SciDept

**Sample Only**

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Final Report

Revision 5

**1. Problem statement and approach**

A local university has several faculty who are making significant progress in an emerging field of science. One faculty member is developing a national reputation in this field and has produced compelling academic rationale to make a significant, ongoing infrastructure to support these faculty’s scientific pursuits. The university is considering creating a new academic department, led by this faculty member and populated by a few other faculty members who are quickly becoming leaders in this emerging field.

The university needs to understand annual and cumulative investment it must make from its unrestricted reserves to support a new academic department. It must understand the major expense drivers (including direct and indirect expenses). It must also understand potential revenue streams to offset the expenses. The gap between revenue and expenses represents the university’s investment.

The university recognizes that in order for a department to be successful, it must create a community of scholars beyond the existing faculty. The lead faculty member developed a plan for building a department of fifteen faculty members over the next twelve years. For the department to be healthy in the long-term, the department will be recruiting junior faculty primarily, but will also need to recruit some senior faculty. All existing faculty are senior faculty.

The major direct expenses that were analyzed include faculty salaries and costs associated with performing their science (i.e., lab personnel, animals, equipment and other costs, such as travel and publications). Indirect costs include administrative support and space needs. Each cost bucket was calculated separately, taking into account inflationary pressures. Within each cost bucket, data about existing faculty and assumptions about incremental faculty drove the analysis.

Two dedicated revenue sources were identified to support the department’s expenses: sponsored research revenue and endowment revenue. As this is an emerging field of science, it will be unlikely that the faculty will have significant success in obtaining grant sponsored support. The existing senior faculty currently have endowed professorships from which an annual revenue stream is derived. Recruiting incremental senior faculty is contingent on raising funds for a new endowed professorship. Both revenue buckets were calculated separately, with data about existing faculty and assumptions about incremental faculty driving the analysis.

As both the expenses and revenues increase with each new faculty member, the model relies heavily on an array parameter, the Faculty Recruiting Schedule.

**2. Description of scenarios**

The expenses associated with the department are relatively constant and well-understood. Given the recent global economic crisis and its impact on university finances, revenue streams are more unstable. In a strong economic environment, the university provides guidance about endowment returns that is based on average historical returns, inflation, new gifts and spending rate. This calculation, which is not done in this model, results in an assumption that the endowment will make an 8.25% annual return. In a weak economic environment, this calculation is adjusted downward. In this model, the assumption ends up being 3.25% returns.

Given the university’s national reputation and the excellence of the faculty, the department is likely to be more successful than other faculty in the same field. Nonetheless, as mentioned above, success rates are likely to be lower than faculty in more established fields. The federal government, the largest sponsor, usually does not give grants to more risky projects. Though the current administration is friendly to the science community, the national political environment is unstable. It is possible that funding for the National Institutes for Health (the primary federal agency) will be cut by the incoming and future congresses. History has shown that the number of successful grant applications is reduced, but the average grant size stays the same when overall available funding shrinks. Thus, in a positive economic environment, the success rate is higher than in the other scenario, a weak economic environment.

**3. Conclusions of the study**

The model projects an annual and cumulative investment required of the University that is more than it can afford (in both scenarios). There is, however, strong political will to make the project work, so the model provides data on where cost reductions could be made or additional revenue could be generated.

Revenue Based Scenario Analysis

Our intent in defining the two scenarios is to look at the impact of two key sources of revenue to support the new department: investment return on endowment funds and new sponsored grant funding.

Historically the average annual return rate on investments held by the University has been approximately 8.25%. The sharp decline in interest rates and the extreme volatility of the financial markets have created significant downward pressure on these returns. Currently the University is looking at returns in the range of 3.25% with considerable uncertainty as to when things will return to a more normal range.

The second major source of funding is sponsored research in the form of grants. While the dollar amount of individual grants has remained unchanged (325k$ for Senior Faculty and 275k$ for Junior Faculty), the number of grants likely to be obtained by the proposed department is in jeopardy because of the newness of the science. Funding agencies have fewer dollars at their disposal and are more likely to avoid higher risk investments. Our proposed department is currently in that category. Historically, with more established fields of science, 30% of Senior grant applications and 15% of Junior applications would be funded. In our more conservative scenario 2, we are looking at the likelihood that only 25% of Senior applications and 8% of Junior applications would be funded.

The cumulative impact of these two factors reducing revenues as shown in scenario 2, translate to an increased financial exposure of the University of more than 17.7m$ versus the more typical scenario 1. However, it is the overall cost of the department even under the more typical Scenario-1 that is the concern.

Both scenarios show the annual investment by the University continuing to rise during the first 11 years of our model. These is only a slight decrease in Year 12 as the startup costs for new recruits diminish and space renovation costs are lower. Under both scenarios, we see expenses increasing much more steeply than revenues with an ever increasing financial obligation by the University. Even projecting forward beyond the 12 years of this model, expenses will tend to far outpace revenues even with a stable headcount.

The University’s option on the revenue side would be to seek out additional non-federal sponsored research funding. These sources could include a collaborative agreement with other research institutes or grants from philanthropic organizations. It is not clear at this point if there is potential for investment by commercial enterprises. This is more likely as the science is developed enough to indication some commercial application.

Expense Analysis

A secondary intent of our model is to look at the projected expenses based on the plan proposed by the future department chair and of the team of senior faculty expected to join this department. In addition to the initial staffing an aggressive recruitment plan for new faculty would be put in place, especially for junior faculty with little or no endowment. Expenses to support the establishment and ongoing operations include salary with fringe; set up, maintenance and renewal costs for both wet(lab) and dry(office) space; lab operating costs including the equipment, animals, support personnel, travel and miscellaneous expenses; plus direct administrative costs supporting faculty and indirect administrative costs supporting the lab facilities. These expenses are expected to the same for each of the scenarios we have created.

Even without the likelihood of lower than typical revenue, the initial and ongoing expenses needed to establish and operate the department are substantial. Over the 12 years of our model, the cost to the University would likely be over 200m$ with a minimum outlay of 14.5m$ in Year 1 to a maximum 33.2m$ in Year 11.

The University sees the establishment of this new department as a way to get in on the ground floor of what has the potential to be significant research in terms of mission and reputation. Reducing expenses by 20 percent would go a long way in making this happen.

Our model shows us that the largest expense is lab operations. The costs per Junior and Senior faculty lab operations are fairly well established. Our model shows cumulative expenses of about 137.5m$ over the 12 years of our model. This breaks down to approximately 56% for senior faculty labs, 30% for junior faculty labs, 10% for start-up costs and 4% for equipment.

Decreased staffing would reduce these costs, but more desirable could be a collaborative agreement with other departments or institutions to co-sponsor research. In addition, the University may want to facilitate collaboration between the new department and existing departments to co-recruit faculty and share in the expenses associated with each faculty member.

Space is the next largest expense item. Some cost reduction could be obtained by decreasing lab size and renovating to a standard design rather than the custom designed space proposed.

As administrative costs are directly related to other expenses, any reductions would reduce the total administrative costs. As with lab operation costs, salaries and fringe are well established and the only way to reduce them is to reduce or delay faculty recruitment (or as noted above, use a collaborative recruiting approach).

While not done as part of the two scenarios presented, it could be possible to explore some cost reduction possibilities. However as our model was designed based on the strict guidelines proposed specifically for faculty staffing and recruitment, complete flexibility in exploring options would require some modifications to the existing model. However, if staffing and department growth are to be limited, the incentive for the future Chair to accept the position would likely decrease substantially.

A special meeting of the executive committee will need to be held to weigh the strategic importance of the new department versus the financial exposure of the University.

**4. Budget and Schedule Performance**

The table below shows the original and mid-point revised time budget for Project SciDept and the actual hours worked by the team to complete the project. As stated in the MidPoint Status Report, hours budgeted increased significantly from the original estimate as the team grew from a solo project to a 4 member team. The actual hours reflect additional time required for communication among team members, review/inspection, and refinements, particularly to the Excel model. The team was quality oriented and spent extra time to assure a solid, well designed and easy to understand model.

BUDGET

|  |  |  |  |
| --- | --- | --- | --- |
|  | *Actual* | *Revised Budget* | *Original*  *Budget* |
| *Total Time – Team Effort (hours)* | *100* | *74* | *32* |
|  |  |  |  |
| Planning | 18 | 12 | 6 |
| Project logistics (incl. 3 teleconferences) | 14 |  |  |
| Work Breakdown | 4 |  |  |
| Modeling | 40 | 30 | 10 |
| Design | 5 |  |  |
| Scenario 1 | 28 |  |  |
| Scenario 2 | 2 |  |  |
| Review, Inspect, Finalize | 5 |  |  |
| Documents | 34 | 24 | 12 |
| Proposal | 4 |  |  |
| Requirements – Word Docs | 4 |  |  |
| Mid-Point Status | 4 |  |  |
| Requirements – Excel Docs | 2 |  |  |
| Final Report | 6 |  |  |
| User Guide | 4 |  |  |
| Reference | 4 |  |  |
| Total Review, Finalize | 6 |  |  |
| Execution | 8 | 8 | 4 |
| Exploration | 4 |  |  |
| Analysis | 4 |  |  |

For project planning and tracking, a detailed work breakdown and schedule was established using the spreadsheet tool on Google Docs. The table below does not include the detail of the working schedule but reflects a summarized version. For additional visibility of project progress, a Gantt chart widget was linked to the schedule worksheet

Even before the team was officially in place, \_\_\_ had put together a draft project proposal reflective of her personal work environment. As we all agreed to work together, members quickly picked up tasks to meet the deadline for the Words Requirements Document, and get the project logistics thought out.

A significant slip occurred in completing the preliminary design. We had just completed and submitted, on time, the two deliverables: The MidPoint Status and the Excel Requirements Document.

We all needed some time to absorb our previous work and better understand our project environment and the terminology we would be using in designing and building the model. The schedule needed to be expanded and improved to reflect a better understanding of the tasks at hand. Task responsibilities needed to be divided up among team members. The initial development of Excel worksheets was delayed by difficulty in scheduling our Virtual Meeting #3, to discuss the design. Once we could meet and agree on the approach, work moved along well.

Some schedule variance was the result of work being done in bursts rather than a consistent flow. Also, differing schedules of the various team members caused some slight delays in response or feedback. We all discovered that we were able to get quite a bit of work done on final documents before the final model was complete, so these were not completely serial tasks as reflected in the schedule.

A slip of several days also resulted in the completion of the base workbook, as a problem was discovered during inspection. This was significant enough of an issue to require several days for the team to respond to and solve.

SCHEDULE

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *Actual* | *Due Date* | *Task* | | *Milestones/*  *Deliverables* |
| October 1 | - | Project Initiation | Project team created | |
| October 6 | Oct 7 | Project Logistics | Working environment | |
| October 7 | Oct 7 | Problem Statement  Init Budget/Schedule | SciDept Proposal | |
| October 7 | Oct 7 | Requirements Checklist for Word Documents | Requirements for Word Documents | |
| October 5 | Oct 12 | Virtual Meeting #1 | Project Briefing | |
| October 20 | - | Virtual Meeting #2 |  | |
| October 28 | Oct 28 | Refined Problem Statement, Budget, Schedule | Midpoint Status Report | |
| October 28 | Oct 28 | Excel model requirements | Requirements Checklist for Excel Documents | |
| November 21 | Nov 8 | Model Design | Process model  WB skeleton | |
| November 21 | - | Virtual Meeting #3 | Design Review | |
| November 28 | - | Build Worksheets per Design | Preliminary Built Model | |
| December 6 | - | Complete Output Design | Final Design | |
| December 14 | Nov 18 | Refine and Inspect Scenario I Model | Scenario I Model | |
| December 14 | Nov 23 | Scenario II Model | Scenario II Model | |
| December 14 | Dec 1 | Comparative Analysis | Project Recommendation | |
| December 8 |  | Draft – Final Report (1-2) | Draft – Final Report (1-2) | |
| December 9 |  | Draft – Final Report (4-5) | Draft – Final Report (4-5) | |
| December 11 |  | Draft – User’s Guide | Draft – User’s Guide | |
| December 11 |  | Draft – Resource Guide | Draft – Resource Guide | |
| December 15 | Dec 14 | Final report | Final Report for Review | |
| December 15 | Dec 14 | User Guide | User Guide for Review | |
| December 15 | Dec 14 | Reference Guide | Reference Guide for Review | |
| December 16 | Dec 16 | Final team review and signoff | Final Versions  Documents & Models | |
| December 16 | Dec16 | Upload Project files to Dropbox | Project Completion | |

**5. Lessons Learned**

From a team and process aspect, project SciDept was a success. Team members worked well together. There was no dysfunction negatively impacting our project work. No project is perfect, but this project and team effort went relatively smoothly. There are a few things which we would like to share for future project teams.

* Communicate with your team members. Email, teleconferencing, or actual meetings if you are not a virtual team – all are important. Group meetings of any kind, take up a lot of time. Use them wisely; have an agenda and specific goals. Communicate to confirm responsibilities avoiding duplication of effort. Don’t hesitate to ask questions if there is something you don’t understand. Ask for help; offer help. You are all working toward the same goal.
* Use technology. Tele-conferences, email, and online repository for documents helped us manage our project. All pieces were important to the success of our project.
* It takes time for team members unfamiliar with the problem space to get up to speed and understand the environment.
* Create a detailed, conservative project schedule. It will slip. Team members have their own personal, family and work schedules and responsibilities. All are competing for a finite amount of time. Have task assignments in writing and accessible to all. When team coordinator was unavailable, team members were able to refer to the online schedule with included task assignments and move ahead.
* Design your project before you begin to build. The design can be improved or modified as you proceed, but have a plan in place before you start building your model.
* Be lucky or selective in forming a great team where everyone is willing to participate and contribute. There may be a range of talent and experience within the team. The willingness of each member to work to willingly contribute and do their best as their personal circumstances allow is important.
* Version control gets tricky once the original worksheets are merged. Establish some type of checkout system or simply agree who is working on the worksheet at that time, what changes were being made, and what the resulting version number would be. Have shared storage for document management.
* Model inspection is critical. In the flurry of activity to move the project forward, it is easy to miss problems. It is always more difficult to fix problems than to avoid them in the first place (see Communications above). One issue that arose near the end of the project, caused us to pause and rethink some of our initial decisions in structuring inputs. We were able to work around this to get the desired results. A slightly different structure might have made the model less specific to the case we were addressing and might have resulted in a model more readily adaptable to other situations.

Additional aspects of our project effort:

* Problem Choice - The problem choice was that of team member \_\_\_, who had intended to work solo. The problem space is one she is familiar with although details of the project are fictional. The choice worked well for a project model since there were a number of data streams impacting the environment: hiring, investment returns on existing money and access to additional revenue sources through grants going forward. The only negative was getting the rest of the team up to speed in understanding the project environment. \_\_\_ did an excellent job explaining the various aspects of expenses and revenues as well as the administrative overheads typical in the environment.
* Design – Once the project proposal was completed and it was time to start the actual model, there was some hesitancy as what to do next. A design was critical in moving the project forward. The design was basically an outline of the various tasks that needed to be accomplished, the pertinent inputs and general methods or calculations required to obtain the needed outputs. This was a good enough starting point to help clarify the tasks at hand and to provide a roadmap for the project.
* Team dynamics – We were fortunate to have a team that seemed to work together very well. Everyone was willing to do their share and step up to take responsibility at various times and in various ways. We all were capable of working independently, but also open to feedback or editing of our work.
* Organization - We had a reasonably easy task of organizing our project and dividing the work at hand. Since \_\_ was the real owner of the problem definition, she was responsible for this portion of the project, putting together the data, describing the environment and the objectives. \_\_\_, the coordinator, took on the role of budget and schedule and high level project design. \_\_\_\_ had the task of merging the worksheets and getting all the data name references working correctly. \_\_\_ had the responsibility for duplicating the model for Scenario 2, making the modifications in parameters, and insuring proper execution of the second scenario model. Since he had access to GoToMeeting teleconferencing capabilities he set up these sessions for us. Each team member had primary responsibility for specific worksheets with a second team member responsible for checking the work.
* Management - While the team coordinator put together the tools for a collaborative working environment, there was really no need to ‘manage’ the project other than to communicate periodic reminders and move things forward a bit when needed. Tasks and responsibilities were readily available for all team members to reference. There was ongoing communications among the team members reporting progress or asking for assistance or opinions.
* Technology - Technology tools enable communication and collaboration and are necessary for any virtual team to function. Email was our primary communications tool and was invaluable for detailed issues, questions, status updates and reminders. Our virtual meetings or teleconferences, while expensive from a time budget, were important and helpful in the success of this project. We were able to get to know each other a bit, discuss the project environment, ask questions requiring lengthy explanations, and make group decisions after some discussion. Our teleconferencing tool was GoToMeeting, an online service to which a team member had access. Document versions were stored online using Google Docs as a repository. While files might also be sent as email attachments, versions were stored online for easy download, document management and basic version control. The Google Docs spreadsheet application was used for the project schedule and could be viewed online. A Gantt chart widget was incorporated in the spreadsheet to serve as a visual project status.
* Budget and Schedule Performance - Reality was quite different from the original budget which was originally put together for a solo project rather than a team of four. No one was very good at keeping track of the hours worked on the project. But no one hesitated to put in the time to get the work accomplished. Communications among group members in the form of teleconferences and emails were a piece of the added time ‘expense’ of the project. Also, reviews, problem solving and editing for consistency also added time. Despite many ‘team’ related expense items, we met our deadlines for deliverables because of a strong team.