.

Vodafone Portugal Case Study

SNARE capabilities of inferring social networks from surveys answered by organizational entities were tested in a case study developed at GSS Group at Vodafone Portugal. This case study allowed us to identify what kind of questions do managers want to understand when they survey employees about their relationships with others or about personal information. Moreover, we could access what important information is important to assess that can enable successful reorganizations or process changes.

GSS managers wanted to understand if Social Network Analysis could help them to explain higher performance and higher evaluations by different functional areas. They wanted also to use SNA to identify the most connected actors in the social network and in different groups and compare if these connections in positive questions are somehow connected with better performances and results.

A survey was defined to allow managers to infer conclusions in questions about general trusting, identification, support, goal reaching, stability and organization’s change, organizational values, motivation and satisfaction. A group of eleven questions was defined to infer relationships with different directionality, properties or relationships with associated properties. In this set of questions were defined questions with open answer, with a defined set of answers but allowing users to create new answers, directly or not directly linked with social entities, together with group questions and hierarchical answers.
The test lasted two weeks, and its analysis allowed, by itself, to understand some important details in ordering entities by their positive or negative importance in the network.

The survey conversion to the social network model was done without errors and in the end of the process we had identified 408 relationships with 7 different types, full detailed with context details and allowing drilling down to individual relationships between more connected social entities.

Performing social network analysis using SNAREExplorer allowed manager to understand, for each individual relation type, who are the most and less connected persons and who are the persons that form cliques in the network by similarity of connections. GSS Manager were able to confirm that most connected social entities about positive questions as trust, enterprise values identification, support, change motivators, are also the ones who have better annual evaluation in the organization. It was possible to identify in the social network groups composed by persons of the same functional areas or connections between oldest peers and recently moved colleagues. As it would be expectable the most dense connection links are the ones maintained among people working in the same functional area.

This case study revealed also some of the reasons for higher performances, as well as some of the integration difficulties detected in some members. According to GSS Manager, it fully indicated some orientations between questioned vectors and individual and group performance. In a posterior analysis it was possible to identify the impact of these connections in the task execution performed by various groups.

**POSI Case Study**

A different case study was developed in order to evaluate SNARE’s capability to support and develop social network communities. We wanted to evaluate the easiness of user profile customization, together with user interaction on connecting among members and publishing content in private and public spaces. The main goal behind this community creation was to enforce links between the school and among past students. Starting from a social network composed by 342 members grouped in editions and with total freedom to interact among them we wanted to understand how this community would evolve and how people would be connected after some time of use.

Before the community creation several meetings were established, to discuss SNARE’s capability to create communities and to understand which features POSI coordinators wanted to be available to alumni. We understood some concerns about lacking of support to groups in SNARE community concept. An important detail required was a strong component to manage members by each edition, joining colleagues from same edition and allowing them to interact in a common space. Managing social entities by different editions would also facilitate the job of some POSI manager or operator.

The need for platform customizations as the adaption to POSI look and feel, and several questions about privacy made us to decide to create POSI alumni community in a separate installation deployed not only in a different address but using different databases and software instances. This option allowed us to customize application using POSI logo, and customize every
A POSI operator was chosen to manage the community in her starting phase. He should first create nine edition groups and associate people with their groups, regarding the filled property “edition”. This operator was responsible for contacting people that do not have a known email address in order to properly correct them before sending any login.

This case study apart from allowed us to extendedly test existing features to community building using SNARE, inspired us to improve functionalities related with members search, group communication and general interaction. After some time to experience user behavior and feedback, we were able to draw some conclusions, and watch some difficulties felt by POSI Operator to understand what was happening in the network, i.e. which users were using the network, how many connections were being made among them, which profiles and public spaces were being updated. Members start to connect among each others, revealing new connections.

Feedback received from POSI coordinators was positive and main goals were achieved. Also by alumni side we felt that this project helped them to find former colleagues, and use the community to establish important connections. However, it is still early to understand how POSI community will work in the future. It is important to maintain activity in the network to avoid that the platform work as a simple people directory. Future will show how alumni will use the community and what kind of content will the members publish in public and private spaces. Probably, new types of relations and other entities as professors, operational staff, coordination and technical support staff will be added to the network, opening new challenges and opportunities. We understood already the need for improving public and private spaces, namely group and network bulletin boards: they represent popular ways of discuss problems, posting content and allowing everyone to easily contribute about POSI subjects or professional ideas. We need also to improve user interaction and options to define privacy options and general configurations to allow members to customize personal experience using the community. An important addition can be done if current students would be added to the system, because they are the ones that most interact with POSI staff and can use knowledge and experience from former colleagues.

More case studies like this one will be developed using SNARE what can present new requirements and challenges that SNARE do not support yet. Apart from that, Social Networking Services are developing at an incredible speed, so it is natural that new features and modules will be present also in SNARE as long as developers and members face the need for this kind of technologies.

6. Conclusions and Future Work

SNARE joins capabilities of social network extraction, management, analysis and reuses these concepts to build active communities that can be used in organizations. An application core is defined to handle fundamental concepts related to social networks and different services and applications are developed to address different requirements and functionality scope. It is expectable that SNARE continues to be used throughout other projects and case studies, namely when its ETL component is developed. SNARE could connect to other information sources and
social networks gathered could be modified and analyzed using other components. A new study in Vodafone Portugal is currently being prepared and will be directed to all collaborators in order to identify organizations issues that were already revealed during the first case study. POSI Alumni community will continue to work as an active community where former students can find old classmates and exchange knowledge and expertise about past and current questions.

7. References