Cloud Consulting Crowdsourcing-Based Framework for ERP Consulting

Full Paper

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Abstract

Information Technology (IT) altered the way of running businesses in all fields. The installation and integration of an Enterprise Resource Planning (ERP) system is a critical process. With the emergence of Web 2.0, many businesses were created or reengineered to gain an advantage from this technology. This offers an enormous network of users with different interests and skills, and support knowledge transfer. Our expectation is that ERP consulting business will be the next to be changed. In this work, a cloud consulting framework will be provided to enhance the services offered based on crowdsourcing. After examining literature on crowdsourcing and ERP consulting, the following research question was stated: "How can cloud consulting employ crowdsourcing to improve ERP consultancy?" Thus, the research objective is to develop a cloud consulting framework for ERP consulting based on crowdsourcing.

Keywords

Enterprise Resource Planning (ERP) system, Crowdsourcing, Cloud management.

Introduction

Information Technology (IT) altered the way of running businesses in all fields. New businesses arose and others disestablished. More changes came with the introduction of social networks after Web 2.0. One of the most imperative IT-solutions is the Enterprise Resource Planning (ERP) system (Shah et al., 2002), which has changed the rules of competition in the market. Nowadays, the integration of ERP systems is essential for building a competitive advantage in a highly globalized and competitive market (Zabjek et al., 2009). The necessity of ERP systems relates to big enterprises as well as small and medium-sized enterprises (SMEs) (van Everdingen et al., 2000). However, some SMEs cannot afford the adoption of an ERP system due to the lack of the resources (Morabito et al., 2005). The installation and integration of an ERP system is a critical process faced by all enterprises that adopt the software. The implementation of an integrated system can represent a bottleneck due to the lack of know-how and adequate internal resources. For this, different support businesses emerged, from single consultancy services to system outsourcing. S.-I Chang believes that in order to support an ERP system, the consultant needs skills in at least three dimensions: the knowledge in the ERP system itself, the right technology understanding, and the business know-how and practice (Chang, 2004). However, it is challenging and cost intensive to find a consultant with a range of skills across all three dimensions. In addition, knowledge of the operating constraints of the legislation, knowledge transfer and management, is essential (Brockmann and Roztocki, 2015). These factors make the project's risk of success or failure dependent upon the consultancy firms and vendors (Chang, 2004). On the other hand, many businesses were created or reengineered to gain an advantage from Web 2.0 which offers an enormous network of users with different interests and skills. Our expectation is that ERP consulting business will be the next to be altered. With the purpose of using the intelligence beyond the social network, a new phenomenon emerged called "crowdsourcing" (Howe, 2006). Its business model benefits from the professionals in the "crowd," and it typically works as follows: A customer asks for a solution to a problem and offers a reward. The request is formed as an open call in a crowdsourcing platform. A random user from anywhere on the globe solves the problem and earns the provided reward. Thus, technology is able to improve traditional consulting by quickly finding a well-fitting consultant with the required skills. In this

work, a cloud consulting framework will be provided to enhance the consultancy services based on crowdsourcing. For this, the traditionally used ERP consulting services along the ERP adoption lifecycle are first studied. This illustrates the needs and relationship between the adopting company and the consultants. Furthermore, the crowdsourcing model is analyzed. Then, the framework is proposed, and a comparison with similar existing models and platforms is used for evaluation. The paper closes with a concluding statement and a plan for future work.

This paper studies the potential of crowdsourcing to offer a range of services which are typically offered and allocated on-site or by an outsourcer. After examining literature on crowdsourcing and ERP consulting, the following research question was stated: "How can cloud consulting employ crowdsourcing to improve the ERP consultancy?" Thus, the research objective is to develop a cloud consulting framework for ERP consulting based on crowdsourcing. To realize the presented framework, the scientific methodology of a design science according to Hevner et al. (Hevner et. al., 2010) was conducted. Moreover, to strengthen the comprehensibility, reproducibility, and ground structure of this contribution, the recommended workflow by Peffers et al. (Peffers et. al., 2006) has been followed.

Literature Review

The objective of this literature review is to discover new research on the topics of "IT Support" and "IT Consultancy" combined with the "online" and/or "web-based" keywords. The target was to observe new Web 2.0 supported models that directly or indirectly fit into the ERP consultancy business model. In addition, keywords such as "IT help portal" and "online experts" were used but were inadequate to deliver sufficient results. Then, new keywords were added, such as "human as a service", that led the research to the "crowdsourcing" phenomenon. The exploration of the crowdsourcing models and their application encouraged and formed the basis to build the cloud consulting framework that is applicable to ERP consultancy services. Several related works were studied to observe their ability to be implemented to support ERP systems. Those were found by searching solutions to cover detected limitations in the basic crowdsourcing model, such as "agreements", "ticketing", and "team building". The last phase of the literature search was discovered by combining "crowdsourcing" with other keywords, such as "SLA", "ITIL", "knowledge management", "agreements", "service desk", "ticketing system", "enterprise", and "ERP".

The literature review is divided into three categories:

1. Background on ERP, its lifecycle, and ERP consulting. The following literature was used: (Shah et al., 2002) (Zabjek et al., 2009) (van Everdingen et al., 2000) (Morabito et al., 2005) (Chang, 2004) (FuiHoon Nah et al., 2001) (Grabski et al., 2007) (Klaus et al., 2000) (Markus & Tanis, 2000) (andresen et al., 2012).
2. Introduction to crowdsourcing in the cloud, crowdsourcing utilizing, and limitations. The following literature was used: (Howe, 2006) (Banerjee et al., 2011) (Rajan & Jairath, 2011) (Buhrmester et al., 2011) (Hammon & Hippner et al., 2012) (Howe, 2006) (Lopez et al., 2010) (Lenk et al., 2009) (Peng et al., 2009) (Porter, 1985) (Rajan & Jairath, 2011) (Silberman et al., 2010) (Whitla, 2009) (Mell & Grance, 2011).
3. Essential services to support the crowdsourcing model for ERP consulting. The following literature was used: (Aceto et al., 2013) (Jones & Farrington, 2013) (Khazankin et al., 2011) (Liberatore et al., 2003) (Lopez et al., 2010) (Oracl, 2010) (Todorov, 2007).

Mainly, the research was carried out using Google Scholar, IEEE explore, Springer link, and Google.

ERP and Traditional Consulting Model

An ERP system is a "comprehensive, packaged software solution that seeks to integrate the complete range of a business's processes and functions in order to present a holistic view of the business from a single information and IT architecture" (Klaus et al., 2000). Firms use ERP systems to gain a competitive advantage on the market by responding faster to demand changes, anticipating strategy, and adopting a fluent way of doing business. Although influential and business integrated, the ERP system adoption process is risky and long and requires the focus of management and users as well as the help of external consultants. Thus, adopting an ERP system must be studied and carefully managed along its lifecycle. Markus and Tanis identified four ERP lifecycle stages: Project Chartering, the Project (the implementation), Shakedown (monitoring), Onward and Upward (continual maintenance and support) (Markus and Tanis, 2000). In general, consultancy services are needed in every stage. During the first stage, a decision and planning support are necessary. Furthermore, an implementation project team and a project manager are required. At the end-phase, a service desk for support and maintenance of the system should be built. Additionally, self-

service is used in every stage by users as well as by experts. For this purpose, the consulting businesses were established to offer expertise to enterprises that are willing to adopt an ERP system. While some big enterprises implement the system and have a supporting team in-house, others prefer to outsource the system and/or the support service to a consultancy firm. Moreover, there are vendors who have started to offer ERP on the cloud —known as Software as a Service (SAAS)— where the customers pay per user and save the hosting and supporting costs. Based on the literature review and the practical experience of interviewed experts, four different services can be recognized:

Project Management: The implementation of an ERP system is a difficult and complex task (Grabski et al., 2007). It is a long term project and it consumes too many resources. This is due to the high level tasks involved, such as business process reengineering (BPR) and the customization of the system to fit business needs. (Grabski et al., 2007). Furthermore, in order to ensure that the project implementation is successful, resources with the highest know-how in the organization and a cross-functional team are essential; for this, a significant investment in consulting services is required (FuiHoon Nah et al., 2001).
Service Desk: "The service desk acts as the central point of contact between service providers and users on a day to day basis. It is also a focal point for reporting incidents and for service requests[1] ." The service desk can be internal, outsourced, or provided by the vendor of the system.
Single Request: When human resources are unavailable in a specific area during an ERP project execution or in the service desk, a consultant is needed to fill the gap. Here the company asks for one consultant and not a team; hence, a freelancer can cover the needs. However, the recruitment in this case is very specific for the task or series of tasks and ends by solving them.
Self-Services: The computer revolution eased information retrieval and provided wide possibilities to obtain needed information using different means of search engines, wikis, database, etc.
Today, new products always come with user-instruction offered online. The Frequently Asked Questions (FAQ) and Wiki pages are examples. These services are traditionally offered by the system vendor or a third party consulting firm.

Crowdsourcing in the Cloud Context

The cloud consulting framework is based on crowdsourcing supported by other cloud services. In this work, cloud computing was based upon the expression "Everything as a Service (XaaS)". The cloud computing concept is relatively new. However, similar concepts have already existed for decades. The advance of IT has enabled the collection of resources and their redistribution according to individual needs. In the 60s, JCR Licklider designed a concept of a gigantic network and believed that one day, everyone around the world would be able to use the same data. This is the inspired forerunner of our current Internet. Nowadays, cloud computing is perceived as an essential component in the IT field. For example, the elimination of the additional costs of unused services can significantly reduce the total production costs. Thus, the use of cloud computing is valuable for companies (Rajan & Jairath, 2011). A common definition of cloud computing was provided by the American NIST (National Institute of Standard Tech.): "Cloud computing is a model for enabling ubiquitous, convenient, on-demand net. access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction." (Mell and Grance, 2011). Furthermore, NIST defines five characteristics for the cloud: on-demand self-service, broad network access, resource pooling, rapid elasticity or expansion, and measured service (Mell & Grance, 2011).

Cloud Services

Cloud computing is not just a pool of infrastructure resources, such as storage, CPUs, and networks, but also offer software, platform, or supporting services. It is a dynamic offer option where resources can be purchased (Rajan and Jairath, 2011). Today, the cloud is available in three variants: private cloud; public cloud; and hydride cloud (Peng et al., 2009). It is worthy to note that cloud computing combines different services on various levels to support customers in form of "everything-as-a-service" (XaaS) (Banerjee et al., 2011). (Lenk et al., 2009) provide a stack which categorizes the different service types containing:

1. Infrastructure as a Service (IaaS): e.g. Amazon© EC2©
2. Platform as a Service (PaaS): e.g. Windows Azure©

[1] The ITIL Service Desk / ITIL Help Desk: http://www.itil.org.uk/sm.htm

3. Software as a Service (SaaS): e.g. Google© services (Gmail©, Docs©, Calendar, etc.)
4. Human as a Service (HaaS): it relies on people to provide their service on demand and profits from the ability to reach a large number of human resources (the crowd). Whereby, the workers may use a number of cloud services to deliver a solution. This service is also known as crowdsourcing, e.g. a HaaS provider of microtasks is MTurk©
5. Supporting Services: they coordinate all the layers of the stack and are categorized into administrative supporting services, e.g. debugging and monitoring, and business supporting services such as accounting and billing (Lenk et al., 2009).

Crowdsourcing

Crowdsourcing is defined by J. Howe as "the act of taking a job traditionally performed by a designated agent (usually an employee) and outsourcing it to an undefined, generally large group of people in the form of an open call" (Howe, 2006). He added that crowdsourcing involves some sort of payment (Whitla, 2009). A marginal factor that led to the new business model of crowdsourcing is Web 2.0 that built the always-on and networked population environment for social and occupational functions. Crowdsourcing describes the outsourcing of tasks required by client organizations to a number of laborers who are connected via Internet to these organizations. The networking of "crowdsourcer and crowdsourcee" (Hammon and Hippner et al., 2012) is achieved either through a mediator platform, a crowdsourcing platform, or public announcements on a crowdsourcer's website. Hammon and Hippner define the crowdsourcer as the "initiator of the open call" and the crowdsourcee is an "undefinably large, heterogeneous mass of users". They define crowdsourcing as "the act of outsourcing tasks originally performed inside an organization, or assigned externally in form of a business relationship, to an undefinably large, heterogeneous mass of potential actors. This happens by means of an open call via the Internet for the purpose of free, value creative use. The incentive to participate can be monetary and/or non-monetary in nature" (Hammon and Hippner et al., 2012). Crowdsourcing has been developed and forked to suit different objectives. The following, are four crowdsourcing types introduced by "Crowdsourcing.org":

- Cloud labor: e.g. MTurk©
- Crowd Creativity: e.g. YouTube©, Shutterstock©
- Distributed knowledge: e.g. Wikipedia©
- Open Innovation: e.g. Innocentive.com©, Ideastrom©

Following the activities of Porter's value chain model (Porter, 1985), it can be seen that work can be crowdsourced in primary activities as well as in supporting activities in every stage. The integration of crowdsourcing in different business processes depends on the products, input, and output. In the case of consultancy services, the input is human and the output is knowledge.

The use of crowdsourcing, compared to conventional in/outsourcing methods, saves costs and adds competitive value. Hammon and Hippner presented seven chances for this use (Hammon and Hippner et al., 2012). Two chances, "access to an enormous pool of competence and knowledge" and "cost cutting potential", are very significant in applying crowdsourcing for ERP consulting. The client has the chance to access a pool of consultants with various skills and expertise that cover all business and IT needs in the enterprise. Furthermore, the costs of hiring a consultant will decrease according to the following factors:

- Working remote will save charges involved in travelling, e.g. car and hotel.
- Office and space rental costs are also saved by working remote.
- Management cost of the consultant decreases or disappears entirely.
- Hiring consultants on demand saves idle time costs.
- Additionally, the remote work has positive environmental impact.

Although there are many advantages to crowdsourcing, the risks and limitations cannot be overlooked. Hammon and Hippner described nine general risks: difficulties of calculating project costs, necessity of precise project definition, necessity of feedback loops for communication with participants, uncertainty of crowd structure (e.g. regarding expertise), risk of losing control (e.g. boycott or obstruction), loss of internal know-how, consideration of legal framework conditions, creation of a motivating incentive structure, and the data quality (Hammon and Hippner et al., 2012). Moreover, Silberman et al. discuss the engineering ethics in crowdsourcing using the MTurk© platform as an example (Silberman et al., 2010).

The Cloud Consulting Framework

The cloud consulting framework (depicted in Figure 1) combines important services and functionalities employed to consult enterprises along the ERP lifecycle using crowdsourcing in the cloud. The four services mentioned in Chapter 2 form the backbone of the framework. The cloud consulting services are distributed according to the cloud stack model provided by (Lenk et al., 2009) in different service categories. A request is served within a service package, which passes through different services depending on the requirements. The providers and requesters cooperate to achieve a service package by processing individual services. Those are maintained and controlled by the supporting services which are executed by the platform operator. As it is illustrated in Figure 1, the framework is structured into four labels.

- Cloud Consulting Service Packages: contain the four main consulting services (project management, service desk, single request, and self-service).
- Crowdsourcing (HaaS): includes the users, their organizations, and their roles (positions).
- Cloud Consulting Services (IaaSs and SaaSs): comprise of eleven service components that are needed to deliver a cloud consulting service package.
- Supporting Services: contain functions that are usually conducted by administrative staff to support the service delivery.

A closer look into the different parts of the cloud consulting framework follows in the next subsections.

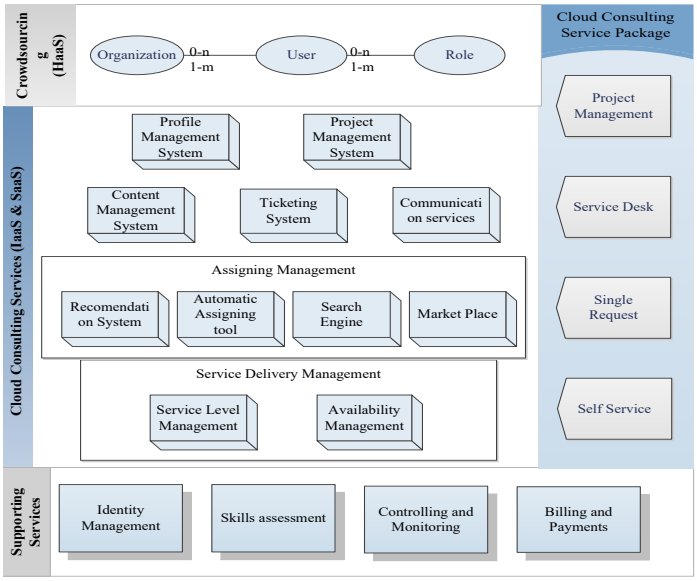

Figure1. The Cloud Consulting Framework

Cloud Consulting Service Packages

For each cloud consulting service, different XaaS contribute in a non-predefined sequence using different components to deliver a valuable consulting service.

- Project Management: sets and aligns a sequence of components needed to execute and manage the project. Usually, the first project will be the implementation project. Other projects, such as upgrading, updating, or developing new processes in the system, can occur and be processed within the PM service package.
- Service Desk: provides the requester with a team of consultants for direct support. It manages the configuration of the desk, the availability, and the offered skills, based on the SLA. It also provides direct contact using the communication services. To ensure a single point of contact, one consultant from the service desk can take the coordinator role.
- Single Request: is defined by a single independent ticket as an object. One or more consultants can contribute as a provider to solve it. The ticket is smaller than a project in its extent and does not require project management. However, a Service Level Agreement (SLA) between the requester and the provider ensures the quality of the work.
- Self-Service: enables users to access the document mangt. Sys. which supports the user with a rating sys., search engine, and privacy setting. The document's provider can request payments for viewing the document.

Crowdsourcing (HaaS):

The crowdsourcing service is comprised of three objects: the users, their organizations, and their roles (positions). This defines the pool of human resources (providers) and requesters. Users can be a provider and a requester at the same time. A user is assigned to roles and organizations, whereby the (n to m) cardinality means that a user can be a freelancer and belong to no organization or work on behalf of one or many registered organizations. An organization should be occupied by at least one user. It is an important object to set up networks and privacy controls. Also, agreements between companies can be better controlled than between individuals. Furthermore, every user should get at least one role during a service delivery process. However, not every role is occupied by online users.

Crowdsourcing (HaaS):

A cloud consulting service is the result of successive Infrastructure and Software Services as IaaS and SaaS. The needed components were derived from the explanation of the four main services of cloud consulting. The different usage of the cloud consulting framework requires flexibility in using the different services and thus, no predefined sequence can be set to guide users from one service to another. However, different scenarios can be developed in future work. In the following, a brief introduction of the service components will be given with examples from the market:

- *Project Management Information Systems (PMIS)*: are mainly used for planning and controlling purposes. Planning usually takes place in the startup phase of the project when controlling is employed along the project life cycle (Liberatore et al., 2003). In the cloud context, a project management system should provide the tools for virtual team building and meetings in order to bring the project members together and to execute the project remotely (e.g. MS Project Online ©).
- *Profile Management System*: is responsible for two tasks. First, to construct and manage the users' and organizations' profiles. Second, to classify and cluster users' key measurements, such as a provider's skills, a requester's field of business, or the used systems. This helps the assigning management task (e.g. LinkedIn©, Xing©).
- *Content Management System (CMS)*: is a software application which allows authors to organize and publish digital content (Jones and Farrington, 2013) in the form of a written document or multimedia contents such as videos and audios (e.g. SharePoint© by Microsoft©).
- *Ticketing System*: is necessary for tracking, assigning, further planning, and reintegration of tasks and solutions into the enterprise's processes. In addition, a ticketing system can be seen as a communication and collaboration tool. Providing a ticketing system in the cloud simplifies the resolving process which enables every participating user to create, check the progress, and update the ticket, or re-create similar tickets (Lopez et al., 2010). An interface between the enterprise ticketing system and the cloud ticketing system facilitate pushing an existing ticket to the mass of experts online with minimal effort. However, integrating different ticketing systems should be investigated in advance (e.g. Atlassian JIRA©).
- *Communication and Collaboration Services*: effective communication is a central need for a reliable client-consultant relationship. Insufficient communication that cannot provide the understanding of users' expression to one another and lacks the clear transferal of needs and expectations is the cause of poor client-consultant relationships (Wang and Chen, 2006). Communication services include asynchronous communication (e.g. e-mail) or synchronous (real-time) communication —known as RTC— which is available in most browsers nowadays. Many collaboration and communication services are included in other systems. For instance, most ticket systems, CMSs, and PMISs provide integrated chat tools.
- *Assigning Management*: the client attains an advanced ability to find the expert provider with the technical and field dependent know-how. To assign a ticket (task), the requester has different services to use, separately or combined. Requestors can directly assign the task by entering the name (or ID) of the consultant. This can be used when the requester and the consultant are already connected, or by utilizing the search engine or the recommendation system. The search engine provides an advanced search tool to find consultants with the right skills, and in combination with availability management, it is able to say which consultants with the needed skills are available now or at a specific time. The recommendation system facilitates the search for the requester by providing a number of consultants according to the needed skills mentioned in the ticket, the requester profile, or the history. Another component is the market place which allows the requester to open a call and take tips from providers. The best fitting offer will be accepted and the ticket will be assigned to the provider (consultant). The requester can also make the open call public and receive solutions as a competition; then, the best solution is awarded. Algorithms, such as the one provided by Khazankin et al., can support intelligent assigning (Khazankin et al., 2011).
- *Service Delivery Management*: service management is "a set of specialized organizational capabilities for providing value to customers in the form of services" (Cartlidge et. al., 2011). Service management as defined by ITIL has different processes that are responsible for the service design package. Here, two processes should at least be integrated into the cloud consulting framework to be supported. The first process is the service level management that negotiates SLAs. The second is the availability management that increases the ability to meet the agreements and support delivering timeline estimation. In cloud consulting with a focus on crowdsourcing, the human resources availability should be considered. Humans are not measurable in the same way as IT components. A possible solution in crowdsourcing is a penalty for incorrect availability information. Still, this might influence the motivation. Further in-depth investigation of the optimum solution is still needed.

Supporting Services

Supporting services facilitate the platform usage, ensure quality, and mediate transactions among clients and providers. The cloud consulting platform provider should —at least— offer the following supporting services:

- *Identity Management*: Oracle© describes it as "the process by which user identities are defined and managed in an enterprise environment" (Oracl, 2010). In the cloud consulting platform, it is necessary to identify users and organizations logging into the system for different reasons (privacy, security, etc.). E.g. enterprises won't exchange sensitive information with an anonymous crowd. Generally, identity management contains two main security processes: authentication & authorization (Todorov, 2007).
- *Skill Assessment*: interviewing is a common recruitment procedure. In the cloud environment, both video and voice interviews could replace face-to-face and the telephone interviews. However, interviewing and rating the crowd requires expertise and knowledge. This led further to the need of a recruiting team with various skills and different working fields. One solution is to crowdsource this task in the form of peer interviewing and skills testing. In addition, online skill tests and endorsements can be integrated.
- *Controlling and Monitoring*: controlling defines the administrative contribution of the collaborative work between task requesters and providers. Controlling has the responsibility of checking if agreements are met; if not, penalties apply. Moreover, service prices can be inspected and controlled to guarantee a suitable average. This keeps all parties motivated. Importantly, conflicts should be handled and solved here. While controlling handles the behaviors of the users, monitoring controls and manages both hardware and software infrastructure to ensure availability, reliability, and security. It should plan and oversee resources, manage data storage, as well as provide system troubleshooting (Aceto et al., 2013).
- *Billing and Payments*: to build an operative platform, the billing and payment process is managed and executed by the platform operator, ensuring online payment possibilities (PayPal©, credit cards, etc.).

The cloud consulting platform that applies the elaborated framework gathers the advantages of using the cloud and crowdsourcing. The framework is an enterprise-oriented construct that takes threats, such as anonymity and company data security, into account. Additionally, it increases customer trust, assures fairness for the provider, allows for integration of consultancy firms, and helps enterprises follow developed technology and gain the advantages of using it. Moreover, using a cloud consulting platform fits in the cloud market for everything as a service.

Use Case Scenario

After presenting the cloud consulting framework, a simple scenario is given to explain the logical workflow of a platform, starting by registering to attend the platform & followed by a self-service scenario. The scenario is continued by a single request when a requester opens a ticket. Then, a project management request is executed and finished with the service desk request when operations take place.

Scenario: Mostly, ERP projects handle ERP updates, upgrades, or replacements. However, when the "APC" enterprise's stakeholders decide to adopt a new ERP system or to replace the existing one, they hand this task to the enterprise executive manager, "Bo", who works together with the IT manager, "Jes". The lake of information about existing ERP systems and components is fulfilled by consultancy services. However, before this, "Jes" prefers to search online for possible solutions as a preliminary step.

Registration

Usually, the registration is the first step to be completed. It includes the:

- User registration and authentication: users can be user providers, requesters, or both. {
    - "Jes" and "Bo" are registered
- Organization registration and authentication: organizations must be registered and authenticated. This facilitates the networking and the knowledge sharing within the organization and between organizations and consultants. It also intensifies the trust between requester and provider.
    - "APC" is registered
- Skills assessment: to build a trustworthy professional consultancy platform, skills should be assayed. There are different assessment models, like online tests, phone calls, and references checks.

Self-Service

When users and organizations are registered, the providers can upload documents for best practices and common issues. Old solved published requests could also be part of the self-service. This step contains:

- Search documents: requesters can search documents in the form of written documents or videos. This helps discover the appropriate ERP solution for their business.

- View rating and tags: well-written documents have a good rating, and their tags are related to the content; tags can also be rated.
- Purchase the document: after searching and viewing the ratings, the requester purchases the document or obtains it for free.
- Rate documents and tags: after viewing the document, the user should rate the document and its tags.

Single Request

After inspecting the profile of an ERP consultant, "Tom", who owned related and well rated documents on the platform, "Jes" decides to contact and hire him to review the business processes of the "APC" company and to support the planning of the ERP adoption. A single request service is selected.

- Open ticket: "Jes" creates a ticket including information about required skills, due date, owner, task/problem description, etc.
- Assign ticket: "Jes" assigns the ticket directly to "Tom" and checks his availability. This helps him better estimate his response time and the possibility that he will accept the request.
- Communicate: "Jes" and "Tom" communicate using different communication services to accurately treat the request. They have many chats before they hold a virtual meeting which included other key users from "APC". "Jes" gives "Tom" access to documents he requested.
- Solution delivery and payment release: after analyzing the business processes and the system landscape in "APC", "Tom" suggests the "GOS" ERP system as an on-premises ERP solution and advises to crowdsource the service desk. After presenting the solution, the project time, and budget estimation, "Jes" and "Bo" agree to accept the recommendation. After, "APC" releases the payment to "Tom" according to the negotiated price and the working hours.

Project Management

- Open ticket: to build the project team, "Jes" creates a new request for within the platform.
- Assign ticket: the service request is assigned in the market place to receive different offers to implement the "GOS" ERP system.
- A consultant with the role of service delivery manager, "Rik", from the consulting company "NOH" sends an offer, including the list of services and the available human resources to be involved in the project. Their profiles and the portfolio of "NOH" are reviewed by "Jes". Furthermore, "NOH" is an approved reseller of "GOS". So, "APC" assigns the project request to "NOH". After negotiating and signing the SLA, the project starts. Subsequently, "Rik" assigns the project manager, "Pit", and the consultants to the project. "Jes" assigns "Solg" as project manager from the "APC" side and the involved users to the project as well. Meetings follow to determine the project scope and to set detailed time and budget plans.
- Open single ticket: the chartering stage ends and the implementation follows. During the implementation, "Pit" needs more consultants. As no consultant with the needed skills from the "NOH" network is available, "Rik" needs to find one from the crowd. He uses the search engine to directly find an available and capable consultant. After reviewing some profiles, she selects "Lan" and assigns her to the project.
- Go live: the implementation phase is completed, test results are successful, and "GOS" goes live.
- Shake down: as planned, the project team continues in the shakedown phase until the system is stabilized.
- Operation: "GOS" is fully operation-ready and is used in daily transactions.

Service Desk

- Open request and assign: "Jes" opens a service desk request and assigns it to "Rik".
- Negotiate SLA: both companies negotiate the new SLA and signed it.
- Build team: the team who completed the project change into the role of providing support as a service desk.
- Assign direct communications: communication services with the service desk are settled. Now users can exchange e-mails, start chats, and make VOIP or phone calls to report incidents. Each incident is handled as a single ticket and assigned directly to the service desk. The service desk coordinator, "Coni", sorts and assigns the tickets.

Open further Single Tickets: Further requests can accrue after finishing the project. For example, the service desk receives an incident ticket in the cloud ticketing system and cannot solve it. "Coni" publishes the ticket in the market place, hiding the "APC" specific data. After solutions are sent to her, she picked one and assigns the reward to the freelancer, "Yas". The ticket seems to be a common problem, so he decided to publish the ticket in the doc. center after agreeing with "Coni".

Discussion and Conclusion

To evaluate the proposed framework, a comparison with similar existing models and platforms can be found in Table 1. Business social networks, like LinkedIn® and Gulp®, facilitate a search from both sides and

connect employees with employers. These platforms do not provide a working environment. Other labor crowdsourcing platforms, such Turk® and TopCoder®, neglect to offer service desks as a service.

In Table 1, the mark '+' is assigned if the component is provided by the platform. The mark '-' is assigned if the component was completely missed and the mark '+/-' if the component is only partly useful. The five compared platforms were: "A" Mechanical Turk®, "B" Top Coder®, "C" Gulp®, "D" LinkedIn®, and "E" Cloud Consulting©. The presented results were delivered by examining the platforms on which all functionalities could not be fully conducted. However, the understanding of the business model and the scope of those platforms helped in delivering reliable results. It can be noticed that both crowdsourcing providers as well as professional networks have neglected to support many needed services. Still, two major points cannot be found in any of the five studied platforms; those are a ticketing system and service delivery management. Nonetheless, there is a high potential that these platforms can improve and extend their business by adapting the cloud consulting framework. The framework evaluation should be enhanced in the future work (interviews, prototypes, etc.).

		A	B	C	D	E
Ticketing System		-	-	-	-	+
Communication & Collaboration Services		+/-	+/-	+/-	+/-	+
Project Mangt.		-	-	-	-	+
Profile Mangt.		+/-	+/-	+	+	+
Content Mangt.		-	-	-	-	+
Assigning	Automatic Assign	-	-	-	-	+
	Market Place	+	+	+	+	+
	Search Engine	+	+	+	+	+
	Recommenda-tion System	-	-	+	+	+
Service Delivery Mangt.	SLA Mangt.	-	-	-	-	+
	Availability Mangt.	-	-	-	-	+
Supporting Serv.	Identity Mangt.	+	+/-	-	-	+
	Skills Assessment	+	-	+/-	+/-	+
	Controlling	+/-	+/-	-	-	+
	Monitoring	+	+	+	+	+
	Billing	+	+	+	-	+

Table 1. The cloud consulting comparison

This research is a starting point for the future of consultancy services in ERP for two main reasons: First, ERP systems are improving and slowly gaining a foothold in cloud computing. Hence, a new outlook on consulting is required. Second, the available IT technologies are ready to support the relatively new crowdsourcing model for enterprises, but a framework that covers the requirements and is aware of the risks is still needed. The elaborated cloud consulting framework paves the way for implementing crowdsourcing platforms that are capable of hosting ERP consultancy services. The research began by discovering the needs and services required to cover the ERP lifecycle. This helped in determining the required functions. Furthermore, the utilized technology was studied (cloud computing and crowdsourcing). These are used to bundle the functions in current technology. Finally, based on the required functions and technology, the cloud consulting framework was elaborated. The evaluation of the framework has shown that different functions should be detailed. Additionally, the complexity and reliability of the framework can be questioned. Individual functions should be further researched in the framework of cloud consulting. Although there have been papers written on the subject, the ticketing system as a crowdsourcing tool and SLA management are two open points for research. Additionally, cloud consulting requires a very organized and controlled crowd which causes high administration costs, such as identity management, skills assessment, or SLA control. This can reduce the advantage of saving costs by crowdsourcing works. Furthermore, future researches should study the individual services in detail in the framework of cloud consulting and their integration with crowdwork. Pricing models are also important for the successful implementation of cloud consulting and require further research. SLA with crowdsourcing did not deliver many results in the literature search and therefore should be studied and tested to determine if it is feasible in terms of an ERP system service desk. Moreover, the motivation and risks of enterprises participating in crowdsourcing labor is an essential subject to be studied in the framework of cloud consulting. Thus, the motivation of SMEs compared to big enterprises will be an interesting research to better show the market needs for new models. However, this paper considered existing solutions for the required components in the framework and introduced a number of examples that are currently on the market. These solutions do not cover all requirements, but some vendors have the potential to improve and extend their business by adapting the cloud consulting framework. Finally, it should be mentioned that the adoption of the framework is not limited to ERP consultancy but can be extended to various enterprise systems supports.

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