



Portfolio

Maintenance

One nice thing about working in a single industry for many years is the opportunity to try out a number of new-fangled ideas and see which ones actually work. For my career in higher education facilities management, the list of new concepts attempted is quite extensive. Such was the case with the idea of “Deferred Maintenance.”

In the mid-1980s I read Harvey Kaiser’s book *Crumbling Academe*. Like so many others I followed the prescriptions of the time by surveying the condition of all my facilities, estimating the cost of repair, and packaging it into a report

I could use with our trustees. I bought lock, stock, and barrel into the idea of “Stewardship” and argued with all I could reach that we had a responsibility to save our investment in facilities the previous generations had sacrificed for and that the future of higher education depended upon. (Sounds good doesn’t it?) The result? No increase in funding, a president fearful that students would bypass a campus loaded with maintenance problems, and a chief business officer who thought he’d be blamed for the whole mess. Obviously it did not work out as intended!

Portfolio Based Renewment

By William A. Daigneau, APPA Fellow

Fast-forward 25 years. What is the number one topic amongst facilities managers in higher education? Deferred Maintenance. The most oft-cited role of the chief facilities officer? Stewardship. Huh? How much longer are we going to beat our head against that wall?

Some years ago I stumbled across the idea of viewing facilities management, or any service enterprise, as a manufacturer of products. I wrote an article about the concept and called it Product Based Management, aka PBM [see *September/October 1997 issue of Facilities Manager*]. The idea was not revolutionary; it just suggested that we need to shift

our focus from “activities” to the final “desired outcome,” i.e., the product of all those activities. Thus the product of maintenance (an activity) was a functional, reliable building (the desired outcome). I found that systematically applying the concept led to improved results because it helped identify waste in the activity. In other words, if the activities employed in maintenance did not lead to a functioning building, they should be reduced or eliminated. As a result we abandoned many things most facilities managers would consider sound and standard practices in our business, such as centralized work control.

Now for the revelation! It didn't take me long to realize that my perception of a functional, reliable building was different from that held by its occupants, or by my boss, or by the president. For example, in one instance I felt we needed to replace the library's boiler and repair the steam heating system. But the head of the library wanted the roof fixed (books and water don't do well together). The president wanted me to repair and refurbish the main hall (where he held receptions). My boss wanted the brick exterior repaired (he could see the library from

his office window). Total rolled-up cost for all the listed work was \$5 million. Amount budgeted for repairs to the library was \$1 million. What to do!

After trying the usual assortment of capital prioritization schemes developed by various other colleges (with little success), I again turned to other industries to see how they handled resource allocation decisions. I didn't look too far when I came across a concept used to make allocation decisions in the world of financial investments: Portfolio Management.

THE CONCEPT

While much has been written about Portfolio theory, and the term is widely used in the facilities management industry, it still amazes me how little is really understood about the concept and its real-world application. For the purposes of this article a brief review of the basic premises of portfolio management, primarily as it pertains to non-liquid assets (e.g., buildings versus financial instruments such as bonds or mutual funds), is necessary.

A **Portfolio** is a group of **assets** owned by an individual or an organization, which they have purchased or invested in with the anticipation the asset will generate some returns on their capital. These returns may be in the form of revenue or to avoid expenses (negative revenue), such as owning a house in lieu of renting it. Each and every asset is expected to generate a return, but there are some risks or variability associated with those returns (rewards). Thus the assets in the portfolio each have a different degree of risk and reward associated with it. This can be displayed in chart form, shown in Figure 1.

The key principle of portfolio theory is the idea that the asset owner can minimize risk and maximize reward by managing the *entire* portfolio, not each individual asset. The greatest risk to the owner of an asset is that no returns are generated or that the invested capital is lost (bankrupt). The lowest risk is that returns are consistent and the asset is durable (profitable). At any given point in time, returns for each asset vary, as well as their degree of risk. This year an asset may be durable and generating a return, while another is not. Next year, the situation may be reversed.

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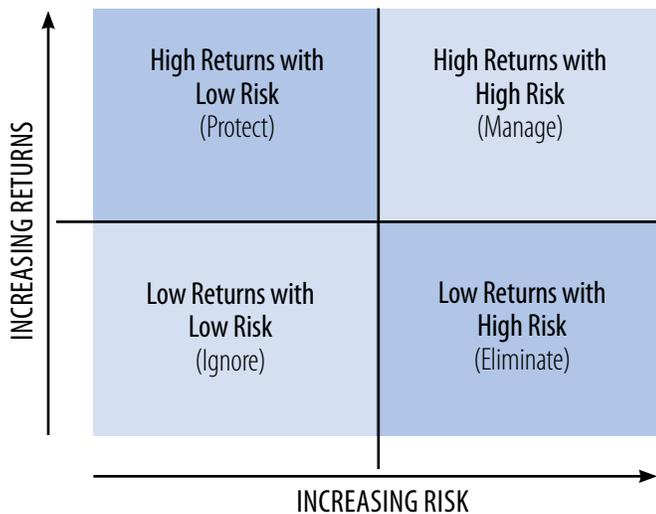
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The idea behind a portfolio is that since the individual assets do not have the same risk/reward in any given period, the portfolio manager will always have a collection of performing and underperforming assets. The portfolio manager must make continual decision about 1) the right balance between performing and underperforming assets, and 2) the likelihood the underperforming assets will generate a return in the future. Thus, the portfolio manager is constantly making investment decisions about the composition of the portfolio and how to use current income to further minimize total risk into the future.

Figure 1



APPLICATION

So how does portfolio theory help anyone make decisions about facility maintenance, repair, remodeling, or new construction? First to successfully adopt Facilities Portfolio Management (FPM for short), facilities managers must shift their thinking from one paradigm to another. The old paradigm about always preserving the institution’s physical assets (stewardship) must give way to a new paradigm about preserving the functions of those assets. John Moubrey describes this new paradigm in his excellent paper *Maintenance Management: A New Paradigm* (www.reliabilityweb.com):

As we gain a deeper understanding of the role of assets in business, we begin to appreciate the significance of the fact that any physical asset is put into service because someone wants it to do something. So it follows that when we maintain an asset, the state that we wish to preserve must be one in which it continues to do whatever its users want it to do. This in turn implies that we have to focus our attention on maintaining what each asset does rather than on what it is.

Once the mindset is shifted, we can apply FPM by first examining the core purpose of a college or university. At the heart, its “core” function is education and research (expanding knowledge). Without performing these basic functions, a university would be something else. While universities do other things as

well, such as public service and athletics, these are secondary or ancillary to its core purpose. Thus, every function performed on a college campus can be scaled, from low to high, on its direct relationship to the delivery of Education and Research.

Next we can examine the collection of buildings that exist and rank them in order on their relationship to the core function. Physical assets generally fall into one of three categories, but they too are scalable. These categories of buildings are:

- **Core:** those buildings that directly provide education and research, such as classrooms, instructional laboratories, research laboratories, faculty and academic department offices. These are the Class A assets.
- **Core support:** buildings that house functions that directly support the delivery of the core function, such as dormitories, food service, central plants, maintenance and operations facilities, libraries, student services, administration. These are the Class B assets.
- **Ancillary:** Buildings for everything else a university is engaged in, such as art museums, performing arts facilities, athletic and recreation facilities, parking. These are Class C assets.

The basic logic of FPM goes something like this: If an institution cannot teach students and support the expansion of knowledge, then the support functions aren’t needed, and the ancillary functions should be spun off to someone else.

Using this logic, one could rank order the relative importance of each building in each class by assigning a point value to it. There are several degrees of sophistication that can be used to determine this, primarily revenue generation of the asset, but for the purpose of this article and to keep it simple, let’s assign a point value for Class A assets from 20 to 30, Class B from 10 to 20, and Class C from 0 to 10. The higher the number, the higher the importance. For example, an instructional laboratory building that generates a lot of credit hours, and would be hard to replace even temporarily, might get 30 points. A faculty office building with lots of faculty who teach lots of classes, but who might work from home if the building is damaged, might score a 20.

Now we introduce the concept of Risk. For every physical asset, there exists some risk that it will cease to provide safe and reliable space for its intended purpose. Fire, tornados, flood, building system failures, IAQ...all can lead to loss of the asset or its temporary disablement. Risk is a function of probability of occurrence and the severity to a building’s loss if it occurs. We can rate risk simply by multiplying probability by severity. Using a scale of 1 (low) to 5 (high) for each factor, we can score risk as follows.

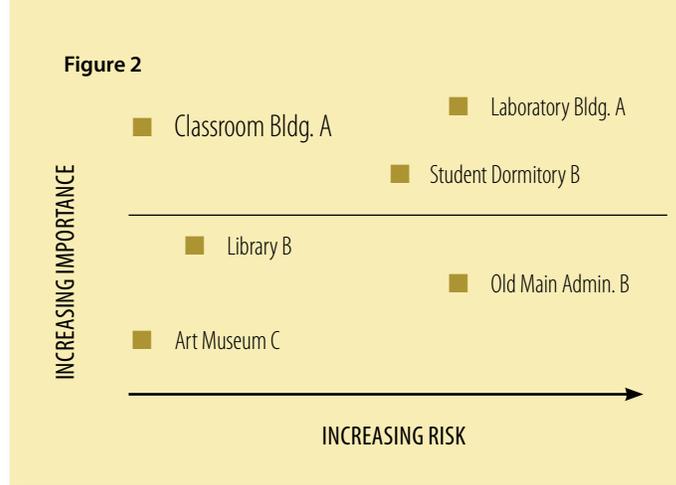
- **Risk from fire:** Probability is medium, so it is rated a 3. Severity is likely high, leading to loss of the facility or portions of it, so it is rated a 4. The risk of fire is probability times severity, or a total scored risk of 12.
- **Risk from tornado:** Depending on where you live, tornados are common or rare. Let’s say they are rare in this example, so it earns a 1 on probability. But severity is quite high, so risk from a tornado is 1 times 5, for a total of 5.

• **Risk from boiler failure:**

Let's assume the building has a very old and dilapidated boiler. Thus probability is high, a 5. If the boiler fails in a cold climate where it provides heat, there could be some serious freezing of pipes and extensive damage, so we give it a severity of 3. Total risk is 15.

This process would continue for every possible risk and every building system. Then either the total or an average of all individual risks would be computed to provide an overall risk score for each individual building. The important concept is that for every campus, there is a collection, or portfolio, of buildings with varying degrees of risk associated with them at any given point in time. That risk is a function of location and condition of the physical asset, and can be numerically rated.

So now we have two dimensions to use to evaluate where scarce resources are deployed. We can evaluate every physical asset on its importance to the core function of the institution, and evaluate the level of risk associate with those assets. Graphically,



each physical asset can be plotted on a matrix shown in Figure 2:

Knowing the Risk/Return ranking of all the assets in the portfolio enables resource allocation decisions designed to maximize the return of the entire portfolio. For example, in the above example Classroom Building A would be in the “Protect” category, and we

would allocate a larger proportion of our O&M resources to ensure building systems did not prematurely age. Laboratory Building A is in the “Manage” category and would be allocated a larger proportion of Capital Renewal Funds (CRR) in order to extend its useful life. The Art Museum (Ignore) would receive little attention in both O&M and CRR, as would the Old Main Admin Building (Eliminate), until it is either demolished, renovated, or replaced. Thus both short-term and long-term resource allocation decisions can be made on where to focus limited O&M, CRR, and replacement construction dollars, and a long-term capital plan can be developed and prioritized.

The same model can be used to make decisions on operating and capital allocation decisions in every individual building. In this case,

the building systems are assigned a level of importance based on a ranking of the impact of its failure on continued building function. Likewise risk can be determined by the condition of the building system and its probability of failure. So in the earlier story about the Library, the roof replacement might get funded before the boiler based on an assessment that the roof was more likely to fail due to its condition than the boiler, even though the boiler was rated as more important (sorry Boss, but the brick repairs came in dead last).

Just as in an investment portfolio, the entire portfolio of physical assets must be reviewed each year and “rebalanced.” That’s because every asset ages from wear and tear (depreciates) or functionally changes due to technology or educational pedagogy. Eventually Classroom Building A, even with good maintenance will migrate to one of the other categories as its building components age (risk increases) or technology impacts its functioning (importance decreases). Likewise Laboratory Building A, given some attention on CRR funding, may have migrated to the “Protect” category. This is the dynamic aspect of FPM. You just can’t ignore the assets; they must be actively managed, just like a 401k portfolio!

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CONCLUSION

Resource allocation decisions have historically been difficult for higher education. When resources are plentiful the loudest and most aggressive interest groups get a larger share, and when resources are scarce, administrative areas, especially capital outlays and facilities operations, get the largest cuts. In such an environment it is difficult to make wise long-term investment decisions in the management of physical assets. Many books and articles have been written about strategic planning and decision-making, yet few reflect the reality of how higher education is actually managed.

FPM is a tool that facility officers can use to make annual funding decisions that are not dependent on an entire culture shift in the real world of higher education. It applies portfolio theory in a practical but effective manner that does not require extensive data gathering or new software systems. While facility managers have used many of the concepts intuitively for many years, FPM introduces a degree of rigor and defensible strategy to the process. And it takes the Facility organization out of the role of just another voice crying for more resources, to becoming an ally of the president, the business officer, the deans, and the faculty. Now wouldn't that be nice? ☺

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