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## An Online General Ledger System

Across academia, decision-makers with small to large budgets often have only the fuzziest idea of their actual budget balance, or what their balance might look like at some point in the future. Somehow, this situation persists with decision-makers who have an uneasy reliance on some kind of accounting process (sometimes automated), which generally they do not control directly. Typically, a manager's dependence on the so-called "accounting department" introduces an information lag of several weeks or even months. Thus, managers look at their budgets through a rear view mirror; and projecting their actual budgets into the future becomes an exercise in divination.

In January 1979, the University of California Division of Library Automation (DLA) found itself with the problem of maintaining a timely ledger. Also at that time, DLA was building a large-scale IBM operating system to support the University of California Online Union Catalog. This system also had all of the computing resources to support a sophisticated general ledger system.

So, an obvious issue emerged as to whether it was more cost-effective to buy, or to write from scratch, a general ledger program. Common sense suggested that it ought to be simple to buy such software. However, exhaustive investigation revealed that flexible general ledger systems came as part of a turnkey hardware/software solution. The fact was that the IBM/370 operating system proprietary software was either mostly batch, or otherwise required costly teleprocessing software which was not a part of DLA's intended software inventory. Timesharing was considered too, but even if the right software could have been identified and located, its cost would have been greater than writing the same programs in-house. The

unexpected conclusion was that it was cost-justifiable to devote a programmer's time to develop an online general ledger system that would be tailor made to DLA's needs.

### **Nature of the Application**

The essence of maintaining a general ledger is to create budget lines, to encumber and to expend against them, to have the balances of each line adjusted automatically, and to carry updated subtotals as well as a grand total. For example, if a general ledger were to have a line for "telecommunications," then its online implementation should support the following general functions:

- Associate the line entitled "telecommunications" with a fund code.
- Allocate an amount of money for "telecommunications."
- Adjust the allocation any time in the future.
- Encumber funds against "telecommunications."
- Adjust an encumbrance against "telecommunications" any time in the future.
- Allow full or partial expenditures against a particular encumbrance against "telecommunications."
- Allow expenditures from "telecommunications" for which an encumbrance was not made.
- Maintain a balance for "telecommunications," while adjusting the subtotal, of which "telecommunications" is a part, as well as the grand total.

### **Details of Implementation**

The general ledger system developed at DLA has no name. DLA runs it under IBM's Time Sharing Option (TSO), and in theory it will run under any IBM/370 operating system. TSO handles communications with the terminal, but it could also be accommodated by CMS, CICS, etc. The application proper is written in PL/1. All of the programs were written at DLA by Michael Thwaites. File management is through sequential (QSAM) and basic direct (BDAM) access. For database management activities like indexing, much advantage is made of large regions of real memory. All transactions are check-pointed for restart. For simplicity and to keep costs down, dumb ASCII terminals are used in line-by-line mode. Through simple screen clearing, cursor addressing and a data rate of 1200 bits per second, a very friendly software interface eases the user through learning and use of the system.

## Design Criteria

The design of the system takes into serious account the fact that the person who actually plugs numbers into it will want to do so without exhaustive training, but with ease, confidence and a minimum of time at the terminal. To those ends, careful attention was paid not only to the textbook functions of the general ledger, but also to the idiosyncrasies of the purchasing and accounting offices through which DLA operates, and to the preferences of those responsible for both the broad management and hands-on use of the system.

Detailed performance specifications were developed by a systems analysis team that included those mentioned earlier—the director and the programmer. The result was a printed document of some sixty-two pages that became the basis for the operator's manual.

Logging onto the system is a function that embodies many exemplary features of the system: brevity, ease of use, security, and selectivity. Within ten lines of text—99 percent of which is coming from the computer not the user—a session is provisionally established, most recent activity is recounted, the user enters the appropriate passwords, and limits of privilege are established based on the user's alleged identity.

In general, there are three levels of privilege: absolute authority to read and write anything (such as setting up fund codes, budget titles, grouping lines for subtotaling, and patching any number in the ledger). The next level of privilege is to encumber and expend. The least privileged users can only read the ledger.

The user communicates to the online general ledger in a command language. The number of functions is very finite and the command verbs are highly suggestive. To aid the user's memory, the system will issue an appropriate help message whenever asked to.

Because the system uses line-by-line terminals, editing is very simple. There are no function keys. The system allows the user to review a transaction in its entirety before executing it. Even if the user makes a mistake, it can be undone.

The online general ledger functions so as to reduce as much as possible problems with the mechanical aspects of the system. Not only does it do all of the arithmetic, but it also helps the user to verify that the right vendor is paid, and that only one payment is made to that vendor. It even allows credits and discounts to be posted to a particular purchase order to invoice. Output from the online general ledger can go to a terminal or be spooled to a printing device. When used in conjunction with an IBM 6670 or a Xerox 9700 online laser printer, the hardcopy output is particularly pleasing.

**Limitations**

One of the design criteria for the online general ledger was to limit its implementation exclusively for DLA. Nevertheless, other departments at the university can use it for internal ledger management. It cannot be used in a distributed fashion where several departmental ledgers might be aggregated, and that was a conscious design limitation.

**Conclusion**

The experience at DLA with a home-built general ledger system has been very positive. The director can look at the budget from his terminal any time he wants to, and see it up to the moment of the keying of the most recent purchase order and invoice information, which takes place virtually every day. It takes one person about twenty minutes each day to keep up with keyboarding. Since DLA has its own computer center, this system runs for no recurring cost of its own. But most importantly, it provides satisfaction with a bare minimum of human involvement.