APPLICATION CONTROLS FOR SPREADSHEET DEVELOPMENT

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Spreadsheets are one of the most popular and important forms of end-user computing. Users can obtain high productivity by developing applications in the programming facilities of the spreadsheet packages. The major benefits accrued to users include low cost, fast development time, and ease of manipulation. However, risks associated with lack of control and improperly developed applications exist as these applications are often used for financial control and other important decision making. In order to avoid these risks, a comprehensive presentation of application controls for spreadsheet development is provided to ensure data integrity and processing efficiency. A general control framework is offered to help developers and users identify the need for control as well as the proper type of control while maintaining a balance of costs and benefits. Roles for end-users, the information center, and the internal auditor in application control are outlined.

A framework for control in spreadsheet development and a comprehensive set of recommended application controls are presented in this article to foster data integrity and processing efficiency in spreadsheet applications. Respective roles for users, the user management, the information center (IC), and the internal auditor in application control implementation are also suggested. This article is important to spreadsheet developers and users because even though many concepts presented here have their origin from mainframe usage, many developers and users are relatively new to system development and most likely have not been exposed to these concepts. Also similar ideas may have been presented in a piecemeal fashion in the literature, yet it would be difficult for a spreadsheet developer to rely on that fragmented knowledge to implement an effective system of application controls. These materials may also serve as the basis for the documentation standard of a preferred spreadsheet development style both for practitioners and academic instructors. Before the control framework and application controls are presented, background material on risks associated with spreadsheet applications is briefly covered.

The 1980’s saw a dramatic growth in
end-user computing (Alavi & Weiss, 1985-86; Benson, 1983; Gerrity & Rockart, 1986; Munro et al, 1987-88; Rockart & Flannery, 1983). Executives, managers, and professionals using information technology as personal support for their daily chores were a major part of this growth. In many of these cases, personal computers played an important role (Benson, 1983; Guimaraes, 1986). Furthermore, spreadsheets were singled out as one of the most important personal computer applications. In a survey of 311 personal computer users, comprising professional workers and managers (Lee, 1986), spreadsheet applications were the most popular, with about 74% of the respondents reporting usage. These users also spent a greater amount of time on spreadsheets than on any other applications, averaging over five hours per week. Apparently, the use of spreadsheets has become one of the most heavily used forms of computing.

Using spreadsheets for data analysis and decision support has many benefits for users, such as low cost and fast development time. In addition, Carlsson (1988) attributed the widespread use of spreadsheet programs to the following factors:

1. Most business people are familiar with the spreadsheet metaphor—a spreadsheet or ledger sheet, and a calculator.

2. Spreadsheets have several “direct manipulation” attributes. Direct manipulation types of user interfaces have been aptly described as “what you see is what you get” (Shneiderman, 1987, pp. 195-198).

3. Spreadsheet packages are relatively easy to learn.

4. Spreadsheet software and PCs are low-priced.

5. Spreadsheets are perceived as relevant tools for many business tasks.

Concerns, however, have been raised about the risks involved with spreadsheet applications, especially when these applications are used to support important decision making (Business Week, 1984; Davis, 1982; Grushcow, 1985; McGrath, 1986; Bryan, 1986; Ronen et al, 1989). Ronen et al (1989) enumerated errors frequently cited in practitioner literature as mistakes in logic, incorrect ranges in formulas, incorrect cell references, etc.

A case of spreadsheet error deserves to be noted: James A. Cummings vs. Lotus Development Corporation (Desmond, 1986). Cummings, a construction company in Miami, filed suit in October 1985 in federal court seeking $245,000 in damages from Lotus. The firm used a Symphony spreadsheet model to arrive at a bid price for a $3 million office complex. Unfortunately, a row which represented a $254,000 estimate for general and administrative costs was inserted but not included in a previously defined range, resulting in its exclusion from the final bid price calculation. As a consequence, the firm suffered great financial loss when it was awarded the project.

To alleviate costly errors such as the one described above, management and application controls are needed for spreadsheet development and use. Various recommended application controls will be presented in this article. Many of these controls were originally experimentally developed as standards for applications development by the first author for the end-user computing support group in the 3M Company, a Fortune 500 corporation located in St. Paul, Minnesota. Some of the controls are adapted from traditional EDP systems development practices (Weber, 1988) and were modified to meet the personal computer and spreadsheet environment. Others are unique to the spreadsheet environment and were selected partially based upon the authors’ experience with spreadsheet application development. Moreover, even though some of those controls have been practiced for some time, only recently have they begun to appear in practitioner literature on end-user computing. These articles will be referred to when appropriate for the benefit of those who are interested in the professional
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