FEASIBILITY STUDY
on behalf of:
EQUITY STRUCTURED FINANCE
HSBC SECURITIES

February 3, 2000

Prepared for: Prof. J. Mylopoulos
CSC340S
Dept. of Computer Science
University of Toronto

Submitted by: Laura Wood (St. George Campus)
Tom Karczewski (St. George Campus)
Nishit Patel (St. George Campus)
EXECUTIVE SUMMARY

A feasibility study was conducted for the Equity Structured Finance (ESF) group of HSBC Securities to evaluate the performance of their current information system and suggest a plan of action towards improving it. The system’s limitations and shortcomings were reviewed, establishing a need for improvement. Design factors and constraints were outlined, and suitable alternatives were presented. These alternatives were evaluated using a set of more quantitative criteria, narrowing them down to one recommendation.

We recommend that the current ESF system be upgraded to a stand-alone application, using the current database structure as a starting point and leaving the reporting aspects of the current system as-is. We suggest that the user interface be redesigned to maintain data integrity, and that we expand the data storage to include inventory and audit trail information. Finally, we conclude that these changes be immediately utilized by introducing new reports and data mining to increase the benefits of having a computerized information system. We estimate that the cost of such an upgrade will be recovered within 18 months.
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INTRODUCTION

This study was commissioned by the Equity Structured Finance group of HSBC Securities to investigate the performance of their proprietary database system. Management has found the database contains serious discrepancies, and wishes to find the cause and remedy it.

Information in this study was obtained through interviews with the members of the securities team, including the team programmer, the securities dealers, and management. A copy of the system was examined to detect interface problems. This information gathering process involved three sessions, conducted over a span of two weeks.

By conducting interviews and experimenting with the system, we were able to construct a clear picture of the problems behind the symptoms described by the users. The following report introduces the system, analyzes the problem, evaluates a number of solutions, and suggests a course of action.

PRESENT SITUATION

Corporate Setting
HSBC Securities is the investment banking subsidiary of HSBC Bank Canada, a member of the world-wide financial services giant HSBC Group Plc. The Equity Structured Finance group (ESF), which is the focus of this study, operates within HSBC Securities.

ESF consists of 8 people, including group management, traders, financiers, financial controls, and technical support staff. Most of these people have multiple roles within the group, and are experts in their fields. ESF mainly operates on behalf of the Bank, as opposed to having a large number of private clients. The nature of this business is dynamic and highly charged, so redundant paperwork is undesirable.

Current System
The system being studied is used exclusively by ESF to keep track of their daily securities transactions, hence it is referred to as the “ESF system”. The system has been in operation for three years, and has been sporadically upgraded and modified as needed. Generally twenty to forty transactions are entered per day. In addition to transactions, the system keeps track of dividends, profit/loss, and handles special situations such as redemptions and splits. The information in the system is used for accounting, decision-making, and financial reporting, and is often the source of information for decisions involving large sums of money. This system is not intended to communicate directly with any of the HSBC’s transactions processing systems. (see Appendix C for a data-flow diagram)
In most cases, the traders input their daily transactions into the ESF system. Other information related to occasional situations, such as dividends and splits, is input into the system as needed by appropriate staff. All input is manual, using the interface provided by the system. Corrections to data are accomplished by retrieving offending records from the database, modifying those records, and subsequently re-saving them.

At the end of the day a printout of the trades is generated and sent to the “cage” where the transactions are processed by the clearing department. The information in this report is referred to as a series of tickets, as it duplicates the information on a traditional ticket (Appendix B). Other accounting reports are periodically generated by the system for decision-making and reporting purposes.

The ESF system is based on the Microsoft Access database system. The system is split between two files. One file contains code for the user interface and helper functions, the other contains all of the data and is modified by the former. This system runs on a Windows NT network, and is configured to allow multiple users to access the data simultaneously.

**PROBLEMS**

Problems in the system are manifested in wasted time and lost profits. A number of highly visible symptoms are detailed below.

**Poor Information Retrieval**
There is a lack of timely and relevant information. The system does not store information in a way that allows it to be accessed efficiently. Although a great deal of information is implicitly available in the database, a batch report or query has to be run before it is available for use. This is not always convenient. The database also contains infrequently used information that would allow management to make better decisions. However extracting this data is a complex matter as it falls outside the scope of the batch report.

**Slow Report Processing**
Reports take a long time to run. Although only 20 - 40 transactions are added every day, most reports are obtained by analyzing all the transactions in the database. As a result, the reports take a long time to produce, and needless work is being performed, as transactions from three years ago are still being analyzed daily. This problem will compound as the years progress. Currently, an end-of-day report takes 15 minutes to produce and involves daily manual intervention.

**Poor Security**
There is a lack of security. It is easy to accidentally make changes to existing data, or to incorrectly enter new data. This occurs both through a poor data entry interface, which
allows users to enter inconsistent information, and also through poor application design, which allows users direct access to the source code and data tables. For example, if invalid information is entered into a particular form field, the database program crashes and the source code is presented to the user for debugging. This level of access should not be made available to the user.

**Poor Reliability**
The system is unreliable. Because of the security problems, bad data has infiltrated the database. Also, omission of critical information can go unnoticed, leading to incorrect reports and hard-to-find errors. Users routinely spend inordinate amounts of time tracing through historical data to remedy unexplained inconsistencies. One such example is missing or incorrect trade settlement information. Essentially the current system lacks the ability to store the required data to provide an audit trail, and to use any data that is currently stored to validate user input.

These are symptoms of three deep problems within the database: poor interface design, poor organization of, and the lack of an audit trail.

**DESIGN FACTORS**

**Down Time**
The current system must be online at the end of each trading day so that the trades of the day can be recorded, and any end of day functions can be completed. Any system upgrades or replacements must be completed without taking the system offline for more than a few hours a day. The nature of the securities business dictates that ESF’s operations must never be hindered by an inoperative system.

**Project Duration**
The project must not take longer than six months. Management feels that a longer period would cause too great a disruption in their business activities. More importantly, distinct milestones must be reached on a regular basis. This incremental progress should allow for changes in the functionality of future stages of the new design, without requiring a substantial redesign of any completed stages.

**Platform**
The management is strongly opposed to switching platforms. The current information system is run in the Microsoft Windows NT environment, and management wants NT to remain as the operating system. Continued use of Microsoft database software is preferable in light of HSBC’s current technical support and purchasing agreements. Database software that is designed to run on other platforms is therefore unacceptable. A system that provides easy access to data to allow for quick, spontaneous examination or querying of data is also desired.
Operational Factors
The basic interface of the system cannot change. It may be upgraded but the overall concept must remain the same. If a new system is chosen then it should mimic the current interface. The users of the current interface are generally accustomed to it, so the learning curve of a radically new interface would be too steep and too costly.

PROPOSED ALTERNATIVES
The current system is slow, provides unreliable data, and lacks functionality. A completely new system can be designed or the current system can be upgraded. There are also several choices of implementation platform for any upgrade. The options are to use the current platform (Microsoft Access) or a true stand-alone application development platform (such as Microsoft Visual Basic) that is compatible with the current system. Furthermore, not making any changes at all is a possible alternative. Detailed descriptions of the alternatives follow.

A – No Change
The current system, with all of its problems, can still sustain daily operations. However, with the current growth rate of the database, budgeting for a future redesign or upgrade is recommended as part of this alternative.

B – Upgrade with Access
Specific parts of the current ESF system that are the most problematic can be redesigned using Microsoft Access. Focus would be on the user interface and some validation of input data, and increasing the amount of data that would be stored to establish an audit trail for corrections and changes to data.

C – Upgrade to Stand-Alone Application
Those upgrades listed in alternative B can be accomplished by incorporating the new interface into a stand-alone application. This application would then access the same data files that are currently being used, so no transfer of historical data or database conversion is required. A dedicated application development package would allow, in addition to the user interface, new data storage capabilities to be added so that data can be organized into a more useable and more extendible form. User input validation can be strengthened to increase data reliability.

D – Complete Redesign
The current system, if deemed wholly unacceptable, can be entirely redesigned. This would involve a redesign of the data model, the user interface, and all of the reports.
COMPARISON CRITERIA

Given the four alternatives mentioned above, criteria for comparison must be established in order to decide on the most desired alternative. These criteria are related to the Design Factors discussed in previous pages, but are more quantitative and precise in nature.

Development Time/Cost
Development time must be very low, in the order of 6 months. Provision should also be made for changes to the specification and revisions to plans in mid-development. Costs are a function of the time involved as no new hardware is required. The cost of the new system includes the cost of training staff to use it, and technical support costs, if they apply.

Efficiency
Input of data and extraction of reports should reflect the advantages of using a computerized information system. The efficiency of each alternative is a measure of how much time users spend interacting with the system on a daily basis, which includes inputting data, generating reports, and troubleshooting problems.

Reliability
System downtime, excluding network and hardware issues, is a function of the system’s reliability. Decisions may need to be made quickly, so the database system must be operational at all times. A minimum of maintenance is also required since the users are not trained in the intricacies of applications programming, and since technical support personnel are frequently unavailable. The integrity of the data maintained by the system is also a reliability issue, since the data is assumed to be correct by management.

Functionality and Expandability
The ability to provide users with timely and relevant information is a main reason for investing in an information system in the first place, so this is an important requirement. Alternatives are rated in their ability provide information in a way that meets current needs, and has the potential to meet future needs.

Compatibility
The ability to use current and past data seamlessly is desirable, as is the ability to import data from the ESF system to tools such as Microsoft Excel for analysis. A system that is able to read old data would require less effort to implement, and would be less prone to unexpected errors.

DESIGN SELECTION
Criteria Evaluation
The following table evaluates each of the alternatives according to the criteria above. The criteria are ordered from most important to least important from left to right. Unacceptable alternatives are eliminated from the selection as each criterion is considered in order, and the remaining alternative is selected as the most desirable.

<table>
<thead>
<tr>
<th>ALTERNATIVE</th>
<th>DEVELOPMENT TIME/COST</th>
<th>RELIABILITY</th>
<th>EFFICIENCY</th>
<th>FUNCTIONALITY AND EXPANDABILITY</th>
<th>COMPATIBILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>A: Use Current System</td>
<td>None</td>
<td>Poor</td>
<td>Poor</td>
<td>Poor</td>
<td>Full</td>
</tr>
<tr>
<td>B: Upgrade in Access</td>
<td>Moderate</td>
<td>Poor</td>
<td>Low</td>
<td>Adequate</td>
<td>Full</td>
</tr>
<tr>
<td>C: Upgrade to Stand-Alone</td>
<td>Moderate</td>
<td>Excellent</td>
<td>Good</td>
<td>Excellent</td>
<td>Full</td>
</tr>
<tr>
<td>D: Design New System</td>
<td>High</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Some</td>
</tr>
</tbody>
</table>

The evaluation indicates that Alternative C – Upgrade in Visual Basic is the best suited to our selection criteria. Designing a completely new system would be a waste of resources since the current system has many elements that function perfectly, such as many of the reporting functions. An upgrade of the current system, therefore, would be the ideal solution. The upgrade would focus on the sections of the system that involve data input and storage.

Cost-Benefit Analysis
Whether or not to proceed with one of the alternatives also depends on a cost-benefit analysis of the situation. However the long-term benefits of making better management decisions is not easily determined. Instead, an estimate of the time saved from key upgrades can be translated to a conservative dollar figure, and applied against the estimated cost of the upgrade work.

The upgrade cost is estimated at approximately $40,000 dollars. This figure is based on current market rates for a programmer at $80,000 per year, for an initial six months. Because this is an upgrade to existing systems, there is no additional operating cost. In

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1 This data is supplied by a technology staffing and consulting firm. The specific criteria used in the estimate are as follows:

- Geography: Toronto
- Industry: Computer/Software Development
- Experience: 7-9 years of experience
- Job Function: Applications Software Developer

The average salary for this qualification is $80000 (Canadian dollar)
fact, we are seeking to reduce the operating costs by way of the upgrade.

It is estimated that staff spend approximately 5 hours per week dealing with the problems outlined at the beginning of this report. At executive salaries, the dollar cost is estimated at $150 per hour.

The following table summarizes the above information and uses an annual discount rate of 20% to perform the Net Present Value Analysis. It is clear that a system upgrade would start paying back for itself after 18 months.

<table>
<thead>
<tr>
<th>Cash Flow</th>
<th>0 months</th>
<th>6 months</th>
<th>12 months</th>
<th>18 months</th>
<th>24 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development cost</td>
<td>$40,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present value</td>
<td>100.0%</td>
<td>90.9%</td>
<td>82.6%</td>
<td>75.1%</td>
<td>68.3%</td>
</tr>
<tr>
<td>Time adj. cost</td>
<td>$40,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cumulative costs</td>
<td>$40,000</td>
<td>$40,000</td>
<td>$40,000</td>
<td>$40,000</td>
<td>$40,000</td>
</tr>
<tr>
<td>Savings</td>
<td></td>
<td>$19,500.00</td>
<td>$19,500.00</td>
<td>$19,500.00</td>
<td>$19,500.00</td>
</tr>
<tr>
<td>Time adj. savings</td>
<td></td>
<td>$17,255.50</td>
<td>$16,107.00</td>
<td>$14,644.50</td>
<td>$13,318.50</td>
</tr>
<tr>
<td>Cumulative savings</td>
<td></td>
<td>$17,255.50</td>
<td>$33,832.50</td>
<td>$48,477.00</td>
<td>$61,795.50</td>
</tr>
<tr>
<td>Net savings - costs</td>
<td>$(40,000.00)</td>
<td>$(22,274.50)</td>
<td>$(6,167.50)</td>
<td>$8,477.00</td>
<td>$21,795.50</td>
</tr>
</tbody>
</table>

**RECOMMENDATIONS**

Given the above criteria evaluation, including the cost-benefit analysis our recommendation is to perform an upgrade to a Stand-Alone application using an application development package such as Microsoft Visual Basic. This involves rewriting and redesigning select parts of the database system. The upgrade could be completed in successive stages, each of which would provide an immediate improvement in functionality.

First, we recommend implementing a new interface that makes it more difficult for users to enter incorrect data. The application software will prevent users from accessing the source code and handle errors more reliably, which is another immediate benefit to the user.

Second, we suggest the addition of an inventory system that will be automatically updated as the transactions are added. This will eliminate the need for lengthy batch reports, and ensure that information is explicitly available at all times.

Third, we recommend that an audit trail be established, creating a separate record of changes to transactions, and linking this data with the original transactions.

Finally, we recommend taking advantage of the new systems data-handling capability and extended functionality to broaden and improve the quality of reports generated by the system. This could include extracting data that was not available before, and perhaps
automating the generation of other reports. This phase would require more consultation with the users, and more in-depth research and thought.

In conclusion, the recommended alternative is a good compromise between using a currently unreliable system and a potentially costly redesign. Our plan allows us to initiate development without affecting the current system. Each stage of the upgrade can be deployed as it is completed, again without affecting the current system.
APPENDIX A – Glossary of terms*

**Book**
An electronic record of all pending buy and sell orders for a particular stock.

**Broker**
A securities firm or a registered individual affiliated with one. Brokers are the link between investors and the stock market.

**Dividend**
A portion of a company's profit paid to shareholders.

**Dividend Yield**
The dividend yield on either common or preferred stock is the indicated annual dividend expressed as a percentage of the current market price of the stock.

**Equities**
Common and preferred stocks, which represent a share in the ownership of a company.

**Portfolio**
Holdings of securities by an individual or institution. A portfolio may include various types of securities representing different companies and industry sectors.

**Settlement Date**
The date on which a securities buyer must pay for a purchase or a seller must deliver the securities sold. In general, settlement must be made on or before the third business day following the transaction date. (T+3).

**Split**
A division of the outstanding shares of a corporation into a larger number of shares, by which each outstanding share entitles its owner to a pre-determined number of new shares.

**Transaction Date**
The date on which the purchase or sale of a security takes place.

* Definitions taken from tse.com
APPENDIX B – Sample trade ticket
APPENDIX C – Dataflow Diagram

Trader

Reports → Transaction Information

Transaction Correction

Query / Report

Data

ESF DATABASE

Clearing Dept.

Transaction Information

Old Transaction Information

Corrected Information
APPENDIX D – People contacted

**HSBC Securities:**

Nishit Patel  
Database Programmer  
(416) 868-7503

Stephen Rider  
Director  
(416) 868 5451

Andrew Marks  
Trader  
(416) 868-5493

APPENDIX E – Group Statement

This report is the result of equal participation and effort by all of the group members.

Signed:

______________________________
Tom Karczewski

______________________________
Laura Wood

______________________________
Nishit Patel
APPENDIX F – Miscellaneous notes to follow.