

Chapter 7

Conclusion

1. Summary

The purpose of this study is to identify the most pertinent internal control risks within the data warehouse environment. Fundamental concepts of the data warehouse have been introduced and a brief indication given of the key internal control risks within the overall data warehouse environment.

The study investigates the concept of a system development life cycle unique to the data warehouse environment. Reasons for the distinction between the system development life cycle for traditional systems and that for the data warehouse development are provided. Internal control risks specific to each of the phases within the data warehouse system development life cycle have been introduced. Suitable internal control considerations were provided as a means of assessing the extent of internal control risks. The most significant result of the empirical study indicates that organisations are utilising a development methodology unique to the data warehouse environment.

Six internal control risks which exist within the established data warehouse environment have been identified. Certain internal control risks identified include, not ensuring the completeness of data migrated to the data warehouse; inability to measure data quality; data warehouse access is not restricted to authorised users; etc. The most significant result of the empirical study indicates that internal auditors are relying on internet resources as a means of preparing for data warehouse reviews.

The concept of the dependent data mart environment has been introduced. The data mart is defined as an extension of the data warehouse. It allows for improved access to data by segregating data types according to business functions or subjects.

Two unique internal control risks have been identified. These are, a lack of sufficient response time monitoring on a periodic basis and the uncontrolled transfer of data from the organisation wide data warehouse to the dependant data mart. Suitable internal control considerations have been provided to assess the extent of these two unique internal control risks.

The study considers the concept of a distributed data warehouse environment. The internal auditor has been provided with a brief synopsis of the development and access and security considerations which should be applied during the development of a distributed data warehouse. Inability to restrict access, ensuing ongoing availability of the distributed data warehouse and the inefficient processing of queries within the distributed data warehouse, have been identified as the three fundamental internal control risks. Suitable internal control considerations have also been provided so that the internal auditor could assess the extent of the internal control risks identified.

Finally, the study concludes by highlighting the expected future trends and developments within the data warehouse environment. Attention has been drawn to defining each of the five areas where significant enhancements to the data warehouse are expected. The internal auditor has been provided with an indication of the internal control risks which could exist should the expected enhancements take place in the foreseeable future. The concept of the internal auditor utilising the data warehouse as a tool in other routine audit cycles is also introduced.

2. Further areas of research

In chapter 1, we said that little attention had been given to evaluating the data warehouse environment by the internal audit profession. The impact this evolving technology could have on the assessment of internal controls has yet to be explored.

The work presented in this study has only provided a brief insight into identifying and assessing the internal control risks within the various components of the data warehouse environment. Accordingly, two additional areas of research have been highlighted which would require more focused attention:

- *A comprehensive auditing framework is needed to assess internal control risks within decision support systems*

By developing this framework, insight would be gained as to how the internal auditor could effectively assist management in ensuring that risk identification follows a consistent approach. All significant threats and possible opportunities would be identified and optimised.

- *The data warehouse environment needs to be practically integrated into the internal auditor's existing audit process as a means of identifying unexpected trends and irregularities when performing routine audits*

Chapter 6 briefly introduces the concept of internal auditors utilising the data warehouse environment as part of their evaluation procedures when examining other routine audit cycles. It is evident from this brief study, that a more detailed investigation is needed to illustrate how this technology could be practically integrated into the traditional audit process. Any technology which would allow the internal auditor to perform his or her functions more efficiently and with increased rigour should be further investigated.

3. Conclusion

The following overall recommendations arise from this study:

- The data warehouse development team should ensure that a system development life cycle unique to the data warehouse environment is utilised whenever such an environment is being developed.
- Internal audit should be involved throughout the development process to ensure that significant internal control risks are identified.
- Internal auditors should ensure that management have considered the effect of future developments within the data warehouse environment when assessing the overall risk of such an environment.
- Internal auditors should use the data warehouse environment to identify significant trends and irregularities when performing routine audits.

In conclusion, the data warehouse environment provides unique opportunities for the organisation to ensure a more reliable and consistent decision making process. As the

reliance on systems such as the data warehouse environment increase, the need for a more controlled system is increased. Management and the internal auditor should work together to ensure that all significant internal control risks are identified timeously and that measures are implemented to negate the effects of these risks.