CoDiT: An Integrated Business Partner Discovery Tool Over SNSs

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HAL Id: hal-01437929
https://inria.hal.science/hal-01437929

Submitted on 17 Jan 2017

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Abstract. The success of open innovation alliances depends on the right selection of business partners. Given the vast representation of business organizations on SNSs and the resulting availability of significant amount of information about their products and services, the SNSs seem to be a promising opportunity for the businesses to look for the potential partners. In this regard, this paper reviews the potential of SNSs for supporting business partner discovery. In order to address the identified inadequacies of SNSs for supporting business partner search, we present a web based search tool: CoDiT. The CoDiT system seamlessly integrates the company pages hosted on multiple SNSs by leveraging the potential of existing social networking APIs. The main premise of CoDiT system is to support open innovation process – in the 'Find' phase - by assisting organizations in locating complementary assets through the aggregation and exchange of the information about potential partners available on SNSs.

Keywords: Open innovation, Social media, Social networking sites, Business partner discovery, Company pages

1 Motivation

Open innovation, a new paradigm of innovation management, is gaining an increasing attention in practice and academia. To overcome the dearth of resources and enhance internal innovation capacity, many firms have started to adapt the open innovation model whereby they acquire complementary resources and knowledge from outside the organizational boundaries by establishing co-operations with different types of stakeholders of the value chain. The open innovation efforts of an organization flow through four phases: Want, Find, Get, and Manage (WFGM) [8, 9]. The WFGM framework suggests that effective open innovation strategy encompasses four questions; what external assets are required (Want), what are possible sources of these assets (Find), which source's assets are superior and how to acquire access to those assets (Get), and how to coordinate and integrate those assets to meet the objectives (Manage) [9]. The success of open innovation alliances depends on the right selection of business partners (sources of complementary assets); which in turn is influenced by the organization's capacity to identify possible sources of the required assets.

Accordingly, the 'Find' stage of WFGM model needs particular attention from innovation managers in order to maximize the benefits and chances of the success of open innovation alliances. Screening and monitoring the technological environment to search and decide whom to collaborate with is not a trivial task for the organizations. This is particularly true for the companies who are neither equipped with sufficient information sources, nor are they financially capable to run an information system or buy such resources from external providers. Consequently, in order to engage in successful open innovation alliances, it becomes vital for such companies to discover and exploit new channels for collecting information about other businesses.

The current era of digitalized information has brought new ways of information dissemination. One approach to share and acquire information is the paradigm of social networking sites (SNSs). Given the escalating number of business organizations being represented on social networking sites, and the resulting availability of significant amount of information about their products and services, SNSs seem to be a promising opportunity for businesses to look for potential partners. In this context, this paper attempts to evaluate the potential of SNSs for supporting the business partner discovery (section 3). In order to address the identified limitations of SNSs for supporting the business partner discovery, we present the conceptual framework and development of a web-based integrated business partner search tool, CoDiT – Company Discovery Tool (section 4). The CoDiT system is designed to support the open innovation process – in the 'Find' phase - by assisting organizations in locating complementary assets through the aggregation and exchange of the information about potential partners available on SNSs.

2   Methodology

The study is oriented around the design science research methodology proposed by Peffers et al. (2007) [7]. Following this methodology, the work discussed in this paper is conducted in two phases. In the first phase of study, we have evaluated the potential of SNSs for supporting business partner discovery. To achieve this task, we have conducted an exploratory study of the structure and searching procedures of company pages facilitated on four distinct social networking sites: Facebook, LinkedIn, Google+ and Xing (a Germany based platform, formerly known as Open Business Club). We have compared these SNSs in terms of four dimensions: 1) the types and pieces of information which can be presented on company pages, 2) the features of the search interface and the underlying search procedures for searching company pages, 3) the search management functionalities offered to the user, and 4) the ways in which a user can interact with the searched company pages. In the second phase of study, with the quest to identify the possible solutions for the identified inadequacies of SNSs, we have assessed the potential of social networking APIs. The existing potential of social networking APIs allows for third party developers to search for and fetch available information from the company pages hosted on social networking platforms. Subsequently, we have exploited this opportunity to develop a prototype of a web based search tool - CoDiT - which seamlessly integrates the company pages hosted on multiple SNSs.

3 Potential of SNSs to Support Business Partner Discovery

Social networking sites have brought a new wave of dissemination of digitalized information, and consequently altered the way businesses communicate within and across the organizational boundaries. Social networking sites have provided many opportunities for the businesses that were either unavailable or very difficult to obtain for most of the organizations on their own [3]. However, effective social media presence of organizations requires specific and appropriate services from the social networking platforms on one hand, and proper strategy and efforts from the organizations on the other hand. To facilitate companies' representation in specific manner, leading social networking sites Facebook, LinkedIn, Google+ and others offer 'company pages' which enable business organizations to display information about them, their products and services, and allow them to interact with their customer community. Nowadays, almost every organization uses one or another social media channel for achieving one or another organizational goal (e.g. promotion of products and/or services, strengthening their relation with customers through easy, timely and direct communication, invading new markets, doing market research etc.). The resulting availability of significant amount of information about the businesses, their products and services on SNSs enables the SNSs to support the dissemination of partnering information. Nevertheless, looking for business partners for B2B alliances is critical and demanding task. Current information models and available services on SNSs pose two main challenges to their potential for supporting business partner discovery:

1. There exists a rich and diverse ecology of social networking sites that vary in terms of their scope and functionality [4]. For instance, where Facebook provides tools more appropriate for networking and communicating with customers, LinkedIn provides more professional services to link with employees [6]. Beside these giant social networking platforms, several other platforms also exist which are more popular in specific parts of world; such as Xing platform which is more popular in Germany and few other countries. All of these platforms work in isolation from each other. As a matter of fact, all companies cannot manage to represent themselves on all platforms or put all information everywhere, useful information remains dispersed and confined to specific platform boundaries. This in turn hampers discovery and information retrieval without actually getting on specific platform. Furthermore, no known service exists for cross platform exchange and/or synchronization of information across multiple platforms.

2. Our exploratory analysis of the structure and searching procedures of the company pages facilitated on four distinct SNSs – Facebook, LinkedIn, Google+ and Xing – yields that every social networking site uses its own platform dependent way for information collection, exploration and presentation. The findings elucidate that each platform collects different pieces and types of company related information, imposes different structure in information collection and presentation, employs varying search procedures, and offers different search management and page interaction functionalities. Table 1 summarizes the features of company pages hosted on four SNSs.

Table 1. Comparison of company page features offered on four SNSs

Facebook	LinkedIn	Google+	Xing
Available information			
Profile, offers, milestones, events, feed, posts, photos, albums, videos	Profile, company updates, employees using LinkedIn platform	Profile, posts, photos, videos, reviews	Profile, updates, reviews, employees using Xing platform and some statistics, jobs
Search interface (search method and depth, query structure and complexity, faceted filtering)			
Direct, Free text (keyword) single valued search over structured data fields without faceted filtering	Faceted, free text, multivalued, full text search with flat, single valued facets on structured data fields with forward highlighting	Direct, Free text (keyword), single valued (with location) search over structured data fields without faceted filtering	Faceted, free text (basic) and structured (advanced), multivalued search over structured data fields with flat (except the location facets), single valued facets on structured data fields with forward highlighting
Search management (Sorting, bookmarking, networking, geographic mapping)			
Individual map	---	Individual and integrated map	Individual map, relevancy and alphabetic sorting
Page interaction			
Like page, post on page, message to page, and like, share and comment any post	Follow page, and like, comment and share any company update	Share or follow page, upload public photo, rate or review page, share any review	Follow, recommend, and rate company, and like, comment and share any update

The dispersion of businesses' information on multiple SNSs, and varying and inadequate search procedures call for their integration together with provision of new or improved services in order to support the discovery of potential business partners for involvement in open innovation alliances.

4   CoDiT System Overview

In this section, we briefly highlight the high-level architecture and implementation of the CoDiT system. Besides enabling simultaneous search over Facebook and LinkedIn platforms, CoDiT is envisioned to provide following functionalities:

   F1. Enhanced search interface with business specific features
   F2. Consistent and effective view of information with content-oriented metadata
   F3. Search management functionalities
   F4. Company page interaction

4.1 Approach

Although each SNS confines its collected data within platform boundaries, leading social networking sites have already started exposing their network and related data to other web based services in form of application programming interfaces (APIs). These social networking APIs allow third party developers to access user data [2], and fetch, aggregate and create content according to users' specific interests. The two openly available social networking APIs allowing users to search and manage company pages are the Facebook graph API [1] and LinkedIn companies API [5]. The potential of these APIs makes it possible to develop a web based tool that can seamlessly integrate the company pages hosted on these platform by following three step logic: Fetch, Integrate and Present. The CoDiT is designed to avail this opportunity and thereby aggregates company pages hosted on Facebook and LinkedIn platforms.

4.2 Architecture

As depicted in figure 1, the design of CoDiT system is based on a three-tier architecture comprising a user interface (enables the users to execute search query, view results, and manage and interact with the searched company pages), a web server (responsible for executing the search queries, the reading and publishing tasks on the company pages, and the user's bookmarking and networking commands on the local database) and a data layer (consisted of three remote sources - Facebook platform, LinkedIn platform, and Google Maps - and a local database).
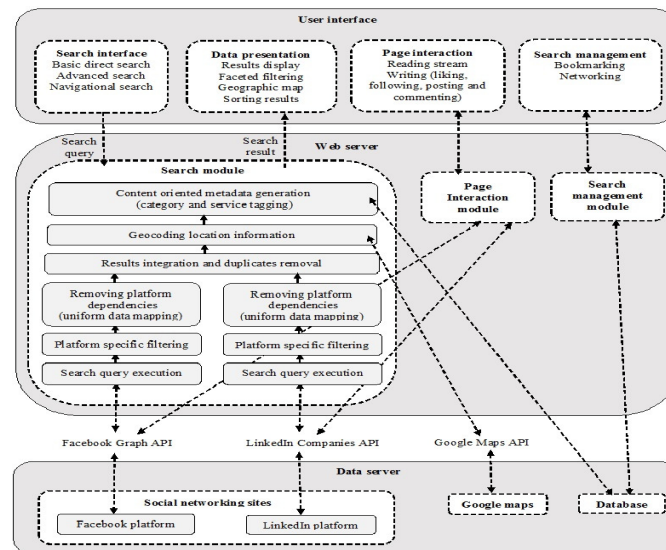

Fig. 1. Conceptual framework of CoDiT

4.3 Implementation

The CoDiT is constructed and configured upon a WAMP (windows + Apache + MySQL + PHP) platform. All static content of CoDiT is written in HTML and the local data is stored using MySQL DBMS. For generating dynamic content on user request, it uses JavaScript with Ajax calls. The sorting and filtering of data on client side is achieved using JavaScript Underscore library. The processing of user requests, and database and SNS querying functionalities are achieved with PHP5 scripts. To connect with Facebook and LinkedIn platforms, it uses 'Facebook SDK for PHP' and 'LinkedIn REST API' respectively and retrieves the API outputs in JSON format.

The CoDiT search interface: The CoDiT search interface facilitates three types of search: a basic search (direct keyword search which is either full text search – keyword appearing anywhere in company information – or user may restrict the search to one of four fields: name, location, industry, or service of the company), an advanced search (where user can design a search query with combination of different parameters including name, keyword, location, industry, and service), and a navigational search (where user can browse the companies by alphabet, location, industry or service). Figure 2 presents the CoDiT search interface after the execution of a basic keyword search.

Fig. 2. The CoDiT search interface

Once search query is submitted, search interface passes the given query to the web server via an Ajax call. On the receipt of the response from the server, user interface lists the retrieved companies, draws integrated map of the retrieved companies using Google Maps JavaScript API, generates the facets, and displays the details of first company of the resultant dataset in the 'company details' section (right column of the screen). Selecting a company in the result set displays its detailed information in 'company details' section together with an action pane (on the top) which facilitates the user to commit several search management and page interaction functions for the selected company page.

The CoDiT search procedure: The CoDiT system executes the given search query in the following steps (see figure 1).
1.   Execution of authenticated API calls for searching companies on SN platforms.

2. Filtering of the returned responses from the APIs to discard the pages which do not match with user specified criteria. Facebook response, in addition, is also filtered against the page category to discard the non-business pages.
3. Mapping of the data fields for each company to a uniform data structure to remove the platform dependencies and facilitate a consistent view of information.
4. Integration of the individual data sets together with simultaneous removal of duplicates by matching the name and location of company.
5. Geocoding the locations of companies through the Google Maps geocode service.
6. Generation of the content oriented metadata (category and service tagging) for the retrieved company pages. The metadata is generated on the basis of textual information available in free text fields of the company profile against the predefined category and service lists stored in the local database by using the specific matching algorithms.

4.4 Experiences and Next Steps

We have tested the CoDiT prototype and verified its functionality on a small scale. In its first version, which is discussed here, CoDiT is able to retrieve a data set of around 500 companies for a given search query. Given the partial responses returned by the SNSs, the CoDiT system makes iterative API calls to SNSs in order to maximize the response rate. The iterative API calls increase the response rate, but also raise the response time. To make a trade-off between the response time and response rate, we have set the throttle limits for the API calls per search query. The throttles are set to 1 Facebook graph API call (returning about 300 company pages) and 10 LinkedIn company search API calls (returning 200 company pages). The running time of a search query is approximately 80 seconds for a simple query and 120 seconds for a complex query.

Our current experiences with the effectiveness of the CoDiT system indicate that it is capable to achieve the desired goal of assisting companies in their search for sources of complementary assets. It enables the users to determine the suitability of potential partners in an easy and efficient way through the provision of several pieces of content-oriented metadata, faceted filtering, and effective and consistent information visualization. However, the system has not been tested in real innovation settings yet. Another limitation of the current version of the CoDiT system is that the semantical issues with the data aggregation and interoperability of heterogeneous information are only partially addressed. Whilst the system fully supports the 'Find' phase, it provides limited assistance in the next phases of open innovation process.

The CoDiT system is in ongoing process of development and improvement. Currently, it connects two social networking platforms, however, it can be scaled to connect other platforms provided their APIs with required search functionalities are made available by the respective platforms. The future steps include the implementation of the measures (caching of the data and/or batching the API calls) to lower the response time and increase the response rate; inclusion of lexical semantics in service identification of businesses; and a set of experiments in real innovation settings to measure the metrics such as usability, effectiveness and efficiency.

5   Conclusion

In this paper, we have evaluated the potential of social networking sites to support business partner discovery for involvement in open innovation alliances. The major inadequacies of SNSs for supporting business partner discovery include the dispersion of businesses' information on multiple isolated platforms, the cross platform variations in information representation, and lacking of appropriate business specific metadata and searching procedures. In order to address these challenges, we have presented the CoDiT system which allows the simultaneous search for company pages over multiple SNSs in business specific manner. The CoDiT system facilitates enhanced searching procedures and semi-automatic identification of industry and services of companies. The tool is intended to support the open innovation process – in the 'Find' stage - by the aggregation and exchange of partnering information available on SNSs.

The CoDiT system can be applied in two scenarios. One, it can be used as a supportive tool by the innovation managers for searching potential partners for them to involve in open innovation alliances. Two, it can be used by the so-called innovation intermediaries (who function as agents of network formation for business organizations, and assist them in searching and selecting business partners) to look for potential partners for their clients and thereby extend their network. The proposed tool provides two benefits. Firstly, it serves as an efficient and effective method for searching potential business partners. Secondly, it supports the reuse of partnering information already available on SNSs. Therefore, it improves the usability of SNSs and may motivate the representation of business organizations on SNSs.

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