UNIVERSITY OF WATERLOO

Faculty of Mathematics

# *An Analysis of Flexible Risk Reporting Systems*

TD Bank Financial Group
Enterprise Risk Management Department
Toronto, Ontario, Canada

Prepared by

WEIWEI (WILLIAM) KONG
#20372777
3A Financial Analysis and Risk Management,
Professional Risk Management (PRM) Specialization
3A Mathematical Finance
April 2013

22 Locust Terrace
Markham, ON
L6E 1P1

April 27, 2013

Donna Taylor
Senior Manager, Enterprise Risk Management Department
TD Bank Financial Group
66 Wellington Street West
Toronto, ON
M5K 1A2

Dear Donna,

I have prepared the enclosed report, "An Analysis on the Importance of Flexible Risk Reporting Systems", as my 3A Work Report for the Enterprise Risk Reporting group at TD Bank Financial Group. This report, the third of four work reports that Co-operative Education Program requires that I successfully complete as part of my Co-op BMath degree requirements, has not received previous academic credit.

The risk reporting team that you lead provides verification, execution, and debugging of various risk related reports to be used in order to improve and monitor the accuracy of data in TD's in-house reporting tool, IRIS. My job as an Associate Co-op Student is to analyze and verify risk related reports, provide improvements, and assist other teams on the Enterprise Risk Management floor with their various projects. The primary tools that I use in my analysis include Microsoft Excel, Word, Access, VBA, SQL, and Tableau. This report examines the importance of risk reporting tools in financial institutions and specifically, the need for them to be flexible enough to handle any type of user based need.

The Faculty of Mathematics requests that you evaluate this report for command of topic and technical content/analysis. Following your assessment, the report, together with your evaluation, will be submitted to the Math Undergrad Office for evaluation on campus by qualified work report markers. The combined marks determine whether the report will receive credit and whether it will be considered for an award. [1]

I would like to thank you for your assistance in preparing and assessing this document.

Sincerely,

Weiwei (William) Kong

Encl.

# Table of Contents

# Executive Summary

Risk management has seen an immense growth in the past decade, especially with more recent area of enterprise risk management. This increase in growth naturally necessitates a robust reporting system under which risks can be identified, assessed, and mitigated. The purpose of this report is to examine three risk reporting systems:

- IRIS
- Tableau
- COGNOS BIA

An analysis of their various strength and weaknesses will be conducted. Their ability to contribute to the risk reporting process and which areas they excel at will also be examined. The criteria that will be used to judge the various systems include:

- User friendliness
- Flexibility
- Maintainability

It will be shown that IRIS excels at providing detailed information to end users, Tableau is great at rapid-deployment ad-hoc reporting, and COGNOS contains a wide variety of tools that allow for extremely accurate reporting. In conclusion, though, it is by combining the various strengths of these systems together that a truly good risk reporting system can be made, with one system's strengths covering another system's weaknesses.

# 1.0 Introduction

Since the financial crisis of 2007-2008, there has been an increase in the importance of accurate and valid risk management. Credit, operational, and market risk are some of the most regulated areas of risk management, but equally, if not more, important compared to the 3 previous areas is the requirement for sound enterprise risk management principles. To be precise about the definition of enterprise risk, Investopedia [2] defines enterprise risk management as a "... management discipline that calls for corporations to identify all the risks they face, to decide which risks to manage actively, and then to make that plan of action available to all stakeholders (not simply shareholders) as part of their annual reports." That is, it is an area of risk that that supports the decisions of other risk areas and the corporation as a whole. Part of this responsibility is to ensure that the risk reporting infrastructure surrounding the organization is flexible enough to handle just about any kind of reporting request while being robust enough to operate with minimal errors.

This paper will explore the various risk reporting systems that TD Bank Financial Group is currently using or plans to use and will compare their various benefits and downsides. Specifically, the reporting systems that will be compared are IRIS, Tableau, and COGNOS.

# 2.0 Analysis

We first begin by defining our judging criteria and then move on to determining how well each system does according to these criteria. A brief conclusion will be given as to which system is the most suited to flexible risk reporting.

## 2.1 Defining Criteria

In short, the three most important criteria needed to judge a reporting system's quality are: user friendliness, flexibility for ad-hoc reporting, and ease of maintainability.

User friendliness is necessary for reporting systems because there is cost associated with training a developer and the time needed to develop a report. If a reporting system or reporting program is easy to learn and intuitive, then the time for both of the previous items will be relatively short compared to other more complicated system which will, in turn, reduce costs.

The need for flexibility in a reporting system is crucial because the financial landscape in which risk management resides is constantly changing. This could be through policy changes like the new Basel III Accord or major financial market moving events such as the recent housing and mortgage crisis. These constant changes are what make risk reporting extremely dynamic in nature.

Finally, is the ease of maintainability which in this context means how difficult is it to implement changes and features in the reporting tool, whether it is through the user itself or through professionals who specifically deal with the reporting system in question. This criterion's importance follows directly from the previous criterion's importance.

## 2.2 IRIS

Using the above, we examine the first of TD's risk reporting system, IRIS, which is the main credit risk reporting tool used by TD today. IRIS is currently maintained by a segment of TD's IT department dedicated to supporting business and end users who use the system. Changes and new features to the system are added through the standard systems development cycle, which on a high level involves [3]:

1. Identification and Planning of the Project

2. Analysis of the Requirements
3. Documenting a Design
4. Development
5. System Integration and Business Acceptance Testing (SIT and BAT environments)
6. Deployment

These cycles vary in length, depending on the changes that are being implemented, but typically will take a one to a few months for a cycle to be completed.

In terms of user friendliness, IRIS does very well in guiding users to which parameters are needed to generate a report through the use of a list based parameter selection menu. The types of reports that can be generated are also well labeled and provide a good summary of the end user information that is needed for traders and financial analysts.

However, IRIS is not a very flexible system because the level of detail is dependent on what parameters are available for users to input and also because of the lack of transparency of how IRIS picks up its data from upstream, how it aggregates it, and how it displays what business logic is involved.

Maintainability of the system is costly because it was developed in-house and without dedicated external support. The long project development cycles also present a costly overhead to maintaining and improving the system.

Overall, though, IRIS is still a solid reporting system that does well in providing information to specific groups of end users, but it would not fare too well as an ad-hoc reporting tool.

## 2.3 Tableau

Tableau is a business intelligence tool developed as a rapid-deployment data visualization system. While it was not specifically developed to generate reports, the tool is robust enough to develop a solid risk reporting system. Of its main features, it includes the ability to create ODBC connection to several dozen different data sources including Microsoft SQL, IBM data repositories, and MS Access. Another useful feature is the ability to generate custom SQL connections that retrieve data from external sources to be parsed in Tableau.

Looking at Tableau through a user friendliness perspective, Tableau interface is extremely intuitive and well built, using a drag-and-drop approach to add new columns or features to a report and dashboard. Tableau also excels at data processing through the use of automatically generated table links every time a user wants to connect one table to another. Dashboards are easily customizable and the end user can interact with them live through buttons and scripts created by the developers of the report.

Flexibility of the tool is also very high because Tableau comes equipped with its own intuitive programming language that closely mimics MS Access. It does, however, have some limitations with data retrieval. For example, data that is joined in Tableau can only be done with left joins when placing data from two repositories in the same report or dashboard, where the user must decide which table is the main table (on the left side) and which table is the secondary table (on the right side). Another slightly more important restriction is that Tableau always wraps any user's custom query into a subquery before executing it. Depending on what SQL engine that an organization is using, this may limit what SQL operations, like Microsoft SQL's SET and GET actions used to control ETL, are available through Tableau's custom SQL parser.

In terms of maintainability, Tableau's interface and development tools are specifically tailored to end business users and do not require complex technical knowledge to maintain, other than the maintenance involved with Tableau Server. The ability to add and remove

features as well as complete transparency to how values and measures created makes Tableau very ideal and cheap for maintenance. Since business users can develop their reports in Tableau, the development cycle for an ad-hoc report would be relatively short.

Despite its shortcomings in data retrieval, Tableau is the ideal tool for rapid development of risk reports, ad-hoc or static, on the business side. The additional features of data visualization only add to the benefits described above.

## 2.4 COGNOS

IBM COGNOS or COGNOS BIA is a business intelligence tool developed by IBM for creating near perfect, high accuracy reports for business end users. This system, in particular, is known for its large suite of statistical tools and large market share in business intelligence tools. COGNOS' main method of interaction is as an online web application with Windows File Explorer like navigation.

From a user friendliness perspective, COGNOS is intuitive enough to be used practically and functionally. However, it does suffer from a larger learning curve when compared to IRIS and Tableau when it comes to understanding how the various tools work and understanding which tools are appropriate in which situation.

Looking at flexibility, COGNOS provides a large array of features such as advanced statistical analysis and query optimization tools, customizable user interfaces and dashboards, as well as some data visualization tools. This makes COGNOS the most flexible in its usage when compared to the other tools, but at a cost of more time needed to learn and effectively apply the tools.

In terms of maintainability, COGNOS has a very large tool set for server and software maintenance that requires some knowledge of load balancing and data management in order to effectively use the tool - if the user does not wish to use a direct connection to a pre-aggregated data source. It is fairly robust and comparable to Tableau in its tool set but

the main differential being that Tableau is far more transparent in how data flows into and out of the system.

In summary, COGNOS, out of the three, is the most powerful and flexible of the tools in terms of what is provided but can be a bit difficult to learn due to its complexity.

## 3.0 Conclusions

All three systems provide some benefit to risk reporting but are very specialized in their benefits. IRIS is a very simple end user reporting tool that provides detailed information to a specific group of end users very effectively. Tableau is a business user tailored tool that is used for rapid deployment ad-hoc reporting and is excellent when it comes to transparency. COGNOS is an industrial grade reporting tool that produces high quality reports and comes equipped with a large suite of additional features at the expense of a steeper learning curve compared to the other two tools.

Ultimately, it would be recommended that IRIS be used for end users who do not wish to partake in any report development, Tableau to be used for rapid-deployment ad-hoc reports, and COGNOS used for automated policy mandated reports that require a high level of detail. Hence it is recommended that for a risk reporting system to be truly effective, it should take advantage of the various industry tools available to utilize their strengths as well as cover any weaknesses created by using only one system. However, on a practical and business level, some effort must be made about considering the costs associated with each system.

# References

[1] Work Report Structure. Internet. University of Waterloo. [Online]. Available: https://math.uwaterloo.ca/math/current-undergraduates/co-op-information/work-report-guidelines/30-work-report-structure

[2] L. R. Quinn. (2009, February) The Evolution Of Enterprise Risk Management. Internet. Investopedia. [Online]. Available: http://www.investopedia.com/articles/fundamental-analysis/08/enterprise-risk-management.asp

[3] (2013, April) Systems development life-cycle. Internet. Wikipedia. [Online]. Available: http://en.wikipedia.org/wiki/Systems_development_life-cycle