Understanding Financing Options for PACS Implementation

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The acquisition of expensive equipment such as picture archiving and communication systems (PACS) becomes increasingly difficult as capital budgets become tighter. Traditional ownership financing options in the form of direct purchase or financing (loan) have several limitations including technology obsolescence, higher fixed pricing, limited options for equipment disposal, and the need to tie up valuable capital. Alternative financing options, in the form of conventional lease and risk sharing arrangements, offer several theoretical advantages including technology obsolescence protection in the form of built-in upgrades, preservation of borrowing power, multiple end-of-term options, and payment flexibility (which can be directly tied to realized productivity and operational efficiency gains). These options are discussed, with emphasis on the acquisition of PACS.

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THE MAJOR FACTORS limiting PACS implementation in today's marketplace are cost and rapidly changing technology. The rate of adoption of PACS has not kept up with initial industry forecasts in a manner similar to that seen with the early diffusion of magnetic resonance imaging (MRI).¹ Initial researchers speculated that the slower-than-anticipated rate of adoption of MRI reflected the technical and financial uncertainties existing in an increasingly cost-conscious environment. An important concern to the initial purchasers of MRI was protection against premature obsolescence.²⁻⁴ A wide range of ownership strategies was developed, with the common objective underlying these arrangements being risk sharing.¹

The rates of adoption of MRI and PACS are similar in many respects. Strategies must be developed to address lingering questions that persist in today's radiology marketplace pertaining to functionality, technology obsolescence, and cost. Regardless of the financing strategy employed, PACS must be cost justifiable, relative to its film-based

counterpart, over a defined return on investment (ROI) period, which typically is 5 years. At the same time, legitimate concerns about technology obsolescence must be addressed satisfactorily, before a multi-million dollar equipment expenditure can be justified. This is extremely difficult with rapidly evolving technology, such as PACS, and requires assurance that hardware and software will be upgradable during the expected lifetime of the equipment. The level of vendor accountability is decreased when multiple vendors are involved, and no individual vendor will accept responsibility for system dysfunction. This leads to the potential for excessive downtime and diminution in realized productivity and operational efficiency gains.

These are the primary challenges facing PACS vendors today. By finding new and innovative ways to make PACS more affordable, implementation rates should continue to increase.

OVERVIEW OF PACS COST ANALYSIS

Previous cost-benefit analysis at our institution showed the break-even point for a hospital-wide PACS to be 38,827 examinations per year, using a conventional 5-year depreciation model (Siegel E, et al: 1998 American Roentgen Ray Society Meeting). This experience suggests that PACS can be cost-efficient when compared with film-based operation. This analysis was conservative in its estimate of savings associated with PACS by not including the "soft savings" that occurs outside the radiology department. This include improved clini-

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cian time management, which is estimated to save 45 to 60 minutes per day,^{5,6} a decrease in lost examination rate from 8% to 0.8%,⁷ improved patient throughput for both in- and outpatient settings owing to enhanced decision making capabilities by increased report turnaround and image accessibility,⁸ and personnel savings (radiologists and technologists) associated with the incorporation of additional hospitals into a multifacility PACS network.

In addition, this cost-analysis model did not take into account the revenue-generating potential of PACS, which occurs through increased utilization of both in- and outpatient radiology services.⁹ Collectively, these data demonstrate a compelling argument for PACS implementation, based on savings through productivity and operational efficiency gains, in addition to enhanced revenue.

WHY PACS IS UNIQUE

Before discussing financing options, one must realize that PACS is unique relative to conventional radiology equipment in several ways. First, PACS by its very definition is a system, not a device. Individual modalities, such as CT or MRI are, to a greater extent, individual pieces of equipment that acquire specific types of imaging data. A PACS, on the other hand, serves to assimilate, store, and disseminate information from multiple sources. Second, unlike individual imaging modalities that are products of the radiology department alone, PACS is an enterprise-wide product. It extends beyond the physical boundaries of the radiology department and the hospital itself. PACS allows users to electronically link multiple medical facilities over a single network, eliminating the barriers typically found in a film-based, paper-based environment. This experience is well illustrated in the Maryland VA health care system, where PACS electronically links two smaller hospitals to the central "hub" at the Baltimore VA Medical Center. This system can be used to acquire multiple forms of data (imaging, laboratory, clinical) from various clinical disciplines (radiology, dermatology, pathology, pulmonary/GI medicine, surgery) and to electronically disseminate these throughout the multifacility enterprise. This can be developed even further by the incorporation of medical records to create the electronic medical record (EMR).

Another distinction of PACS that separates it from conventional radiology equipment is the degree of technological evolution. Because PACS is a system composed of multiple individual compo-

nents, technological advancements occur both individually and collectively. Developing interfaces or gateways between the individual components is an increasingly complex challenge, which constantly changes as the individual components change. This technological complexity is further aggravated by the relative lack of industry-wide standards that prevent incorporation of new components from different vendors into the existing system without significant technical challenges. Even with the introduction of the Digital Imaging and Communications in Medicine (DICOM) standard, few standards currently exist that link information system technology with PACS. This has led to a new initiative within the industry, Integrating the Healthcare Enterprise (IHE), where PACS and HIS vendors are being asked to create industry-wide protocols that allow separate information systems to communicate with one another with greater ease. The bottom line is simple: PACS, unlike traditional imaging equipment, is not a "plug and play" technology. This creates myriad challenges for the end-user with respect to predicting how the technology can be applied now, as well as how future developments will become incorporated into the existing paradigm.

Vendors plan in advance how future developments will be incorporated into the current technology. The traditional engineering planning cycle with imaging modalities is approximately 2 to 3 years. This facilitates the development of an "open platform" system, where hardware and software developments are incorporated directly into the existing system at relatively modest costs. Unfortunately, because PACS is a multicomponent, multivendor system, it does not allow the same flexibility in the planning and implementation processes. Engineering developments are difficult to predict accurately, and the impact of an individual component on the system as a whole is equally difficult to predict. Infrastructural modifications to the network become increasingly complex, requiring periodic upgrades and added expense to accommodate increasing traffic demands. The net effect is that technology obsolescence and future developments are nearly impossible to predict in today's PACS environment.

Another critical decision in the financial decision-making process is delineating the expected lifetime of the equipment being implemented. When one purchases an individual imaging modality like CT or MRI, the predicted lifetime can be determined based on examination volume, other user's experience, and expected technological developments (as

envisioned by the manufacturer). Similar data cannot be predicted accurately with PACS because of the multivendor, multicomponent composition, rapidly evolving technology, and relatively minimal experience to date. Thus, the customer is at a disadvantage when trying to determine the optimal financing strategy.

REDEFINING THE VENDOR-CUSTOMER RELATIONSHIP

The traditional relationship between vendor (as equipment supplier) and customer (as end-user of the technology) undergoes a major change with PACS. With CT or MRI, one purchases or leases the equipment and has it installed; this is followed by clinical applications and subsequent long-term use of the technology. With the exception of maintenance/service (which can be supplied by on-site engineering or outsourced to a third party), the relationship between vendor and customer essentially ends, until the next equipment purchase is anticipated.

For PACS implementation to be successful, a different relationship exists between vendor and user. This takes the form of a long-term partnership, which does not simply end after delivery and installation of the equipment. Because PACS is not a "plug and play" technology, myriad technical, clinical, workflow, and political issues arise after delivery and installation. To successfully resolve these matters, ongoing collaboration between multiple parties is required. On the user side (hospital), the collaboration involves radiologists, technologists, clerical staff, administrators (in and outside of radiology), information technology (IT) specialists, engineering, referring clinicians (and their staff), and nursing. On the manufacturer side, collaboration requires participation by all vendors involved in the entire PACS/HIS network. To date, no single vendor offers a true "turnkey" approach.

The end result is that, upon delivery of the equipment, the challenges escalate. It is in the best interest of all involved parties to forge an honest, open, long-term relationship if the transition to PACS is to succeed.

Although the concept of risk sharing has been around for several years, it takes on new meaning with PACS. Multiple factors including rapid evolution of the technology, undefined lifetime of the equipment, multicomponent system, and excessive cost all contribute to the theoretical appeal of risk-sharing arrangements. If vendors want PACS

to succeed (and increase their market share), they are required to become active participants in the process, taking on the multiple roles of sales, education, consulting, and engineering support.

For all these stated reasons, one can appreciate why PACS is unique compared with traditional medical imaging equipment. Therefore, careful consideration must be given to select the appropriate financing option as it pertains to the unique needs of each individual customer.

REVIEW OF FINANCING OPTIONS

To determine the optimal financing strategy for any medical equipment, one must first define the intended use of the equipment, the planning horizon of the technology, the expected lifetime of the equipment, and potential changes during the intended lifetime (in the form of upgrades or replacements). Once these have been determined, the advantages and disadvantages of the different financing options can be evaluated critically (Table 1).

The two primary classes of financing are owner-

Table 1. Comparison of Financing Options for PACS

Advantages	Disadvantages
Ownership (purchase or loan)	
1. Fixed price (if price increases over time)	1. Fixed price (if price goes down)
2. Depreciation benefits (for-profit only)	2. Technology obsolescence
3. Long-term commitment to technology	3. Large cash outlay (purchase only)
4. No large cash outlay (loan)	4. Limited options for disposal
Operating lease	
1. "State of art" at lower payment	1. Do not own equipment
2. Minimize technology risk	2. Fair market value difficult to assess
3. Preserve borrowing power	3. Upgrades at whim of lessor (when not specified in contract)
4. Keep debt off balance sheet	
5. Improve financial ratios	
6. Multiple end-of-term options	
7. Payment flexibility	
8. Limited up-front expenditure	
Risk sharing (fee-for-use lease)	
1. Minimize downside risk	1. Minimize upside gain
2. Long-term partnership with vendor	2. Loss of autonomy
3. Payments tied to utilization	

ship (holding title of the equipment) and leasing (lessor holds the equipment title). Whichever party holds the equipment title has ultimate responsibility and can benefit from any potential tax savings through depreciation. However, if the titleholder is a "not-for-profit" entity, these tax benefits do not apply.

Ownership can take the form of either direct purchase or loan. This approach is commonly thought of as traditional financing. It is similar to purchasing an automobile. The purchaser may pay for the car outright by writing a check for the full amount, or may purchase it in the form of a loan over a predetermined time. When dealing with the purchase of medical equipment, the loan period is usually 5 years. In both cases (direct purchase or loan), the user takes the title for the equipment, and therefore is making a long-term commitment to the technology. This can be an anxiety-provoking proposition considering the technological dilemmas inherent with PACS, such as rapid evolution, undetermined lifespan, uncertainty regarding future developments, and the proprietary nature of equipment with multivendor/multicomponent composition. Collectively, this transfers a large responsibility to the final decision maker. This is a formidable task, even if this individual is an IT specialist or radiologist who keeps up with the technology. When the decision maker is someone less technologically sophisticated (CEO or CFO), the decision is precarious at best. When one considers the career liability associated with making the "wrong decision," the stakes are enormous. This liability is further exacerbated by the rapid changes occurring within the vendor community, in the form of mergers and acquisitions. The vendor from whom you purchase or lease your PACS may not be in business 3 to 5 years down the road. By then, the system may be outdated, with no support for maintenance, parts replacement, or upgrades.

Leasing provides the customer with some inherent protection not afforded with ownership. There are different types of leases (Table 2), which differ largely with respect to accounting and ownership. With regard to financing options with PACS, an operating lease may be preferable because it limits the customer's responsibility at the end of the lease. Operating leases are best suited for situations in which the technology is rapidly evolving, the equipment lifetime is difficult to establish, and available capital is limited. These criteria would be

Table 2. Types of Leases

Capital lease
1. Must fulfill one of the following criteria:
a. Lease transfers ownership of property to lessee by end of lease term
b. Lease contains option to purchase at a bargain price
c. Lease term >75% of estimated economic life of leased property
d. Present value of lease payments >90% FMV
2. Capital lease is accounted for like a purchase (assets and liabilities show up on balance sheet)
3. Best chosen when defined use and lifetime of equipment are well defined and relatively constant.
Operating lease
1. No assets or liabilities on balance sheet (costs are recorded as operating expenses)
2. Lease term less than 75% of projected lifetime of equipment
3. Best chosen when:
a. Financial ratios or balance sheet issues are sensitive
b. Technology is rapidly changing
c. Expected needs are <90% of useful lifetime of equipment
4. FMV lease option to purchase or release at term end, at current fair market value

applicable to most PACS purchases in the current marketplace.

A fair market value lease is an operating lease with a fixed term, which provides the customer with an option to purchase or re-lease at term end. The problem with this form of lease for PACS is that fair market value is difficult to establish. With the rapid changes in technology and the undetermined lifespan, PACS depreciates rapidly and thus residual value at term end is small and difficult to determine. This presents a challenge to the customer when entering into an operating lease, with the need to define fair market value prospectively.

Even with minimal fair market value, how does one "dispose" of the PACS after its intended use has been completed? In an ownership arrangement, the hospital or radiology group owning the PACS must find a buyer for the equipment. This usually takes one of two forms: resale on the open market (usually through a third party) or "trading in" toward a new PACS. In both cases, the owner is in an unenviable position, and likely will recoup only a minimal dollar amount, well below the expected fair market value. When leasing the PACS, however, a number of options are available to the lessee upon term end. These include renegotiating a new lease (typically at a lesser amount with upgrades), purchasing the existing PACS at fair market value,

and returning the equipment to the vendor. In any case, the leverage is with the lessee and not with the lessor, who would be burdened with significant costs and labor having to remove the PACS. Because fair market value is so difficult to establish, customers choosing lease options should insert specific language into the initial lease, specifying how fair market value is defined at lease expiration.

Long-term commitment to the technology can be either an advantage or a disadvantage, depending upon one's perspective and decision-making expertise. If a PACS system is selected without the appropriate functionality and upgradability, long-term commitment could have "career ending" ramifications. If, however, through due diligence, a functional cost-efficient PACS is implemented, then long-term commitment to the technology can be "career advancing." The key is accessing the appropriate resources (both inside and outside the respective institution), and researching both the vendor and proposed equipment carefully. Professional organizations can be extremely valuable resources in providing data, consultants, publications, and other customers/society members with previous experience. Any educational material provided from the vendor should be viewed with healthy skepticism, in light of the potential bias present.

In this day and age, where equity is a precious commodity, potential PACS customers must be judicious in allocating capital for large equipment purchases. For a hospital administrator, large capital expenditures have the potential to limit other capital-intensive projects, decrease borrowing power, create large debt on the balance sheet, and decrease the institution's financial ratios. Leasing arrangements offer the advantage of preserving capital while providing state-of-the-art equipment at a lower monthly cost than a comparable ownership agreement. However, with leasing, the PACS user does not assume ownership. In some customers' minds, ownership is preferable because it provides a certain sense of security. Although this concept may seem somewhat antiquated, it is a real and important consideration for many decision makers.

For many years, leases have incorporated upgradability as a major selling point, and this is particularly true of PACS. When equipment has an uncertain future, leases provide the ability to incorporate built-in upgrades and/or replacement. This can be done in a number of ways. Some lessors provide a flexible structure in the form of a

technology refreshment lease. This is a type of capital lease that incorporates upgrades at the discretion of the lessee, with adjustment of lease term or amount to cover the additional upgrade costs. The ability to incorporate upgrades into the lease provides the customer with a powerful tool to protect against technology obsolescence. Although not impossible, similar upgrade options are more difficult to incorporate into purchase agreements. PACS customers need some form of leverage to ensure upgrade options will be honored after the equipment is delivered.

The final consideration when determining the ideal financing option is cost. Once a purchase is made, the price remains fixed, and future changes in market conditions are relatively meaningless. This can be a positive factor for the customer who pays less in an escalating market. On the other hand, when prices move downward over time, "locking in" early can be a detriment. This scenario is especially true for new, evolving forms of technology like PACS. The PACS at Baltimore VA Medical Center was purchased in 1991 for approximately 7 million dollars. Today, a comparable PACS would cost considerably less than half this amount because of the decreased costs of computers, network equipment, and short/long-term storage systems.

RISK-SHARING ARRANGEMENTS

Although not a new concept, risk-sharing arrangements have taken on increased interest in the PACS marketplace to date. In an attempt to increase PACS penetration into the radiology marketplace, several vendors have successfully introduced risk-sharing alternatives. One notable example occurred between Siemens Medical Systems (Iselin, NJ) and St Barnabas Hospital (Livingston, NJ), where monthly payments are calculated on a utilization model. In this example, payment is based on megabytes of storage used, with a baseline guarantee of 70,000 megabytes per month. Utilization models can take various forms, with payment options based on other variables including examination volume or access to images. These types of risk-sharing arrangements are commonly referred to as fee-for-usage leases, in which the customer (lessee) pays the vendor (lessor) a monthly fee based on predetermined benchmarks.

In theory, fee-for-use financing enables implementation of new technology without high up-front costs. By tying payment to procedure volume and revenue stream, downside risk to the user is

minimized. A true fee-for-use asset management program is based on performance. Therefore, if the system falls below specified performance levels, the user is not obligated to pay. This provides a strong incentive to the vendor to develop a reliable, fault tolerant system, with an absolute minimum of downtime.

Fee-for-use costs are calculated by combining a number of factors including equipment costs, installation, service, training, software upgrades, cost of money (lease rate), and net present value (NPV) of the system, both at implementation and term end. Rather than charging additional fees for service, support, and upgrades, the vendor commits to a single per-procedure cost for the duration of the contract.

NPV is the standard method of comparing financing alternatives and determines the most desirable investment strategy. It is calculated by adding the initial investment (represented as a negative cash flow), to the present value of anticipated future cash flow. NPV is proportional to the financial value of the asset; therefore, the greater the NPV, the more desirable the financing strategy.

When a customer enters into a risk-sharing arrangement with a PACS vendor (or other third-party financier), they must be aware of the potential downsides. Any vendor entering into such an arrangement does so with the full expectation of recouping the entire expense of the equipment, with an additional profit margin, based on utilization and/or productivity gains. Typically the contract will be skewed in favor of the lessor, to ensure ultimate payment on the investment. Payment is based on estimated revenue and/or operational efficiency gains, which requires careful analysis before PACS implementation. Because of the paucity of unbiased or rigorous data published to date, the customer is at a relative disadvantage in accurately predicting the true gains achievable with PACS implementation.

Several vendors have developed pro forma economic models to calculate expected gains with PACS, with the ability to incorporate unique variables from each respective institution. It is essential that the customer be aware of available data to ensure that any proposed risk-sharing arrangement be constructed in a mutually beneficial manner. One must always realize that the transfer of downside risk to the vendor comes at a price, which is the transfer of upside gain (profit).

CONCLUSION

When considering financing options for PACS implementation, one must realize that PACS is unique relative to traditional radiology equipment. It is an enterprise-wide product that has profound effects on medical care throughout the entire health care enterprise. Therefore, cost-justification should include data points extending beyond the confines of the radiology department.

When comparing ownership and leasing strategies, many variables should be factored into a careful analysis; these include the intended use of the equipment, expected lifetime, and upgrades envisioned. Because of the rapidly evolving changes in the technology and pricing structure of PACS, leasing offers added flexibility in protecting against technology obsolescence and decreasing prices over time.

Newer forms of risk-sharing arrangements are being offered by PACS vendors in the hope of increasing penetration of PACS into the marketplace. Although these options offer the advantage of minimizing downside risk, they transfer a percentage of the profitability to the vendor. One must carefully consider all available options, based on one's unique needs and available resources, to properly determine the most cost-effective, technologically sound solution.

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