WEB TECHNOLOGIES FOR DECISION MODELING: AN EXCURSION INTO THE EMERGING FRONTIERS

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ABSTRACT

In this paper, a hypothetical case study involving Monte Carlo simulation for financial decision-making is presented to argue that the required decision support functionality can be made available to the user through a browser and internet connectivity---without the need for specific DSS software on the client computer. The distinction between Web-based and Web-enabled is discussed and it is argued that the current trend toward wholesale abandonment of legacy systems needs to be reconsidered in favor of incremental adaptation toward web-enablement.

INTRODUCTION

In spite of the fact that web has achieved widespread acceptance as a medium of communication, relatively less progress has been made in terms of leveraging this technology for distributed decision support purposes. A web-based technology has the inherent advantage of standardization and cross-border dispersion of management roles.

The fundamental challenge in web-enablement of decision technologies is the ability to run fairly sophisticated models and algorithms at the backend even while providing a friendly graphical user interface at the front end. Underlying the massive trend is what is referred to as "browser mentality," or the tendency among users to demand that information and software be instantly accessible and usable. This requires implementation of a thin-client transformation.

Web-enablement is gaining unprecedented acceptance and advocacy among users of decision support systems. It is argued that web technologies offer the ideal medium for various applications including: (a) Accessibility of databases (b) migration of client-server applications (c) Bringing legacy systems to the web (d) Creating platform neutrality (e) Creation of interactive user interfaces (f) Deploying expensive functionalities to a wide range of users even while centralizing or at least concentrating the location of application providers (g) acceleration of transaction processing (h) Facilitating collaborative flexibility (i) boosting innovation (j) shortening cycle time.

The principal appeal of web-enabled technologies lies in their platform-neutrality. Once fully web-enabled, a technology is available via various web browsers; however, the standards are yet not fully uniform between various browsers such as Netscape, Internet Explorer, Mozilla, Opera, Safari and platforms---sometimes compatibility does not exist even between different versions of the same browser. The server side coding and implementation could become extremely complicated if uniformity between various platforms needs to be ensured. Further, as compared to the traditional client-server Graphical User Interfaces, the navigation models are very different as a result of the limited controls available.

Additionally, web technologies, while complex, are built from a common set of reusable components. This can result in cost savings, simple application integration, lower risk, reduced programming time, higher reliability, and shorter time to market.

THE PROBLEM AND ITS IMPLEMENTATION

For purposes of illustration, the following capital budgeting problem adapted from Moore and Weatherford [1] is used:

> *June Wilson is the manager of a new-product development and is considering the financial implications of a possible addition to Airbus Industry's jet airplane product line. Startup costs for the proposed new model A3XX (which include extensive research and design, building a prototype, and so on) are estimated at 150,000 (in thousands). The new aircraft would be sold at a price of 35,000 (in thousands) per unit. Fixed costs are estimated to run at $15,000 (in thousands) per year, while variable costs should be about 75% of revenues each year. Tax depreciation on the new equipment would be $10,000 (in thousands) per year over the expected 4-year product life of the A3XX. The salvage value of the equipment at the end of the 4 years is uncertain, so June conservatively estimates it to be zero. Airbus' cost of capital is 10%, and its tax rate is 34%.*

The above data are implemented in a spread-sheet model by assuming that the demand could be a random number between, say, 8 and 12 units (both inclusive) in any given year. Monte Carlo simulation is used to calculate the average NPV for any given number of iterations.

Now assuming that for any number of possible reasons (as in the case of a multinational company evaluating different investments in different countries), there is an element of real time data involved in the above calculations, it is possible to implement the web query functionality of Excel to convert the NPV from US Dollars to Euros and update the file on a constant basis or upon opening the file. A web query has been implemented with a link to Yahoo's Currency converter at http://finance.yahoo.com/currency/convert?amt=1&from=USD&to=EUR&submit=Convert and http://www.xe.com and the resulting model is published on the web at the following locations using different providers:

XL2web

The model is published at http://www.itksoftware.com/home.jsp and shows some of the interactive capability of xl2web.

Excel Everywhere

Whereas the interactive capability of XL2Web model is restricted to refreshing data, Excel Everywhere is able to provide for user input of the variables such that automatic refreshing of data is possible whenever there is an active connection to the internet. The implementation is in the form of a zip file supplied to the user. This is to be extracted to the local disk and the resulting HTML file is to be opened while connected to the internet. Web query, macros and VBA are not supported.

Microsoft Front Page

The model is published using the *minimally available* features of Excel and Front Page at Bloomsburg University's server and can be accessed at:
http://cob.bloomu.edu/akorukon/ExcelwInteractAbrEntireWbNov25d.htm

As can be seen the commercially available applications for web-enablement of this relatively simple model fall far short of the stand-alone simulation in terms of features, continuous refreshment of data, macro-enablement and graphical dimensions. Part of the reasons can be sought in the current state of client-server communications technology.

DISCUSSION

In the last few years one of the common trends has been that almost all of the original data-analysis products are in the process of being made available in web-enabled versions. From an examination of this simple implementation, it is clear that even the web-enablement of a fairly simple Monte Carlo model is far from satisfactory in terms of: (a) lack of ability to incorporate macros and (b) comprehensiveness of user input and ability to edit and input data. The present paper, while it does not completely reflect the full range of what is commercially available and feasible, serves to illustrate the limitations of what is commonly within the reach of end-users.

Contrary to what is commonly believed, web-enablement is not a simple change of the existing user interface; on the other hand, it is much more complex and involved. As Hess, Rees, and Rakes [2] point out, DSS refer to support systems for semi-structured and unstructured decisions and draw on a variety fields including Management Information Systems, Operations Research, Artificial Intelligence, Organizational Studies, and others.

There is an appealing, yet wrong temptation to believe that technology can be neutral in terms of moral values, and adherence to legal, societal and political structures. This is not always the case considering that there are some ethical and legal burdens that come with information sharing.

REFERENCES

[1] Moore, J.H., & Weatherford, L.R. *Decision Modeling with Microsoft Excel*. Upper Saddle River, NJ: Prentice-Hall, 2001.

[2] Hess, Traci .J., Rees, Loren P., & Rakes, Terry R. Using autonomous software agents to create the next generation Decision Support Systems. *Decision Sciences*, 2000, 31(1), 1-31.