The distinguished characteristics such as on demand provisioning, pay-per-use, acceptable pricing schemes of cloud computing attracts the user community to avail different level of services from the cloud providers. Though many cloud service providers are existing, issues with respect to service identification, selection, trust evaluation and recommendations attract significant research challenges. To cater various solutions for these challenges, the concept of cloud brokerage emerges recently for effective provisioning of cloud services. As an intermediate layer, a typical cloud broker offers various value-added services on behalf of service providers. However, the exploration of service effectiveness in the broker based cloud computing requires further research. Therefore, the research work proposes novel techniques in the broker based cloud framework to increase the effectiveness of cloud service utilization. This proposed work comprises of four tasks for the better improvement of cloud service utilization.

To begin with, a cloud broker is proposed to obtain service requirements in the numerical representation. The infrastructure type of services such as computing and storage are considered for this proposal. With respect to the user specification, the proposed broker constructs the cloud ontology to represent the available services from the service repository. With the aid of ontological representation, the proposed broker discovers the infrastructure services from the available vendor. The appropriate services are represented using semantic network, which enables the user to know about the available services as per their posted requirements. Finally, the broker recommends the services with add-on features to the cloud users.

After that, the work is remodelled to handle the service requirements in the form of linguistic terms. In a typical cloud environment, the task of
identification and selection of required services is solely depending upon the service specification furnished by the cloud user. The experienced users of the cloud can specify the service requirements in precise terms by using numerical representations. On the other end, the task of service specification is always a challenging one for an in-experienced cloud user who seems to be new to the environment and furnishes the requirements in an imprecise manner. Such a kind of requirement vagueness results service mismatches and affects the involved parties. Hence, identifying and offering suitable services against the imprecise service requirement have been emerged as an important research issue. In this work, a fuzzy logic based intelligent cloud broker is proposed to clear the imprecise state of the in-experienced cloud user while furnishing the infrastructure requirements. The proposed broker find out the appropriate services through fuzzification and de-fuzzification techniques. In addition, the broker performs service aggregation through Sugeno integral and makes decision about the right services by implementing the fuzzy decision tree.

Subsequently, the need for trust evaluation has been focussed in view of improving the utilization cloud services. With the rapid development of cloud computing services, it is highly essential to ensure the Quality of Service (QoS) offered by the service providers. Though several trust evaluation methods are available, based on user feedback, it is hard to reap meaningful trust level of services, when large number of cloud users are involved. To tackle the problem, this work advocates a big data processing framework for evaluating the trust level of availed services. An Intelligent Cloud Broker (ICB) with the incorporation of MapReduce framework has been put forth for the effective pre-processing of cloud users’ feedback. Besides, the broker constructs the Fuzzy Inference System (FIS) and performs Decision-Making process for evaluating the trust level of services on the basis of processed feedback.
Finally, the thesis intends to propose a technique for the recommendation of cloud services. With the rapid development of services in cloud, existing recommendation techniques face the problem in the prediction of QoS values. The idea of contextual information of services are not incorporated in existing methods. In this work, a service context-aware cloud broker is proposed to extract the service details by including the contextual information. Then, service similarities are calculated to group services according to the QoS values. However, the arrival of new services without QoS values must also be processed for tackling the cold-start problem. A matrix factorization technique has been put forth for the proposed broker to predict the QoS values.

In summary, the thesis proposed novel techniques for effective utilization of cloud services through an intelligent cloud broker. All the proposed methods have been comprehensively validated with experimental studies.