

# Designing Successful Strategy for Business Process Outsourcing Based on Ontological Knowledge Map

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## Abstract

Business process outsourcing (BPO) is an advanced type of IS outsourcing. This study will investigate the obstacles and challenges of BPO Industry. One of the most important problem in this area is identifying existing explicit knowledge and using it to create further knowledge for decision making, so deep investigation on a conceptual model is needed that helps realize the complexities of outsourcing areas especially for business process outsourcing. Most of outsourcing literature has focused on social and cultural impacts and very few tools have been developed to assist manager in making outsourcing decision by modelling the knowledge. In this paper we propose a methodology for modelling the knowledge of a domain in small and medium size enterprises (SMEs). This methodology is based on ontological knowledge map. Findings of this research overcome these obstacles through the use of a formal organizational ontology and knowledge structure maps. The ontology guides decision makers in managing the complexity of outsourcing with holistic approach to the domain of outsourcing. Ontologies as a conceptual model provide a framework to facilitate efficient and effective knowledge-sharing, knowledge reusing and improving communication by modelling the domain of discourse.

**Keywords:** business process outsourcing, ontology, knowledge map

## 1. Introduction

IS outsourcing has many definitions. All these definitions agree on that outsourcing involves the use of external parties to fulfil the IS needs of the client organization. IS outsourcing may concern information systems, IS components (hardware, software, people, procedures, data), and IS activities (e.g. IS planning, design, development, maintenance). The aggregate of these parts is referred to as the IS function (De Looft, 1996). According to Dahlberg and Nyrhinen (2006) the focus on outsourcing has changed from technical to service management. A service is a logical representation of a repeatable activity that has a specified outcome. Outsourcing services is provided by vendors that may be offshore, or located in a country outside of the organization's country. Initially, IS outsourcing consisted of an external vendor providing a single basic function to the customer, exemplified by facilities management arrangements where the vendor assumed operational control over the customer's technology assets, typically a data centre. Outsourcing of information systems began to evolve in 1963 when Ross Perot and his company Electronic Data Systems (EDS) signed an agreement with Blue Cross of Pennsylvania for the handling of its data processing services. This was the first time a large business had turned over its entire data processing department to a third party (Dibbern et al.2004). There are a number of obstacles that have prevented successful business process outsourcing. One of these obstacles is caused by an emphasis on the business process itself at the exclusion of considering other important knowledge of the organization. Another is due to the lack of tools for identifying the cause of the inefficiencies and inconsistencies in BPO. unattended and overdue, the company is then vulnerable to overtime cost, shrunk capacity and productivity, extra queuing time, lost business income, etc. In order to prevent these deteriorative effects, optimising the number of workers can be helpful. As a fundamental branch of knowledge in manufacturing business, workforce management will never fall behind the times. Therefore, it is worth an attempt to incorporate a novel methodology, such as HMS, into the state of the art of workforce sizing.

## 2. Business Process Outsourcing (BPO)

Outsourcing has been defined as the process of transferring the responsibility for a specific business function from an employee group to a non-employee group (Zhu et al., 2001). The basic premise of outsourcing is that there exists a cadre of experts in given business process operations, whose specialty in these services allows them to offer higher quality services and competitive pricing. Among the popularly acknowledged drivers of business outsourcing are lower costs, efficiencies, improved quality and reduced time to market.

## 3. Knowledge maps

A knowledge map has been defined as a visual display of captured information and relationships (Vail, 1999). These maps enable efficient and effective communication of knowledge at multiple levels of detail, by observers with multiple views of backgrounds too. A knowledge map is a represented knowledge of technique that reveals the underlying relationships of the knowledge sources by using a map metaphor for visualization (Ong et al., 2005). Resercher also take this technique that can be used by organizations to identify their intellectual assets of the knowledge domain. Eppler (2001) categorized different types of knowledge maps and emphasized that the

process of building the maps is difficult in compared with technology application. The five knowledge maps stated are knowledge of source maps, asset maps, structure maps, application maps and development maps. Knowledge maps have been used to represent the views of participants and linkages to other views and to represent the dependency of learning (Gordon, 2000; Edwards et al, 2005).

In this study the knowledge map approach has been represented organizational knowledge, as this map provides a mechanism for decision makers to identify areas of strategic or critical knowledge. These maps can also provide the knowledge base to implement knowledge management solutions in the organization (Kim et al., 2003). Awareness of nets has been developed as a concept modelling techniques and specialized knowledge is considered to be the map (Daneshgar, 2004; Daneshgar & Parirokh, 2007). In these nets, the emphasis is on the role and tasks and purpose is to represent the needs of actors in the process of knowledge sharing business cooperation.

#### **4. Ontology**

Ontology is a set of structured concepts or terms and relationships between them in a given specified domain. The commonly used or highly cited ontology definition is adopted from (Gruber, 1993) where an ontology is a formal, explicit specification of a shared conceptualization.

Ontology provides a way of data representation for entities in a specific domain to annotate the content for the current Web pages. However, ontology in terms of computer science enables to understand the concepts to share information in a specific domain (Noy N F and McGuinness, 2001). One model that describes a particular knowledge domain also called ontology. A formal definition of ontology is "a clear specification concept". Ontologies are shared vocabulary which can be classified into two different types of ontologies (R.Subhashini and Dr. J. Akilandeswari, 2011).

- Domain ontology which provides a set of structured concepts for determining particular domain; it is applied in areas like jobs, medicine, military intelligence, agriculture, automobiles and so many other relevant areas. So, domain ontology is a huge and can be contained more and more terms to interrelate.
- Theory ontology which provides a set of terms for describing some aspect of the world, there can be time, space or plans. Theory ontology is to be more likely smaller and abstract than domain ontology.

##### *4.1 Components of ontology*

Four main elements to represent ontologies in a domain include (R.Subhashini and Dr. J. Akilandeswari, 2011):

**Instances:** Individuals (also known as instances) specify objects or the actual example of concepts in the domain that we are interested in. Individuals can be actual objects i.e. animals, people, tables or abstract objects i.e. words.

**Classes:** Set of individuals or entities form classes (also known as concepts) within a certain domain. Class may contain other classes (concepts) and can be organized into super and sub class hierarchy.

**Attributes:** Attributes are used to represent the objects in that domain of ontology. Every attribute has a name and value to have specific information about that particular object.

**Relationships:** Attributes are used to identify the relationship between concepts or objects in the ontology. Types of relationships can be is-a, is subclass- of, is-subtype-of, part-of and made-in.

#### **5. The application of design science research as a method**

This research presents a systematic design method for developing ontology based knowledge map for business process outsourcing, which not only is developed based on the design science guidelines, but also incorporates the same design paradigm. Following design research guidelines, this research is conducted in an iterative and incremental manner where each iterations, extends, refines and eventually evaluates the artefact(s).

The artefact, which is the solution to the stated problem and its defined objectives, is built in the 'development' phase. The output of this phase is an artefact or a set of artefacts (Vaishnavi, Kuechler 2007). The techniques for developing the artefact vary depending on the type of the artefact to be constructed. As stated by Vaishnavi (2007), the implementation of the artefact itself does not need to involve novelty beyond the state-of-practice for the given artefact; the novelty is primarily in the design, not the construction of the artefact.

#### **6. Ontology development for BPO**

There are various parts that could be outsourced in this study but the data entry service is the main part for present company. Thus, the data entry services are chosen to be used and evaluated for this research. Development is when the main artefact of the research is created. The corresponding artefact in this paper is the Ontology based knowledge map which can provide some inputs for decision makers in outsourcing decision. The knowledge map represents task, subtask, the decision maker, involved and interaction between them. There are some steps that should be followed to achieve a suitable ontological model:

Step 1: Specifying the domain of ontology. Step 2: In detail some key concepts, attributes and the relationships between these concepts were extracted by researcher in specific domain of knowledge. Step 3: Then based on this data the ontological model has been developed in field of study. Step 4: Finally based on ontology the

researcher can design knowledge map and investigate connectedness and relationships in domain.

**Step 1:** Case study - data entry services

Whether big company managing and distributing large quantities of information, or a small company handling; there are a lot of data from formats such as papers, images, CDs, and PDFs, there is no doubt that data entry is vital in transforming them into information that each business needs. Today, every business needs to focus on differentiating itself in the market. One way to do this is by outsourcing all non-core work such as document data entry to a skilled expert. This frees the business to focus its energies on building core competencies. With this increased commitment, the business can provide better goods and services to end customers. Data entry services for all kinds and formats of documents like directories, databases, catalogues, yellow pages, government registries, company reports, questionnaires and more. These are a few of our featured data entry services:

- Document management system
- MySQL database data entry
- Data entry from enrolment forms

**Step 2:** Concept extraction for data entry services

Data entry service is considered as a case study in this study which is chosen by researcher to extract the necessary concepts, relationships and finally developing the ontology. In this example the new style of developing ontology is used by researcher named formal ontology. Table 1 shows the extracted concepts and relationships in data entry services.

**Table 1.** Instantiation of concepts

Entities	Relationships
Data Entry	hasDatabaseIntegration
Document Management System	hasImage Editor
Website Data Entry Service	hasInvoiceOrganaizing
Image Data Entry Service	hasInvoiceOrganizer
Company Report Data Entry Service	hasReportOrganizing
Invoice Form Data Entry Service	hasReportOrganizer
MYSQL Database Data Entry Service	hasResizing
Data Entry for Enrolment Form	hasScanning
Role	hasUpdate
Task	hasUpdater

**Step3:** Ontology development for data entry services

Formal ontology contains developing the specified model by web ontology language (OWL). By means of OWL the researcher specifies attributes, instances, properties and finally class hierarchy. In this study all the OWL codes have been produced by Protégé. At first the researcher defines classes and subclasses to make class hierarchy then defines the property for each object to reach to class hierarchy that has been shown in Figure 1.

Table 2. Owl sample for class hierarchy

```

    OWL sample
    <owl:Class
    rdf:about="http://www.semanticweb.org/mahmood/ontologies/2012/11/DataEntryOutsourcing#
    InvoiceOrganizng">
    </owl: Class>

    <rdfs:subClassOf
    rdf:resource="http://www.semanticweb.org/mahmood/ontologies/2012/11/DataEntryOutsourci
    ng#Task"/>
    <rdfs:subClassOf>
    <owl:Restriction>

    <owl:onProperty
    rdf:resource="http://www.semanticweb.org/mahmood/ontologies/2012/11/DataEntryOutsourci
    ng#hasInvoiceOrganizng"/>

    <owl:onClass
    rdf:resource="http://www.semanticweb.org/mahmood/ontologies/2012/11/uDataEntryOutsourc
    ing#InvoiceOrganizing"/>
    </owl:Restriction>
    </rdfs:subClassOf>
    </owl:Class>
    
```

As it can be seen in Figure 1 the class hierarchy in the domain of data entry services has been extracted from OWL. According to extracted data that is done by researcher there are three conceptual parts such as document management system, role, and task. Document management system is categorized to three types of document such as HTML files that include the files which is extracted from website. It has been known as website data entry services, another type is image files that can be considered as image data entry services and last type is PDF files which is extracted from company report and invoice form. My SQL database entry service is related to data that has been extracted from database and should be retrieved. Also data entry enrolment is extracted from some registration form that should be retrieved from system and save to system.

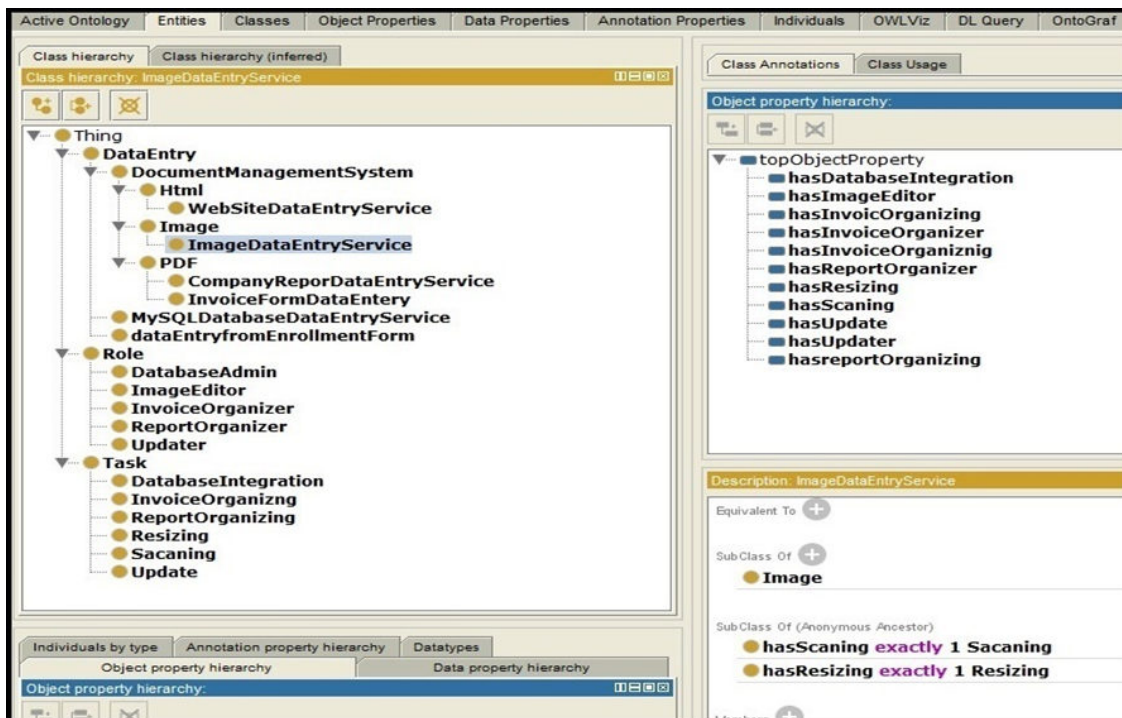
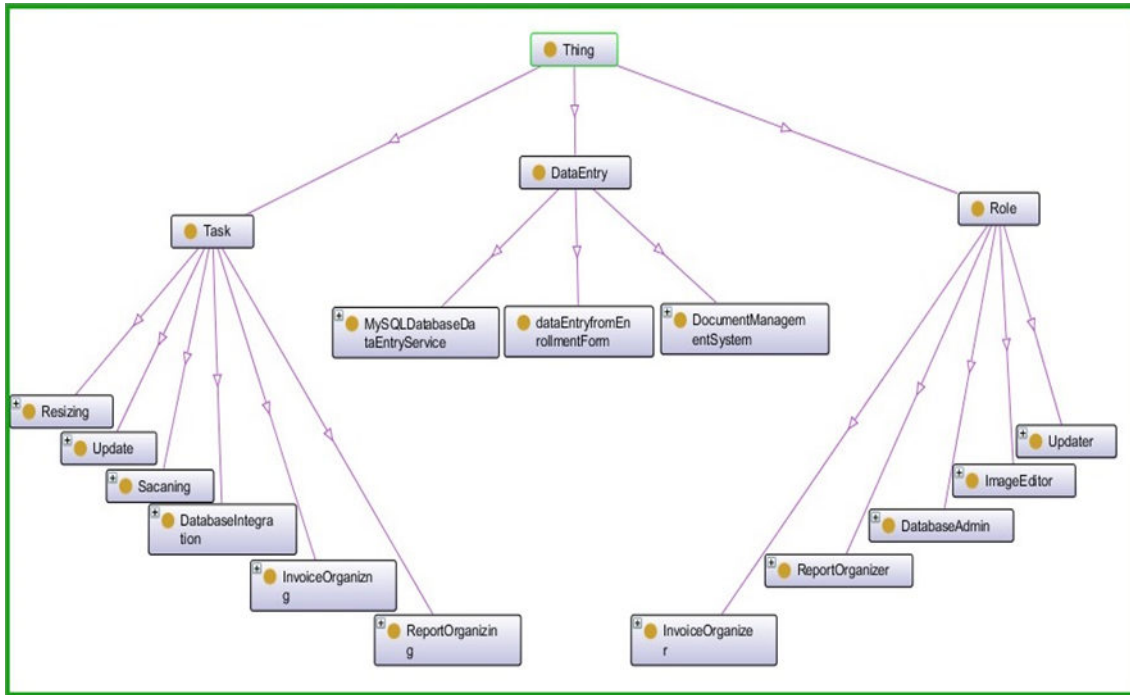


Figure 1. Class hierarchy data entry ontology in Protégé-OWL

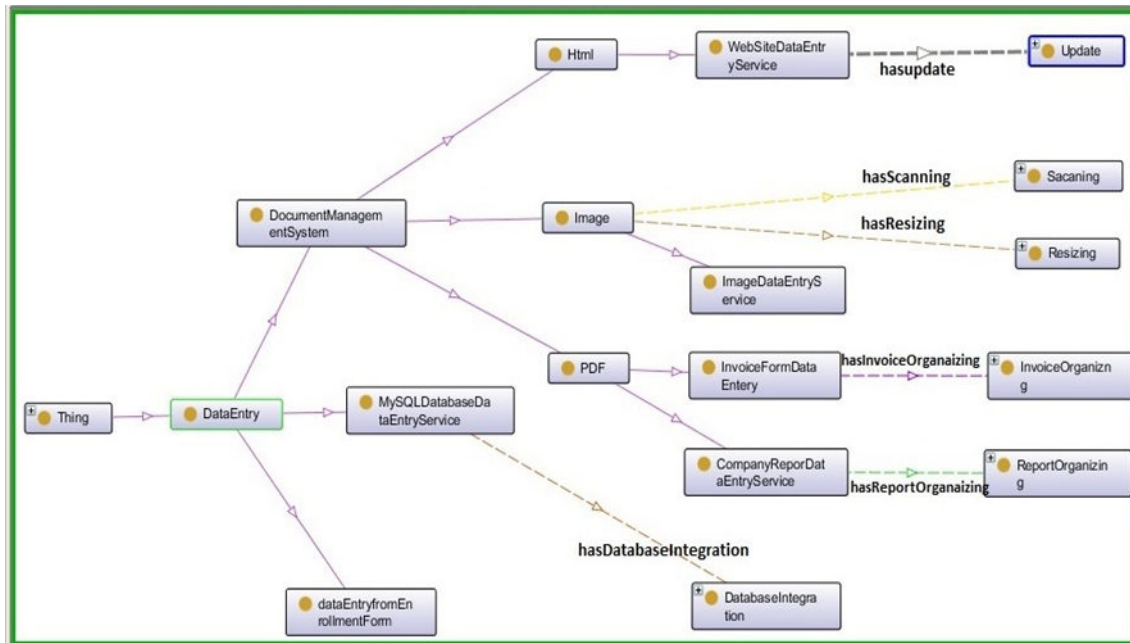
**Step 4:** create ontological knowledge map

This organizational ontology is then represented using a formal notation of Protégé-OWL (see Figure 2). This ontological knowledge map will provide a common understanding of the structure of information involved in data entry services process which in turn facilitates more effective communication and idea sharing as all stakeholders will be used the same information as a common reference point. Also this graphical model of ontology can facilitate knowledge sharing in domain of data entry. Additionally, Protégé-OWL will support the analysis of the domain knowledge. As it can be seen in Figure 1 the root box is categorized to data entry, task and role.



**Figure 2.** General ontology for data entry services

As it can be seen in Figure 3 and Figure 4 each task has some subtask, for an instance document management system has website data entry that it has another subtask consider as update, Image data entry has scanning and resizing that there are a link between these two task. Moreover company report data entry has report organization as a subtask.



**Figure 3.** Ontological knowledge model for data Entry

Here it becomes important to examine the connectedness of a task (scanning) with other tasks (resizing) and



examine how a decision to outsource will affect a role's behaviour and the resources. If the dependence on the interactions and value of the interactions with the role performing the task is large then it would be difficult to outsource such a task.

Service debasement may occur when there is high dependence between tasks. When a task is outsourced and performed elsewhere it should not negatively impact those tasks that have stayed in-house. Hence, when there is high dependence between tasks, outsourcing can cause a disturbance in the path by which the goals are achieved (see Figure 4). The knowledge structure map based on ontology shows the relationships between different tasks, what roles are needed and how they relate to each other in a task and resources created or used. By analysing the links and the connectivity between concepts (see Figure 3, 4); the interactions between the different roles, that is, image editor, updater, database admin, report organizer can be examined. Thus when deciding whether document management system or My SQL database data entry services are going to be outsourced, the types of interactions that occur between roles, the type of knowledge sharing that occurs during the interaction and the connectedness of the task with other tasks will help determine whether perturbations will occur due to outsourcing.

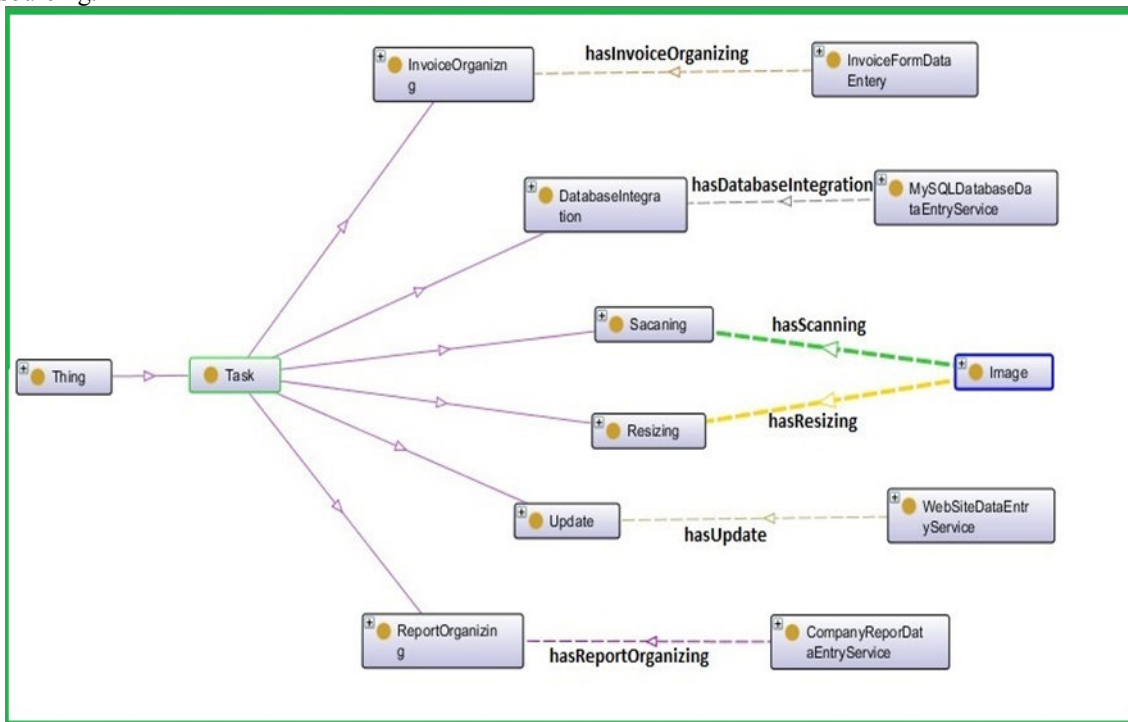


Figure 4: Ontological knowledge model for tasks

The most important purpose of outsourcing is focusing on core competencies by omitting non-core competencies and moves them to third party service provider or outsourcer. As result this is economic for organization by decreasing human resource (because some role may be omitted) and also it makes some resources such as internet bandwidth, hardware equipment and data ware houses more free.

In this case there is connectivity between some tasks and some roles, then outsourcing may be the cause of disturbance. For instance if the decision maker decide to outsource image task, he should consider the connectedness between resizing and scanning subtask (see Figure 4). These two subtasks have the same actor (image editor), therefore if the organization intend to omit this role should outsource both task resizing and scanning. In the other word role image editor has the same relationship (hasImageEditor) for both subtasks resizing and scanning that shows the interconnectedness between these subtasks.

On the other hand by means of these ontological models decision maker can easily make decision about MY SQL database data entry because according to knowledge model that has been shown in Figure 3 there is no connectedness between MY SQL database data entry services with the other tasks and subtasks. Moreover it has simple role as a Database Admin that has the relationship (hasDatabaseAdmin) with database integration subtask which can be outsourced by third service provider without any disturbance to system and will not affect to the other business process and interactions in the organization, whereas according to Figure 3 outsourcing seems too difficult, because there are many subtasks that have interconnectedness with the other tasks which totally run the task of document management system. Moreover the different types of interactions that occur between roles make increase the difficulty of outsourcing process. If decision maker decide to outsource this task (document management) should consider all the interactions and possibilities that may be occur due to outsourcing of PDF, HTML and Image subtask. Therefore it will be better all tasks such as website data entry services, image data entry services, invoice form data entry service and company report data entry services be outsourced.

## 7. Evaluation

There are many ways to evaluate the ontology such as gold standard evaluation, data driven evaluation, evaluate by human, application based evaluation and criteria based evaluation which in this study the application based evaluation is used by researcher. The application based evaluation method first uses the ontology in application and then evaluate the results. This method investigates the capability of the developed ontology to achieve the objective (Brank et al, 2005). However the perspective evaluation has not to evaluate everything, just evaluation of major thing is enough.

In this study researcher tries to know how ontology can help decision maker to make a good decision, by having case study to illustrate the problem and showing how ontology works to solve the problem in domain of business process outsourcing in certain case study. To simulate the solution the case study is acceptable, also in literature and previous works the same methodology based on application and using case study have been used by authors. In this area there are some papers which has some problems that are solved by developing ontology based on extracted concepts from different case study and the developed model examine by those case studies and the proper results were extracted. After designing organizational ontology and formal ontology the knowledge map is created by different concepts such as task, role, and evaluate and apply in certain case study in call service canter domain in one enterprise.

## 8. Conclusion

This study has proposed a model for decision making by using ontological knowledge map and conceptualization the knowledge of domain in business process outsourcing area. Data of this study were collected investigating current environment around data entry services area which has been extracted different business process, tasks, roles and interaction between them. According to the objectives of this study, the purpose of this research was to develop effective model for outsourcing strategy to apply for decision making in this area. This study leads us to have some tangible and intangible effects that would help us to:

- To develop a model which has been demonstrated the domain of BPO by using represented ontology.
- To propose a knowledge map that helps organizational knowledge visible and assists decision makers.
- To extract explicit knowledge in organization and to specify different business processes, tasks and roles in organization as an ontological knowledge structure map which shows different relationships and interconnectedness in organization.
- To help top management in organization in outsourcing decision making whether outsourcing of some business process will be failure or not by examining connectedness between business processes.
- Cost saving by doing some tasks of organization to other third party service providers with lower price.
- To reduce the human resource by outsourcing some business process inside the organization.
- Some resources such as hardware equipment and internet band width will be free.
- To focus on core competencies by outsourcing non-core competencies.
- Maximize customer satisfaction by quickly resolving any customer queries.
- Get access to specialized services.
- To increase customer satisfaction and customer loyalty.

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