

# Chapter 5: Tool Evaluations

Risk Management Tool: The Statistical Manager was explored and assessed by 10 lecturers teaching computer-related courses at colleges and 5 computer sciences undergraduates. These people were chosen on the basis of their knowledge on computer science and statistics. The concepts, rationale and objectives of this tool were explained to them. The evaluators were supplied with a questionnaire containing a series of 12 questions evaluating the usefulness of the tool and its possible strengths or weaknesses. The questionnaire is listed in Appendix D.

The feedback to questions 1 to 10 are summarized in table 6.1

	Q1	Q2	Q3	Q4	Q5	*Q6	Q7	Q8	Q9	Q10
Average	4.000	3.857	4.143	3.429	3.857	4.000	4.286	3.571	4.286	4.143
Standard Deviation	0.707	0.378	0.378	0.535	0.690	0.000	0.488	0.535	0.488	0.378

Table 6.1: The summary of the questionnaire feedback.

[Q = Question]

The tool seems to work very well (Q7: average 4.286). There wasn't any problem encountered while testing the tool. Another encouraging feedback (Q9: average 4.286) of this tool is that evaluators commented that this is a very interesting tool and they liked it very much.

All the evaluators agreed very well on the adequacy of potential information in the database (Q6). They commented that information gathered in the database is enough to assist in the decisions making processes. The evaluators also seem to agree on the

overall user friendliness (Q10), ease of use (Q3) and the relevance of concepts employed in this tool to risk management (Q2), as their standard deviation are among the smallest (0.378).

The most modest scores, however, are achieved with the question related to the concept of risk management (Q1). Even though the evaluators are computer science literate, they are not aware of the presence of risk management, and a number of them even have difficulty understanding what risk management is, in the context of software development. The reason being that risk management is a very recent concept. Most available software engineering books include only a little or no mention at all of risk management. This had caused many, even computer science literate, to have limited knowledge of risk management. In spite of this, after detailed explanations, they have indicated that risk management is interesting and should have a promising future.

Opinions about the practicality of this tool divide the evaluators more sharply (Q4, Q5 and Q8). Some of them said that the tool would be useful only if the software developers are made aware of the need of risk management. One of them commented that by employing formal risk management practice (hire risk expertise), it becomes the responsibility of this second party in the event of any failure; whereas by using this tool, the organization will have to bear this responsibility. However, during the discussion sessions with them, all agreed that it would be cheaper (by at least 10 times) if this tool were made use of. Software organizations will also be able to build up their own database and to manage risk confidentially, without the need to expose their organization's data to rivals.

The last two questions allowed more flexible comments to be made by the evaluators on the tool. As a summary of the notions put forward by the evaluators, the following improvements would enhance the tool and make it a more powerful and useful tool:

- ♦ **More flexible user input and navigation.** Improvements to the keyboard-oriented input, such as moving from a field to another. Currently the tool allows moving from a field to another by the use of the Tab key. The evaluators pointed out that most users are more familiar with the Enter key than the Tab key. Enter key should also be activated to increase flexibility.
- ♦ **Reliability improvement.** Some evaluators commented that inputs to the Impact, Time Frame and Probability fields in the user-input form are subjected to individual judgement. Individual interpretations of the current method, (for example HIGH, MEDIUM and LOW) will be different. A more reliable method to avoid these individual judgements should be used. Method like using a range of real numbers is suggested.
- ♦ **Statistical output improvements.** Some evaluators felt that plain English should be used in the statistical output interpretations. Users with non-statistical background would have difficulty in understanding the current outputs.
- ♦ **Include more complex statistics.** To increase the usefulness of this tool, more powerful and complex statistics should be incorporated. For examples, multiple regressions and correlation that involve three or more variables, and other non-linear relationships.

The Statistical Manager possesses a number of characteristics that provide the user with a convenient and interesting environment to work with. The characteristics of the tool that were most appreciated by the evaluators are discussed briefly below:

- ♦ **Functions of the tool.** The idea of correlation and regression of two project variables is said to be new but interesting. Predictions of future projects based on actual collected data are more concrete and reliable; subjective forecasting and intuitive judgements can now be avoided. Users will be able to communicate the reasons of decisions, especially when higher management is involved. However, for experienced decision-makers, they can now have another powerful option, that combines statistical techniques in this tool with their personal judgement and expertise.
- ♦ **Graphical statistics displays.** Even though certain constituents of the statistical module have shortcomings, this module had impressed most of the evaluators. They were very receptive to the way that the statistics module is presented. Simple interfaces, clear and colored graphical displays, easy navigation and simple but concise comments on the analysis results were much commended.
- ♦ **User friendliness.** The tool is a windows-based tool that is very easy to learn and use. Whenever a user has made an illegal move or input, an error message is displayed. The user will be given another chance again. At any time when the tool is in used, user can get assistance by pressing at the standard help key, F1 or by clicking at HELP button from the main menu screen. HELP provides simple but concise guidance. Tour Guide has enhanced user friendliness feature considerably, especially for first time user. A user can explore this guide before performing any task. The Tour Guide is designed to provide sufficient information to a user. The number of pictures is also kept at a minimum to increase its performance as well as to reduce the program size.



- ♦ **Database query search.** Many of the evaluators liked the powerful query module. Users are able to set criteria(s) with respect to any attribute (field) in database and to view them in ascending, descending or database order. Quick and specific search can be performed by narrowing down search criteria.
- ♦ **Attractive but professional look.** The tool has standard GUI, common 'look and feel' and user familiar 'point and click' interfaces. It used a minimum number of colors and fonts, simple but meaningful icons and consistent windows-type navigation. These provide a very comfortable working environment for user.

## 5.1 Achievements of Statistical Manager with respect to the Non-functional/Performance Requirements

In Chapter 4, a set of seven software quality attributes has been specified as the performance specifications of Statistical Manager. It is appropriate to review these quality attributes now to analyze how far they have been achieved by Statistical Manager. They are discussed individually as follows:

- ♦ **Easy to learn and use (usability).**

The tool has standard windows GUI with common "look and feel" and "point and click" features. It employs simple concepts and statistical theory, which do not require high intellectual skill to learn and use the tool. In addition, a context-sensitive help facility with sufficient information is provided to answer user's' doubts. At any time when the tool is activated, user is able to access to Help facility by pressing on F1 key or clicking on **Help** button from the main menu screen. Users are able to master the tool in a very short time since Tour Guide is also attached with the tool. Users will see error messages whenever they perform illegal inputs or actions.

The required inputs from users are well defined, since the tool uses standard software engineering terms and definitions, definitions of these terms are also provided in the Help. Further, all theories, definitions and internal equations used in the tool are also visible to the users since they are provided in the Help facilities. Evaluation results have shown that Statistical Manager has attained high degree of usability.

♦ ***Reliable (reliability).***

All the functions of the tool have been thoroughly tested and evaluated. During tool development, all input fields were verified to ensure that they accept only valid inputs. During testing, erroneous inputs were purposely introduced to all fields and functions. The tool is tested against all possible range of inputs to ensure that they work as intended. Whenever the tool encounters an illegal input or interrupt, an error message was displayed on the screen, or the tool disabled the input. These have shown that Statistical Manager is able to isolate errors and remains operable.

The results from the command executions were carefully examined and found to be what they are expected to be. During evaluations, the tool had never crashed or failed to perform its functions (as feedback from the evaluators). These would certainly confirm the reliability of Statistical Manager without doubt.

♦ ***Produces correct outputs (correctness).***

The tool is developed strictly according to its functional requirement specifications. All functions of the tool are traceable to its requirement specifications. Further, all functions involving mathematical calculations were tested manually. Few examples were used and result compared. The tool has been verified to produce correct and accurate outputs.

Another important fact is that the estimates generated by the tool are only as good as the input data used. Careful collections of all inputs are essential since small changes in input values can result in large variations in estimations. This is achieved by careful applications of standard and well-defined software engineering terms and terminology. The correctness of the tool is thus further confirmed.

♦ ***Maintainable (maintainability).***

Uniform design and documentation techniques have been used throughout the development process. The source code of the tool were written according to good programming practices, so that they can be understood by others. Simple but concise comments are included in the program source code to make them self-descriptive and self-documented. This will ease the job of maintenance and future modifications of the tool.

♦ ***Integral (integrity).***

The tool is designed with security mechanisms to protect its program and data. There are two levels of user: the tool administrator and the normal user. A username and password are required to log in to the tool. If the tool administrator password is forgotten, there is no way to retrieve the password, except to reinstall the tool again. The tool administrator is the most powerful user of the tool. He/she has access to the program and all data as well as in charge of user management. A normal user has permission to use the tool and to view all data but is restricted to modify only his/her own data.

To further enforce security of the data, users are able to set up database login name and password. With these security mechanisms, Statistical Manager has attained a reasonably degree of integrity.

♦ ***Cost-effectiveness.***

The tool is developed on the research basis with the use of a Pentium-microprocessor personal computer. No additional costs were involved. It does not consume high-cost resources to use the tool. An IBM compatible Intel Pentium-75 MHz microprocessor and a standard printer will perform satisfactorily. Thus, the tool has achieved its cost-effectiveness attribute.

♦ ***Reusability.***

Object-oriented technique and programming language have been use to develop the tool. The tool is developed around objects/object classes and methods. The inheritance mechanisms in the language allow adaptation for component reuse. Furthermore, the encapsulation provided by the language object/object class mechanisms makes components self-contained which improves their reusability. When additional or different functionality is required, base classes can be used as a starting point, with little modifications, to create new functions or to make up new objects.

## **5.2 Comparison of The Statistical Manager with Existing Similar Tools**

The differences between Statistical Manager and existing similar tools were viewed from the major functions and facilities provided by these tools. Two commercial tools were compared with Statistical Manager. They are Risk Master from Sphygmic Software Limited and Project Self-Assessment Kit (PSAK) from Kulik and Lazarus Consulting Inc. Below are the summaries of comparisons:

5.2.1 Risk Master and Statistical Manager

Risk Master	Statistical Manager
1. Emphasizes on project cost, schedule and resources. It does not consider other project attributes such as process model and technology.	1. Statistical Manager considers all aspects of a project that may threaten its success.
2. Risk Master uses complex Monte Carlo Simulation to derive the overall effect on a project and produce a probability distribution graph.	2. Statistical Manager uses solid data to perform correlation and regression; and based on these results, it predicts the desired project attributes.
3. Risk Master is a very advanced and sophisticated graphical analysis tool. It is very difficult to use. To understand and utilize this tool, users need to have very strong statistical backgrounds. Interpretations of the results of analysis are also difficult.	3. Statistical Manager only uses correlation and regression, which are easier to understand and use. It displays visually results of analysis and in simple text format to enhance user understanding. Users do not need to know advanced statistical theory. They can visually judge and spot the trend (for example from scatter diagrams).

Risk Master	Statistical Manager
4. Users need to enter project's starting and estimated completion date to run simulation.	4. Statistical Manager uses software life cycle phases and activities as a basis for collecting and maintaining project development information for future use. It uses standard software engineering terms and definitions to ensure systematic collection of required information.
5. Risk Master does not have any database. There is no reference for any analysis.	5. Statistical Manager accumulates larger database with time. Eventually this database becomes a strong foundation for future referencing.
6. Risk Master has no query facility.	6. Statistical Manager has a very powerful query module that allows various kinds of queries.
7. Risk Master has a powerful and complex reporting facility.	7. Statistical Manager has only a simple reporting facility.
8. Does not include any security features.	8. Statistical Manager is password protected and there are two levels of users with different access permissions. User can also set up database login and password to enforce database security.

Risk Master	Statistical Manager
9. Risk Master does not track user's log in.	9. Statistical Manager tracks every user's log in. It maintains records of users' name, log in dates and times. Tool administrator can always check these records for security reasons.
10. There is a Guided Tour in Risk Master. Installation is compulsory.	10. Tour Guide comes as a separate module. Installation of Tour Guide is optional. User can choose not to install this module if he/she has disk space problem.
11. Risk Master is more like a scheduling tool. It allows triggering and branching along multiple paths and correlation between activities that leads to project completion problems.	11. Statistical Manager is purely a risk management tool.

5.2.2 Project Self-Assessment Kit and Statistical Manager

Project Self-Assessment Kit (PSAK)	Statistical Manager
1. PSAK measures project's cost-schedule-quality tradeoffs.	1. Statistical Manager measures all aspects of a project.
2. PSAK identifies risks as well as strengths of a project.	2. Statistical Manager identifies all known risks in the current and future projects.

Project Self-Assessment Kit (PSAK)	Statistical Manager
<p>3. PSAK is a self-administered project assessment tool. It uses staff surveys as the primary data source and identifies project strengths and risk areas. These are then used to estimate confident project completion dates. This tool is only useful if everybody involved in the assessment is committed and cooperative. If any staff should provide insincere responses to these surveys, the analysis results become unreliable.</p>	<p>3. Project manager is responsible to maintain the Statistical Manager. He/she has the overall responsibility to oversee that project data and risk information is gathered consistently. As more data is collected and database size increases, the effectiveness and reliability of the tool improves.</p>
<p>4. PSAK develops actions plans based on the results of surveys.</p>	<p>4. Statistical Manager guides project planning by looking at the past experiences and strategies.</p>
<p>5. PSAK is not a stand-alone tool. It does not has its own statistical analysis functions, instead it is an add-on tool to Microsoft Excel.</p>	<p>5. Statistical Manager is a fully stand-alone tool that works by itself.</p>
<p>6. There is no query facility in PSAK.</p>	<p>6. There is a powerful query feature in Statistical Manager that allows various kinds of queries.</p>



Project Self-Assessment Kit (PSAK)	Statistical Manager
7. PSAK is relatively less friendly as compared to Statistical Manager.	7. There is a context sensitive HELP and a Tour Guide. Tour Guide comes as a separate module. Installation of Tour Guide is optional. User can choose not to install this module if he/she has disk space problem.

An important fact about these existing tools is that they are sophisticated tools that used complex concepts. A user will take more time to learn to become familiar with these software tools. Some complicated functions in these tools may not be relevant and will not be used at all. The Statistical Manager does not have these drawbacks. It is developed after thorough studying and tailoring of existing methods. The approach taken is to offer a simple but effective way to risk management rather than a complicated set of facilities which are difficult to use.

Another difference is that, the existing tools were developed by commercial software houses/developers. They were developed by a team of software professionals consisting of experienced project managers, software engineers, system analysts and programmers. Thus a large amount of investment in resources (building, equipment, technologies, manpower etc.) and expenditures were used. As such, these tools are directed to the corporate institutions. The high costs of these tools may not be affordable to smaller companies. The Statistical Manager, being developed as a research project, is able to provide solutions to these small yet growing companies.

In conclusion, The Statistical Manager has overcome shortcomings of many other tools by incorporating features that are not available from other tools. It is a simple tool that does not have sophisticated functions like others, yet performs very well compared to many commercial tools.