This thesis covered some research investigations towards Ontology Based Software Engineering for improvement in various issues of usual software engineering practices such as generality, requirement engineering, reusability, reliability and security. We summarize the following important conclusions:

1. We have mapped phases of Object Oriented Software development Life Cycle (OOSDLC) and Ontology Development life cycle (ODLC) to develop *Ontology Driven Information System (ODIS)*. We have observed that, it enables the developer to reuse and share application domain knowledge using a common vocabulary across heterogeneous software applications. To establish this, we have developed generalized Use Case Model and Object Model during *Ontolysis* phase, generalized Design Model during *Ontodesign* and generalized Implementation Model at *Ontocontation* phase of ODIS development. Our investigation revealed that each phase of OOSDLC has very well derived from ODIS Life Cycle while developing any information system such as Transaction Processing System (TPS), Management Information System (MIS), Office Automation System (OAS), Decision Support System (DSS) or Expert System (ES). It is concluded that ODIS facilitates the developer to concentrate on structure or the domain and task.

2. Requirement Engineering (RE) is promising process and especially draws on with the aim of amenable to analysis, communication, and subsequent implementation. We have reviewed conventional REP models and observed that each REP model have certain lacunas over the former hence there exists no ideal REP model. Ontology Aided
Requirement Engineering (OntoAidedRE) model has been introduced in order to enable knowledge driven requirement engineering covering requirement type, practices and suitability. Consequently, we have compared conventional REP models with OntoAidedRE on the basis of various project parameters such as Project type, Project size, Project team, Project effort, Project quality, Project prioritized element and Project key element. The study reveals that none of the conventional REP models can accomplish each and every project parameter than OntoAidedRE. It has been concluded that, it can be put into practice to overcome the problems of conventional REP models and consequently project parameters can be optimally contrived by adapting OntoAidedRE.

3. Ontology based reuse is an emerging aspect and specially used for resolving scalability and heterogeneity issues due to elicit practices. We have attempted to present P4View approach to ensure the software scalability and heterogeneity. Accordingly, Ontop4ViewReuse framework has been developed based on ontology oriented systematic P4View approach for reusing. We have found that, it fits in well to make use of the content of ontologies to a maximal extent depending on their particular domain, task and level of application formality. In addition, to build a common conceptual base characterized by knowledge, Ontology based Reuse Algorithm (OntoReuseAlgo) for process planning has been recommended. We observed that, it supports the application from three aspects such as System Element Classification, Ontolayering Principle and Knowledge Reuse Scheme for process planning. Lastly, Ontological Reuse (OnR) has been devised from Object-Oriented Reuse (OOR). We have explored that OnR achieves lucidness of unclear concepts related with software reuse. Besides, the concepts have been linked rigorously. A significant aspect of OnR suggests its independence from implementations or
technological aspects and effectiveness of OnR has been suggested in terms of software component, architecture, requirement, process, technology and experience reuse subclasses.

4. Software reliability achievement is a challenging task due to its dependency on users' perspective. We have introduced ontological approach for reliability achievement over object-oriented approach. Then, a comparative analysis has been presented and scope of Ontology Oriented Reliability (OnO-Reliability) has been outlined. In addition, ontological specifications have been developed using OntoReliability protocol. We have presented some case studies to understand the application of OntoReliability protocol for software specification development. Subsequently, the benefits have been discussed. Lastly, we have attempted to quantitate the reliability using various project parameters. For the same reason, we have introduced Ontological Reliability Quantification Method (ORQM). These project parameters vary in their number and type as per the category of project. Therefore, we have considered the project category as a prerequisite for computing the reliability. We conducted a study of different project case as per the category with varying number and type of parameters and establish the fact that ORQM generates direct empirical value for software reliability. Finally, we conclude that ORQM is not a informal method but found to be a highly useful in absence of reliability experts and historical failure data.

5. Software security is an important issue that needs to be resolved in case of Ontology Based Projects (OBPs) due to the side effects caused by inherent unvisualized states such as complexity, variability, ambiguity and uncertainty. In this view, we have discussed OBPs developed using various perspectives such as generality, requirement engineering, reusability and reliability. We have attempted to develop a secured
environment by presenting Abstraction Method (AM). Furthermore, performance of AM has been examined on the basis of allocation of security attributes with the associated benefits. It has been noticed that the influence of kinds of benefits associated with each perspective leads to different unvisualized state and AM provides analytical scheme to acquire secured environment for different OBPs.

Thus, it involved development of Ontology Driven Information System (ODIS) by mapping OOSDLC and ODLC. Subsequently, it entailed Ontology Aided Requirement Engineering (OntoAidedRE) model for accomplishment of generalized requirement specification set. Then, software reuse well engrossed by building Ontop4ViewReuse framework based on ontology oriented P4View approach for reusing and followed by Ontology Based Reuse Algorithm (OntoReuseAlgo) to aid product redesign. Next, it leaded to software reliability with Ontology-Oriented Reliability (OnO-Reliability) and OntoReliability Protocol. In addition, Ontological Reliability Quantification Method (ORQM) quantified software reliability. Lastly, it included Abstraction Method (AM) for developing secured environment for ontology Based Projects (OBPs).