

Restructuring a Small Research Support Unit

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Abstract

Organizations of every size sometimes need to restructure. However, small firms and departments (fewer than 50 persons) may lack the resources to hire external consultants or buy specialized software to help with the task. The Department of Physics at the University of Virginia faced this dilemma in 1994. A commercial spreadsheet program was used to analyze the "cost of doing business." The methodology presented in the following case study proved useful for comparing the financial costs of different arrangements of duties and courses of action during the restructuring process.

Introduction

In 1994, the Department of Physics at the University of Virginia faced a crisis. The state legislature had just closed the Commonwealth Center for Nuclear and High Energy Physics, and a similar fate was being considered for the Institute of Nuclear and Particle Physics in 1995.

Besides the loss of support for nuclear and high-energy particle physics research, the department was confronted with the task of absorbing many of the research faculty and staff from the Commonwealth Center. After a 5-year decline in funding for salaries coupled with a growing need for support staff, the department was hard pressed to deal with this new demand.

Meanwhile, growth in student enrollment between 1989 and 1992 had produced changes in the nature of physics instruction. Information presented in large lecture classes could no longer be illustrated with only a blackboard. More sophisticated demonstrations were required. A dedicated computer lab and more experimental lab sections were needed to enable students to work at an advanced level. New multimedia classrooms required the support of an audiovisual technician, and a computer specialist was needed to assist with a growing information systems infrastructure.

The level of sponsored research in physics also had risen steadily during this period. Despite the recession of the early 1990s, the level of external funding in the department grew from \$3.2 million to \$4.9 million. This represented a 53% increase.

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By 1994, the Department of Physics had a faculty of 41 tenure track and research professors, approximately 23 post-doctoral associates and scientists, and 88 graduate students.

Payroll and fringe benefits for the 27 classified staff totaled about \$917,000 per year from all sources. These funds supported approximately 45,000 staff hours of labor— an overall labor rate of \$20.38 per hour. More than half of the labor costs were associated with direct technical support of the laboratories. Administrative costs absorbed one-third of the total costs. Only 7% of the observed costs were related to overhead activities.

Between 1989 and 1992, the department was forced to reduce the number of clerical staff by 25% and cut the positions of two experienced technicians. One cryogenic technician retired and was subsequently employed on an occasional basis as a wage worker. At the end of the recession, the department's share of state funds for payroll was fixed at \$398,000, 43% of the total.

Initially the department was able to use its share of the university's indirect cost recovery funds to supplement state funding of employee salaries. However, after 1992, the payroll exceeded the budget allotted from the indirect cost recovery account by 47% (\$125,000 instead of \$87,000). Budget projections indicated that the account would run out of funds by 1996.

Clearly, personnel changes were needed. A simple comparison of staff payroll to budget would have yielded a "hitlist." The problem was how to make the necessary changes in personnel without adversely affecting departmental services. An external consultant was out of the question. The following article describes the restructuring process and the methodology used to compare the financial costs of different arrangements of duties and courses of action.

The Restructuring Process

The objective of the restructuring process was to maintain the level of service while decreasing the department's dependence on state funding. The following four steps were instrumental in achieving this objective:

1. Cataloging departmental functions and activities. The department was responsible for carrying out various organizational functions. Individuals within the department performed activities to support these functions. A description of the 12 functions performed by the salaried personnel in the Physics Department is presented in Table 1. A given individual within the department could perform an activity related to more than one function. For example, a technician might repair classroom equipment as well as equipment in research laboratories. Table 2 lists the activities that support the first five functions listed in Table 1.

In a unit of fewer than 50 employees, it is possible for a research administrator to understand the duties of the employees as well as the functions of the organization. In this case, the department's research administrator and civil service staff had worked together for 5 years before the onset of the restructuring process. By consulting with civil service staff, the research administrator was able to generate a list of functions and activities in the department. This collaborative process resulted in a high level of agreement in the way the department's functions and activities were defined.

To catalog the department's functions and activities, it was necessary to examine its work flow. The unstructured evolution of bureaucratic requirements outside the department had created a confusing picture of the functions and activities being

carried out in the Accounting and Purchasing Section. In 1994, a Commerce School graduate student was invited to study the work processes in that section (Wood and Smith, 1994).

Table 1
Function Descriptions

Sixty-nine activities were grouped into these 12 functions in the Physics Department study.

Code	Description
ACAD	Academic support, faculty and student affairs, teaching. Not research.
ACCT	Financial accounting functions, especially bookkeeping and reporting.
FAC	Facilities maintenance of common physical plant. Not specific-use areas like classrooms or research laboratories.
FIN	Financial management. Includes departmental level and individual management of assigned budgets.
GEN	General. Functions any employee might perform, simply by being an employee.
OSS	Office support and supervision. Administrative office functions.
PAMS	Purchasing and material support. Buying, contracting, and associated activities, including gasses and stockroom operations.
PAY	Payroll. Setting up payroll, managing payroll records. Distribution of pay.
RA	Research administration. Pre-award and post-award procedures other than bookkeeping.
RSF	Research support functions. Direct technical support of research, e.g., electronics, repairs, and manufacturing.
TVL	Travel. Administration of travel program (not travel expenses themselves).
INT	Internal controls, e.g., cash controls, auditing, and back-up activities.

Using the graduate student's flow charts, a list of functions and activities for the Accounting and Purchasing Section was developed followed by a list of the functions and activities of the other sections within the department. Supervisors within the department reviewed the Function Description List and suggested additions as well as deletions to make the list as complete and consistent as possible.

A full list of functions and activities was developed using a workbook in Microsoft Excel Version 5.0, a spreadsheet program. As the process evolved, columns and rows were added and deleted, new spreadsheets were copied as templates and drafts, and data were compiled and displayed in many different ways.

The cataloging process revealed the importance of including social activities and activities related to personal business on the list. A list of activities with no coffee breaks all year is more suspect than a list with extra hours designated for organizing the faculty/staff picnic. Care must also be taken to avoid calling the same function by a different name.

2. Determining the portion of time devoted to each activity. The next step was to ask employees to estimate the percentage of time they devoted to each activity. To organize these data, a column for employee names and a column for percentage of

Table 2
Section of the Function Descriptions List

Activities are grouped under the first five functions. Each line is an employee activity that contributes to the function in the left column.

FUNCTION #	DESCRIPTION	REMARKS
ACAD	1 Maintenance and repair; academic labs	Nonelectronic; nonrenovation; includes equipment and facilities
ACAD	2 Electronic support of teaching labs	Maintenance; repair; electronics excluding computers
ACAD	3 Computer support; hardware	Maintenance; repair; installation; excludes purchasing activities
ACAD	4 Computer support; software	Includes network maintenance; not system design
ACAD	5 Lecture demonstration building and design	Construction of classroom demonstration experiments
ACAD	6 Graduate program	All aspects of student affairs administration, except counseling
ACAD	8 Student counseling	Counseling
ACAD	10 Faculty administration	Meetings; records; nonteaching service
ACCT	1 Recording transactions	On-line entry into University Financial Accounting System (FAS) (G/L, A/P)
ACCT	2 Recording commitments (dept.)	Official posting to department records
ACCT	3 Local review of accounts	Oversight of funds assigned to researchers
ACCT	4 Process inter-dept. transfers	Accounting in support of others
ACCT	5 Reconciliation	Official reconciliation of FAS accounts with department records
FAC	1 Making trouble calls	Initial reports
FAC	2 Follow-up on trouble calls	(Other than "show them where")
FAC	3 Project planning and design	Includes plans, CAD, liaison with Maint. Dept. and contractors
FAC	4 Project planning (renovations, etc.)	Any level of participation in process affecting physical plant or equipment
FAC	6 Space management	Space allocation, planning, assignment
FIN	1 Managing budget	Includes planning and execution; own assigned funds
GEN	1 Safety; compliance and inspections	Inspections, training and other activities not tied to a specific job
GEN	2 Vehicle management	Insurance; paperwork; maintenance; fuel; etc.
GEN	3 Housekeeping	Cleaning spaces; organizing; picking up
GEN	4 Coordinate social activities	Organizing picnics, receptions, parties
GEN	5 Social activities	Dept./unit parties, lunches, picnics, etc.



Table 3
Survey List for a Machinist and an Office Supervisor

FUNC	#	DESCRIPTION OF ACTIVITY	DONE BY	EST %
ACAD	1	Maintenance and repair; academic labs	Chuck	2%
FAC	5	Renovations and maintenance, in-house	Chuck	2%
GEN	3	Housekeeping	Chuck	3%
GEN	5	Social activities	Chuck	1%
RSF	1	Maintenance and repair; research labs	Chuck	3%
RSF	5	Manufacturing, mechanical	Chuck	90%
ACAD	6	Graduate program	Della	4%
ACAD	8	Student counseling	Della	3%
ACCT	3	Local review of accounts	Della	4%
FAC	1	Making trouble calls	Della	2%
FAC	2	Follow up on trouble calls	Della	1%
FAC	3	Project planning and design	Della	1%
FAC	4	Project planning (facilities, renovations, etc.)	Della	1%
FAC	5	Renovations and maintenance, in-house	Della	1%
FAC	6	Space management	Della	1%
FIN	1	Managing budget (assigned funds)	Della	5%
GEN	1	Safety; compliance and inspections	Della	1%
GEN	3	Housekeeping	Della	3%
GEN	4	Coordinate social activities	Della	7%
GEN	5	Social activities	Della	1%
INT	1	Deposit cash	Della	1%
OSS	1	Reception	Della	6%
OSS	3	Pickup; receive; distribute mail and faxes	Della	6%
OSS	4	Messenger runs	Della	2%
OSS	5	Assemble mass mailings	Della	2%
PAMS	1	Filling out order paperwork	Della	7%
PAMS	4	Returns to vendor	Della	1%
PAMS	5	Deliveries	Della	2%
PAMS	7	Filing and moving files	Della	1%
PAMS	9	Processing outbound shipments	Della	4%
PAMS	12	Special ordering	Della	1%
PAMS	13	Arranging shipping services	Della	1%
PAY	1	Setup support	Della	1%
PAY	2	Disbursing	Della	2%
PAY	3	Monitor status	Della	1%
RA	1	Proposal development	Della	2%
RA	2	Pre-award processing	Della	4%
RA	3	External interface	Della	2%
RA	4	Post-award monitoring	Della	8%
RSF	4	Computer support; software	Della	6%
TVL	1	Making travel arrangements	Della	2%
TVL	2	Pre-trip processing (Authority forms, etc.)	Della	2%
TVL	4	Processing travel reimbursements	Della	1%

**Table 4
Hours-Salary Data Table (HSDT)**

COMPENSATION DETAIL

HOURS AVAILABLE

NAME	YEAR	HOLIDAYS	ANNUAL LEAVE	SICK LEAVE	TOTAL HOURS/ YEAR	BASE SALARY	SOURCE	FRINGE RATE	LOADED SALARY
Carrie	2080	88	96	120	1776	\$25,632	1-2XX00		\$25,632
Marie	2080	88	120	120	1752	\$18,765	1-9XX00	30.0%	\$24,395
Max	2080	88	120	120	1752	\$23,447	1-2XX00		\$23,447
Chuck	2080	88	120	120	1752	\$34,240	4-5XX00	30.0%	\$44,512
Della	2080	88	96	120	1776	\$22,426	5-2XX00	30.0%	\$29,154
Fiona	2080	88	168	120	1704	\$24,515	1-8XX00		\$24,515
Fred	2080	88	144	120	1728	\$35,012	1-2XX00		\$35,012
Gregg	2080	88	168	120	1704	\$39,136	1-2XX00		\$39,136
Hector	2080	88	168	120	1704	\$35,012	1-2XX00		\$35,012
Jack	2080	88	144	120	1728	\$35,800	1-2XX00		\$35,800
Joseph	2080	88	120	120	1752	\$40,018	1-8XX00		\$40,018
Louise	2080	88	96	120	1776	\$15,018	1-9XX00	30.0%	\$19,523
Mary	2080	88	120	120	1752	\$20,062	1-9XX00	30.0%	\$26,081
Liz	2080	88	144	120	1728	\$26,800	1-2XX00		\$26,800
Cesar	2080	88	144	120	1728	\$42,783	1-2XX00		\$42,783
Peter	2080	88	168	120	1704	\$37,431	1-2XX00		\$37,431
Susan	1560	66	90	90	1314	\$18,801	1-2XX00		\$18,801
Sandra	2080	88	144	120	1728	\$26,209	1-2XX00		\$26,209
Tess	2080	88	96	120	1776	\$16,788	1-2XX00		\$16,788
Troy	2080	88	168	120	1704	\$35,800	1-2XX00		\$35,800



time was added to the list of functions and activities on the worksheet. The worksheet was then sorted by employee name, and a list of each employee's activities was printed.

Employees were asked to consider their efforts over a full year when estimating the percentage of time devoted to each activity. The cumulative percentage for each employee's activities had to total 100%. Hourly equivalents were presented only to give employees a sense of perspective (e.g., 18 hours represented approximately 1% of a full work year for most employees). This approach avoided the statistical anomalies caused by seasonal peaks and valleys, and allowed the effort expended on occasional activities to be compared to that spent on routine work.

Every activity that could be performed by a given employee was listed under each function, even if the employee did not currently perform every activity. Each employee was also provided with a list of all defined functions and activities so they could suggest changes.

After checking the returned data to ensure that each submission totaled exactly 100%, the data were incorporated into the Microsoft Excel spreadsheet. Table 3 shows a completed survey list for two employees.

The completed worksheet for the department, although quite large, was useful. During the evaluation of alternatives, the extra (null) activities allowed various duty assignments to be analyzed without rebuilding the worksheets.

3. Adding departmental data. Table 4 shows the Hours-Salary Data Table (HSDT). The HSDT displays the annual working hours available for each employee, the employee's salary, and the source of the employee's salary (by account number).

As Table 4 illustrates, fringe benefit rates were listed as either 30% or zero. This occurred because some departmental payroll sources paid fringe benefits from a central pool. As a result, fringe benefits at the department level were calculated for some employees and not others. Different classes of employees (e.g., faculty, wage employees, part-time employees) could have different fringe benefit rates.

Next, three additional columns were added to the completed survey data. These were: "Hours/Year," "Cost," and "Account Number." The percentages from the survey were then multiplied by the number of hours per year that each employee was available ("Total Hours/Year" of the HSDT). An additional column was created to display the cost of those hours. The formula in the "Cost" column cells calculated each individual's hourly rate from the "Loaded Salary" and "Total Hours/Year" of the HSDT. This product was then multiplied by the "Hours/Year" for each activity. Table 5 shows a section of the spreadsheet at work.

The software was used to total the data several different ways to ensure internal consistency as changes were made. For example, the sums of the "Hours/Year" and "Cost" columns of the spreadsheet had to agree with the sums of the "Total Hours/Year" and "Loaded Salary" columns of the HSDT.

4. Analyzing the data and evaluating alternatives. A variety of tools that came with the Excel program were used to analyze the data and evaluate alternatives. The workbook, with its collection of spreadsheets, became a model of the department. Activities and functions were reassigned to units and individuals to see immediately the effect of these changes on employee hours, payroll and percentage of effort. The software was also used to vary the source of pay for individuals, since shifting the burden to users of reimbursable staff services was one way of reducing the state contribution to payroll.

Table 5
Section of the Main Driver Spreadsheet.

The spreadsheet calculates the entries for Hours/Year, Cost, and Account Number from the data in the HSDT (Table 4).

FUNC CODE	#	DESCRIPTION OF ACTIVITY	NOW DONE	EST %	HOURS/ YEAR	COST	ACCT #
ACAD	1	Maintenance and repair; academic labs	Chuck	2%	35.04	\$890	4-5XX00
FAC	5	Renovations & maintenance, in-house	Chuck	2%	26.28	\$668	4-5XX00
GEN	3	Housekeeping	Chuck	3%	52.56	\$1,335	4-5XX00
GEN	5	Social activities	Chuck	1%	8.76	\$223	4-5XX00
RSF	1	Maintenance and repair, research labs	Chuck	3%	52.56	\$1,335	4-5XX00
RSF	5	Manufacturing, mechanical	Chuck	90%	1577	\$40,061	4-5XX00
ACAD	6	Graduate program	Della	4%	71.04	\$1,166	5-2XX00
ACAD	8	Student counseling	Della	3%	53.28	\$875	5-2XX00
ACCT	3	Local review of accounts	Della	4%	71.04	\$1,166	5-2XX00
FAC	1	Making trouble calls	Della	2%	35.52	\$583	5-2XX00
FAC	2	Follow up on trouble calls	Della	1%	17.76	\$292	5-2XX00
FAC	3	Project planning and design	Della	1%	17.76	\$292	5-2XX00
FAC	4	Project planning (fac. coord., renovations, etc.)	Della	1%	17.76	\$292	5-2XX00
FAC	5	Renovations and maintenance, in-house	Della	1%	17.76	\$292	5-2XX00
FAC	6	Space management	Della	1%	17.76	\$292	5-2XX00
FIN	1	Managing budget (assigned funds)	Della	5%	88.8	\$1,458	5-2XX00

The pivot table feature of Excel proved to be a very flexible tool. Pivot tables display output in rows and columns, which can drive charts, graphs, or other displays. The pivot tables could be set up so quickly that trial-and-error learning was fast and effective. Other major spreadsheet programs should have a similar tool.

"Cost By Accounts" became our key pivot table (Table 6). It displayed the number of dollars from each account spent in each functional area. Adding rows and columns yielded total payroll outlay by each source account and the function on which it was spent.

Other information was displayed and linked to other areas of the workbook, making this a useful briefing tool. For example, by linking the results of this pivot table to a spreadsheet that listed the operating targets (budgets) for each account and external sources of revenue, it was possible to see instantly which sources of funds were over or under budget. This feature could also be used when duty assignments, source of salary or the operating target of any of the budgets were changed. In this case, activities were grouped by function, but other groupings could be used if a

Table 6
Cost by Accounts Pivot Table

After making changes to the duty assignments, we ran this table again and compared the grand total line to our desired payroll budget, both total and for each account. Spreadsheets that calculated burden shares, drew charts, etc., referred to the totals on this table. When the pivot table was updated, so were the other spreadsheets.

PAYROLL SOURCE	4-5XX00	1-9XX00	1-2XX00	1-8XX00	5-2XX00	GRAND TOTAL
ACAD	\$1,849	\$28,436	\$113,050	\$600	\$2,041	\$145,975
ACCT	\$153	\$22,209	\$14,602	\$6,653	\$1,166	\$44,783
FAC	\$1,243	\$3,133	\$31,973	\$2,061	\$2,041	\$40,451
FIN	\$0	\$0	\$3,650	\$4,802	\$1,458	\$9,910
GEN	\$2,746	\$2,928	\$21,154	\$4,002	\$3,498	\$34,329
OSS	\$0	\$17,450	\$30,827	\$3,907	\$4,665	\$56,849
PAMS	\$16,103	\$25,772	\$54,947	\$19,897	\$4,956	\$121,676
PAY	\$0	\$1,367	\$8,607	\$400	\$1,166	\$11,540
RA	\$0	\$1,659	\$5,862	\$20,409	\$4,665	\$32,595
RSF	\$41,396	\$17,061	\$112,802	\$0	\$6,542	\$177,801
TVL	\$0	\$6,747	\$3,286	\$1,000	\$1,458	\$12,492
INT	\$0	\$683	\$1,443	\$800	\$292	\$3,218
Grand Total	\$63,490	\$127,445	\$402,203	\$64,531	\$33,948	\$691,619

different perspective was needed. The spreadsheet program which has been described is flexible enough to accommodate a variety of organizational needs.

Results of Analysis

Due to impending retirements, only minor changes were needed to bring the state share of the payroll back to 1992 levels. A 4-year plan to restructure the staff to improve service was developed, using the model to ensure that the proposed changes were affordable and effective.

In the near term, the electronics and electrical repair operation was merged with the machine shop to form a single Technical Services Facility. The new computer specialist was assigned to this facility. Reimbursable work for sponsored research performed by employees of the facility was billed to sources both inside and outside the department. This made it possible to distribute the labor costs of the technical staff among various payroll sources. Although the facility's cost is borne primarily by the state, the state's share is now more clearly related to the instructional mission and the general infrastructure of the department.

Even with the addition of the audiovisual technician to the state payroll, salary savings showed up immediately. Analysis of the data revealed that the department would be able to operate for at least 2 years without making any changes. This allowed time to evaluate the ramifications of different employee assignments in preparation for the first round of retirements.

Future changes include the merger of the Administration and Accounting Sections. The stockroom, which currently issues everything from office supplies to sheet metal, will downsize and focus on laboratory support. The merged Accounting/Administration Section will also perform research administration duties.

Over a 4-year period, the department also expects to reduce staffing by 37% (down from 17 FTE to 10.7 FTE) and roll back the state payroll by 14% (from \$463,000/year to \$398,000). By stretching out the reclassification of positions, there should be time to train employees for their new assignments. All reductions should occur by attrition rather than by layoff.

During the restructuring process, the model was used to respond to unanticipated challenges. During the preparation of the 4-year plan, Virginia's governor issued an executive order offering a buyout package. The legislature incorporated the governor's order in a Workforce Transition Act that added new layoff procedures. This accelerated portions of the plan. The research administrator's secretary took advantage of the buyout, and the research administrator transferred to the Business Operations Group's Housing Division. The model was used to merge the staff of the Commonwealth Center into the Physics Department Administration Section and to restructure the funding formula for reimbursable work in our Technical Services Facility.

Conclusions

The restructuring process focused on salaried staff. It occurred while the department wrestled with problems caused by the termination or reassignment of research faculty from the Commonwealth Center, as well as changes in the nature of physics instruction due to increased student enrollment.

The success of the methodology described depended heavily on the quality and reliability of employee input. Subjective assessment procedures were considered to be as accurate as a time motion analysis (TMA) or other survey techniques (Breton and Wintrobe, 1982). However, it was observed that omissions had a more powerful effect than other modeling techniques, because the inputs (functions, activities, and employees) were multiplied.

Although the Hours-Salary Data Table was useful for identifying employee costs and the total number of productive hours available from each employee, it did not yield information on the cost of providing services. It was necessary to run the full model to test for projected changes due to the reassignment of duties. This is critical. It is pointless to terminate a position only to find out that the duties associated with that position cannot be redistributed or eliminated. Sometimes layoff choices depend on what duties the survivors can shed, not on the duties performed by potentially departing employees.

In some ways, the challenge facing the department was not to save money, but to redistribute it. The governor's civil service reduction in 1995 is a good example of how the process worked. Using the spreadsheet program described, the department was able to demonstrate that distributing research administration functions to faculty would cost Virginia taxpayers up to 56% more than they had been paying. The spreadsheet model allowed the department to quantify the effect of transferring faculty activity to other duties. It also enabled the department to ensure that the monetary savings in the target budget accounts were real.

It is possible to interpret the model inappropriately. For example, the total hours or dollars the department devotes to putting up the mail is a valid number; how much

time a particular employee devotes to this task is not. This is because the methodology takes small numbers of employees, functions, and activities, and multiplies these outcomes to see the effect of changes at the level of the whole organization. Overall, the methodology is simple enough that a research administrator or analyst can rerun the data easily, after detecting initial errors. The basic structure should not need changing.

The time and effort required to model a small organization using spreadsheet software will vary with the experience of the user and the sophistication of the software. For example, Excel Version 5.0 collects worksheets in a single workbook file. Older programs can do the same work using a different file for each spreadsheet. Many spreadsheets are built on other spreadsheets. It is easy to save the new version to a different file name and maintain two separate spreadsheets for different purposes.

The payback from projecting the intelligent use of personnel should be worth the time spent to learn how to extract more performance from the spreadsheet program. For example, use of this software made it possible to obtain a new reimbursable rate for the Technical Service Facility in about 20 minutes. This had formerly been a time-consuming exercise. An immediate savings of \$14,000 per year was also realized by simply changing the way the department's mail was delivered. This more than paid for all costs associated with the restructuring process and the development of the model. Other administrative entities should be able to use the methodology described to achieve similar results.

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