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By any accounting method, ERP investments are among the largest single concentrated investments in dollars and human resources ever made by higher education in any area (Kvavik and Katz, 2002, p. 17).

Costs of ERP Implementation and Then Some

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Introduction

Institutions planning to implement an Enterprise Resource Planning (ERP) system often fail to understand the total cost of ownership of such an undertaking. Total cost of ownership includes not only the implementation costs but acquisition costs and long term on-going support costs. It includes "all direct and indirect costs that might associated with the life-cycle stages of an ERP project including its implementation, operation, and eventual replacement" (West and Daigle, 2004, p. 5). For the sixth year in a row, college chief information officers report that ERP implementations cost more in human and/or financial resources than any other IT related issue (Dewey, B.L. & DuBlois, P. B., 2006). An ERP implementation is not for the faint of

heart. It involves a very significant investment of resources: money, personnel, and time (Green, 2005).

The focus of this chapter is on the total cost of ownership of an ERP system from the pre-planning/acquisition stage through implementation to post implementation, ongoing support, maintenance and replacement. This chapter stresses the importance of building and funding a realistic ERP budget, which includes a substantial contingency fund, from the beginning of the process.

The chapter begins with definitions of some common, key, ERP terms which should assist the reader in gaining a better understanding of total ERP costs. Following key term definitions, the remainder of the chapter will focus on the component costs of an ERP implementation at each stage of the process—pre-planning/acquisition, implementation, and briefly on post implementation costs which are treated more fully in Chapter ?. The forgotten and hidden costs of implementation will also be discussed.

Understanding the terminology—a key to ERP Planning and Implementation

Before beginning an in-depth analysis of the costs of implementing an ERP system, college stakeholders should have an understanding of some common terminology that they will repeatedly see in print and hear in conversation. It is difficult to build a case for an ERP system and a realistic budget if terminology is not clearly understood by all parties involved. Key terms include:

Enterprise Resource Planning (ERP) System refers to software that provides computer system integration and support to all units and functions across an organization into one single system eliminating the need for individual unit databases or systems.

Hardware/infrastructure refers to physical equipment required for an implementation such as servers, personal computers, load balancers, bandwidth, cabling, network and clustering switches, back up devices, storage devices, and disaster recovery devices.

Software refers to all programs, procedures and routines associated with a computer system. System software controls the computer's internal functioning. Application software directs the computer to execute commands that complete processes and solve problems.

Licensing fees refer to the cost of vendor licenses for software required for an ERP implementation. These are usually one time only fees.

Maintenance fees refer to the cost of vendor support tools such as list serves, help desks, updated documentation, user conferences, some consultant support, and application of software patches. These are typically yearly fees and tend to increase on an annual basis.

Customization refers to modification of base system software (code) to meet a functional need that the baseline product cannot.

Backfill refers to additional staff hired, or reassigned from other departments, to replace key functional and technical staff assigned to the project because of their knowledge, skills, and abilities.

Communication plan refers to an integrated approach of various media to keep all stake holders involved in the ERP implementation project.

Consultants refer to third party individuals who have expertise and experience in implementing ERP systems. They are hired to assist the project team in implementing the ERP system in the most efficient and effective way in the shortest period of time.

What Does an ERP Implementation Really Cost?

An ERP implementation generally has three cost stages: phases—acquisition, implementation, and post implementation. To avoid cost surprises during any one of these phases it is important for a college to develop an initial budget that provides funding for all the components of the three phases of implementation from the initial planning through going live to post implementation and yearly on going support and replacement costs.

The budget should include a 'contingency' amount which is, at minimum, 10% of total project budget. In truth, unexpected costs do occur but they are usually minimal in terms of percentage of cost if the original implementation budget is realistically developed and funded.

Acquisition Costs—Sometimes Forgotten Costs

A true ERP budget cannot omit early costs associated with the decision making process to implement or not implement an ERP system. *Initial planning and acquisition* costs are a real part of ERP implementation costs and should be included within the budget. Most of these initial costs fall in the area of human resource expenses (people) because of the amount of time key staff need

to spend carefully analyzing the need for an ERP system, making a decision to pursue the implementation, and then planning for it. Staff time commitment includes numerous meetings with campus stakeholders to determine that implementing an ERP system is in the best interest of the institution and to get buy in. Staff time is also necessary to identify and review ERP systems available in the marketplace; this time factor includes discussion with other institutions about their experiences with different ERP systems, vendor demonstrations, and visits to selected institutions to see ERP systems in working environments.

Travel costs associated with visiting campuses that already have ERP systems operating, and attendance at vendor user-group meetings or professional conferences, are funded through the ERP budget, not departmental budgets.

These planning activities are important because they provide key stakeholders with an opportunity to speak with many people in one place who have implemented, or are implementing, an ERP system. The travel costs can be substantial, particularly if several of the key implementation team members make these trips.

Writing the Request for Proposal (RFP), once the decision is made to go forward with an ERP implementation, requires additional staff time. It is critical that the RFP is well thought out and comprehensive. Any important

aspect or feature of the implementation that is necessary but left out of the RFP can result in problems during the implementation. Such problems may cost additional money and staff time because they may delay the vendor in implementing the system in the time frame originally agreed upon. For these reasons, allocating sufficient staff time to carefully analyze the responses to the RFP must be a planned cost.

A well designed communication plan is another early essential component of an ERP implementation strategy and it should be developed and ready for use as soon as the announcement is made that the campus is considering the implementation of an ERP system. A communication plan is an important factor which keeps stakeholders abreast of the implementation progress, timeline, goals, and milestones. The plan should include a variety of media approaches to reaching campus stakeholders including weekly newsletters (both paper and on-line), web sites, video demonstrations, and brochures aimed at specific groups of stakeholders and live, interactive progress meetings.

The communication plan must also include a feedback mechanism for stakeholders to comment, ask questions, and to receive quick responses. Unfortunately, the importance of a communication plan is often overlooked and the costs are often underestimated. Kvavik, commenting on his experiences at the University of Minnesota stated, "Build a communications budget that is four times what you think you are going to need. Then double it! You then have the right amount" (2002, p.80).

Implementation Costs

Once the decision is made to implement an ERP system, the development of the implementation budget can begin in earnest. A realistically developed and funded implementation budget that covers all components and aspects of the project ensures as smooth a process as possible and lessens, to some degree, the stress an ERP implementation places on staff. It will minimize the surprises of unexpected costs and the abrupt search for funds to cover these unexpected costs. If the funds are not available for unexpected costs it can put the project in jeopardy or result in a less than satisfactory implementation. The next section discusses the major cost components of an ERP system implementation.

A major cost of an ERP implementation is usually the cost of new hardware including *network infrastructure*. The institution of higher education (IHE) should budget for at least three system environments: development, test, and production. Generally, an IHE will purchase some combination of data base servers, application servers, web servers, disks, a load balancing switch, and storage and disaster recovery devices.

New or additional personal computers may be needed. The amount of hardware a campus requires depends on size of the institution, the number of users, how many modules of the system will be implemented, whether or not a portal is being implemented and acceptable response time. If third party software is included in the initial implementation, additional servers will most likely be

needed. The ERP vendor works closely with the IHE to 'size' the system which determines what configuration of hardware and infrastructure is necessary to meet the needs of the institution, particularly performance requirements. *Infrastructure* costs could be substantial if a campus does not have an adequate and appropriate telecommunications network and bandwidth. Co-ax cabling, fiber optics, network devices, routers, wireless networks, UPS, power sources, and back up power sources and air conditioning are just a few of the potential infrastructure costs.

A major reason an IHE decides to implement an ERP system is to improve services to all constituent groups. To meet this goal, IHEs must understand the relationship between hardware, network components, infrastructure, and the service solution they would like to achieve and then budget appropriately. The more people who use the system on a daily basis, the more application servers needed. A quick response time requires more application servers, more memory, and a faster processor speed among other components. To avoid system down time, redundant data base servers are needed to provide automatic back-up when one malfunctions.

IHEs must balance the cost of additional hardware with how much they want the new system to improve client services and business processes.

Software licensing costs include the ERP vendor software package and any third party software the IHE decides to include as part of the initial

implementation. The ERP vendor software includes the functional software which includes: human resources, student records as well as all the software components required to run the new system including the data base, system tools, operating systems, compilers, and network and integration software. Third party software is also often purchased to enhance the functionality of the system. For example, a third party software typical for a student implementation is a class room scheduling product that is intended to improve the efficiency of class room utilization. A finance implementation may include a third party facilities management product. Each third party product adds a separate cost item to the implementation budget. In addition to the cost of the third party software, a third party product may also require additional hardware, data bases, operating systems, and so on. Adding third party software and hardware usually requires an assessment of integration with the ERP software and hardware. A third party product may extend the implementation time frame which also has cost factors associated with it.

Hardware and software maintenance fees can be substantial. Institutions that have been building their own systems tend to forget the ongoing software maintenance costs that are part of a vendor package.

The majority of ERP vendors include a software maintenance cost component in their contracts. These maintenance costs generally vary between 18% and 24% of the initial licensing cost depending on the level of maintenance the IHE

requires. Software maintenance fees typically cover software patches which repair defects, new releases, vendor help desk support, user list servs, and the right to attend a vendor user conference. Most maintenance programs include an annual escalator clause. The maintenance fee becomes an ongoing support cost once the system is implemented.

Hardware maintenance fees are similar and cover many of the same support services that software maintenance fees cover, for example, vendor help desk, user list servs, patches and upgrades to operating systems. In addition to hardware maintenance fees, IHEs should build in hardware replacement costs as part of the ongoing budget. The life cycle of most hardware is three years.

A third significant cost associated with implementing an ERP system is *staffing*. To fully staff a project an IHE must consider *internal staff* assigned to the project (some consider internal staff as an indirect budget cost), *backfill* for these staff positions, and vendor or other outside *consultants*. Fully understanding staffing implications of the implementation and proactive approaches to potential staffing problems is discussed in this next section.

Most decision level administrators understand that their top functional and technical people should be assigned to the implementation project however, they often fail to understand exactly how much of these peoples' time will be required to implement an ERP system.

Many fail to account for the value of that time and the significant additional workload that is placed on staff during an implementation (Powell and Barry,

2005). Reporting on the University of Minnesota ERP implementation, Kvavik and West (2002) stated, "We clearly underestimated the personnel resources required for implementation" (p.45). Gonzaga University reported that its indirect costs more than doubled the cost of acquisition. The majority of these costs were [in house] human resources devoted to implementing and migrating to the ERP (Powell and Barry, 2005). The average percentage of total ERP costs associated with in house staff as reported in the 2004 EDUCAUSE Core Data Study was 19.6%. The percentage ranged from a high of 23% for doctoral institutions to a low of 17.8% for bachelor institutions (Hawkins, Rudy and Nicolich, 2004). IHEs also fail to consider how much ongoing services can be negatively affected when key staff members are assigned to an ERP project. The loss of services is considered by some as an indirect cost of the implementation.

In failing to understand how much time key staff will spend on the project, IHEs also do not acknowledge that implementing a new system puts a tremendous amount of pressure on staff. This is particularly true of staff who fill key functional roles and whose knowledge and understanding of the institution are important factors in the success of the implementation and the smooth operation of their offices.

In many instances these staff members are expected to participate fully in the implementation **and** to continue in their daily roles. They quickly become emotionally drained and physically exhausted. They get sick and, in short, they burn out. Some decide to resign. Others remain but become ineffective workers due to their physical and/or mental state. In essence, ERP implementations tend to have a human resource toll as well as a monetary cost. If key staff members depart from the project due to physical illness, emotional stress, or other factors, the project is delayed and this further increases the cost of the implementation.

By building an implementation budget from the beginning that includes sufficient money to backfill key functional and technical roles with qualified backfill staff, who are hired and trained before the implementation begins, should alleviate much of the stress described above. The 'backfill' staff carries out the daily role responsibilities of staff released full time to the project. A budget that includes backfill funds recognizes the valuable contribution key staff can make to the implementation project before it begins.

If an IHE chooses not to backfill positions on the pretext that they are saving money, they probably will find they have a 'false savings'. Staff can do only so much well and once they burn out, or leave, in the middle of the project replacing them not only cost money in terms of recruitment and training but can also cost money because of subsequent project delays.

Services in key functional units can be disrupted or delayed affecting customer service and satisfaction. In a competitive market, poor services can be a factor in current students leaving or new students choosing to go elsewhere. Alumni who cannot get a transcript mailed in a timely manner may think twice about contributing to the annual fund.

The third area of staffing necessary to an ERP implementation is the use of outside consultants. This is another area where IHEs tend to think they can successfully implement an ERP system without spending money on consultants. They fail to understand the complexities of an implementation and thus fail to engage enough consultant time. What seems like a prudent decision at the beginning of project becomes costly when new processes are not as efficient as expected because consultants were not available to help set up the process in the 'best way'. The learning curve for in-house staff to gain the expertise and skills a good consultant brings to an ERP implementation could add months, or even years, on to an implementation timeline and time is money. It also means that the improved services a new system provides are delayed. At one institution, with which I am familiar, it was thought that the in-house programming staff could learn Oracle quickly enough to eliminate the need for an Oracle consultant with programming expertise. The learning curve was so great that after six months or so, it was decided to bring in outside assistance to get the project timeline back on track.

Implementing the degree audit component of an ERP system is an additional area where expert consultant help can save money. Degree audit modules are extremely complex and involve a steep learning curve. If the module is not set up properly, students can be erroneously granted a degree. Vendor consultants who are degree audit specialists can work with, and train, in house staff to set the module up accurately to reflect the academic policies of the institution. They can do it most efficiently in a lot less time than a staff member who only has a beginner's understanding of how the degree audit system works. Another institution, with which I am familiar, hired a full time consultant for almost two years to bring up the degree audit system.

Although expensive and, at times, difficult to manage, good consultants can be an invaluable asset to the timely success of an ERP implementation and campuses should spend the money to get the expertise they need (Swartz in Murphy, 2004). Consultants bring vendor implementation expertise with them. They have first hand experience with new versions, new releases and patches; the changes they bring and can bring staff up to speed quickly. They are critical resources (Camp, 2004). Kvavik and Katz (2002) found that "Institutions hired consultants primarily to support training, provide on-going project support, and help with system selection. They derived benefits from consultants on the basis of their particular skills, which were used to fill gaps in existing staff skill sets" (p.15).

A realistic budget plan that includes funds for functional and technical consulting, as needed, helps ensure a successful implementation although these costs can be significant. Results of the 2004 EDUCAUSE Core Data study showed that consultant fees averaged 18.6% of ERP expenditures (Hawkins, Rudy and Nicolich, 2004).

Most ERP vendors provide in-house functional and technical consulting help at additional cost. There is also a growing array of third party independent consulting companies that provide functional and technical implementation services. In some cases an institution may choose to purchase the services of vendor consultants for one part of the implementation and outside consultants for another part. Some campuses choose to bring in a third party consulting company to implement and then operate the ERP system once it has gone live. Which type of consulting arrangement an institution chooses has much to do with internal staff skill sets, which ERP system they choose, and what resources are available. Some vendors do not provide consultants but require IHEs to rely on a 'partner' consulting organization. A more comprehensive discussion of the role of consultants in a successful implementation is found in Chapter ???

Implementing a new system without fully training all users is a waste of time and money yet many institutions do not adequately fund an on going training program. In this section we will explore the importance of staff training and why more is generally better than less.

Training project implementation staff in the new system is vital if the new system is to meet the institution's implementation objectives. Yet many IHEs report that they did not adequately budget for staff training. Kvavik and Katz (2002) found that training was the most underestimated budget item. Koch (2006) reported that "training expenses are high because workers almost invariable have to learn a new set of process, not just a new software interface" (p. 5). Koch (2006) further advises, "take whatever you have budgeted for ERP training and double or triple it up front. It will be the best ERP investment you every make" (p. 5). Vendor consultants usually provide the hands on training for key functional users and technical support staff. The cost of this training is usually included under 'consultant costs' in the budget

The training of end-user staff is another critical cost factor in an ERP implementation. Some IHEs opt for a train the trainer model for end user training. In this model, training is generally carried out by key functional implementation team members who are fully trained during the implementation. As IHEs realize training needs do not necessarily end, they are beginning to fund full time, on going, trainer positions. The trainer is then responsible to develop and implement an end user training program. An end-user training plan must be professionally delivered, well thought out, organized, and delivered just in time (Kvavik and Katz, 2002).

End user's training can be hands on in a classroom type setting or it can be web-based using course management systems such as Web CT. In most cases it is a combination of these activities. Training materials, whether paper, CBT, or web based, must be developed and delivered.

Hands-on training requires a properly set up and dedicated training laboratory for on-going implementation training as well as post implementation training. Usually these laboratories have 20 to 30 computer stations, an LCD projector, and a good quality screen. Some institutions already have a computer laboratory that can be dedicated to implementation project use. If a computer laboratory is not available full-time for the life cycle of the project, the implementation budget should include funds to set up and maintain one.

Training is a never ending cost of an ERP implementation and the post implementation budget should reflect this fact. If resources are not devoted to train staff to function in the ERP environment, the system will not be used to its fullest potential and people will return to shadow systems to accomplish their tasks. The business efficiencies anticipated will not occur. The average percentage of total ERP costs associated with training as reported in the 2004 EDUCAUSE Core Data Study was 7.8%. The percentage ranged from a

high of 9.7% spent by baccalaureate institutions to a low of 6.1% for doctoral institutions (Hawkins, 2004).

Customization of vendor software generally adds significant cost to an ERP implementation and it is a cost that will repeat itself every time there is a new release of the software. IHEs must carefully consider the implications of customizing vendor software and in this section we will explore some of the pros and cons of customization.

ERP systems available to the higher education market today are complex, integrated systems that are developed and enhanced based on the changing needs and expectations of clients as well as the new technology available. When IHEs begin their ERP system review process they look for the system that best fits their business needs with the intent that they will not customize the underlying software code. Customizing ERP software code is costly at implementation and continues to be costly every time a patch, fix, or new release of the current version, or a new version, is released. This is because the customized code has to be retrofitted in the new release and has to be tested. Retrofitting and testing takes key staff time.

Customization is usually done for one of two reasons. The ERP baseline code does not meet what the IHE deems an important functional need or

customization will save the IHE time and, possibly, money. An example of the former is Cornell University's decision to retain the ability to report a median grade for each course on a student's transcript when it converted its homegrown student records system to Peoplesoft's student records system.

The initial estimate for this change was \$25,000 to \$30,000. The total cost of this change will be multiplied every time a new version of the software is released (Olsen, 2004). Other types of customization result in long term savings to the institution, particularly if the customization saves staff time in processing some function. Indiana University modified the front end of the e-document module of its vendor software. This modification centralized the process to fit its business needs speeding it up and saving staff time every time the process is done (McDevitt and Walsh, 2005).

Hawkins, (2004) reported that 37.6% of the respondents to the 2004 EDUCAUSE Core Data Study stated that they modified underlying code. Doctoral institutions were most likely to make modifications (49.7%) and bachelor institutions least likely to do so (14.7%). In addition to code modifications, 82.7 % of the respondents indicated they modified the system configuration and 72.8% modified external modules. Kvavik and Katz (2002) found that "customization was the primary reason for projects to go over time

and budget" (p.14). Even if an IHE begins planning for an ERP implementation with the mantra 'no customization' it should, to be on the safe side, include some contingency funding for it!

IHEs quickly learn that existing staff roles and staff skill sets are not the roles and skill sets needed in the new, complex, ERP environment. New functional and technical support roles are needed.

The new support roles tend to be at a level that requires higher skill levels and expertise than many existing roles. This means that they are more costly roles to fill. In this section, we will discuss new roles that most institutions will find they need to create to gain the most business benefit from the new ERP system.

As mentioned above, to meet user training needs throughout the life cycle of the system, some institutions create full time trainer positions rather than rely on ad hoc training or training carried out by someone who does not have professional training experience or expertise. In a similar vein, ERP systems bring an increased need for professional Help Desk support. Help Desk professionals have the skills and expertise in the software and the technology supporting the software to answer user questions or assist users in finding a

solution to a challenge. Specialist roles in report writing have evolved. Most ERP systems deliver very few reports whereas IHEs find they must develop their own reports. The more complex the institution the more reports it tends to need.

The role of System Coordinator is now found in many core functional offices. The coordinator is typically responsible for maintaining the integrity of the data in the system, assisting functional staff with system challenges, liaising between the functional office, IT, and other campus units, and working with IT staff to resolve system glitches, while developing and maintaining a systems operations calendar. The IT Security Officer is another role increasingly found on many campuses but particularly on campuses that have ERP systems.

ERP data bases store a large amount of confidential information and security protections must be put in place and monitored to protect that information from falling into the wrong hands. Among other roles that have been created or, have a greater presence in the ERP environment are data base administrators, software system engineers, systems analysts, application programs and disaster recovery experts.

Each ERP implementation project will likely carry with it some unique costs. There are a few that all institutions will incur to one degree or another. The clean up of data on the existing systems, whether paper or computer systems, is one example. If there are paper systems than there will be data entry costs. Data conversion and migration can be time consuming and

costly. Much depends on how much data is being migrated and how easily it maps to the new system. Building and testing links between the ERP system and other university software and web sites is often an underestimated cost (Kvavik and Katz, 2002).

Post Implementation Costs—Costs That Never End!

An ERP implementation budget is increasingly referred to as a 'total cost of ownership' budget because costs associated with the initial implementation do not go away once the initial implementation is 'live'. Post implementation costs cannot be forgotten because they are substantial. They become part of the campus operating budget. There are staffing costs associated with every patch, fix, new release, or new version of the system. If any modification was made to the underlying code, it has to be recreated every time a new release, or version, is installed.

As mentioned previously, there are ongoing software costs (a new data base is released, upgrades to operating systems and networking systems, or new third party software). Additionally, there are ongoing hardware costs as hardware is upgraded or must be replaced and there are yearly hardware and software maintenance fees.

Consulting fees continue as new releases and new versions of the software are implemented. As with the initial implementation, it is important to have consultant expertise and experience to assist in these upgrades. If the initial implementation focused on the core functional products,

implementing other modules or new third party software will most likely incur some consultant costs. Training costs also continue as new staff, faculty, and students arrive on campus and as new releases and versions of the software are implemented. Part of on-going training for functional users and technical staff is attendance at professional conferences, workshops and seminars and vendor user group meetings. These activities should be funded as on-going ERP costs.

Summary

Deciding to implement an ERP system is not a decision made lightly. It is expensive and it usually takes 18 to 24 months from the start of the process to the first 'go live' function. A complete suite of functions going live can take three to four years, or more. This chapter emphasizes that if an IHE goes forward with an ERP implementation it must budget sufficient funds including a contingency amount from the beginning.

The budget must include funds for three stages of implementation—acquisition, implementation and post implementation, as well as funds for ongoing support, maintenance, and replacement costs. Each stage has critical components that must be funded. Critical to all stages are human resource costs. Attempting to implement an ERP system short on funds will only lead to a less than effective or efficient outcome and unhappy stakeholders and customers. It is unlikely

that the new system will meet business needs or improve its business processes to the fullest.

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