COSTS, COST ACCOUNTING AND COST CONTROL

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by

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This paper is based on my personal experiences in the wonderland of budgets and costs during my all-too-brief period of service with the Department of Oceanography of the University of Washington. The views expressed are my own and not those of the organization to which, until lately, I belonged.

Cost as a factor in business management is seldom considered in the abstract--nearly always in relation to some other factor: can a given cost be met; can it be recovered; does worth balance or exceed cost; can a cost be better used for something else? Translated into business terms, the cost of a thing--be it inventory, plant, wages, or money--must be considered with respect to current net operating balance, cash flow, return on investment and market forecasts.

It is unfortunately but also historically true, that "costs" and their management come under the scrutiny of top management in business and officials in government only when they get so far out of hand as to threaten corporate existence or, in the case of government, a budget is exceeded or jeopardized.

There are innumerable examples. I cite two business examples that are classics and still studied.

General Motors in 1919 went through a financial blood-bath that a year later resulted in the resignation of William C. Durant as president. He lost control of the company he organized through failure to monitor control over capital spending and levels of inventory. The duPonts were brought in to rescue the company and to lend their not inconsiderable abilities in financial management.

GM went through another cost crisis in 1924--this one caused by a failure to keep informed of the market by monitoring dealers' inventories with consequent over-production. This situation had quite an effect on cash flow. Alfred P. Sloan, who had succeeded Pierre S. duPont as president the previous fall, detected trouble in March 1924: sales had declined 4%, yet the division managers had production scheduled 50% higher. Mr. Sloan personally checked dealers' inventories on a trip in May 1924 and flatly ordered a production cut-back. At that time, as now, GM division managers scheduled their own production, but corporate controls

had not been set up. Mr. Sloan was subsequently taken to task by the GM Finance Committee.

The second business classic which I cite is Consolidated Aircraft's 880, by many considered the best of the early jets in design, in engineering, in acquisition cost and in operating costs. Very briefly, management at the San Diego plant had no idea what development costs were and still less what production costs were. When one of the cost engineers documented that Consolidated's payments to their vendors exceeded the selling price of the plane, he was fired for his pains. The result of all this was that by the time General Dynamics headquarters in New York woke up to what was happening, it was too late in the day. The airlines liked the 880 and wanted it, but they could not wait for Consolidated and GD to straighten out their financial problems and turned necessarily to the Douglas DC8 and the Boeing 720. The 880 didn't miss the market--the market moved on past.

There is no need to cite government examples--we are all familiar with the C5A, Navy shipbuilding programs, highway construction and other examples too numerous to mention.

I cite these cases as classic examples of the troubles that ensue when current costs are not known and when future developments affecting cost management are neither foreseen nor considered.

Though we, as the managers of research vessels, may not be considered to be businessmen, we must manage costs in the same way and to the same extent that successful businessmen do. We have a service to sell: seagoing platforms for oceanographic research; we have a market: oceanographers; we have costs: salaries, repairs, equipment, overhauls, indirect costs, etc.; and we have income: grants and contracts. These factors define a business. So, in a sense, we are running a business, but, admittedly, one with some unbusinesslike peculiarities.

A short comparison will illustrate: If a company thinks they might make some money by selling their newly developed Mark II Widget, they will conduct a market survey and arrive at a market forecast; they will calculate production costs; add "G and A" costs, and profit and contingency; determine a break-even point, set a

selling price and schedule production. If they do all their home work properly, have made some astute guesses, if their business intuition be good and if nothing goes wrong, they will make a profit and their banks and stockholders will be happy. But if any one thing goes wrong, or if their home work was sloppy, the company will suffer a loss in marketing the Mark II Widget. The result will be at best a loss write-off and a fall back on operating reserves to stay in business; at worst, a call on their bankers or underwriters, or even bankruptcy.

The point of this comparison is that businesses are permitted to make a profit, which can be distributed as dividends or carried forward to operating reserve. If they incur a loss it is covered out of operating reserve or by going to the money market. For a while at least. This is an over-simplification, but it is sufficient and not inaccurate.

How do we compare to businesses? We make a market survey: how many days or hours will our ships be used by scientists? This market survey or forecast is made, really, by our customers, the scientists, and despite the care and thought that goes into the process, our market must be considered largely unpredictable. We estimate costs based on proposed use, and if we have done our homework properly and everything falls into place, we will come out within and close to budget and the operating forecast will be fulfilled.

If, at the end of the year, we are too far under budget, our colleagues--and we ourselves--will be unhappy, because we might, in hindsight, have spent money to some worthwhile purpose on our ships; if we end the year over budget, we are in real trouble. In short, we may be in a business, but it is a peculiar business for three reasons: we have an unpredictable market, we are not permitted to make a profit, and we had better not operate at a loss.

So much for some classic business examples and what I believe is a not-too-inapt comparison between our business and business in general.

I believe there are three major areas or trouble spots in the budgeting, funding, accounting and cost control function. Overlapping fiscal years, fiscal

accounting by institution accounting departments and the lead time required to accomplish capital improvements in our ships.

I am not sure that I know the answers to these problems. I can but suggest some possible solutions.

The funding agencies, particularly NSF, are, I think, moving toward a solution of the problem or awkwardness of overlapping fiscal years by awarding accelerations to ship operating grants, rather than strict annual grants; ONR contracts have, so far as I understand matters, given us some leeway by the nature of their continuing contracts. The overlapping of the NSF year and the ONR year ought to be eliminated if at all possible. But to get real relief in this area, the matter of operating deficits and surpluses must be considered. If a deficit shows up at the end of a given period, much turmoil and anguish ensues. I think deficits really ought to be recognized as apt to occur if budgets are realistic. You simply cannot come out with a zero balance every time. At the end of a given accounting period, the bottom line is going to show a surplus--profit, or a deficit--loss. These ought to be carried forward to the next accounting period. Deficits could be made up out of the following year's operating budget, or in justified cases, liquidated by an acceleration. Surpluses could be set off by corresponding reductions in ensuing years' grants or contracts. The point is that deficits and surpluses ought to be recognized for what they are and be permitted to show on the budgets submitted to the funding agencies. They are a fact of business life and they are with us.

Once this be permitted, perhaps we can make use of a pre-determined rate: charging for ship use at a fixed rate about equal to that which we show as "operating cost per day" on the operating budgets we submit to NSF. This will eliminate the re-charge juggling that follows an approved audit, and would give us a workable method of handling deficits and surpluses: the pre-determined rate could be adjusted upwards or downwards to offset any deficit or surplus occurring in the previous year.

I do not foresee any easy or immediate solution to the leadtime problem associated with capital improvements. Capital improvements are always subject--and properly so-- to a searching scrutiny. Once a need is foreseen there must follow preliminary technical and cost feasibility studies, vendors' brochures obtained, preliminary designs prepared and cost estimates made, and finally a budget submitted--a once-a-year occurrence. Following approval and grant award, production drawings must be completed, regulatory and agency approval obtained, invitations to bid sent out, and finally, and hopefully, the improvement is accomplished. In the case of improvements that are scientific in nature, many scientists don't care to wait that long, and we, as ship operators, find this leadtime annoying. It can amount to as long as two years. However, capital improvements, by their nature, must be carefully considered and evaluated and care takes time.

Mr. Sloan had this to say about evaluating capital improvements, "Five principles are to be satisfied:

a. Is the project a logical or necessary one considered as a commercial venture?

b. Has the project been properly developed technically?

c. Is the project proper, considering the interest of the corporation as a whole?

d. What is the relative value of the project to the corporation as compared with other projects under consideration....".

These are valid criteria to be applied to any capital spending project. Based on this year's NSF Guidelines for Ship Equipment Proposals, NSF has moved in this direction. I think it would be better if capital spending for ship improvements were budgeted and funded separately for improvements that are strictly scientific in nature, for once the latter are installed, repair and maintenance become a cost charge against ship operations.

In speaking of financial controls generally, Mr. Sloan stated: "In the beginning many limitations in our method were evident. The reports, for example, were not usable for evaluation and comparison until they were set up on a uniform and consistent basis. Uniformity is essential to financial control, since without it comparisons

are difficult if not impossible. One of the immediate tasks, therefore, was to strengthen the accounting organization, both centrally and within the divisions and to institute standard accounting practices throughout the divisions."

Having again cited Mr. Sloan, let me turn to our accounting reports, budget format and cost reporting. These are necessary parts of the cost control process, for only when we know what the costs are, what they should be, their nature and purpose, can we hope to exercise control.

Here, of course, my remarks are based entirely on the systems at the University of Washington. I daresay that the University of Washington is not unique, for when I proudly showed my self-imposed pencil and paper cost accounting and reporting system to Dr. Greene he gently laid it down and sadly remarked, "Yes, I know. I had to do the same thing at the University of Georgia."

The Grant and Contract Accounting office at the University of Washington issues a "Budget Status Report" monthly. This shows outstanding obligations, expenditures, unencumbered balance, etc. Costs are coded to categories which may or may not have some relation to reality. These various categories are, I believe, imposed by state regulation.

Another characteristic of these BSRs is that expenditures in each accounting code are totaled over time back to the ONR contract start date, in our case, 1 November 1969. Annual costs for a given year or current costs to date must be determined by the tried and true but also time consuming pencil and paper method at the Principal Investigator's level.

The accounting codes are in some instances meaningful and usable, in other cases not. Food, POL, telephone, employee benefits and indirect costs can be taken directly from the BSR and related to line items in the budget submitted to NSF, but for the majority of the budget line items, the cost must be determined, apportioned and related to line items at the operating level, i.e. by the Marine

Operations office. This has been done by use of a cost coding and reporting system instituted by the Marine Superintendent in late 1971. The difficulty here is that the BSR shows not what the expenditure was for, other than by an often irrelevant accounting code, but to whom the money was paid.

For example, we submit several "Requests for Requisitions", a local form, for such items as galley supplies, paint for the mate, tools for the engineers and some machinery repair parts. These items are often consolidated on a single purchase order, by which they are identified on the BSR, and will show up on the BSR as a single obligation initially, but eventually expenditures will show up as payments are made to individual vendors and all under accounting code 03-99, Supplies. Advance payments to agents show up as payments to a local bank, arbitrarily split between 03-99 (Supplies) and 05-99 (Contractual Services) and the accounting promptly drops out of the report. The actual expenditures, as you all well know, can fall under nearly any line item except salaries and indirect cost: fuel, travel, repairs, food, medical services, port expenses, etc. Memory and a reference to the purchase order help in identifying costs to line items, but it is a time-consuming process. In the case of agents' billings, their summary of charges eases the task.

Even salary and overtime costs as shown on the BSR must be analyzed, due in part to the University's method of paying crew salaries. Base pay is shown under one accounting code and paid on the last working day of the month and shown on that month's BSR. Our 15% sea pay, the first eight hours of overtime on Saturdays and Sundays, and all other overtime is paid on the 12th of the month following and appears on that month's BSR, all under one accounting code. This does not give us the salary information we need: sea pay and the first eight hours on Saturdays and Sundays are functions of the ship's operating schedule and hence not subject to immediate control. We really need to know how the extra overtime is running so it can be monitored and controlled. These salary breakouts can be identified but it is a laborious task.

A solution? There is at least one solution to every problem, often more than one. The solution selected must be a reasonable one from the standpoint of effort and cost and it must give timely results. This is a problem that by its nature is one of information handling and in approaching problems of such nature, one immediately considers the use of computers.

The cost accounting codes we have been using in Marine Operations at the University of Washington are such that cost data, once coded, can be programmed for computer print-outs of monthly cost reports, showing monthly costs, costs to date, budget allocations and balances available. Downstream, ship use time could be introduced and current operating cost rates computed and charges summarized to the various funding budgets. A copy of cost codes which we were considering earlier this year is appended.

As a first step in resolving some of the problems I have discussed, I propose:

1. That NSF change the budget line item designations from the current Roman numeral, alphabet letter, Arabic numeral designation to a three Arabic numeral designation.
2. That institutions be required to establish an accounting system that will relate costs directly to NSF ship operating budget line items.
3. That NSF establish definitions of line items so that costs attributed to line items will be the same for each institution.
4. That the present line item, "Overhaul" be changed to "Scheduled Repairs", which would include not only overhauls, but also any repairs regularly scheduled and accomplished during other than overhaul periods, such as during a turn-around period; and that an additional line item, "Unscheduled Repairs" be added.
5. That "Normal Maintenance", "Scheduled Repairs", and "Unscheduled Repairs" be broken out to the third level: Deck, Engineering, Ship Electronics, Steward and Scientific Systems.
6. That "Steward Supplies" be eliminated and "Stores and Minor Equipment" be broken out to the third level, as above.
7. That "Travel" be broken out to "Scheduled Rotation", "Unscheduled Replacement"

"Medical Evacuation".

8. That fourth level breakouts be reserved for use by institutions. Fourth level "8", for example, could be used to identify unexpected, and therefore unbudgeted costs--such as port expenses for an unscheduled port call; fourth level "9" could be used to identify reimbursable costs, such as for hospitalization, repatriation and salary expenses covered by insurance; or for agents' charges that are reimbursable from an investigator's budget.

9. That accrual accounting be required.

10. That Fleet Support costs be separately budgeted and allocated to ship operating costs on the Budget Summary.

There are various ways of identifying costs as discussed previously. Generally costs are identified by their nature: salary, overtime, freight and express, etc., but I do not believe this is a totally valid method of cost identification. We need to look at the purpose of the cost. For example, the total effort in effecting an unscheduled repair can entail cost of repair parts, commercial labor, overtime by our engineers, telephone calls and freight and express. Should the costs of the repairreally be distributed in such manner? Or should they be coded to "Unscheduled Repairs"?-and perhaps fourth-leveled to the system or equipment repaired? I pose this as a question. The answer, if indeed there be one, and if needed or wanted, is in the future. But we would do well to start considering the purpose of a cost, not alone its nature.

Another area of cost concern is that of comparative ship operating costs. We have all heard the oft quoted remark, "Comparisons are odious". Perhaps they are; they are also necessary. UNOLS and NSF have an unenviable task in arriving at valid comparisons. They have done remarkably well, given the diversity of research ships. In some cases we probably are comparing apples and oranges, at least to some extent. This is unavoidable. Direct comparisons even between the AGORs may not be entirely valid for several reasons: schedules, the nature of scientific

work, differing personnel regulations, Union contracts, installed equipment, the institutional organization, etc. Significant variances between line item costs for the various AGORs can probably be identified and accounted for. Certainly, if Scripps establishes salaries for the WASHINGTON crew that differ from salaries established for the THOMPSON crew--which incidentally are set, not by the University, but by the State Higher Education Personnel Board--there will be a variance in salary costs, over which the operator has little control. But the variance can be identified.

One step that could be taken is to identify the cost of operating and maintaining the ship separately from costs directly attributable to the ship's scientific systems and equipment. For example, WASHINGTON still carries the Deep Sea Anchoring and Coring Winch; THOMPSON does not. THOMPSON still has the stern A-frame; WASHINGTON does not. The cost of maintaining these scientific equipments are borne by the ship operating budget, and the costs differ. The point is that AGORs are different and have differing operating costs.

Cannot a basic AGOR and her equipment be defined and the scientific equipment peculiar to a given AGOR identified and accounted for separately? Perhaps even to the extent of crew overtime necessitated by scientific requirements, and even the extra cost of food which depends on the size of the scientific party? Here, be it noted, I am speaking of the purpose of a cost--not its nature.

Study may well show that many of the foregoing suggestions are unworkable or not worth the effort. Certainly we must avoid promoting a bookkeeping nightmare. We must be careful to expend effort, time and money only when the results are clearly worth the expenditure.

We as ship operators are faced with a real problem in cost control: level or slowly rising levels of funding and rapidly rising costs in nearly all areas: salaries, fuel and food particularly. Increases in other areas have already been experienced, and they will increase in some areas precipitously. We are not going to be able to hold these costs level and maintain the past tempo of operations. We can spot trouble areas and maintain some control, but only if we know the purpose of our

expenditures, their magnitude, and can get timely, meaningful and relevant cost data on an accrual basis for comparison with line item target allocations.

References: "My Years With General Motors", Alfred P. Sloan, Jr.
Doubleday and Co. 1963. Library of Congress Card No. 64-11306
pp 120, 130-131, 143.

"Corporations in Crisis", The Editors of Fortune
Doubleday and Co. 1963. Library of Congress Card No. 63-20800
pp 63-96

Annex: Sample cost codes.

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MARINE OPERATIONS COST CODE

MAJOR SHIP

111 Base
112 Sea Pay
113 WEOT
114 XOT
115 Security
116 Stu Help
110 Salaries

120 Benefits

100 Total Salaries

211 Deck
212 Engineer
213 Comm & Elex.
214 Nav
215 Steward
216 Science
210 Maintenance

221 Deck
222 Engineer
223 Comm & Elex.
224 Nav
225 Steward
226 Science
220 Overhaul

200 Mtce & Operations

311 Fuel
312 Lube
313 Misc
310 POL

320 Food

331 Vessel
332 Personnel
333 Liab & P.D.
330 Insurance

340 Utilities

351 Deck
352 Engineer
353 Comm. & Electronics
354 Navigation
355 Medical
356 Science
350 Stores & Eqpt.

360 Steward Supplies

370 Trvl/Per Diem

381 Outport
382 Comm
383 Morale/Welfare
384 Med Services
385
386 Ships Business
387 Frt & Exp
388 Dockside Assist.
389 Other Misc.
380 Miscellaneous

510 Computer
520 DAS
530 STD/CTD
540 Radar & DF
550 Winch Readouts
560 NavSat
570 Depth & Prof.
580
590 Portable & Misc.

500 Scientific Systems

600 Technicians

710 Crew Indirect

SMALL VESSEL

111 Base
112 Sea Pay
113 WEOT
114 XOT
110 Salaries

120 Benefits

100 Total Salaries

210 Maint.
220 Overhaul
200 Mtce. & Overhaul

310 POL

320 Food

331 Vessel
332 Personnel
333 Liab. & P.D.
330 Insurance

340 Utilities

350 Stores & Eqpt.

360 Steward Supplies

370 Travel & P.D.

381 Outport
382 Communications
387 Freight & Exp.
388 Dockside Assist.
389 Other Misc.
380 Miscellaneous

500 Scientific Systems

710 Crew Indirect

FLEET SUPPORT

810 Base
820 Benefits
800 Salaries

411 Secretarial
412 Purch.Services
413 Truck Trans
414 Matl.Handling
415 Waterfront
416 Computer Services
417 Reprod & Carto.
418 Office Supplies
419 Miscellaneous
410 Eqpt.Supps,Services

420 Travel & Per Diem

430 Communications

400 Shore Support

720 Staff Indirect