CRM 어플리케이션에서의 소셜 네트웍의 서비스 시스템

Service System of Social Network with CRM Application

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요 약

엔터프라즈 어플리케이션에 대한 요구 사항은 서비스와 가치의 입장에서 철저히 변화되고 있다. 최근 기업들은 기술과 고객과 마케팅 운영의 필요를 충족하는 서비스를 제공하기 위하여 설계된 조직체의 네트워크와 함께 결합하면서 이러한 어플리케이션들을 서비스 시스템으로써 보기 시작하였다. 소셜 네트워크는 이러한 방향에서 주요한 역할을 담당하며, 고객과 파트너 간의 견고한 관계를 세울 수 있는 결정적인 정보를 조직에 제공해줄 수 있다. 기업은 소셜 네트워크 서비스를 CRM과 같은 엔터프라이즈 어플리케이션들과 통합하여 이런 개념을 이용하기 시작하였다. 본 논문에서는, 오픈 소스 기반 소셜 네트워크 엔진과 CRM 어플리케이션을 결합하여 소셜 CRM 시스템을 구성하였다. 이를 통하여 고객들을 기업에 더 근접하게 이끌어 올 수 있게 되며, 고객들과 더욱 원활한 소통을 촉진할 수 있게 된다. 서비스 시스템의 효율성을 분석하기 위하여 소셜 네트워크 분석을 사용하였다. 경쟁적이고 경제적으로 도전적인 상황에서, 판매자는 빠르고 효과적으로 고객들과 의미있는 소통을 정착할 필요가 있다. 본 접근방법을 통하여 최소화된 시간 안에 변화하는 고객의 요구사항을 처리함으로써 이러한 이슈를 겨냥할 수 있으므로, 서비스 품질과 비즈니스의 가치를 향상할 수 있게 된다.

키워드 : 소셜 네트워크 엔진(SNE), CRM, 소셜 네트워크 분석(SNA), 소셜 CRM

I. Introduction

As organizations grow drastically and spread across the globe, individuals have begun to initiate, extend and manage their networks of professional relationships through social, web 2.0 technologies. Service sciences enable effective implementation of complex systems such as Social Networking Systems and help people to use technologies to take appropriate actions that provide value for others. Science of service system aims to understand how an organization (service provider) can invest effectively to create service innovations and to realize more predictable outcomes(H. Chesbr-

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ough and J. Spohrer, 2006). Service is performed in a close contact with a client; the more knowledge-intensive and customized the service, the more the service process becomes critical on client participation and input, whether by providing labor, property, or information (S. E. Sampson and C. M. Froehle, 2006). In this direction, corporate social networking technology is changing the way that relationships are formed and strengthened in business environments and the way that business is conducted by increasing the service value. The developments in IT (Information Technology) and Web Services have changed the look of Customer Relationship Management (CRM) and enable organiza- tions to achieve better results and also facilitatethe data integration with other enterprise applications and back end systems. The transformation in CRM according to customer's service requirements are shown in <Table 1>.

Off-late social networking is playing a crucial role and it provides organizations with the critical data needed to build relationships with donors, members, prospects, participants, and volunteers –all in one single, interactive system. Enterprises are moving towards integrating the social networking into the current CRM system. A social CRM system can help organizations in the following ways:

Single View of On-line and Off-line Constituent: Social CRM allows organization to capture variety of on-line interactions such as e-mail activity or Web form donations automatically generated, and to track off-lineactivities such as event participation or volunteer hours are also tracked.

Overall View of the System: Social CRM serves not only its organization, but also its constituents with a total view of their relationships with each other. This gives visibility on how their contribution was used. This may also include tools that help organizations better manage and communicate with individuals in the same household, workplace, or alumni group.

Comprehensive Knowledge and Oversight: Social CRM provides the comprehensive knowledge and oversight of not just constituents, but all of fundraising efforts. Since most business processes are managed on-line, real-time reports such as integrated campaign activity statistics or customizable dashboards are always at fingertips.

Social CRM is one of the emerging applications that help enterprises to reach their customers and make them participative. To analyze this concept, we used **V-tiger** (open source CRM application) and **Elgg** (open source social networking engine). Since both the applications are flexible and loosely coupled, theyenable easy integration and exchange of information in a more secured manner. We randomly created number of communities and classifyit based on customer categories. By doing this, the target groups can be reached with

〈Table 1〉 Transformation of Service Requirements in CRM

As-is	To-be
◦ Managing Customer Relationships so that customers can provide valuesto the company based on the company's value to the customer.	◦ Engaging Customers in collaborative activity for mutually created value. ◦ Based on the prediction from analyzed data, services are provided for customers.
◦ Strong process driven operational applications like SFA(Sales Force Automation), enterprise marketing management, contact centre management, and field service.	◦ Customer inclusive applications like social networking and other social media applications(blogs, wikis, podcasts); use of user generated content that can be shared.

minimum time and reduced cost.

In this paper, service integration of social networking with CRM enables to study and analyze as follows

- Analyzing the existing contacts with customers and defining collaborated services to improve the connectivity
- Extending the contact network or customer base (including potential customers) by bringing customer's network into the community
- How on-line social features can impact customer relations policy
- Which social features and practices can bring value to their activities

The structure of the paper is as follows. In Section 2, we discuss service integration with social network, social network services, service system platform, service application and SNA (Social Network Analysis). Section 3 shows open source applications and tool used to support our concept. Section 4 shows the social CRM architecture, Section 5 covers the layered structure of social network and its interaction with CRM application, Section 6 shows the scenario and social network analysis, and conclusion in Section 7.

Ⅱ. Service Integration with Social Network

In this section we will talk about social networking, social network platform, service systems and social network analysis metrics.

2.1 Social Networking

A social network (Barnes J. A., 1954) was originally designed to act like a get-together place for the millions using the Internet around the globe. A social network is always implemented with a module wherein the users from both the ends do confirm necessarily in order to be included as a part of a link or aformed network. This has been replaced recently as some networking sites have developed schematics wherein there exists a tab of favorites eradicating any feature that would need approval from the invitational side. Though this feature can be used or disabled, the most common factor is that every social networking site moves in with an option for the user to choose whomto show their profiles, which can be made private/public/ or specifically filtered in some cases.

Social network as a term was introduced by J. A. Barnes in 1954 and the shape of a social network helps to determine network's usefulness to its individuals. Smaller, tighter networks can be less useful to their members than networks with lots of loose connections to individuals outside the main network. A group of individuals with connections to other social worlds is likely to have access to a wider range of information. It is better for individual success to have connections to a variety of networks rather than many connections within a single network. Similarly, individuals can exercise influence or act as brokers within their social networks by bridging two networks that are not directly linked (Scott John, 1991).

In general, social networking services facilitate users to create a profile for themselves, and can be broken down into two broad categories: internal social networking (ISN) (Facebook, 2008) and external social networking (ESN) sites, such as Myspace, Facebook and Bebo. Both types can increase the feeling of community among people. An ISN is a closed/private community that consists of a group of people within a company, association, society, education provider, organization or even an "invite only" group created by a user in an ESN. Users can upload a picture of them and can often be "friends" with other users. Social networks usually have privacy controls that allow users to choose who can view their profile or contact them, etc.

Social Network Engines provide the basis for community driven content and social/business networking. There are few social networking engines available out of which many are open source and come with options for customization. Organizations can select one that suit their requirements and customize according to their desires. These engines can be easily plugged within the existing applications via a plug-in or adapter. We have shown a brief comparison among the different social networking systems in <Table 2>.

Social networks connect people at a low cost; this can be beneficial for small and medium enterprises looking to expand their contactbase. These networks often act as a customer relationship management tool for companies selling products and services. Companies can also use social networks for advertising in the form of banners and text ads. Since businesses operate globally, social networks can make it easier to keep in contact with customers around the world.

2.1.1 Social Networking as Service System

Social network services focus on linking like-minded people to share their interests and activities by building online communities. Most social network services are web based and enable users to interact in a number of ways such as email, instant messaging services, etc. There are two famous mo- dels of social networking such as trust-based and friendship-based developed to popularize the usage of social networking (Rosen. C, 2007). Social networking began to flourish as a component of business internet strategy at around March 2005 when Yahoo launched Yahoo! 360°.

〈Table 2〉 Comparison of Features of Social Networking Engines

Category	People Aggregator	ELGG	Community Server	Joomla	PHPizabi
Base	PHP, MySQL	PHP, MySQL	ASP.NET 2.0	PHP, MySQL	PHP, MySQL
Access Control	Group Based	Group Based	Yes	NO	N/A
Wiki	Not Available	Can be used through Plugin	Not Available	Not Available	Not Available
Forum	Members can create their own forums	Not Available	Members can create their own forums	Not Available	Members can create their own forums
Blog	Can be used for Blog	Can be used for Blog	Can be used for Blog	Can be used for Blog	Can be used for Blog
Media Sharing	Image, Video, Audio	Image	Image, Video	N/A	Video and Audio
Messaging	Yes	Yes	Yes	Yes	Yes
Connectable to	MySpace, Facebook, Youtube, AIM, Licker	N/A	N/A	N/A	N/A
Comment	Integration of many Services	Clean and Simple	N/A	Content Management	N/A
Customizable	Under Development	Plugin	N/A	N/A	N/A

The rise of social networking services has created a global village that has lead to the compression of space and time, where spatial barriers have been reduced and "the pace of social life has been speeded up" (Thompson, 1999). The instantaneous access of information and communication makes the world "no longer had a vast expanse of unchartered territories but a globe thoroughly explored, carefully mapped out and vulnerable to the meddling of human beings". Social networking service thus provide an interactive, interconnected and flexible medium that present an arena for all users to become producers and receivers of information and communication (Thompson, 1999).

2.2 Service System Platform

Service System Platform is matured with the Web 2.0 technology. Web 2.0 is a second generation of web-based communities enabled to host services such as social-networking sites, wikis, blogs, and folksonomies, which aim to facilitate creativity, collaboration, and sharing among users rather than just using for email and browsing for some information. It is vital to encompass the essence of Web 2.0 and treat it as a platform to build applications and services around its unique features.

Web 2.0 websites allow users to do more than just to retrieve information. It can be built on the interactive facilities of "Web 1.0" to provide "network as platform", allowing users to run software applications entirely through a browser (Tim O'Reilly, 2005). Users can own the data on a Web 2.0 site and exercise control over that data (Dion Hinchcliffe, 2006). These sites may have an "architecture of participation" that encourages users to add values to the application as they use it (Tim O'Reilly, 2005). Web 2.0 sites often feature a rich, user-friendly interface based on Ajax, Flex or similar rich media. The sites may also have social-networking aspects (Dion Hinchcliffe, 2006). The impossibility of excluding group-members who do not contribute to the provision of goods from sharing profits gives rise to the possibility that rational members will prefer to withhold their contribution of effort and free-ride on the contribution of others (Gerald Marwell and Ruth E. Ames, 1979).

The complex and continually evolving technology infrastructure of Web 2.0 includes server-software, content-syndication, messaging-protocols, standards oriented browsers with plugins and extensions, and various client-applications. The differing, yet complementary approaches of such elements provide Web 2.0 sites with information-storage, creation, and dissemination challenges and capabilities that go beyond what the public formerly expected in the environment of the so-called "Web 1.0". Web 2.0 websites typically include some of the following features/techniques:

- Semantically valid XHTML and HTML markup
- Micro-formats extending pages with additional semantics
- Syndication, aggregation and notification of data in RSS or Atom feeds
- Mash-ups, merging content from different sources, client-and server-side
- Weblog-publishing tools
- Wiki or forum software, etc., to support user generated content

2.3 Service Application-Customer Relationship Management

CRM applications are used by enterprises to manage their customer data and use it for appropriate business decisions. As it focus on capturing information related with their customers and also try to find new customers through the existing, it will be appropriate to apply with the social network by building communities.

CRMis a broad term that covers concepts used by organizations to manage their relationships with customers, including capture, storage and analysis of customer information. CRM's main functionalities are marketing, sales and service. Similarly there are three aspects of CRM Collaborative CRM, Operational CRM and Analytical CRM.

It is also important to mention here that a CRM system is capable of executing all three sub modules via multiple communication channels. Even though it is crucial to see the importance of information systems and marketing, according to(Ryals, L., and Payne, A. F. T., 2001), the ability to identify and attract customers allows for the retention and identification of profitable customer (Freeman, Linton, 2006). It helps organizations to provide information upfront regarding customers to take effective and timely decisions and also to serve the customers better and retain them.

2.4 Social Networking Analysis

Social network analysis is based on an assumption of the importance of relationships among interacting units. Several analytic tendencies distinguish social network analysis (Freeman, Linton, 2006). Since service needs a number of socially interactive relationships, the social network perspective encompasses theories, models, and applications that are expressed in terms of relational concepts or processes. In addition to the use of relational concepts, we note the following to be important:

- Service actors and their actions are viewed as interdependent rather than independent and autonomous.
- Relational ties (linkages) between service actors are channels for transfer or "flow" of resources (either material or nonmaterial).
- Network models conceptualize structure (social, economic, political, and so forth) as lasting patterns of relations among service actors

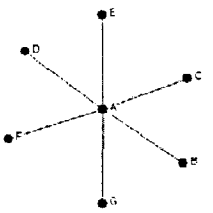
The unit of analysis in network analysis is not the individual, but an entity consisting of a collection of individuals and the linkages among them. Network methods focus on dyads (two actors and their ties), triads (three actors and their ties), or larger systems (subgroups of individuals), or entire networks. The main constructs that are used within a community for Social Network Analysis are as follows:

- **Density:** It is indexed as the connectivity ratio of observed links to all possible links in a network (Kunter, S. and Cripps, J., 1997). Density of a network with value observed link is calculated as the ratio of the sum of all the values (strengths) of the links to the maximum number of links. For undirected simple graphs, the graph density is defined as:

$$D = \frac{2|E|}{|V|(|V|-1)}$$

The maximum number of edges ½ is $|V|(|V|-1)$, so the maximal density is 1 (for complete graphs) and the minimal density is 0, where V is the number of vertices and E is the number of links.

- **Centrality:** It refers to the degree to which a social entity is a key entity within a network (Direct connection to others within a network) (Kunter, S. and Cripps, J., 1997). A central point (as shown in <Figure 1>) is one which is 'at the centre' of a number of connections, a point with a many direct contacts with other points. Since this is calculated simply in terms of the number of points to which a particular point is adjacent, ignoring any indirect connections it may have, the degree can be regarded as a measure of local centrality.



〈Figure 1〉 Star Network

For a graph $G: = (V, E)$ with n vertices, the degree centrality $C_D(v)$ for vertex v is:

$$C_D(v) = \frac{\deg(v)}{n-1}$$

where deg(v) is the degree of node v.

- **Closeness:** It refers to the distance between the entities. The closeness shows how an actor is more powerful than the other actors in the star network <Figure 1> (Kunter, S. and Cripps, J., 1997), when the actor is closer to more actors than any other actor. Power can be exerted by direct bargaining and exchange. But power also comes from acting as a "reference point" by which other actors judge themselves, and by being a center of attention whose views are heard by a larger number of actors. Actors who are able to reach other actors at shorter path lengths, or who are more reachable by other actors at shorter path lengths have favored positions and have more influential power. In the network theory, **closeness** is a sophisticated measure of centrality. It is defined as the mean geodesic distance(i.e., the shortest path) between a vertex v and all other vertices reachable from it:

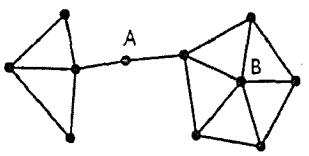
$$\frac{\sum_{t \in V \setminus v} d_G(v,t)}{n-1}$$

where $n \geq 2$ is the size of the network's 'connectivity component' V reachable from v. Closeness can be regarded as a measure of how long it will take information to spread from a given vertex to other reachable vertices in the network

- **Betweenness:** It indicates the extent to which a node lies on the shortest path between every other pair of nodes (Kunter, S. and Cripps, J., 1997) (Robert A. Hanneman and Mark Riddle, 2005) The person with the highest betweenness centrality is the person that others in the network most commonly must go through in order to reach each other. In the <Figure 2>, A is high in betweenness degree since it provides the connectivity between two different groups whereas B has high centrality degree since it is connected to more number of nodes.

For a graph $G: = (V, E)$ with n vertices, the betweenness $C_B(v)$ for vertex v is:

$$C_B(v) = \sum_{\substack{\sigma \neq v \neq t \in V \\ \sigma \neq t}} \frac{\sigma_{st}(v)}{\sigma_{st}}$$



A is high in betweenness centrality.
B is high in degree centrality.

〈Figure 2〉 Betweenness within Two Communities

where σ_{st} is the number of shortest paths from s to t, and $\sigma_{st}(v)$ is the number of shortest paths from s to t that pass through a vertex v. This may be normalized by dividing through the number of pairs of vertices not including v, which is $(n-1)(n-2)$ for directed graphs and $(n-1)(n-2)/2$ for undirected graphs.

- **N-Cliques and Sub-groups:** Many approaches understand the structure of a network emphasize how dense connections are built-up from simpler dyads and triads to more extended dense clusters such as "cliques." (Kunter, S. and Cripps, J., 1997) This view of social structure focuses attention on how solidarity and connection of large social structures can be built up out of small and tight components. Divisions of actors into groups and sub-structurescan be a very important aspect of social structure. It can be important in understanding how the network as a whole is likely to behave. Knowing how an individual is embedded in the structure of groups within a net may also be critical to understanding his/her behavior.

Ⅲ. Open Source Applications for Social CRM System

In this section, we give brief introduction about a social network of Elgg, a CRM application of V-Tiger, and a network visualizing and analysis tool of JUNG. These open source applications are used to develop social CRM system.

3.1 Elgg-Open Source Social Networking Engine

Based on our study with different social networking systems such as People Aggregator, Joomla, PHPizabi, Elgg and Community Server, we found People Aggregator and Elgg are better than others in terms of the features and services. People Aggregator is a commercial tool and has complex features to integrate with other packages. In contrast, Elgg is an open, flexible social networking engine, which can be easily designed to be integrated with other applications.

Elgg is a simple application to work with, as the engine handles common web application and social functionality and enable to concentrate on developing our idea rather than building application. The screen shot of this application is shown in <Figure 3>.

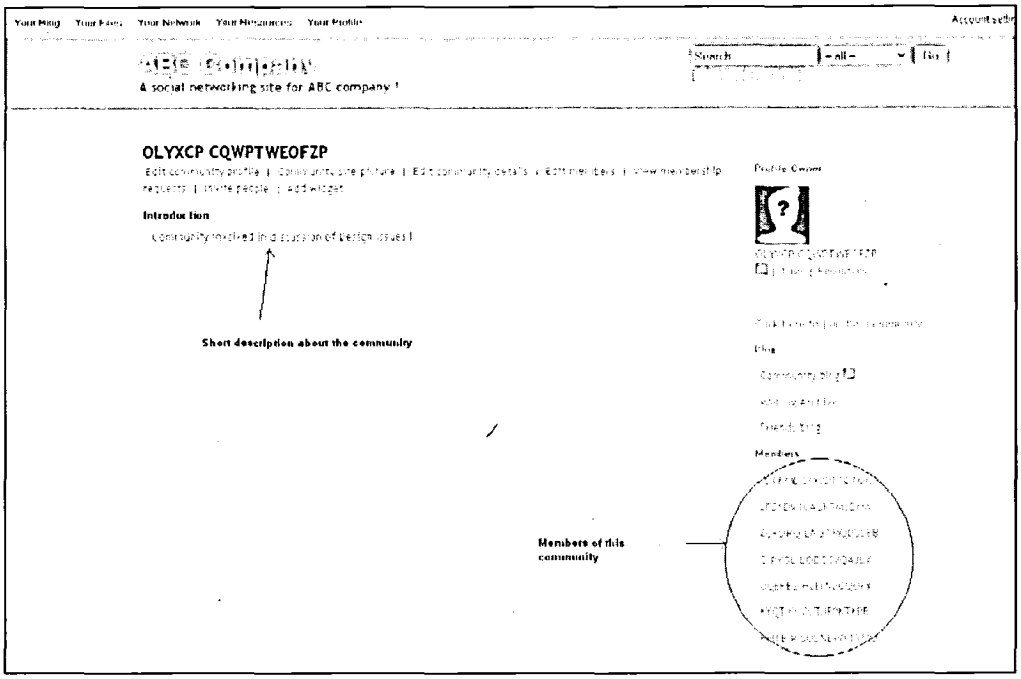
3.2 V-Tiger-Open Source CRM Application

The open source CRM software, V-tiger, was used mainly by small and medium-sized businesses. V-tiger CRM can be used to manage company-wide CRM and inventory management activities, such as sales force automation, customer support and service, marketing automation, procurement, and fulfillment. V-tiger provides many extensibility and customization features to enable CRM solution to meet the needs of business. In cases where we need new functionality, V-tiger provides customization services to meet the need.

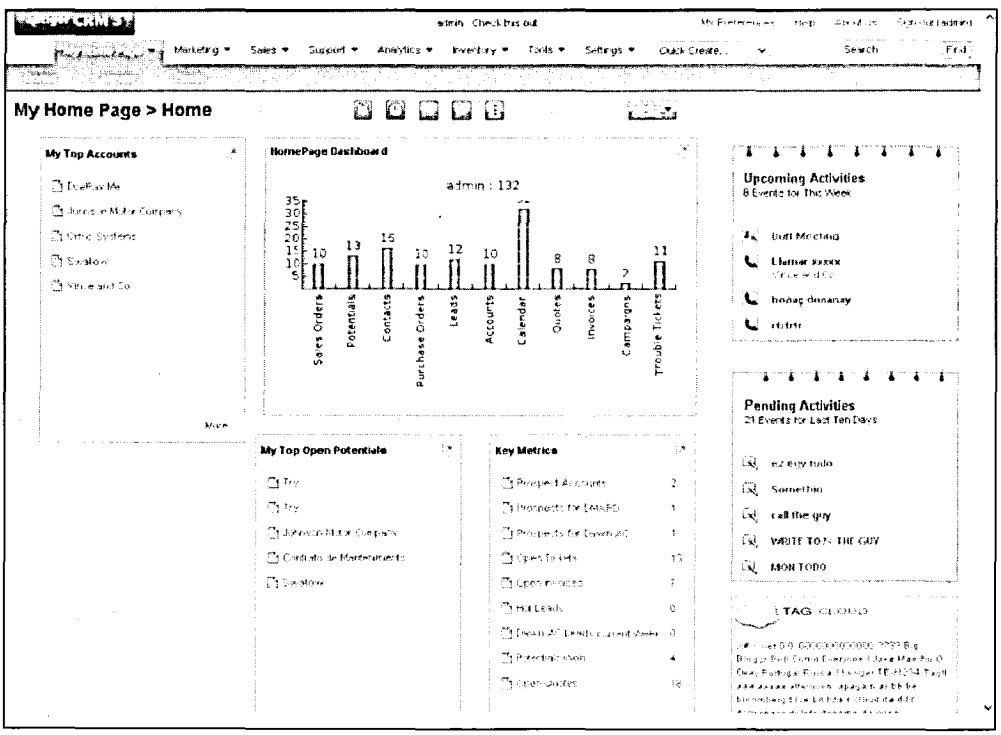
V-tiger also provides enterprise grade business productivity enhancement add-ons: Customer Portal, Outlook Plug-in for Microsoft Outlook users, Office Plug-in for Microsoft Word users, and Thunderbird Extension for Thunderbird mail users.

3.3 Network Visualization and Analyzing Tool

There are different network visualization and analyzing tool like JUNG/GUESS. These tools are an exploratory data analysis and visualization tool for graphs and networks. These network analyzing and visual-



〈Figure 3〉 ELGG Social Networking Engine showing Community and Members



〈Figure 4〉 V-Tiger Application

ization tools are capable of analyzing different social network metrics like density, centrality, Betweenness, etc.

Ⅳ. Social CRM System

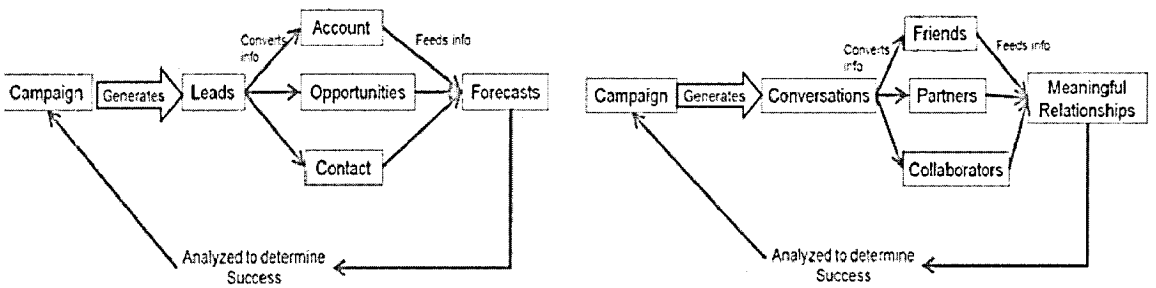
The main purpose of CRM is to manage the customer information and use it for appropriate business decision makings. It helps to understand their customer better and to make the sales person provide better and faster services. With the developments of web-services as platform, it can be a major breakthrough to develop applications with CRM and integrate with other enterprise applications and back end systems.

The information cycle with a traditional CRM system is as shown in <Figure 5> (a). It is a top-down approach according to the enterprise systematic view. In this cycle, whenever the campaign generates Lead's it is then converted into Opportunities and addedto Accounts and Contacts information. Based on the lead's generatedsales person will be working to convert into a successful sale or put into future calls. Accordingly the information is analyzed for future campaigns and helps them for useful forecasting. But organizations need to think better way of working by bringing the view of Social networking into their existing CRM system <Figure 5> (b). It is a bottom-up strategy according to social networks and relations to generate and share opinions.

Changing from a traditional to a Social CRM system enables organizations to convert the content (information) into conversations, to extend the conversation into collaborative experiences and later to transform these experiences into meaningful relationships. Based on the analysis of natural relationship, we can bring the hidden relationship we can bring the hidden relationship of social network to the business activity. This increases participation of customers into business activities and the service value rendered to customers.

The key component of CRM application development is in integrating outside information sources and leveraging web technologiesof collaboration and community, including social networking applications. Social CRM applications extend beyond simple LinkedIn links or integrated Google maps. Social CRM applications are easy-to-use as standalone applications that can be layered on the structured processes of the existing CRM to help end users and have better leverage from social networks, which can provide internal and external data and news feeds.

In our conceptual model, we are trying to combine customer relationship management with social networking and Web 2.0. As the social networking grows and organizations have started to leverage its impacts



(a) Traditional CRM Flow (b) Social CRM flow

〈Figure 5〉 Transformation towards Social CRM

as shown in <Figure 6>.

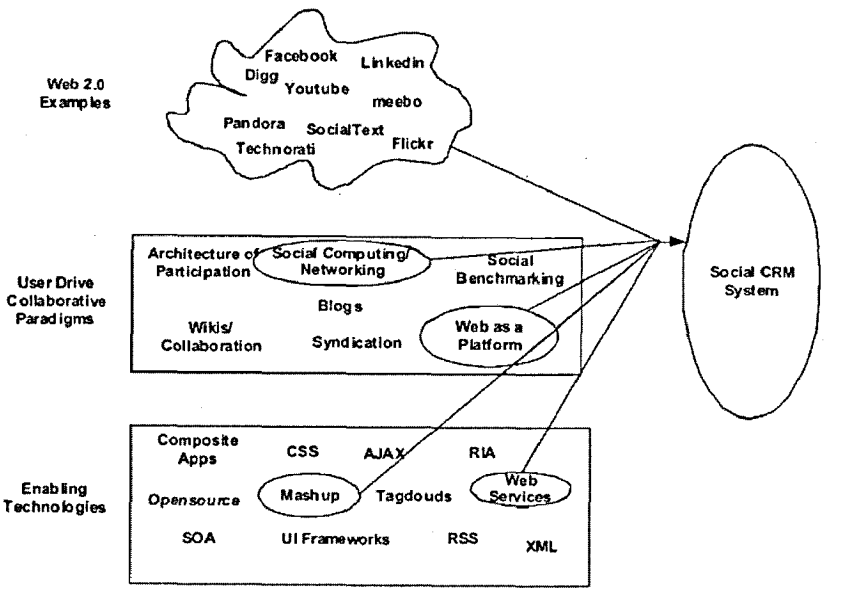
The social networking engines are coming with many options of customization. Companies design and modify the social networking site to match their needs before merging it with the existing application. Administrator from enterprise side can control the whole process and users to prevent misusing of the site and any kind of information stealing. Organizations can create their own internal or external social networking communities and started to create opportunities for the business. They can use the information from social networking communities to capture new customer information and also publish information. Social CRM can save time and money for organizations as they get connected to a number of potential customers.

Social CRM system can be deployed using Web 2.0 as it is more than just information retrieval but has the potential to be usedas a platform. The technology that can be used for exchanging the data between CRM and social networking applications is Mash-up technology and it can be used to expose the aggregation of enterprise data sources to Mash-up client frameworks thus an enabling technology for Web 2.0 style applications in the enterprise.

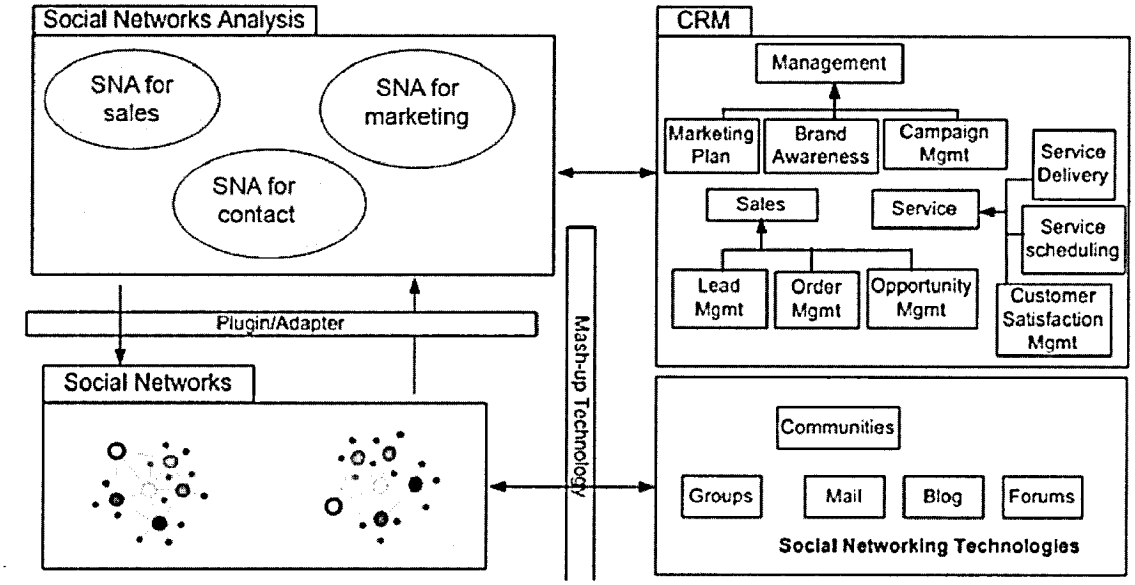
4.1 Architecture of Social CRM System

There are three major functions in social CRM applications that enable interaction with social networking sites and provide a sharper focus on user experience, with more intuitive graphical designs and relevant mash-ups in <Figure 7>.

Managing Sales is a major function in the social CRM system, which enables the sales people to develop sales predictions for accounts and products that are relevant to the user's territory based on an analysis of buying patterns of customers with similar attributes. Bringing orders, territories, and financial information together to analyze buying patterns at the community level helps users determine what the next possible purchases is likely to be, the size of the deal, when the deal is likely to close, and the probability of the



〈Figure 6〉 Collaborative Platform of Social CRM System



〈Figure 7〉 Service System of Social CRM

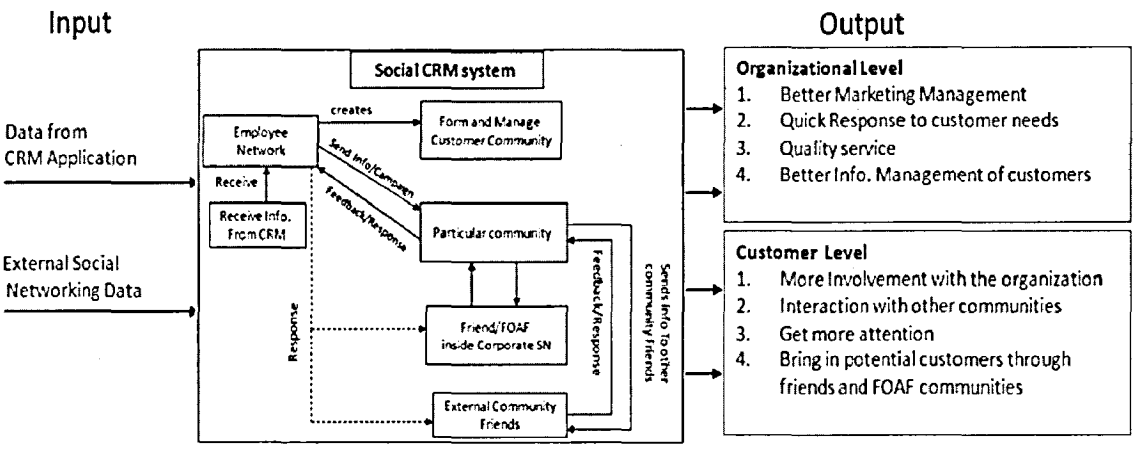
deal.

Campaign Management is another function that enables campaign managers to create sophisticated HTML campaigns in e-mail, create segmented lead lists, and then track the results of targeted campaigns based on the open rates, click through, bounce backs, and other metrics. Sales people can convert leads into opportunities with campaigns by delivering offers and capturing real-time positive responses. Campaigns can be shared across both organization and company boundaries.

Contact Management is the third major function in social CRM system that allows to enables the ability to easily manage and organize contacts to maximize leads. For example sales people to find their colleagues working in different area and can share their experiences. When the contact management is integrated with social networks all the communication is visible to the employee which help then to communicate more easily with the customers.

4.2 Social CRM System Process Flow

Based on our architecture and the three layered structure of social CRM system, the process flow within the social CRM system is shown in the <Figure 8>. The system gets the input in the form of CRM and external social network data, which is been used by the employees of Marketing, Sales and Service department who form the first layer (employee community) in the social network to interact with customers and friends of customers. As shown in the figure, whenever the employee gets some information from CRM system it will be published to the target group within the customer's community. The feed back or response received from the customer's will be sent back to the CRM system for further processing. In case of generalized information then that will reach the friend of customer's in the same network or in different network. In that case external social network data will be coming into the enterprise social network which



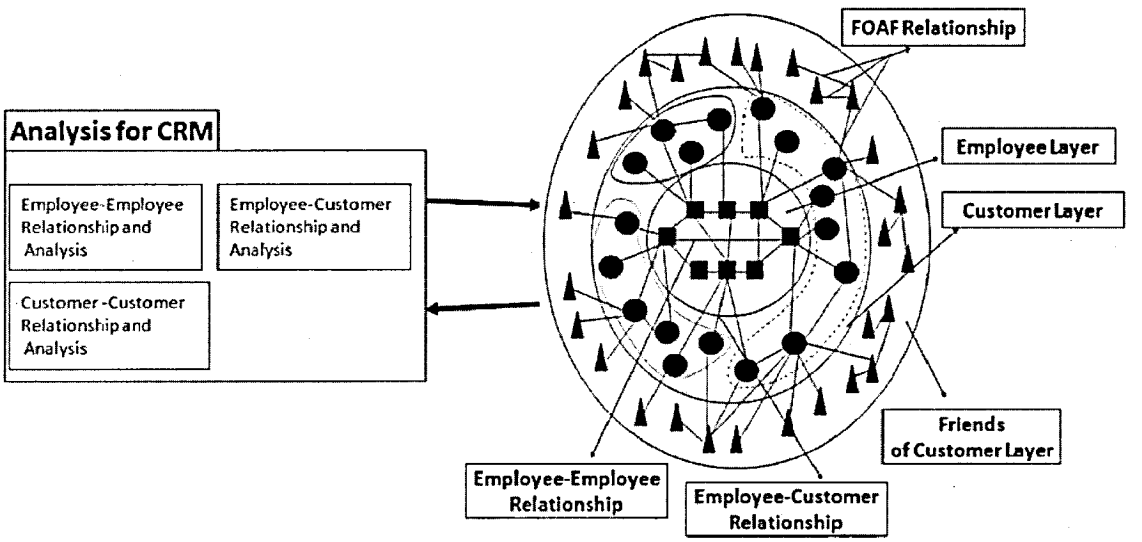
〈Figure 8〉 Social CRM System Process View

will be analyzed and the potential customers will be tapped by the employees. Finally the output from social CRM system is shown from two perspective one from organizational perspective, such that it can support to have better marketing operations, have the opportunity to reach more people in shorter time, improve their quality service and have better communication with the customer's. Second output is on customer's perspective, which can improve the involvement of customers with the organizations activities, enable interaction with other communities and find their peer groups and bring in potential customers through their friends and friends-of-friend communities.

V. Analysis of Three Tier Social CRM System

In this section, three layered structure of service connectivity in social CRM network is shown in <Figure 9> and analyzed in detail. Our social network has been segregated into three layers by placing employee network in the first layer, customer network in the second layer and friend of customers in third layer. Only employee in the first layer of the network will be connected to the CRM application for exchange of business information between social networking and CRM applications. They will be having a complete view of second and third layer and control the whole network functioning. Customer network in the second layer will have interaction with employee network on one-to-one or one-to-many relationships type. They are instrumental in bringing their friends network and this can essential increase the visibility of enterprise and reach more people who can be their potential customers. Friends of customers placed in third layer will be able to interact only with their friends in second layer and they can be future customers for the organization. In this section we have made detailed analysis of what interactions going on in different layers of the social network and its contribution to the CRM application for supporting organizations business decisions.

The first layer <Figure 10> shows the employee community insocial network connectivity and their interactions with CRM application bring more collaboration between employees. Employee network is the core within the social network of a company. Employee community has the privilege to interact with the custom-

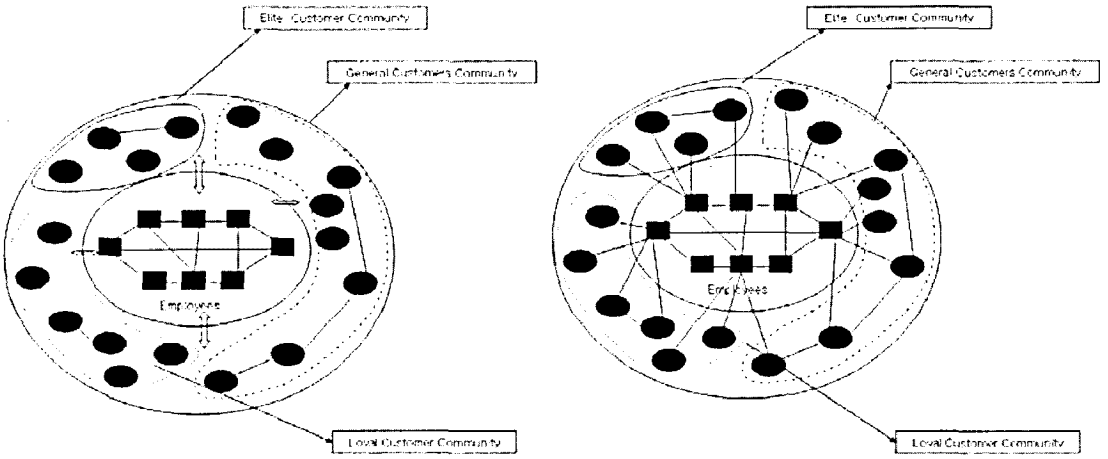


〈Figure 9〉 Social CRM-Connectivity between CRM and Three Layered Social Network

Layer		Analysis Focus
1	Employee Layer	Sharing of ideas. Maximize Collaboration
2	Customer Community	Better communication about product/services Better info management of customer
3	Friends of Customers	Find out potential customer Better communication about product/services

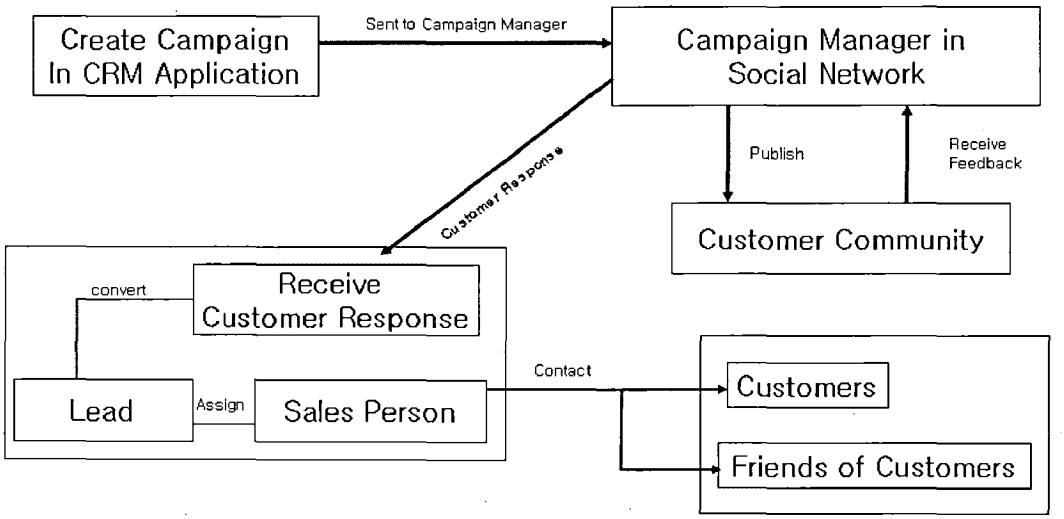
〈Figure 10〉 Analysis focus on Layered Social CRM

ers and friends of customers in the social network and with the CRM application. In addition to employee-customer relationship, there will be also inter-employee connection where employees can share their ideas, giving suggestions and sharing other information that can help to strengthen employee's relationship. The input from CRM application to employee network consists of customer profile, campaign and product information etc, based on these information employees interact with the customers in the network. In turn data such as details of potential customer, feedback/ response from customer and any other useful information captured during the employee-customer interaction will be sent back to CRM for making appropriate business decisions and provide better service to their customers.



(a) All-All Connection (b) Individual Connection

〈Figure 11〉 Connection Patterns



〈Figure 12〉 Campaign Scenario Process Flow in Social CRM

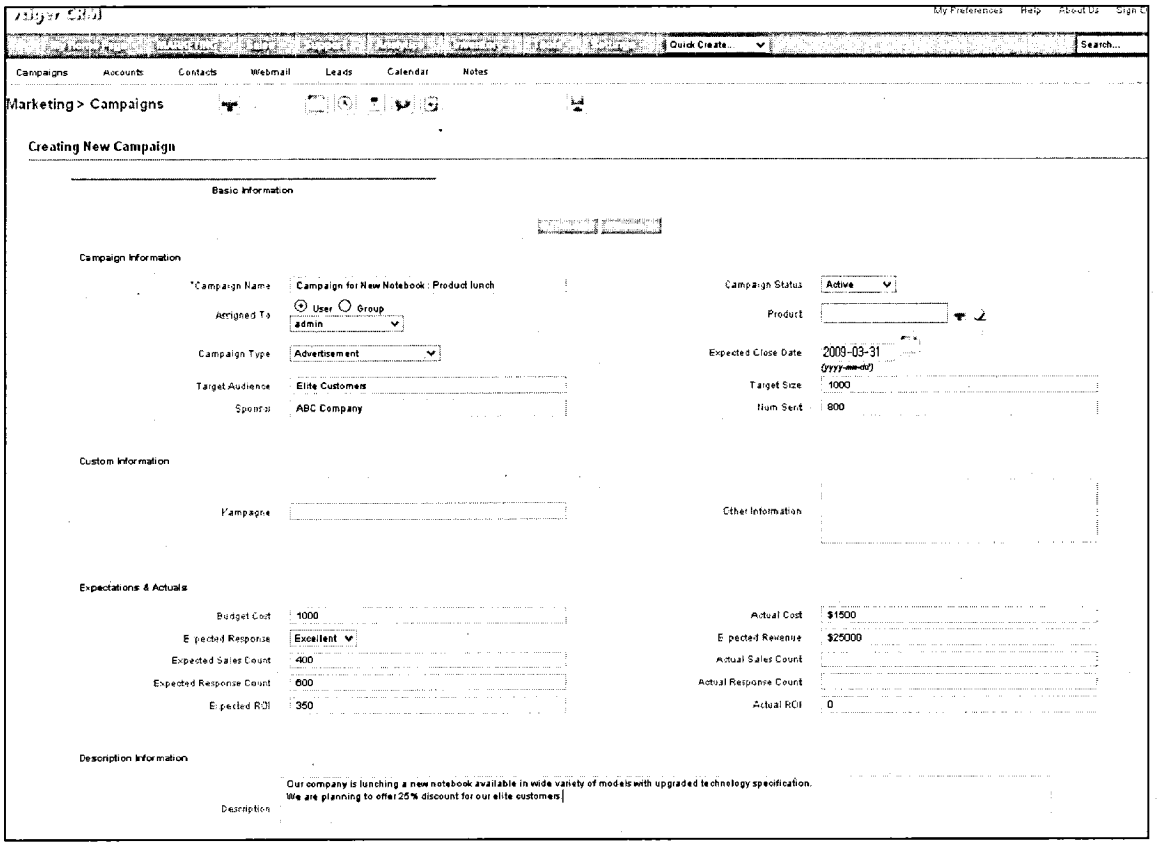
In the second layer the nodes are generally customers and they are formed into different communities based on their connection with the company. We have grouped the communities such Elite, Loyal, General and Potential customers. Segregation of the customers can be done on any basis plus the customers may be joined to different discussion groups and suggestions groups of the corporate social network. They have direct interaction with one or more employees in Layer 1. At this level there can two types of employee-customer relationship. First one is all-all connection <Figure 11>(a) it means all employees in the Layer 1 can

interact with customers in different communities in Layer 2. Second is one-one connection <Figure 11> (b) where some customers are having interaction with some specific employees only.

Finally in Layer 3, friends of customers or the friends of friends of customer is present. Members in this layer are invited by the customers to form their own community and from which employee can trace some potential customers, can know about what people thinks about their products and services. This group falls under potential customer category. Once the member becomes a customer, it moves to the second layer (one among general, elite or loyal customer) where he has the capability to bring in his friends and build a community.

VI. Case Study : Campaign Scenario

To analyze the effectiveness of the integrated application we tried to show an example campaign management. Using the V-tiger CRM application, we created a sample campaign as shown below in <Figure 13>. This campaign focused on a particular community (Elite Customer). The created campaign will be published through the campaign manager in the social network to the corresponding community. The newly created campaign is now available to members of the Elite customer Community. Members outside this community cannot view the information posted and therefore the application enables more security during information transaction. Interested community members



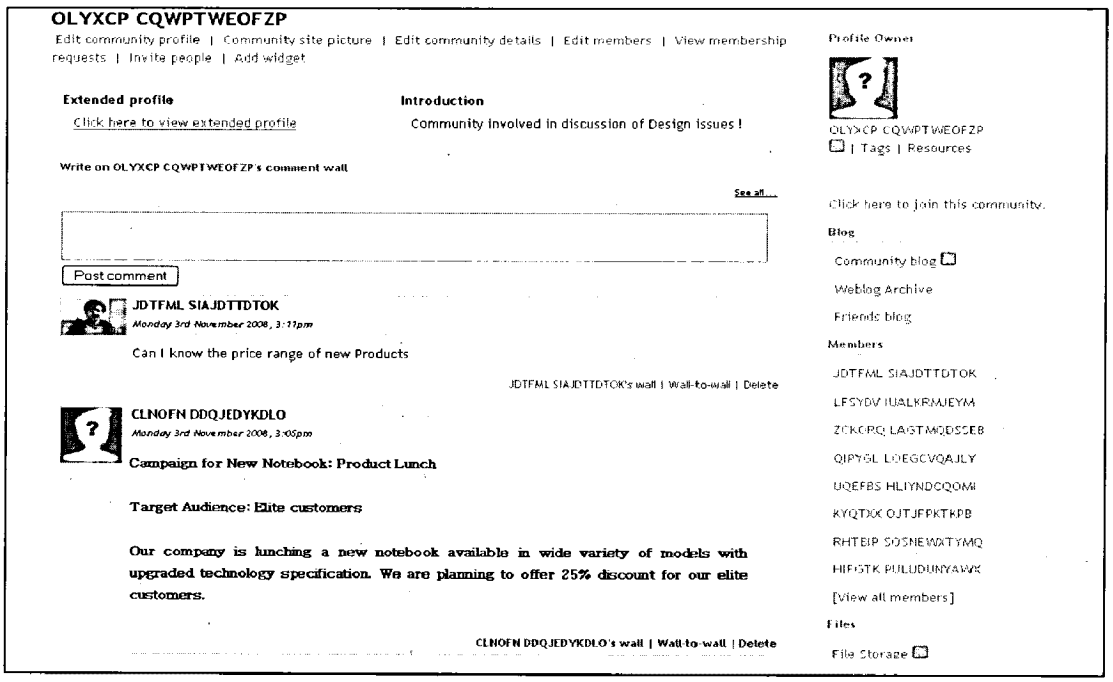
〈Figure 13〉 Campaign Creation in V-tiger CRM Application

then start interacting with the company for further follow-up towards this campaign. Based on the response received, it will be sent into CRM application and with the help of lead management component, it will be assigned to the proper sales person who will contact the corresponding customer and close the deal.

In this scenario, it will be easy for the campaign manager to create the list of target group to whom the scenario is tested. The campaign manager can have better communication with the target customer group with less cost and time. The process has more control over the information flow and captures the response and give feedback to customers at the earliest.

Based on the lead generated by the Campaign manager assigns to the corresponding sales person. Using integrated business data from existing system and the analytics, he can quickly access the profiles of customers that are similar to the new lead, analyze history of buying behavior, and plan a sales strategy based on the new lead's predicted buying behavior. With a short period of time to pull together a closing a sale for a new prospect sales person can leverage the most successful sales-driven marketing campaigns (such as HTML email campaigns) executed by their peers and track the results of these campaigns in real time, apart from publishing their own campaign to the potential groups or communities.

When a sales person is given a new lead in an unfamiliar situation using the integrated social networking technology, one can quickly identify people in his network with links to the lead or potential new contacts. The emerging social networking technologies had added value to the current environment. This will definitely provide a new direction in taking the business closer to the customers and serve them better than their competitors. Among the screen shots of our scenario, <Figure 13> shows the campaign designed in the V-tiger CRM software and <Figure 14> shows the



〈Figure 14〉 Members in the Elite Customer Community Receiving the Campaign

customers in the elite community viewing the campaign the elite community viewing the campaign and then enquiring about the campaign for further information. Regarding promotion of the campaign in this scenario, we access and show the customer community in the second level of social network.

6.1 Social Network Analysis with Respect to Three-Tier Social CRM System and Scenario

The analysis of service quality in three-tier social network is evaluated with the criteria shown in sub-section II. 4. In our approach employees are the central element of the network that brings in the customer or customer's friend. Using CRM and social networking sites together to better listen to customers, analyze information, and respond to customers in a way that's meaningful to them. The network analysis tool helps to get the information about the key players based on different scenarios.

• **Betweenness Centrality**

In this social network, Layer 1 (Employee network) plays a major role of managing different communities in the network, with the capability of broadcasting the message to the whole network as well as communicating with customers (Layer 2) and friends of customers (Layer 3) on one-to-one and one-to-many basis. With respect to our campaign scenario discussed above, marketing manager will be in the point of centrality as most of the interaction during that period will be carried out by him with the target community in the enterprise social network. With the social analysis tools, employees can find the key influencers (customers) in the community. These people can then used to get more response from the community.

• **N-Cliques/Sub n Group:**

As the network grows larger, the particular domain/group can be divided into different sub-groups. The division within the domain/group will be based on different criteria such as discussion-based, product-based etc. In our layered social network, we have divided the customer community into four major groups such as elite, general, loyal and potential. These groups may be further divided based on the criteria specified by the organization. This helps the employees to target specific customers in more convenient and faster way. In the marketing scenario, the campaign designed is for the subgroup within the elite customer community. This helps the campaign manager to select and filter the target list easily as the subgroup is already categorized based on specific interest.

• **Closeness Centrality:**

In enterprise social network, members in Layer 1 play the role of centrality, manage the customer network, and could also extract information from Layer 3. The Layer 1 members can monitor the information flow in the network-they have the best visibility of what is happening in the network. For example, if a potential customer in Layer 3, it makes a request to join in Layer 2, then this request should be processed by a member in Layer 1. Every promotion and campaign should be directly reachable to all the nodes, since Layer 1 members are having all-to-all connection.

Ⅶ. Conclusion

As social networking enables to build online communities and provide an interactive and flexible platform facilitating users to produce and receive information. This encouraged us to couple the Social Networking with the CRM application and develop a Social CRM application-application for next generation.

This can help organizations to extend conservations into collaborative experiences and to transform them into meaningful relationships, and to increase the participation of customers into their business activities. As Social Networking engine comes with an option of customization, organizations can modify and customize to match their needs before plugging it with their existing applications. It also provides control over the information flow and helps to create new business opportunities from their social network communities. The Social CRM system gets input in the form of CRM or Social Network data, and its output is shown in two perspectives: on organizational level (Better Marketing, Quality Service) and customer level (Interactive, Bring in potential customers). We have shown the three-tier structure of the Social CRM system by showing employee network in the first layer, customer network in the second and friends of customers in the third layer. The first layer will be connected with the CRM application, and all business information between Social Networ- king and CRM application are exchanged through this layer. It also hasthe complete view over second and third layers, and the whole network functioning is monitored by them. Finally, social network analysis was made with respect to three-tier social CRM system such as Betweenness Centrality, which shows the role played by layer 1 as most of the interaction is carried out them with other communities and shows how effectively the layer 1 is exchanging information and hascontrol over their network. The next analysis was N-Cliques/Sub n groups, which the appropriate categorization of sub groups based on their domains and the last analysis was Closeness Centrality, this helps to analyze the monitoring capability of members in layer 1 on the information flow in the network and visibility over the network. This showedthat Social CRM application provides new avenues of business opportunities and increases the customer service values.

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Service System of Social Network with CRM Application

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Abstract

Demands onenterprise applications are changing drastically in terms of service and value. Currently enterprises have started to view these applications as service systems, as they combine technology with organizational networks designed to deliver services that satisfy the needs of customers and marketing operations. Social networking is playing a crucial role in this direction and provides organizations with the critical data that enable to build strong relationships with their customers and partners. Enterprises have started using this concept, by integrating social networking services with their enterprise applications such as CRM. In this paper, we combine an open source social networking engine with a CRM (Customer Relationship Management) application to constitute a social CRM system. This can bring the customers closer to the enterprise and facilitate better communication with them. Social Networking Analysis constructs were used to analyze the effectiveness of service system. In the current competitive and economically challenging conditions, salespeople needs to quickly and effectively establish meaningful communication with customers. Our approach can address this issue, by handling the changing customer demands in minimal time, and increases service quality and business value.

Keywords: ***Social Networking Engine(SNE), Customer Relationship Management(CRM), Social Networking Analysis(SNA), Social CRM***

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