User Based Expert Discovery System with Improved Access in Web

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***Abstract*-In the modern world the web services available, provide facility for interacting between the system and human. All the communications are done through the web and it is more essential. Web service is a mode of communication between two devices. This communication can also be implemented by using Service oriented architecture (SOA). To achieve this complex interaction, mixed service oriented system is used. Complex service-oriented systems typically span interactions between people and services. Compositions in such systems demand for flexible interaction models. The progression of making out the right actor whom the user demands for is very complicated. In mixed service oriented system by using the HPS the complexity of the system increases. We present an innovative approach for the flexibility of the system, so that experts can offer their expertise and skillfulness online. In this work we present an approach to explore the experts based on their dynamically changing skills, and also to generate an E-Mail to the expert on behalf of the user. Experts provide their skills by human provided services which can be requested when needed. Our main contribution is based on the UserHITS in the web based environments. The UserHITS provides the reputation of the experts.**

Index terms- Human Provided services, Software based services, social trust, UserHITS.

I. INTRODUCTION

Web services provided a new combination of the composable systems. Web services engage a prominent role in the business environments in flattering their objectives, making the user to feel comfortable to use web services. The Web Services Business Process Execution Language [5] (WS-BPEL), which is primarily designed to support automated business processes based on Web services the Human user interactions are currently not enclosed with it. However the spectrum of activities that makes up general purpose business processes is broader than this, because people often participate in the execution of business processes. To support a broad range of scenarios involving people within business processes, a BPEL [2] extension is required. The users and the developers can use various services in different applications. Web based applications provide a wide range of services which is well-defined, programmable. When process-centric collaboration is used, which is a top down approach it is taken by defining process activities and tasks prior to organizing and accomplishing the process.

In addition to that each time before creating the model, the designer must fully be familiar with the each step involved in the process. In such a composition models flexibility is limited because some unexpected changes require renovation of the process. That change causes exceptions, upsetting the normal execution of the process. In collaborations and compositions it is of great consequence to support adaptivity. The ability to support ad hoc activities and flexibility in human interactions to react to unanticipated changes is adaptive processes. While the process-centric collaboration approach follows a top-down methodology in modeling flows, ad hoc flows in flexible collaborations emerge at runtime. In this paper, we make use of software based services (SBSs) to endow with flexible interactions in service oriented services.

The experts offer their skills and capabilities to the admin that can be requested on demand. The key contributions of the work are: 1) Evaluation of user reputation by using an approach called UserHITS. 2) Experts trust and expertise is calculated based on the expert seekers preferences. 3) Evaluation of Scalability, availability and effectiveness. 4) Automatic E-Mail generation to the experts. The system mainly focuses on identifying the right actor [1], that is, the expert in the particular service requested by the user. An expert is a person who is well skilled in a particular service. In the request provided by the user the skills are specified. The skills provided will be constructed as a query, that query will be processed and list outs the experts with ranks according to their skills and connection to other people having similar expertise. In addition to the process of exploring the experts requested by the user, the details about the experts of the related services will be collected and kept in the buffer. When the user chooses the appropriate expert, then he can also send mail directly from the web service itself.

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II. RELATED WORK

An inspiring scenario is in an organization to develop software of a specified demand the higher authority has to find the exact expert who could complete it accurately with less time. Assume that there are many developers who can do the process. It is difficult to select the suitable expert based on the demand of the expert seeker. While an assortment of languages and techniques for modeling these processes already exists, for example BPEL, discovery and interactions with trusted experts. The BPEL demands for the precise definition of flows of input/output data. Even though it has been modeled as BPEL4People activities, ad hoc interactions adaptations are needed due to complexity of human tasks. Several challenges remain unsolved that are addressed in this paper. 1)Who is the right expert that can assist in solving problems? 2) How can third parties (experts) be contacted and informed about the current situation and how can they easily be involved in ongoing collaborations? 3) Based on which decision are experts selected, which information needs to be exchanged, and how can such scenarios be supported in service-oriented systems? 4) How can one support trusted interactions in such dynamically changing environments?

A. Manual Exploring

The exploring process starts with the expert seeker initiate an inquiry for an expert to their friends, colleagues who have faced the same problem in the past for their opinion. By using the suggestions of other people, the expert who is trustworthy is identified. If the expert seeker identifies the exact expert, contact can be established by using some of the standard tools like electronic-mail, messaging, or making a call. A serious disadvantage is that people should have knowledge about the friends or colleagues and structures of the organization. This process of exploring experts manually becomes very much thorny when the number of experts increases. The skills, reputation, and trust that are calculated could change dynamically which makes manual exploring tricky. This process is done by the software based services [3]. When the user requests for an expert, the query is processed. After processing the query, the details are matched up with the tree where the details of the experts are stored. Table I shows the expert list that is available in the system.

TABLE I: Expert Details

ID	Name	Area	Skill1	Skill2	Skill3	Contact no	Mailid
1	Raghu	Technical	OOSE	IS	SS	8220865966	raghu@gmail.com
2	Nivetha	Programming	Java	Perl	Php	9750072295	rknivetha@gmail.com
3	Ravi	Placement	Non verbal	aptitude	Verbal	9783452341	gravi@gmail.com
4	Belinsha	Technical	CN	DS	CA	9629154888	belin@gmail.com
5	Balgani	Placement	Aptitude	soft skill	Verbal	9823540854	empty
6	Nadhiya	Technical	CA	OOSE	OOPS	8346785345	nadhiya45@ymail.com
7	Saranya	Technical	CN	TOC	OOPS	9677325622	saran@yahoo.com
8	Girija	Placement	Soft skill	verbal	Non verbal	9456128876	grijap@hotmail.com
9	Sathiya	Technical	DS	WT	OS	9688809843	sathiyap@ymail.com
10	Rubiya	Placement	Verbal	Nonverbal	Aptitude	9874562357	ruby234@gmail.com
11	Priya	Programming	Java	C#	.Net	8794552356	priyacool@gmail.com
12	Maggi	Programming	.Net	Java	Perl	9784356120	Mragret@hotmail.com

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The authorities are the experts whose details are stored in the database. The hubs are the experts who are known to the experts in the database. The hub score and authority score are calculated by the number of people referred. Finally the rank is calculated and according to it the experts are referred to the user.

Table 2: User Details

Name	Username	Mailid	Contact no
Nivetha	Nivi	nivetha@gmail.com	9750072295
Jegan	Jak	rkjak@gmail.com	9446263449
Ramesh	Ramesh	ramesh@gmail.com	9788720267
Kala	Kala	vrkala@gmail.com	9976487183
Paramesh	Gsp	gsp@gmail.com	9952599805

To use the expert system the user has to register in it first. So that he will be provided with the username and password. By using that username and password only the user can login into the system. Those username and password are stored in the database as shown in table II and can be altered only by the administrator.

When the user starts using the contact of the expert, the details pertaining to the related services are collected and stored in the buffer, so that the details can be retrieved quickly. This reduces the time of searching when the user requests for the next expert. This makes the system efficient, and also the user can get the details about the correct expert. In

addition to that the user can also send a mail to the expert whom he has selected from the system itself, if mail id of the expert is provided. This paper is prearranged as: in the second section an inspiring example explaining the need for interaction models. Third section gives the concepts of the UserHITS exploring. Section four discusses ranking experts using UserHITS and paper is concluded in section five.

B. The skillful network

Recent technologies cannot completely address the challenges specified above. In this paper we present a skillful network consisting of experts which provide support in service oriented manner. Example is the crowd sourcing applications in enterprise environments. The members of skillful network are either some company employees providing help online, or can be provided as software-based services [3].

Experts can also delegate Request For Support (RFSs) to other experts in the network when they are overloaded or unable to provide satisfying responses. Subsequent to this not only expert seekers establish trust, but also trust between the experts transpires.

C. Request Generation

The experts who are available in the repository will be listed to the user by the system. After that if the user wants to send a mail to the expert requesting for the service then user can send a mail from the system itself by using their own mail ids. So that the expert can identify the user who has requested for a service and it will be easy for the expert to respond to the request generated by the expert seeker.

III. EXPLORING EXPERTS

This section explains about the basic concepts of the process of discovery of experts. This methodology is based on the following ideas: 1) a query is collected containing the set of required skills 2) collecting the details of the experts satisfying these demands and 3) accumulating the particulars of the experts who are not satisfying the search but related to it. 4) Retrieving the mail id of the selected expert 5) if requested by the user sending a request mail to the expert.

A. Expert Algorithm

The following steps in Algorithm 1 outline our approach at a high level, which will be detailed in the following sections. First, matching is performed based on the query context. In this step, a set of skills is specified to retrieve qualified users. Second, expert hubs are discovered using link and interaction information. We will further elaborate on this concept in the following sections.

Algorithm: Outline exploring approach
Input: Given a query context Q to discover expert hubs

1) Find experts matching demanded set of skills.
2) Calculate hub-expertise of experts given query context Q.
   a) For each user calculate hub score in Q.
3) Rank users by hub score.
4) Display ranked experts in Q
5) Display selected expert details

Output: Retrieve E-Mail id and send mail if needed.

B. Pattern Matching Algorithm

The basic approach is to use a metric to calculate the overlap of two sets A and B. A straightforward way to define overlap similarity is $\frac{|A \cap B|}{n}$ [6]. In this work, we present an algorithm supporting the notion of strong, weak, and optional matching preferences through alternate approaches for calculating overlap similarities of sets of properties. These preferences have impact on matching of skill properties on lower levels. As mentioned before, all nodes in the skill tree that do not have successor nodes are called leaf nodes. The numerator of the set metric (i.e., $|A \cap B|$) is calculated by the Steps 1-3. The set similarity is divided by the number n based on different matching preferences.

Table 3: Experts on demand

ID	Name	Area	Skill1	Skill2	Skill3	Contact no	Mailid
10	Rubiya	Placement	Verbal	Nonverbal	Aptitude	9874562357	ruby234@gmail.com
15	Anitha	Placement	verbal	aptitude	Non verbal	9857345673	Empty
16	Suganthi	Placement	verbal	Aptitude	Soft skill	9743842345	gsuganthi@ymail.com

Minimum match (Step 1) means that user profiles and interaction data matching the query root node are taken into account for subsequent ranking. All profiles and interaction data that have been tagged with elements underneath will then be considered for matching and ranking. As shown in Algorithm 2 (Step 4), n is appended to the matching result to

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obtain similarity scores based on the different preferences

$$n = \begin{cases} \left|child\left(q_p(L_i)\right)\right| \cup \left|childN\left(q_p(L_i)\right)\right|, & (a) \\ \left|childN\left(G_T(L_i)\right)\right|, & (b) \\ \left|P(L_i)\right|, & (c) \end{cases}$$

Condition (a) is satisfied if strong preferences are selected, (b) if weak or optional and (c) otherwise.

Algorithm2: Tree matching algorithm.

Input: Given a query context Q containing a set of properties qp and elements E Compute:

1) Get all elements e ε E′ whose properties provide a minimum match of topics.
2) Extract topic tree matching query root node.
3) Iterate through each level and calculate overlap similarity of property in query at current level i.
4) Divide similarity by n and append score with wLi to previous score sum.

strong; weak, or optional as defined in the following:

Output: Ranked elements according to similarity

Table 3 shows the shortlisted experts based on the user's requirements, and also the details of the related experts.

C. *UserHITS Model*

In this section, we discuss the formal model for our proposed expertise ranking algorithm consisting of the following component 1) hub score H(u; Q) of user u in query context Q

H(u;Q): Hub score of user u is calculated by the hits of the users. That is when a particular user selects an expert and clicks submit the expert's rate of access will be increased. That rate of access is called as the UserHITS. This UserHITS acts as a reliable entry point to the Expert Web brokering to authoritative users.

Table 4: Experts list related to the search

ID	Name	Area	Skill1	Skill2	Skill3	Contact no	Mailid
3	Ravi	Placement	Nonverbal	aptitude	verbal	9783452341	gravi@gmail.com
5	Balgani	Placement	Aptitude	soft skill	verbal	9823540854	empty
8	Girija	Placement	Softskill	verbal	nonverbal	9456128876	grijap@hotmail.com
10	Rubiya	Placement	Verbal	Nonverbal	Aptitude	9874562357	ruby234@gmail.com
15	Anitha	Placement	Verbal	aptitude	Nonverbal	9857345673	empty
16	Suganthi	Placement	Verbal	Aptitude	Soft skill	9743842345	gsuganthi@ymail.com
20	sneha	Placement	Softskill	verbal	Nonverbal	9664962887	cjsneha@ymail.com
21	Sneja	Placement	Aptitude	verbal	Soft skill	8523905573	cjsneja@gmail.com
14	Kala	Placement	Softskill	verbal	Nonverbal	9976487183	vskala@gmail.com

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That rate of access is called as the User HITS. This User HITS acts as a reliable entry point to the Expert Web brokering to authoritative users. Hubs are recognized based on the demanded expertise, knows relations connecting u to other experts and feedback ratings received from prior delegations. The detail of the expert that is selected by the user is displayed. The experts can also delegate the request to another expert, by sending the mail id or contact number to the requested user.

This user HITS model helps in the process of identifying the expert who is well expertise in that particular area. Since the people will refer to the expert only if the expert is good. That's why we consider the User HITS as a parameter to rank the experts in the database. Though the process of ranking and ranking algorithm already exists, it is essential for the ranking process in this system to identify the best expert.

D. *Sending request to Expert*

In the existing model the user will send a request to the account of the expert in the particular website only. So that when the expert comes online to that website then only he could reply to that request. So there is a provision in this system such that the user could send a request to the expert through mail or message. This helps in quicker

reply to the request to the user.

The user requested for an expert by giving a query to the system. That query will be processed and list of experts will be displayed. Form those experts the user can select the particular expert whom the user wants. The selected expert complete details will be displayed to the user as shown in Table 5.

Table 5: Selected Expert details

ID	Name	Area	Skill1	Skill2	Skill3	Contact no	Mail ID
15	Anitha	Placement	aptitude	Verbal	Non verbal	9857345673	Empty

If the user wants to contact the expert through mobile the mobile number can be used. That is the user can send a message to the expert directly to their mobile. Else if the user wants to send a mail to the expert then he can send it through the system itself. The id of the expert is taken and it will be sent to the html file so that from that the mail will be sent to the expert. After sending mail to the expert the user can get the reply from the expert directly to their mail id. The User HITS of the expert will increase when the user sends a mail to the expert.

IV. HOW IT WORKS

The system has a flexible architecture such that it could be implemented in all the places. The Expertise of an expert will be analyzed and stored in the database. Such that user could gain trust on the system. The data when needed i.e. when it is on demand, it is transmitted, filtered and stored for the user's selection. The steps that are proceeded to calculate the User Hits that is for ranking the experts are as follows:

1) The expert seeker logs into the system.

   Since for every search the expert seeker has to log into the system for authentication.

2) Create Query

   Then he creates his own query to identify the set of experts matching his conditions.

3) Generate preferences

   From the given query the keywords are selected and the preference to be compared is constructed.

4) Skill matching

   After constructing the preferences the key words are matched with the data stored in the database. This done by using the user profiles and the relationships of the experts stored in the database.

5) User hits Calculation

   The users would have referred the experts already, for each user who refers a particular expert, the user hits of the expert increases by one count. By using that counts the User hits are taken.

6) Ranking

   Based on that User Hits the process of ranking is done. The experts are ranked in descending order of User hits.

7) Additional services

   To make the system access easier for the expert seekers, the additional services are also collected. This is done in the same time when the matching experts are identified. This provision is optional for the users; if they need it they can get the additional services.

8) Publishing results

   After the process of analyzing, ranking and retrieving the data form the databases; the final results i.e. the ranked experts who are exactly matching the query are displayed. And also the additional services are displayed if requested by the user.

9) Publishing contact details

   From the list of experts specified in the published result, the user can select a particular expert to whom he / she would like to contact. After selecting a particular expert the contact details of the expert like the mail ID, contact number will be displayed.

10) Request generation

    The expert seeker could choose either to contact the expert through mail or through contact number. For both services there is a provision in the system.

To make the user to feel comfortable, the additional

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services or search related to the search is also displayed. The process of search is done based on the area in which the experts are skilled and also the particular subject in which he / she is expertise. After the expert seeker selects the expert to communicate with, he / she could send a mail to the expert's mail id, or send a message to the expert's mobile number.

V. EXPERIMENTS

In Fig. 1, we show the essential steps of the UserHITS ranking algorithm including data sources used to calculate the weighted interaction graph. A query interface enables expert seekers to specify queries based on preferences. As mentioned before, preferences include demanded set of hierarchically defined skills (Skill Matching). User profiles are evaluated to find the potential candidate experts. The UserHITS calculation is performed online based on the weighted, trust-based interaction graph.

After calculating the UserHITS and displaying the preferred expert's details and also the related experts, the user can send a mail to the expert to request about the service that the user needs. The mail is generated by the user with his details. For generating the mail, the expert id number is required.

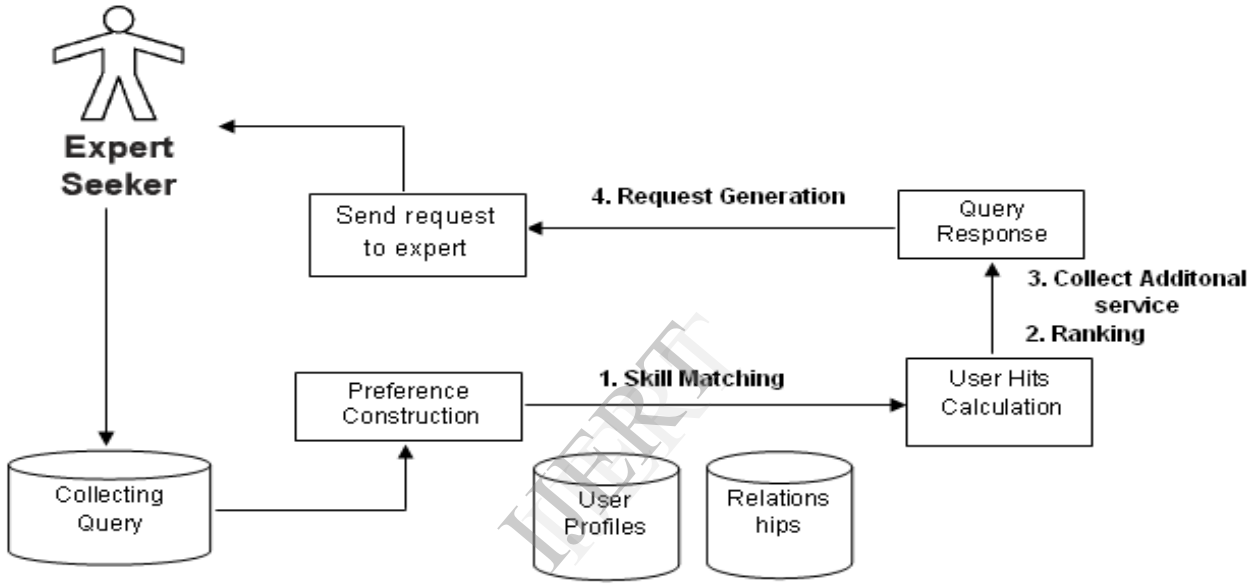

Fig I: Exploring experts process steps

From the displayed details of experts the user can get the id number of the expert. Such that the mail id will be retrieved by using the id number from the database.

VI. CONCLUSION

To solve the emerging problems in distributed collaboration environments, a combination of preplanned steps for process is proposed. Our approach is completely based on the software based Services concept enabling knowledge workers to offer their skills and expertise in service-oriented systems. The process of exploring the experts is greatly influenced not only by trust and also iteration of the process.

That is the process of repeating the search for another expert in the same field will take longer time for the user. Since the entire process has to be repeated. The trust details are regularly updated such that the expert seeker would gain trust on the system as well as the expert. For the process of gaining trust on the users we presented an innovative approach for estimating expert reputation based on trust relations. Trust is major problem in the process of collaboration. Since it has many process like monitoring, analyzing, planning and executing.

As explained before, sine the User HITS are calculate online, which enables full personalization during runtime. The User HITS are used to calculate the effectiveness and service capability of the expert in the system. This evaluation shows that the algorithm explores the experts who are exactly matching with the demanded set of skills. This user HITS contains the properties like trust, efficiency, capability.

VII. FUTURE ENHANCEMENT

In general, though the application of User HITS is focused in human-centric and social collaborations, the underlying trust-based interaction model can be applied to coordination problems in distributed systems. There are many improvements could be done in the process of exploring experts, first is that network effects of two-sided markets in mixed service-oriented systems will be analyzed. Second is the addition of Bayesian network to control the evidence combination form various sources. The recent method of evidence combination is moderately random. The addition of a Bayesian net would allow the system to learn over time by using the results of each query to adjust the weights of each term. Third is to make the system available for public use.

Other improvements that could be made in the exploring experts system is to add additional sources of information of experts and also implementing more standard storage and retrieval methodologies like expansion of queries and Boolean operations and also providing the ability to define online quires such that user will be informed when new experts are added to the system.

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