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Fluctuating Currency Budget Management

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INTRODUCTION

Many major projects require access to world markets for financing and/or procurements. That requires budgets and costs associated with those projects to be in more than one currency, and to be estimated into the future. This paper presents an overall procedure and system called **Futura**, which can meet that objective.

This paper provides the following: a brief introductory profile of project and multi-project management needs as background to the need of a well founded budget/schedule system for fluctuating currencies; the basic concept of the fluctuating currency budget/schedule system **Futura**; an overview of **Futura**; its usefulness and reports; and a brief outline of its application requirements to establish a successful system.

OVERVIEW OF THE BUDGETING CYCLE

There are several facets of projects, multi-projects, and program budgeting cycles that need overviewing to place **Futura** in perspective. These are briefly introduced below.

Understanding the Individual Project Life Cycle

The typical project life cycle divides into three phases: the idea phase, where a fundamental thought is organized; the pre-authorization phase, consisting of studies alternative selection and adequate preliminary design to present the project for authorization; and the authorized phase, which includes detail design and construction. Each work step in each phase contains a number of work task categories for management. Each phase has certain characteristics relevant to budget preparation and management. The **Futura** concept umbrellas all three phases. Additionally, many projects are in the stream. Thus, a multiple project capability is necessary and is provided in the **Futura** concept.

The cost/schedule variance analysis control system has become the classic target of adequacy in budget management. Briefly, its key features are: cash flow plot of the planned job, typically a form of "s" curve within the schedule time period; the tracking of actual costs on a cumulative basis; the determination of an earned value of work performed; and a resultant ratio analysis of a number of factors illustrating the health of a project. The **Futura** concept includes meeting these requirements.

Given a complete budget/schedule analysis, important current status variances can be determined and included: percent spent; percent complete; schedule variance percentage; schedule variance time; schedule variance time percentage; cost variance percentage; cost performance index; schedule performance index; completed project index; predicted time overrun; and schedule total variance percentage.

THE KEY CONCEPTS OF A FLUCTUATING CURRENCY BUDGET/SCHEDULE MANAGEMENT SYSTEM

Two major and guiding objectives must be achieved to successfully implement a workable budget/schedule management system with a fluctuation currency. It must be timely. Time is of the essence for reporting and decision making. Turnaround time from data cut off to produced final product must be two weeks from the start of process, such as date cut off data (this provides one week for assembly of data and one week to assemble and analyze all reports). Two weeks must be the maximum.

The data must be reasonably accurate. This is not an accounting system. Although the accounting portion of actual costs should be precise, the forecasting part of budget, estimate, and schedule can only represent one's best prediction at the time of input. Input this best estimate. Getting the whole picture is more important than being exactly right. What is "exactly right" on a prediction? Let's look at a number of concepts that need to be established.

A Comprehensive Budget/Schedule Management System

Futura is designed to be used from the start of authorization through to a completed project. This includes architectural/engineering design, procurements, and field construction. Included as the products are the budget, actual costs, schedule, and progress for each individual stage of a project and its estimates for subsequent stages. Commitments are included as well as changes, pending and approved as change orders. Monitoring and updating progress in term of cost and schedule are included.

Futura Is a Mainline Shell System

The mainline shell system for **Futura** is composed of seven specific steps: system set-up and coding; budget/schedule amendments; budget/schedule database; multiple currency analysis with companion schedule analysis; consolidated database; reports; and additional analysis.

Recognize that **Futura** only works with budget monitory values, currency ratios, and schedule information. Thus, a substantial set of supporting systems and procedures needs to be in place to even attempt a **Futura** application. These support systems can be manual or computerized.

One required support system is a schedule calculation system. Essentially, this can be any available computer system that is compatible with **Futura**. **Futura** operates as a pre- and post-processor with the scheduling system, which operates as a satellite with its own schedule outputs.

All other support systems require no direct interfacing or data export or import. Thus, they may be manual or computer based. However, export or import data interfaces could be developed.

Control Is Established Through a Double Entry Budget/Schedule Transaction Entry

Once the original budget and schedule are set, all changes are tracked. A double entry budget/schedule transition system is used to manage each change and addition. The account(s) increased are balanced with the account(s) decreased. Supporting documentation accompanies each transaction and supports any net increases or decreases. These budget amendments control the changes in budgets, conversions to commitments, and change orders adjustments. Schedule changes are handled in essentially the same manner by changing, deleting, or adding new schedule data.

Scheduling Targets

Scheduling does not target specific detailed analysis. This is left to contractors' schedules. Scheduling targets all monetary expenditures being tagged with an activity cross-reference and a start date or critical path method (CPM) relationship and a duration. In addition, significant schedule-only activities are included.

The emphasis is on obtaining committed schedules from all parties as soon and as continually as possible. Thus, a flexible approach to scheduling is important in assuring acquisition of schedule data.

Expanding Individual Budget Line Items into Trackable Budget Pay Items

Upon awarding any contract, the applicable budget line items, using the budget amendment procedure, are expanded into the pay items. Additionally, all budget items as well as all representative non-budget activities needed to establish a contract schedule are scheduled by the contracting party.

Following a commitment, change orders (pending and then approved) are processed in a similar manner. One major feature of processing a change order is establishing a level of authority structure for approval of the change order. The clout on this is simple: no payment unless the system is conformed to.

Providing the Basis for a Multi-currency Forecast and Budget

Given a budget line item and schedule, the potential expenditure period can be identified. Providing that a conversion rate for currencies is given, the budget value for that line item for all currencies can be estimated.

The Linchpin Data Needed for Providing a Forecast Is the Recording of Actual Costs in all Related Currencies

The only point in time when the actual value of all currencies is fixed is at the time of invoice payment. In a multi-currency project, there are typically two currencies that are required, and a number of times a third and differing currency is necessary:

- domestic currency is the currency of the country carrying out the construction. Information is typically needed on a total basis as well as for specific in-country's purchases and payments;
- a base currency is required whose characteristics are firm, generally not fluctuating. These values are typically needed to assess the whole project by out-of-country parties, as well as for payment of portions of the project. This currency is also used to carry out the budgeting and estimating analysis for all foreign procurements; and
- a third country or several third country currencies may be involved. Worldwide procurement will result in commitment to such third country currency. The third country's currency typically is set up only with a contract commitment, unless a specific line item is known to be such a currency prior to a commitment.

All currencies can be specifically calculated at the time of invoice payment. This is an important record for a multi-currency budget/schedule system.

Long-term Forecasts of Multiple Currencies

To this point, the actual costs, a schedule, and budget against which the actual can be deducted to determine a to-be-expanded amount have been set up. There are a number of fine tunings, including pending change orders, approved change orders, and outright forecasts. These can vary the predicted cost to complete. Precise procedures and selections need to be applied to which numbers are selected.

Given the schedule, budget to complete, and conversion rates from the budgeted currency, all other currencies can be calculated. Given that all budget line items are so calculated, the values of all budget line items over the full project schedule can be totaled for the budget value in all appropriate currencies.

Carrying Out Financial Analysis

A sophisticated Futura with a comprehensive coding system permitting ancillary codes could permit complex additional analysis. These codes would be applied to budget line items and permit extraction of all budget line item data to analyze such items as: differentiating real and personal property; geographically isolated budget accounts; and identifying specific groupings of budget accounts for specific analysis needs. The appropriate organization of budget codes will provide the opportunity to include special codings.

FUTURA'S STEP-BY-STEP OPERATION

Futura's step-by-step operation focuses on: an interactive access; concentration on current input of data, reduction of auditable input records, and a current database; the follow-up of schedule calculation, multi-currency analysis, and budget consolidation; and an overview of report capabilities.

The following system components are discussed below: accessing system, general menu, initiating a project and specific menus; understanding the budget/schedule database; coding; budget/schedule amendments; reporting actual charges and schedule progress; progress analysis and forecast inputs; schedule analysis; currency exchange rates; multi-currency analysis and database; consolidated database; and reports.

Each section is presented in an outline version of a systems manual of an interactive PC program. Included are outlines of the major algorithms of the system. Brief introductions will outline the interaction activities to introduce the data.

Accessing System, General Menu, Initiating The Project, and Specific Menus

Following the PC interactive concept, Futura's accessing system will reside on a hard disk or diskette and be accessible. The user will have the access coding to call down the system and the general menu. The general menu provides five actions: initiate a project, which provides for starting a new project database; inputing data that needs the identification of a project and leading to the input data menu; running an analysis of a project, which requires a job number and leading to the run analysis menu; displaying information requiring a job number and leading to the display menu; and output hard copy, which requires a job number and leading to a hard copy output menu.

Initiating a database includes inputing a project number for the system, the project name, and additional identification information that may be accessed including, but not limited to: location; owner's name, address, telephone/fax, contracts, positions; architect's name, address, telephone/fax, contracts, positions; engineer's name, address, telephone/fax, contracts, positions; contractor's name, address, telephone/fax, contracts, positions; others' names, addresses, telephone/fax, contracts, positions; and job information.

Five input categories segregate the input data into unique inputing of records to manage the acquisition, inputing, and contemporaneous correctness of all data. The menus for specific inputing of data are: coding menu; budget/schedule amendment menu; progress reporting menu; progress analysis and forecast inputs; and currency exchange rates menu. Each menu, its alternatives, and algorithm are presented below.

This menu provides the six basic analysis procedures for Futura including: schedule analysis, export, and run; schedule analysis, export, run, and import; update currency's exchange rate for run; run multi-currency analysis; run multi-currency analysis and consolidated budget; and run consolidated budget (a multi-currency analysis had been previously run). These menus select what analysis and data manipulation of the database is to be undertaken.

Displays are provided to present basic reports. The range is limited only to programming ingenuity with examples such as: display budget amendment number; display multi-currency spreadsheet; display budget report; and many more. Additionally, all archives records are to be displayable. Note that no displays for schedules are included. All schedule displays would be accessible through the satellite scheduling system to the full capability of that system.

Hard copy is provided to present the basic reports. They are listed in the output hard copy menu and, as examples, include: output budget amendment number; output budget/schedule account, database, sector number; output multi-currency spreadsheet; output cost report, account; and many more. Note that no outputs are included for the schedule. All schedule outputs would be accessible through the scheduling system to the full capacity of the system.

Understanding the Budget/Schedule Database

The core control concept of Futura is retaining a contemporaneously correct database of all budget, cost, forecast, and schedule input data managed by budget and schedule transactions that, on a double entry basis, extract data to be changed and inputs new data. These changes to this database can be made on a continuing real time basis. Analysis can be then be carried out of any point with essentially the best, most current, and correct data being available.

Time wise, this has procedural restrictions. Certain information is only input periodically, such as progress payments. Thus, there is a time-related reliability and quality factor. However, other data, such as amendments to budgets, forecasts, and basic schedule data, can be updated continually by accessing what is in the database, and updating that data through an amendment.

The budget/schedule database is introduced at this point to provide and understand the target of all inputs. The budget/schedule database divides into sections of data elements as listed further on. All monetary data element groups (a group lies within a section) divides into the three currency categories that

apply. There are currencies for all estimates of budget paid and forecast budget line items: domestic country currency; and base estimating/control currency, typically a firm-base currency; and currency category, which is the paying currency. This can be domestic or base, or a third country, all identified by a code.

Later, this database will be expanded to include the key forecast future multiple currency budget and the schedule dates. The inputs are from the budget/schedule amendment inputs; progress reporting and input forecast inputs; and budget/schedule earned value and to complete inputs.

Using the codes from the code menu inputs will update and provide the control codification to all data in this database. The currency exchange rate inputs will provide the paying currency code to cross reference all currency conversions rates.

Again, the core of the system is to have a contemporary real-time database of all planned, committed, and changing budget and schedule information linked with the routine timetable of inputs for actual progress. It is important to visualize this database to understand the coding and input requirements.

Coding

Although a coding menu and its database may vary, **Futura** has five basis coding inputs: account/special code input/change with the account code description, to set up the work breakdown structure (WBS); special code descriptions; activity code suffix and descriptions; contractor code with all pertinent contractor data, including the owner, all architects, and engineers, which essentially operates as an organization coding dictionary; and currency code, identifying the full country name for each code.

The account code is a typical WBS code relating a project, location, component, and specific (usually physical) work item. The special codes provide the opportunity to assigning unique, special, and separate analysis extractions to each code, for example: to differentiate funding sources; to separate real from personal property for tax purposes; and to geographically divide such as with a transmission line between owners and geographic regions. This coding capability provides the opportunity to serve unique management needs in segregating data.

Special code descriptions simply provide functional analysis reference for a particular code:

- the activity code suffix is typically a two-digit code that provides the position to differentiate between several work tasks associated with an account code. It can divide the code item into sub-items. The descriptions are included.
- contractor's codes identify a code of responsibility for all line items. This includes a code for the owner as well as architects/engineers.
- currency codes identify, in a compressed form, the different currencies in use on the project.

Budget/Schedule Amendment

All adjustments (budget, commitment, changes to budget and commitments, schedule and schedule adjustment) are entered by budget/schedule amendments. The information management concept of **Futura** follows these rules:

- all cost items will be priced and scheduled;
- all non-cost schedulable work/time items will be scheduled;
- the account code will identify the budget/cost/bid pay item, budget/pay item, actual incurred cost/schedulable item; and
- the schedule suffix will differentiate various budget/bid pay items between work items, which are scheduled. Multiple schedule suffix codes will permit budget codes to be used over a large number of schedulable work tasks yet provide the unique budget code identification.

Routine change in data can be made by identifying the account/activity code and changing the data therein, and major changes are accomplished by a double entry control system, deleting old accounts or adding new accounts.

There are seven budget/schedule amendment inputs that keep **Futura** up-to-date on the plan, budget, and commitments: initiating the database for a job; enter pending budget changes; enter an approved budget change; make a commitment; enter a pending change order; enter an approved change order; and make a general schedule change.

These entries will maintain the current database for **Futura's** job. A standard format is used to both identify the entry information and record the authorization, as illustrated in Figure 1. Each form of entry will require different inputs. The suggested form is believed to best assure a complete visual display of the transaction.

The budget/schedule amendment input component has one additional important function. All transactions are retained in an archive that is accessed monthly to obtain a report on all changes introduced in the month. Additionally, on any selected period, the archive can be accessed for an analysis run of what accounts have been affected by amendments including listing the audit trials of all changes. This can be done by individual account or on an overall basis. These access capabilities, displays, and reports are important in the ongoing management of a project.

Reporting Actual Charges and Schedule Progress

Reporting actual charges and schedule progress is done only against existing budget account/activity code records initiated and maintained by the budget amendment procedure. With the exception of the forecast, no data can be accepted on a line item unless the budget amendment committing amendment has been processed. The forecast's next three months will continue to be allowed with each succeeding report without a committed and actual expenditure, simply washing out the old and adding the new until an actual expenditure is made.

Control Code:	Budget Accounts	Activity Code	Special Account Code	Budget Responsibility		
Budget:*	Original Budget	Committed	Approved Amendment	Total To Date	Pending Amendment	Potential Total
Line Item Contingency:*	Original Budget	Committed	Updated Availability	Transferred Out	Remaining Balance	
Commitment & Actuals* (Contractor)	Contract Commitment		Approved Co's	Total To Date	Pending Co's	Potential Total / Actual This Period / Actual To Date
Schedule/Earned Value & Input to Complete:*	This Period Schedule Value	To Date Schedule Value	This Period Earned Value	To Date Earned Value	To Complete	
Short Term Forecast:*	Total Prior Request	Last Report Request	Short Term Request — Period 1	Period 2	Period 3	

	Description	Calendar ID	Duration	Constraints Start Compl. Date Date	% Complete	Actual Start Compl. Date Date	Preceding Activity Code Type Lag	More Preceding Activities
Schedule:			Original Remain					

* Includes domestic, base, and third country categories of monetary values

Figure 1—Budget/Schedule Amendment Input

There are six progress reporting entries that represent the updating of a budget account/activity code line item. They are controlled against the budget account/activity code and the contractor code:

- actual charges this period per the budget account/activity code as contractual pay items. This would be calculated in all currencies, that is, domestic currency, base budgeting currency and the paying currency, or a third country currency;
- remaining plan duration for work on the activity;
- percent complete;
- actual work start date;
- actual work completion date; and
- payment forecast for the next three months.

The input would be in the paying currency. The database will update the base and domestic currency using the input exchange rates.

Progress Analysis and Forecast Inputs

Three traditional and major budget management approaches are recognized as integral with **Futura**. Their basic data requirements have been included to permit a separate satellite analysis and reporting procedure, should a user wish. They are for schedule value to date, earned value to date, and estimate to complete.

Schedule Analysis

Futura is not a scheduling system. For control of input, retention of an audit trial, and coordination with cost, all schedule input is acquired by the budget/schedule amendment input and the actual charges and schedule progress input. All schedule data is retained in **Futura**. This includes the input and the calculated schedule dates and float.

A separate, compatible scheduling system is used for the schedule calculation and all scheduling outputs. The schedule data is exported to the scheduling program with calculated results imported back into **Futura**. Certain key restraints are placed on the scheduling system with regard to it being a precedence method system, it having an import/export capability, and it being able to run with multiple starts, multiple finishes, and a mixed network and plug start/finish date/duration input for bar charting.

Satisfying the above condition, any commercially available schedule system will serve **Futura**. Selection of a scheduling program should also include a review of its own report capabilities.

Currency Exchange Rates

Through the input menu selection, currency exchange rate input will be accessed from the run analysis menu also, when the multi-currency analysis is called. The currency exchange rate simply uses the current date as a reference. The required input data includes: assuming a 1.0 factor for the base currency; provides an inflation rate input for future months for base currency; provides exchange ratio to the domestic currency; and provides an exchange rate to all third country currency used.

This, when input with the multi-currency analysis, provides the most current currencies' exchange rates for the budget and the ability to calculate all currencies for all budget line items.

Multi-currency Analysis and Database

The multi-currency analysis is basically a spreadsheet form of analysis, given all information resources are available: the budget values by budget account/activity code for the budget currency; actual to-date costs in all currencies; the schedule analysis showing when all future budgets (including committed budget line items); and the currency conversion rates. All that needs to be done is to set up the full conversion spreadsheet. The algorithm steps are fairly straightforward, as follows:

- set up the conversion rate by currency for the time period of the job. This information is in the currency exchange rate database;
- set up the account/activity code database, one for each of domestic and base currency for all accounts, and then one for each of the paying currencies, including base currency, domestic currency, and third-country currency for the specific accounts; and
- calculate the amount to be spent one account/activity code at a time, exporting from the budget/schedule database. This calculation is one of two calculations:
  - if not committed, or committed with no actual charge, the paying currency is extracted from the budget potential total and the budget total to date data items; and
  - if committed and actual charges have been made, then the paying currency budget potential total and the budget total to date are reduced by the paying currency actual to date.

  These resultant budget potential total and budget total to date values are placed in the appropriate base, domestic, or paying currency field of the spreadsheet to record the "to be spent" amount;
- import, to the spreadsheets, the schedule start and completion dates for the time periods of the activity. If the account/activity is in progress, only the completion date will be needed; and
- with a calendar accessible to this next step, prorate the cash flow for the particular month of occurrence. Do so, taking into account partial months for both early and late dates in separate calculation runs.

Now all accounts in all currencies have those numbers that represent the to be incurred costs in their budgeted or committed/spent currencies as paying currency. Apply the conversion rates to convert all currencies to the budgeting base and domestic currency:

- conversion of base to base will be at 1.00 multiplied by the base inflation factor;
- conversion of domestic to domestic will be at times 1.00 unless an inflation factor is introduced;
- conversion from base to domestic or domestic to base will be by use of the exchange rates for the month; and
- conversion to third country currency will be by the calculated exchange rates from third country to base and domestic.

Upon completion of the table, the calculations can be totaled by budget account/activity code. Now the cash flow forecast database has been assembled for all budget/account/activity codes, for all currencies. The budget account/activity codes are totaled as well as each currency totaled by month.

This important spreadsheet database provides the forecast cash flow for the job and is maintained until the next analysis is run. It is also archived. This important database will provide the cash flow projections for all periods of the job for all currencies. Reports as needed can be formatted from the source.

	Months to End of Job	
	Month 1	Month 2
	9/93	10/93
Conversion Rates		
Base Currency Factor	1.0000	1.0000
Base Monthly Inflation		
Inflated Base Currency Rate	1.nnnn	1.nnnn
Domestic Currency Exchange	1.nnnn	1.nnnn
Third Country #1 Exchange	D.dddd	D.eeee
Third Country #2 Exchange	TC.1111	TC.1111
	TC.2222	TC.2222

ACCOUNT/ACTIVITY
Codes

	To Date Actual	To Be Spent Total To Date Balance Approved	Potential Total To Date Balance	Period Early S E	Late S E

Base Currency Total Listing
   ACC/ACT #
     ↓

Domestic Currency Total Listing
Paying Currency Base, Listing
Paying Currency Domestic Listing
Paying Currency TC #1 Listing

*Note: Total All Values to the End of Job Providing a Line Item to Complete

Figure 2—Calculation Spreadsheet

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Consolidated Database

Now, given the to complete totals in all currencies, the budget/schedule database can be consolidated. The four essential calculations are completed. First, all internal record calculation can be completed prior to the forecast. Second, the calculated schedule data is included. Third, the totaled forecasts to complete for both approved costs and potential costs, for both early start and late start dates can be imported from the multi-currency cash flow database. Fourth, the forecast totals for each budget account/activity code can be totaled. This completed consolidated budget/schedule database represents the best project data at that time.

Reports

At this stage, reports in terms of displays or hard copy are anti-climatic. There are reports that can be formatted from the archives, special analysis, and financial reports and with computerized ancillary source systems those reports. Selected example reports include the following:

- the budget/schedule amendment report, individual budget/schedule entry, or series of all transactions;
- budget account/activity code budget amendment profile, showing all budget amendment transactions affecting an account/activities code;
- a budget report at an account level that can be rolled up into summary codes;
- a cost report at an account level that can be rolled up into summary codes; and

- cash flow report.

These are the basic reports of the system.

CONCLUSION: IMPLEMENTING A SYSTEM

Implementing a fluctuating cost budget/schedule system requires a systematic installation. A number of support systems and procedures are needed to develop input the information. **Futura** is a mainline shell system requiring a number of developments for success full implementation, which are:

- an adequate organization, procedures and systems to provide all supporting data inputs in a timely manner. These may be manual or computer interfaced. In either case, the design and installation of the data quality and interfacing are important implementing steps;
- an implementing and operating organization and staffing. Implementation work will require an appropriate team to bring up the system, assure the interfacing, and establish the policies and procedures. Implementing would include bringing an agency on board with the application on a project(s) and setting up an operating unit; and
- **Futura** is a custom application in installation. The basic operational system content is routine but will require customization, as will interfacing and final report organization. A substantial implementation undertaking needs to be committed to achieve a successful installation.

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