CHAPTER 9

CONCLUSIONS AND FURTHER RESEARCH

9.1 Summary of Research

World-wide markets are becoming increasingly competitive and in order to sustain market share, organizations are under constant pressure to increase the speed of product development and the product choices that are offered to customers. Concurrent engineering has emerged as one of the most commonly referenced enablers for improved process management. Crucial for the process management under the concurrent engineering is the availability of suitable and formally defined techniques for the representation of the information related to feedback mechanisms. In order to develop a computer based systems to support the process management, it is necessary to represent the feedback from an information point of view.

This thesis reports an investigation into what information needs to be represented for the feedback in process management and how it is to be represented. This research has resulted in the design of an information model for feedback control using semantic data representation technique. An algorithm has been developed to implement feedback control in process management. A prototype has been developed and tested to prove the concepts identified for representing information on feedback control. To demonstrate the use of information model for feedback control, an user interface -has been designed and developed.

9.2 Conclusion

The overall goals of process management include compression of the project time and project cost. Now a days, industries use concurrent engineering technique to meet
these goals. The major problem in using computers for supporting concurrent engineering is representation of information associated with the feedback control during process management.

There are four types of concurrent engineering: within stage overlap, across stage overlap, overlap across models and hardware/software overlap. Most of the product development companies use the type 'within stage overlap' concurrency. Practicing of other types of concurrency such as across stage overlap, overlap across reusable models and hardware/software overlap is very difficult because structural information is complex and it is intertwined with information or instances.

A review on existing literature shows that there is a need for representation of feedback control in process management. Existing software tools for process or project management do not represent feedback control in an explicit way. In order to represent feedback control for process management, it is necessary first to develop the information model for feedback control. Hence this research has been carried out to represent feedback control in process management.

The research has resulted in the design and development of an information model for feedback using information modelling technique and semantic data representation technique. The schema of information model for the feedback control is represented using Express-G language and a software prototype has been developed using MS-Access as back end and Visual Basic as front end. The concepts have been tested using a case study on software development process and found successful.
9.3 Achievements

Effective communication is one of the prerequisites for successful control and the feedback system in process management is very complex in its structure. The whole control process depends on the flow of information among the activities. Various pieces of information are needed to enable decisions to be made. Output of the decision-making function is channeled to the intended destination to initiate control action. Thus, speedy communication of information which is fundamental to the management of the task and is one of the prerequisites for successful control is achieved through representing the same in an information model.

The information model using object/relational concepts has been proposed. The prototype implementing the features of feedback information model has been developed to test the validity of the model. The highlights of the proposed feedback information model include the following:

i. Representation of input, output, monitoring function and decision making function of a process

ii. Representation of a feedback control of a process.

The information model of feedback control is capable of the following:

i. Dynamic management of databases, tables and attributes.

ii. Dynamic management of information associated with input, output, monitoring function and decision making function details of the processes.

iii. Pictorial representation of project information in the form of project tree representing processes, sub-processes and associated input, output, monitoring function and decision making function and
iv. a tool has also been developed to represent feedback information of a process.

9.4 Limitations

The limitations of feedback information model are as follows:

- This model can be used only for concurrency among modules in a stage. There are certain limitations imposed by the registered local databases in building the feedback model of the process information using the meta-model.
- The feedback loop can branch to any of the given three nodes of comparing function of output value and expected value. But some process may need multiple branching of nodes for multiple values of comparing function of output value and expected value. The number of branching is limited to three in the prototype.

9.5 Recommendations for further research

The information model for feedback mechanism can further be extended in the following directions:

Towards an Integrated Project Management Information System under concurrent engineering: In projects like new product introduction or product development of complex products such as aeroengines and integrated software applications, the overall project network would consist of various levels of complex project networks and many controlling parameters for the project management. In such cases, the feedback mechanism would be complex as it would involve intuition and complex relationships among the interacting activities and parameters. Concepts towards information models for representing the goals of such complex project, the critical
parameters of the project and the linkage or relationship between the goals and the process and product have been designed and developed by researchers. These concepts which have been proved through software prototype and the concepts developed in this research work for representing feedback control information may all be integrated well to form an integrated project management information model to support concurrent engineering.

Feedback Control in Distributed Projects: In distributed projects, the overall project encompasses several geographically distributed sites. The coordination is necessary among geographically distributed sites to execute these projects. Extra coordination is necessary to schedule the different activities over several sites. Representation mechanisms towards this extra co-ordination and information flow among these distributed sites towards feedback control may be developed.

Representing other forms of Concurrency: Other forms of concurrency such as across stage overlap, overlap across (reusable) models and hardware/software overlap may be considered. When carrying out concurrent activity across stages and across hardware/software overlap, all the information flows must be coordinated among the development team. The concepts developed in this thesis that considers overlap among modules within a stage may be extended to represent feedback control under other forms of concurrency.