Chapter 7

SUMMARY, CONCLUSIONS AND FUTURE WORK

This chapter provides the summary of the thesis work done besides drawing conclusions and providing recommendations for future work. The summary includes the literature survey insights and the practical work is done right from proposing the framework for efficient configuration management of SPL and quality product derivation. The conclusions provided in this chapter provide insights into the research results. These insights can help to make well-informed decisions in adapting the framework that guides SPL configuration management and product derivation.

SUMMARY

Configuration management and product derivation are the two important activities in SPL. The research carried out in this thesis is summarized here. Before that, the insights of secondary research carried out by reviewing literature are briefly discussed here. From the literature review, it is understood that configuration management in SPL is still in its infancy and research is needed to improve it. The state-of-the-art revealed that there are many researchers who contributed to SPL. However, no comprehensive framework is found to guide configuration management and quality product derivation. This is the motivation for taking up this research work. A comprehensive framework for efficient configuration management and quality product derivation is proposed. Towards this end, the work done is briefly described here. A generic framework is proposed and implemented with provisions for configuration management, product derivation, variability-aware design patterns and ontology-based feature representation for automatic reconfiguration of SPL and optimizing quality product derivation. The work done is evaluated and the empirical results revealed that the proposed framework is comprehensive, domain independent for efficient configuration management and quality product derivation.

CONCLUSIONS

Of late, software product line engineering has been attracting considerable research. With the emergence of component-driven development in distributed
environment software systems became very complex. Software product line configuration management in the wake of modern trends in software development process became a challenging task. Software product line is the paradigm shift from a traditional approach to reusability which has a plethora of advantages besides reducing cost and development time. There is ever growing complexity in the product line with plenty of core and custom assets that are characterized by variability. To address this, a comprehensive framework for configuration management of SPL is highly desired. Moreover, customer needs are diversified and they are based on certain quality and performance attributes. Product derivation process that can fulfill needs of the customer while making a new product is crucial for the success of SPL. From our research work, the following conclusions are made.

- A generic framework is proposed that is domain independent and could facilitate configuration management of SPL. The framework guides in defining and improving software product line. This will enable to fulfill a product's intended functionality with the best possible composition of core and custom assets with underlying features. The framework also can handle different means of change propagation and supports product derivation based on customer needs.

- Two algorithms are proposed for configuration management and product derivation. These algorithms employ associated weights to assets and critical path analysis for the composition of the new product that is in tandem with customer requirements. A prototype is built to demonstrate the proof of concept. Dr. School product line which is related to both education and healthcare domains is used to validate the proposed framework and underlying algorithms.

- Variability-aware design patterns were incorporated into configuration management and product derivation. The idea behind this was to exploit the concept of roles in design patterns that can be mapped to elements of artifacts for optimization of SPL besides product derivation and configuration management.
The framework is enhanced to exploit domain ontology to have a formal representation of features in software thus realizing dynamic reconfiguration of SPL and quality product derivation.

The prototype application is enhanced and tested using different SPL case studies such as Automated Academic Regulations (AAR), Dr. School, Library Management System (LMS) and Travel Reservation System. Results revealed that the framework brings about significant performance improvement over traditional approaches. The usage of variability-aware design patterns and domain ontology model to represent feature model further improved the performance of SPL configuration or reconfiguration and product derivation.

Hypotheses are evaluated against the framework and the underlying algorithms with the prototype application. Results revealed that propositions of hypotheses are true.

FUTURE ENHANCEMENTS

Having understood results of hypotheses testing and the framework with underlying algorithms, the following are directions for future work.

Cloud has emerged as new computing paradigm which is yet to be explored for SPL. Stating differently, cloud-based SPL, product derivation and configuration management is to be explored to gain insights into the fundamental changes in cloud-based SPL development, configuration and quality product derivation.

Mobile cloud applications are becoming popular. However, there is little research in this area with respect to SPL configuration and product derivation. The research can be extended to this unearthed area.

The SPL development, configuration, and product derivation can be explored specifically in the agile models. This is another important direction for future work as agile methodologies are prevailing in the real world for faster software development and delivery.

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