Chapter 6: Conclusions and Future Work

The research objectives as defined in Chapter 2 have been successfully accomplished. This dissertation addresses problems faced by current software development organizations, and discusses how software risk management has solved some of these problems. Thorough investigations of current risk management techniques and existing software tools have also been made. It is followed by the introduction of Software Risk Management Tool: The Statistical Manager. This tool is an attempt to provide the software development personnel a computer-assisted tool that will provide assistance to identify and resolve risks before they threaten projects’ success. It is a Windows program that reveals the patterns and relationships which may be hidden in sets of data. The tool utilizes the correlation and regression concepts of organization historical data. It displays visually (scatter diagram) and provides meaningful insights into the trends and factors hidden in enormous sets of data. The results are then used to forecast parameters of interest. The tool does not make decisions, instead it supports decision making process so that users will be able to make better decisions. It is easy to implement, simple and convenient to use, and is inexpensive.

Evaluations of the tool have also been carried out by a group of professionals and undergraduates. The results from the questionnaire indicated that even though certain constituents of the Statistical Manager have room for improvements, the various facilities provided by the tool has shown its adequacy and usefulness. Many of the evaluators were very receptive to the simple statistical functions, which displays all the analysis
results in one screen, clearly and concisely. The familiar user interfaces and the friendliness of the tool are also much favored.

Further, the Statistical Manager has achieved its functional specifications as defined earlier in Chapter 4, and the execution performances of its various commands have been promising. The development process of The Statistical Manager which makes use of standard software engineering practices and object-oriented methodology, have contributed to the ease of maintenance and future modification, as well as possible reuse of its components in the future.

Summarizing it all, the main features of this tool are:

- It is a Windows-based stand-alone program that works on WIN 95 or later;
- Standard GUI software with common “look and feel” and “point and click” interfaces that shorten the learning curve. It is designed to be non-confusing and easy to master;
- A context-sensitive HELP facility which can be called up from any active window explains user's doubts;
- A Tour Guide is attached to the tool that provides step-by-step guidance and explanations that will help a user to start up. Tool Guide is a separate component from the main program. Installation is optional;
- Keyboard shortcuts and Tab-key supports have been incorporated for better accessibility and usability of the tool. Also, the Esc key for cancellation and Enter key for default selections are added;
- Pictures and images have been used to a minimal level (except Tour Guide) to reduce the size of the program and also to increase the performance, as well as for professional interface style;
Conclusions and Future Work

- Database maintains a risk repository of industry experience. It is expandable to accommodate a maximum of useful information with a minimum of overhead;
- It uses proven forecasting methods: correlation and regression. It first correlates pair of project's parameter, finds patterns and provides meaningful relationships between them, and accurately forecasts future parameters;
- Displays graphically and in text format results of analysis;
- Provides user defined queries, views and reports. SQL database management allows user to manipulate project data and generate reports on any of the project parameters;
- Provides highly accurate prediction, i.e. at 95% level (based on 2-tailed test of t-Distributions, page 142 Appendix A);
- Secure, since a password is required to access to the tool. Tool administrator (superuser) is responsible to setup user accounts and permissions to login to the tool;
- Flexible to use in different situations and phases of the software life cycle;
- Database backup facility to prevent loss of data;

The Statistical Manager treats software project development from a "top-down" perspective, providing a context consistent with experience. Individual organizations can decide if they are better or worse off than experience based on the analysis of data. It first creates a project database that allows software development personnel to identify, compare and correlate, communicate, analyze and predict risks in all areas of their projects. For project planning teams with a strong matured foundation, database is an extremely valuable supplement to assist them in their work. Where the data and experience are in agreement, the team's decisions are reinforced. Where the data and experience are different, a strong database will catalyze important examination of
underlying factors and root causes. For project teams without a strong background
experience, this database provides a framework within which to evaluate project
planning assumptions and results.

The Statistical Manager is useful at all levels of the project development process.
Software development personnel can always find out what and where the high risk
factors are in the current projects or new coming projects, and know how to manage
them. Management can also be presented with more concrete and reliable data.

The risk management technique illustrated here provides valuable guidance which will
increase the probability of potential problems being identified, confronted, and overcome
before they run into crisis situations. At the same time, we are assured that the right
risks are taken at the right time.

However, there is no single monolithic risk management approach that is optimal for all
projects. Wall Street analysts typically use many different financial ratios (price/earning,
debt/equity, etc.) to help analyze a company's health. The Statistical Manager will be an
extremely useful tool, but generally in combination with other good software engineering
practices. In order to make this tool a useful one, everyone on the project team must
participate and be committed in the collection and maintenance of an adequate volume
of historical data. It is hope that with the realization of this tool, software risk awareness
will be increased.

6.1 Future work

It is every software developer's ultimate goal to produce high quality software, but in
reality, it is almost impossible. There are always some internal and external factors that
hinder the development of a perfect system. This is also true for The Statistical Manager.
Even though The Statistical Manager possesses a number of important useful characteristics, it also suffers certain shortcomings which need to be improved on. Besides those limitations and possible future improvements that I have mentioned in Chapter 5, it is my ultimate intention to further my research in this field. In order to increase the usefulness of this tool and extend its applicable life span, I would like

- to incorporate more powerful and complex statistical functions. For example, multiple regressions and correlation that involve three or more variables, probability distribution functions, Fourier spectral analysis, and other non-linear relationships. The reason for this enhancement is to let users have a greater variety of choices and hence be able to make better decisions;

- to include other useful functions such as cost estimation and duration (i.e. Boehm's COCOMO), so that this tool could be used as early as during bidding process. This facility will also allow comparisons of actual and estimated values, for example actual project price and the estimated price;

- to include planning facilities. This is because how well we perform in the future depends on how well we plan for it. With planning facilities, user will be able to generate sets of alternative risk management plans. Among others, these plans will include the following information for each project:
  - definition;
  - related project risks;
  - possible root causes;
  - suggested actions to mitigate/eliminate risks;
  - estimated amount of money or effort that is required to be spent;
  - possible benefits or advantages that will be achieved.
The tool will advise on the pros and cons of each alternative, and provide a diagnostic summary that shows why the chosen one is the best.

♦ to support full risk management cycle coverage, such as disaster and recovery planning;
♦ to allow exporting of analysis results to other spreadsheets packages like Excel and Lotus for making custom reports and graphs. This feature is useful for users who need to present results in other formats or wish to do further analysis in these packages;
♦ to include e-mail notification feature. This is to facilitate communication of all team members so that they will be alerted instantaneously through network notifications;
♦ to further enforce security by having more levels of accesses permissions.

The Statistical Manager, which is already a useful risk management tool for the software practitioners, would certainly stand out above other similar tools, if these goals could be realized.