Final Project Report

Optimize life cycle of faculty's computers at PSU

Operation Research 540

Portland State University

2009

Fall Term

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Overview:

The Office of Information Technology (OIT) in PSU offers all computer services for the whole university community. For further development, especially under current down turn economic situation, OIT is going to propose a plan for the university to large segments of population and minimize the costs to face budget crisis problem. The project will discuss the most reasonable life cycle of faculty's computers and maximize computers' utilization. It will establish a life cycle model and based on the analysis results to evaluate different weights of different parameters, the model is used to do the best investment and maintenance of the university computers [1].

To minimize the cost and maximize the usage of computers, OIT needs to determine specific factors. In order to provide the needed information for each factor, we interviewed and contacted one of the directors of the Office of Information Technology (OIT) in PSU. His name is Jahed Sukhun, and he was really helpful and cooperative in providing all the needed information for this project. We used to send him e-mail if we have any question or concern about any part or confusion in the project. He was really cooperative, and he answered all our questions and requests.

A spreadsheet model will be presented later on to explain all the results and outcomes of the model based on our study, and collected data and gathered information of this project. The results of this model can be changed depending on the cost and givens that we used as an input for this model in

order to get the required output which is considered the cheapest cost that represents the best alternative for the OIT.

The factors that most influences computer cost:

When it comes to analyzing the cost of purchasing a computer, you realize the complexity and intensity of this process. Purchasing computers for a university requires an understanding of the needs of the user, evaluate the computer purpose and specification, and finally negotiate prices with vendors. This is not an easy task because it involves many entities and departments from both the buyer and supplier sides. For our purpose, Portland State University has given this responsibility to the Office of Information Technologies, OIT. OIT oversees the purchase, maintenance, and support to all of Portland State's computers, whether it was in a laboratory or faculty's office [1].

The most important influence in the economic life cycle of a computer is the current economy because if the budget is available, then computers will be replaced between 3-5 years. This factor is critical due to the nature of today's economy. Budgets have become tighter which results in fewer and lower financial resources allocated to computer purchase or upgrade.

In addition to this, the company that is the main supplier of PCs to campus laboratories is Dell due to their price levels. Different price levels and the ability to customize the configuration to extreme details provide any

company with competitive advantage. Furthermore, the average budget of each PC used in Portland State's labs is about $850 per unit when purchased from Dell. This price represents the average price range of an average computer lab. The more powerful and sophisticated the computer is the higher the price will be [2].

Office of Information Technologies, OIT, negotiates with the vendor, such as Dell, for the best possible price and extends this for a period of time. As the time goes by the relationship between the buyer, Portland State, and the supplier, Dell, grows and strengthen which leads to better offerings from the supplier. In cases where the Office of Information Technology requires more sophisticated computers for more-technical-orientated faculties the complexity of the negotiation increases. Depending on the need of the faculty the prices might jump if there is a need for more memory, faster processor, bigger monitor or better graphics card. The same goes for the regular computer labs.

The factors that make a PC supplier attractive versus another supplier basically boil down to price attractiveness. Most if not all supplier have been providing good customer service, free help line, good web sites for help, good products. At the end price is one of the main factors that decides which supplier to use. When you are ordering $200-$300K of computers, $50-$100 makes a big difference in the amount of computers that OIT gets. Therefore, paying close attention to different price offerings from different suppliers will

increase the probability that you are receiving the best offer. Of course, this is done by proper researching and having interpersonal relationships with suppliers and providers of computers.

When it comes to purchasing computers for the labs, normally OIT communicate with the vendors about our needs, provide them with the requirements and start negotiating with them. PSU purchase a large number of computers each year, with that number, vendors are willing to negotiate and reduce their pricing. Developing a good relationship with the vendor representatives makes a big difference in getting good pricing, as well as other resources such as consulting, road maps of their products, trial equipments, etc. That is why having highly trained and skilled negotiators will result in making valuable relationship which in return leads to better deals.

The factors that are most significant in determining the benefit that faculty member receive from using the PC:

The faculty members get several benefits from using PC. These benefits will be classified into two categories. First one is about using computer services in the PC. A lot of services and facilities are produced to the faculty members from using the computer. For example, saving any kind of data for the lectures, or even saving various documents for exams. Also, using required programs for any purpose or task that anyone from the faculty members might need to do.

In addition, the computer could provide several updates that might be useful and helpful for any member of the faculty members. According to Jahed, the expert that we asked him for this project information, he illustrated that faculty member on campus use computers to make their work easier and more productive. Moreover, OIT provides support to the faculty in different areas such as help with the office computer, help with designing a course using the different tools available such as Blackboard or other LMS solutions, or help attending computer workshops.

One of the other benefits that faculty members could receive from using computer is Computer Conferencing (CC). CC is considered an effective service that is provided to enhance the quality of conferences at several organizations and different areas. It is a kind of service that computer provides to facilitate the conference meetings between people and make conference much easier and desirable. CC has many benefits and advantages for people who use it; for example, CC improve the communication between people because of its comfortable environment, understanding all the ideas and important points during a conference will be much easier, and there will be no problems for virtual meetings or conferences between distant or remote areas at any organization. In addition, any part of the meetings could be documented as a fixed record while using the CC service. Moreover, individuals whom are performed in CC meetings could be more effective in participation because they got better concentration during the CC meetings with no distractions [3].

Regarding the internet, it brings various benefits for faculty members while using the PC. It is considered a great way to communicate via e-mails or outlook. Furthermore, it is really useful in checking the updated news for the department or the university. It also can provide the perfect strategy or of researching for important topics and subject through the web.

The internet is a great way to do research, get resources and keep connected with the world. Based on Jahed, the internet could also provide a lot of benefits to the faculty members. It is considered a great way to do research, get resources and keep connected with the world.

The factors that most impacts the benefit utilization:

According to Jahed, training is very important in the benefit utilization. If the faculty is not trained in the use of the computer or not familiar with new technology, then they might as well use that computer as a paper weight in the office. Users must be trained and familiar with the use of technology in order for them to be more productive.

The computer provides several benefits in various fields. It provides a lot of services that facilitate the use of many tasks, services, and assignments. For example, computer makes a lot of things much easier to use such as researching, communicating with other people, and improving some types of businesses [4].

Computers are considered an electrical software tool that offers a lot of

services for many tasks. There are many good reasons that are considered effective elements to use the computer machine in order to achieve several goals of different tasks and assignments. These reasons are basic features of the computer software that mainly provide the best experience of the computer users; for example, some of these features are speed, accuracy, consistency, and professionalism [5].

The factors that most influence the economic life cycle:

The technology changes very fast especially the technology of the computers. Each year companies provide new PCs and laptops that have many improvements that were not available in the previous year. So, first we have to decide what the reasonable life cycle is for a PC.

As a PC life cycle stated by the Department of Information Resources of the State of Texas," A PC life cycle describes the usefulness of a desktop or laptop computer to the agency, from its initial acquisition through its ultimate disposal." The life cycle depends on several factors that determine for how long the computers are going to be used for:

a) Technology Changes.

b) Customer desire.

c) Cost to support technology.

According to the information from the computer industry, generally PCs have a lifecycle of 4 to 5 years while laptops have a 2 to 3 years

lifecycle. In fact, it depends on how the customers are using their computers and the applications that they are using it for. Also, any changes either in the software such as upgrades or in the hardware could affect the lifecycle [6].

The diagram below shows a PC lifecycle as a combination of usage and technical issues [6]:

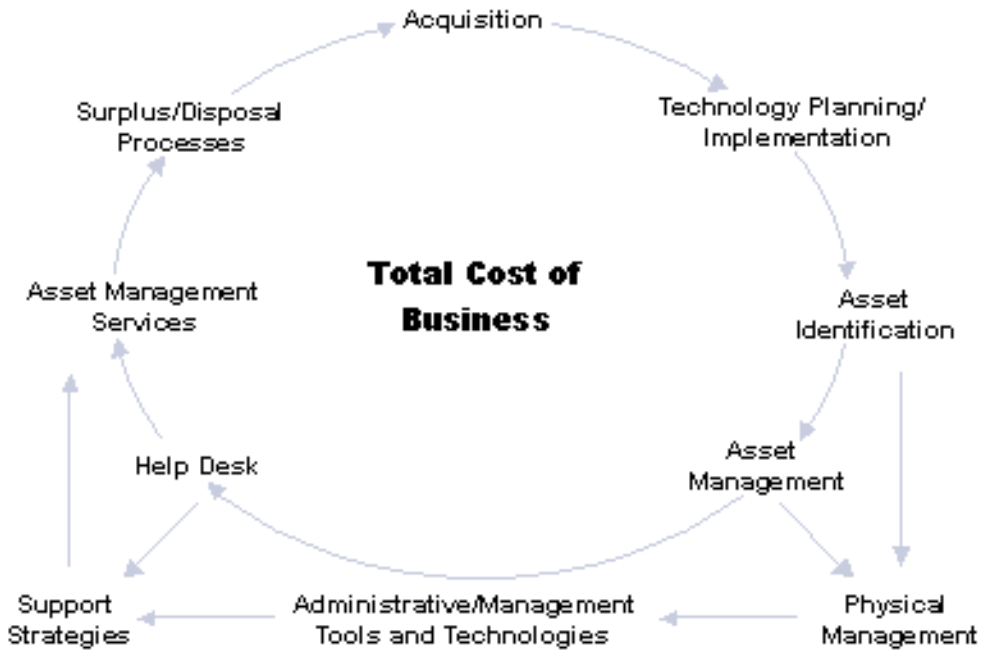

Figure.1

The lifecycle starts by acquiring the computers. Then, those computers require technical support by implementing the organization's or agency's software. After many technical and usage stages, the computers reach the last stage which is the disposal stage where the new lifecycle will be ready to start again.

The management of any organization has to decide specific factors to come up with an effective lifecycle:

1. The company has to be careful when implementing specific criteria because that will be most important in the decision process.
2. The organization processes should be in place to manage PCs.
3. Customer desires are specified to the available technology.
4. IR staffing skills, availability, and priorities should be factored in.
5. Agency technology purchasing is coordinated through the IT departments across the organization for standardization and future compatibility.
6. The state of current technology should be assessed. Also, the organization should decide which technology to select.
7. Deployment issues.

When any organization addresses these factors, the lifecycle plan will be easy to establish and decisions will be easier to make. [6]

The costs of the university PC acquisition and management strategies:

The costs of three alternative university PC acquisition and management strategies:

- Purchase all PCs and provide all attendant services, including maintenance, training, and help desk support.

- Lease all PCs but provide maintenance, training and help desk support.
- Lease all PCs and secure maintenance, training, and help desk support services from outside vendors.

There is a model been established to evaluate the costs of implementing the purchasing, leasing, and outsourcing strategies over a 5-year planning horizon [7]. The model is formulated by Microsoft Excel spreadsheets. The use of Excel allows OIT to update data estimates and parameter values, and to evaluate different scenarios as the computing environment changes.

Data were collected to estimate the values of parameters in the models. The PC life cycle model determines that a $850 PC has a five-year optimal life cycle. This computer has a 3.0GHz Pentium processor, 2G of random access memory, 120 G of hard drive storage, and several software applications, including Microsoft Office, Macfee anti virus,etc .

Since these data estimates are subject to error, a sensitivity analysis was performed that allows for errors of + 20% of each estimated parameter value. If the models tend to make the same choices, even while the parameter values vary, we have confidence that errors in estimates are not a serious concern in evaluating results. This was indeed true, as the models produced the same policies for a variety of parameter values. Sensitivity analysis revealed that.

- In about 80% trials, replacing faculty's PC every four years to maximize net present value (NPV)
- PC acquisition price, PC market price, and the amount of training provided

to the user were the most significant factors in determining the optimal life cycle of a PC.

- In 85% of the trials, purchasing was the least expensive of the three acquisition strategies. In 65% of the trials, leasing induced an NPV that was more than the NPV for purchasing.
- For given acquisition price and replacement interval, hardware maintenance costs and support staff salaries were the factors that were most significant in determining the cost of the purchasing strategy. The lease and outsource rates were the factors with the greatest effect on the costs of the leasing and outsourcing strategies.

Lease rates and salvage values were the most important factors in determining the optimal acquisition strategy. Purchase all PCs and provide all attendant services, including maintenance, training, and help desk support is less expensive than leasing PC and services from outside vendors.

We also discuss about some current technology which can help up optimize the faculty PC life cycle and select the best selection. Technology that helps OIT with large PC deployments manage the full life cycle of their PCs pays [8]. It includes:

1. Maximize the return on each PC investment
2. Help audit and manage applications deployed on PCs
3. Provide disaster recovery tools and PC storage management
4. Assist in retiring old PCs; eliminates data from hard drives

And also many other factors are involved in the life cycle progress, such as hardware, software, compatibility, timing, data, procedures, security protocols, etc.

There are a number of financial planning exercises that can help OIT determine if capital expenses for PC hardware with complete parts and service contracts for the life of the unit are best suited for IT infrastructure. Alternatively, leased IT equipment may be more cost effective and would assist in maintaining a more comprehensive IT equipment life-cycle program.

Visualizing the product map of the software uses and planning major equipment purchases within a timeline helps structure hardware retirement strategy. By synchronizing hardware purchases with software investment, we can minimize large capital expenditures and stagger departmental purchases so that we can qualify for volume discounts. Additionally, if it qualifies for specific licensing models, OIT may be able to plan software purchasing on alternate years from hardware purchasing.

The spreadsheet model:

We will use an excel spreadsheet to analyze the three alternatives. The following is a spreadsheet model that implements all of our incomes and data to optimize this study for the three alternatives with the consideration of 5-year PC life cycle. The input of the model illustrates all the expected costs and given information that were estimated from the computer science department's employees depending on the budget and the economy situations. Therefore, the output and results of this model could vary based on the input that is added to the spreadsheet model.

Alternative A= Purchase all PCs and provide all attendant services, including maintenance, training, and help desk support.

Alternative B= Lease all PCs but provide maintenance, training and help desk support.

Alternative C= Lease all PCs and secure maintenance, training, and help desk support services from outside vendors.

In the table below, the costs involved with each alternative are shown with the total quantity and the time period that the computers will be needed for.

Purchase PC	Maintenance	Training	Help Desk Support	Quantity of PC	Time Period
850	60	70	30	4000	5
0	400	250	0	4000	5
0	450	300	0	4000	5

Table.1

The model for our problem can be formed as:

Min $A*X_1 + B*X_2 + C*X_3$

S.T.:

$A = P_1*Q + (M_1+T_1+H_1)*Q*Tp$

$B = P_2*Q + (M_2+T_2+H_2)*Q*Tp$

$C = P_3*Q + (M_3+T_3+H_3)*Q*Tp$

X_i = 1 if the alternative i is chosen, 0 otherwise

A, B, C > 0

X_i must be binary

After implementing the model, the following analyses are obtained. First, the sensitivity analysis has been obtained and shown below:

Sensitivity analysis report

Microsoft Excel 11.0 Sensitivity Report
Worksheet: [pro1.xls]Sheet1
Report Created: 12/7/2009 11:04:09 PM

Adjustable Cells

Cell	Name	Final Value	Reduced Gradient
C10	A maintenance	60	20000
D10	A training	70	20000
C11	B maintenance	400	0
D11	B training	250	0
C12	C maintenance	450	0
D12	C training	300	0

Second, the answering report is obtained and shown below:

Answering report

Microsoft Excel 11.0 Answer Report
Worksheet: [pro1.xls]Sheet1

Report Created: 12/7/2009 11:04:41 PM

Target Cell (Min)

Cell	Name	Original Value	Final Value
C14	Total maintenance	3200850	3200850

Adjustable Cells

Cell	Name	Original Value	Final Value
C10	A maintenance	60	60
D10	A training	70	70
C11	B maintenance	400	400
D11	B training	250	250

C12	C maintenance	450	450
D12	C training	300	300

Constraints

Cell	Name	Cell Value	Formula	Status	Slack
C10	A maintenance	60	C10<=70	Not Binding	10
C10	A maintenance	60	C10>=60	Binding	0
C11	B maintenance	400	C11<=450	Not Binding	50
C11	B maintenance	400	C11>=400	Binding	0
C12	C maintenance	450	C12<=550	Not Binding	100
C12	C maintenance	450	C12>=450	Binding	0
D10	A training	70	D10<=80	Not Binding	10
D10	A training	70	D10>=70	Binding	0
D11	B training	250	D11<=300	Not Binding	50
D11	B training	250	D11>=250	Binding	0
D12	C training	300	D12<=350	Not Binding	50
D12	C training	300	D12>=300	Binding	0

Analyzing the solution:

Our objective is to choose one of the three alternatives that we have based on the cost of these alternatives. In the model, the constraints are the current costs of maintenance, training and help desk support. These costs are in ranges, for example, the cost of the maintenance for alternative A is between $60 and $70 per year. The total cost for each alternative is then obtained by multiplying the sum of the maintenance, training, and help desk support costs by the quantity and the 5 year time period.

Total Cost = P*Q + (M+T+H)*Q*Tp

Where:

P = purchasing cost

M = maintenance cost

T = training cost

H = help desk support cost

Q = quantity of PC

Tp = time period

The total costs for the three alternatives are written below:

Alternative	Total cost
A	$3,200,850
B	$13,000,000
C	$15,000,000

The final solution in the target cell is the value for the first alternative which is $3,200,850; because, it's the minimum among the three solutions. This model can be useful in the future with different constraints values.

Conclusion:

The OIT management may use this study to discover critical issues involved with computers' lifecycle. First, the budget will be the major concerns for any practice of action. Second, the economic lifecycle will have a major contribution to the practice of action because it contains both usage and

technical issues.

The model that is used in this study is a simple model that can be modified for further and more complex calculations. Also, the same model can be useful in the future when the OIT management has to decide which plan to obtain from several alternatives.

In this project, a lot of feedback was really helpful and useful for collecting data and gathering information for this study. We considered several factors and important givens in this project in order to get all the required information to complete the results and data of this study. Various departments and persons, such as Mr. Jahed Sukhun, were involved in feeding us with the needed information for this project and they were really cooperative and helpful.

In conclusion, the spreadsheet model presents important results that can be really helpful for the OIT department in obtaining computers for faculty members with the consideration of providing all the technical support, required maintenance, and various services. As a result, the study showed that the first alternative, OIT should buy all the computers and assign people from inside the department for technical support, was the best and appropriate choice for the OIT department.

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