Which Facility Condition Dataset is Right For You?

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Which Facility Condition Dataset is Right For You?

Setting the Table

I worked with a State-Level University system over this year who has been presented with two different approaches to developing a forecast of future capital renewal needs. Throughout the discussions, I have been providing ideas and insights into the values, limitations, and drawbacks of each approach.

In this paper I will share some of those ideas so that others struggling with these critical decisions may benefit from the discussions that I have had and feedback that I have received.

The type of condition dataset that will make the most sense for you and for your organization will be based on a few factors including:

- Where you are in your asset management journey.
- The story you are trying to tell.
- The resources you have available to utilize and leverage the data into the future.

For each organization, there will be a right type of dataset for each moment in time. What might work for you today, may not work for you in the future as you evolve and enhance your thinking and approach to asset management.

The three main types of condition dataset are as follows:

1. Modelled/Lifecycle Data
2. Time-Limited Forecast of Needs
3. Element-Level Inventory

There are some different permutations and combinations of the above, but I don't think it makes sense to get too granular in the breakdown. Later in this article I will provide some options or nuances that can exist within each of these three main categories.

With regards to my conversations with the State-level University system, they were contemplating between Option #1 – Modelled/Lifecycle Data and Option 3 – Element-Level Inventory. Although not part of that specific discussion, I felt that I should also include a discussion of Option #2 – Time-Limited Forecast of Needs, as it is an approach that many institutions utilize for a variety of reasons.

The level of effort and costs associated with gathering each of these three datasets increases as you go down the list. However, at the same time the accuracy and overall value of the dataset in terms of developing prioritized, multiyear capital plans also increases significantly.

In this article I will also focus on questions that you and your team should answer at the outset of any program to make the right selection, followed by an explanation of each option and the type

of circumstances where each makes the most sense.

When Modeling is Right for You

The first, and highest-level type of condition dataset that we see clients leveraging is what we call Modeled or Lifecycle Data. This essentially entails developing a lifecycle forecast of future renewal needs for a building or portfolio. With the date of installation, Expected Useful Life (EUL) for an element (based typically on Uniformat II codes), an estimate quantity as well as unit costs, you can develop a model of your future capital renewal needs.

The benefits of modeling include:

1. Significantly lower costs compared with conducting on-site assessments.
2. The dataset provided is typically at a higher level (Uniformat II Leve 2 or 3) so maintaining the dataset overtime tends to require fewer internal resources.
3. Models can be developed in a shorter timeframe than conducting on-site assessments as there is no need to mobilize to site. Finally, in avoiding the on-site assessment, you limit the disruption to your on-site staff and occupants.

The downside of modeling include:

1. Greater potential for unexpected failure of elements as the forecast is based solely on EUL, a theoretical lifespan for an element, and has not been adjusted for real-world situation.
2. Dataset won't match the real-world situation within each building, meaning that at a portfolio-level your forecast should be generally accurate, at a building-level the actual needs will likely be very different.
3. Dataset will not provide sufficient detail to easily build a prioritized, multiyear capital plan that can be executed without additional assessment or study.
4. Integration with Operations and Maintenance programs is limited, as the dataset is very high-level and does not represent the actual elements within buildings.

Modeling generally works best for organizations that are early in their asset management journey and are somewhat resource constrained in terms of managing both the project associated with the data collection and the on-going data management.

If you have no concrete idea of what your future capital renewal needs will be, a modeling exercise can get you a reasonable, high-level forecast in a relatively short period of time. Using the high-level dataset, you can start to engage the non-facility stakeholders (finance, program, etc.) by developing visualizations at the portfolio-level to begin to tell the story of your future capital renewal needs.

Given the high-level and theoretical nature of the dataset, we always recommend that clients communicate the limitations of the dataset, the critical assumptions made and the likely future potential changes to the dataset as the program evolves. This avoids angst or issues when the dataset experiences significant changes as more and more reality is built into the program.

Following is an overview of the most common types of building models that can be applied to your portfolio, if you decide that modeling is the way to go for you and your team.

Building-Type Models

There are generally two ways to gather modeled data:

1. Building-Type Models (BTM)
2. Client-Informed Models.

There are some clients that will also consider limited on-site validation of a model, whether building-type or client-informed.

A BTM is where you develop a list of elements that are typically found within a

specific type of building (e.g. elementary school, recreation centre, long-term care home, etc.). Using the date of construction of the facility (and potentially data of major renovation) as well as the building square footage, you develop a future forecast of renewal needs, assuming that each element is original to the date of construction. Generally building costs are based on the square footage of the building for each element assumed to be present.

In some instances, if there are multiple additions to a building (I like to call those Franken-Buildings), you may consider modeling each addition separately. This will increase the complexity of your dataset but may give you a more representative list of future renewal needs.

The benefit of using a BTM is that it is quick and easy to get a dataset created. Also, the cost is inexpensive as it is typically a desktop exercise. The process also doesn't generally require a lot of effort for you and your team, other than providing some tombstone information on the buildings. For a relatively small cost, minimal effort, and short time frame you can get a reasonably accurate, high-level forecast of future renewal need for your portfolio.

The drawback of a BTM is that it is theoretical, and the data will not match up with the reality of what is within the buildings. Also, assuming that everything is original in the building is generally not an accurate assumption, especially for older buildings that have had lots of elements replaced over time. Additionally, you can end up with elements in your dataset that are not actually in your buildings, which can create doubt in the validity of the dataset in the first place. Finally, the granularity of the dataset does not allow you to take much action (prioritizing an actual capital plan).

If you are in the early stages of your asset management journey and you need some high-level numbers associated with your Deferred Capital Renewal and Maintenance Backlog in a short period of time, a BTM may be the perfect first step on your

journey. However, as your program evolves, you will likely realize that you need better data on which to base your asset management story!

Client-Informed Models (CIM)

The main difference between a Building-Type Model (BTM) and a CIM, is that the model is based on feedback from the owner/manager of the building(s).

For the most basic of CIMs, a spreadsheet is created listing all the potential elements that could be present within a building. The Asset/Facility Manager is asked to confirm if it is present/absent from the building, and an approximate date of installation. We utilized this approach during an Ontario School Renewal Initiative back in 2002. The spreadsheet was called the Asset Review Tool (we called them "ART" files). Each school district was given an ART file for each building, and they had to complete them and return them to our team. We then used the data to build a lifecycle model based on the client data.

Having worked with 72 different school boards, we saw a wide range of quality of ART files that were returned. Some boards took their time and put in the effort to build ART files that were representative of the real-world assets. However, others rushed through them, and the quality of the model was terrible.

A more complex CIM involves the preparation of a BTM, which is then sent to the Facility/Asset Manager for review and revision. This way the CIM is an advanced version of a BTM, where knowledgeable staff have the ability to validate the model and adjust the dates of installation based on their knowledge and experience.

Compared to a BTM, a CIM (if the Facility/Asset Managers put in the proper effort), can provide a more realistic view of the future capital renewal needs forecast. However, in some cases where there are not staff with a long history and deep institutional knowledge, the CIM may provide "worse" or less realistic data for a portfolio. If you and your team are all new to your institution, a CIM may not be the best approach for you.

The biggest challenge with a CIM is the amount of time that it takes our clients to put it together. Currently, almost everyone that I talk to is understaffed and is having trouble finding good employees. Dedicating a significant amount of time to building out the data models can be hard to prioritize when there are urgent and important tasks that need to be done just to "keep the trains running on time".

We have seen lots of clients put in the required effort to develop a valid and useful CIM. The most important aspect of the decision, however, is understanding the effort that it will take and making sure you set aside the ample time for your knowledgeable staff to do it right.

On-Site Validation of Models

Given that models may not accurately represent the real-world elements within a portfolio, and generally rely solely on lifecycle modeling (date of installation plus expected useful life equals the

replacement year), there is a fair amount of risk of potential errors in models. To help close that gap with the real-world, some clients choose to do on-site validation of models.

The benefits and drawbacks of building upon your model through on-site assessment.

When a model has been completed for an asset, it provides a solid starting point for the on-site assessors to build on through the site walk through. The assessors will generally:

1. Adjust the dates of installation based on observations, observable manufactured dates, and review of make, model serial numbers. Etc.
2. Update quantities (often expanding beyond the square footage of building unit cost basis).
3. Remove modeled elements that are not present within the building.
4. Add elements that are present that were not included in the model; and
5. Most importantly adjust the Remaining Useful Life of the elements based on a condition assessment of the element.

The general quality of the original model can have an impact on the updated dataset. Garbage-in, garbage-out as they say.

The result is most often a more accurate and condition-based (as opposed to purely lifecycle) forecast of future capital renewal need, which has increased value in terms of prioritized multi-year capital planning.

However, the costs are considerably higher than creating a modeled dataset. Additionally, the more granular dataset will require more effort to maintain over time as you complete capital renewal projects.

For clients that have moved beyond the need for just an estimate for future capital renewal needs, the investment in on-site assessment is well worth it and is a big step towards enhancing your asset management capabilities.

Time-Limited Forecast

Starting to build your condition dataset is a big step in terms of creating a consistent and defensible dataset on which to build a capital plan.

However, there is a cost associated with gathering these enhanced datasets. A team of professionals are required to mobilize to each building and spend between a few hours to a few days on-site to interview your staff, walk the buildings, take photos of the elements, and observed deficiencies and go back to the office and prepare a report and dataset. These costs will be considerably higher than the modeling exercises outlined previously in this article.

The first type of on-site assessment that we are going to tackle is the time-limited forecast. For these projects, you provide a forecast of capital needs over a specific and limited time horizon, what we call the evaluation period.

In the commercial real estate sector, this is where the Property Condition Assessment (PCA) typically falls. If you are doing a finance-level PCA, the evaluation period is usually based on the term of the loan plus two or three years. For example, if the loan term is 5 years, your PCA Opinion of Probable Cost (OPC) table would likely cover 7 to 8 years.

To support the acquisition of a property, the evaluation period is most commonly 10 years. The purpose of the acquisition PCA is to provide a purchaser with an understanding of future near-term capital needs that can be used in negotiating a reduction on the purchase price, and to provide some guidance to their asset and facility management teams of what to expect upon taking the building into their portfolio.

There are some public sector and institutional clients that include an evaluation in their Facility Condition Assessments (FCAs) to support on-going asset management. Evaluation periods can range from 10 years to 30 years.

In a time limited PCA or FCA, the future capital recommendations and corresponding data are limited to the evaluation period. The rest of the building is generally only mentioned within the narrative section of the report. The condition of the elements that do not have recommendations are assumed to be good as they do not require any “attention” until outside of the evaluation period.

The benefit of having an evaluation period for the commercial sector PCAs, is that the work is limited to the timeline of interest for the various stakeholders, including lenders, investors etc. The cost to collect a time-limited dataset is lower that an element-level inventory (more details to come next week). For those that don’t need a longer-term view of their portfolio renewal needs, whatever the reason, why would you pay the additional price.

The biggest issue with time-limited dataset is that your planning horizon gets shorter every year. If you do a 5-year evaluation period, next year you only have a 4-year forecast, the next year, 3-Years and so on. Given that the standard cycle for FCAs is 5-years, you can literally run out of future forecast data if you do a 5-Year evaluation period.

The other issue as well is that you will not have data (dates of construction, quantity, condition, remaining useful life, photos, narratives, replacement value etc.) on all the elements within your buildings. If you don’t want or need this data, then it isn’t an issue. However, if you are trying to take a longer view in terms of Asset Management, there will be holes in your data.

Also, if you are going to use the “Sum of the Parts” methodology to calculate your facility Current Replacement Values (CRV), the denominator of a Facility Condition Index, you won’t be able to do so with a time-limited dataset. Sum of the Parts involves adding up the Element Replacement Values (ERV) for all the elements within the building. You won’t have ERVs for all elements in a typical time-limited FCA or PCA.

Next week we will explore the highest-level, and most resource intensive

approach to gathering a condition dataset for your portfolio, the Element-Level Inventory.

Element-Level Inventory – Chapter #1

The Element-Level Inventory (ELI) is the most detailed and resource intensive methodology for collecting facility condition data. This approach includes the collection of an inventory of all of the elements present within a building, whether there is a requirement for any recommendations in the near term or not.

While an ELI does gather information on each element within the building, the granularity is generally based on the combination of like individual pieces of equipment. For example, if there are three rooftop units on a building and they are all the same capacity, age, condition, etc., the ELI will bundle them into a single element with a quantity of 3 or the sum of the capacity of each unit (depending on the unit of measure used in the ELI). If one of the units has been replaced recently and the other two were older, you would get two elements, one new and one old (with a quantity of 2).

One critical thing to understand about an ELI is that the expertise of the professional assessor is most valuable in the near-term. The closer you are to the present day, the more impactful the professional opinion. In general, the recommendations within the first 5 to 7 years of an evaluation period are impacted by the assessor's opinions (based upon observations and reported issues/concerns). After that, the process tends to default to lifecycle replacements (Date of Installation/Construction plus the Expected Useful Life (EUL) of the element). The reason for this is that many things can change over five years in terms of the condition of an element. The best roofing professional in the world would not be able to look at a roof today and say with any confidence that it would last 12 vs 13 years. There are so many things that come into play (maintenance, weather, etc.) that will impact the condition of that roof in the next decade. This is one of the main reasons that the industry standard is to reassess buildings every 5 years. In this way, you can update the lifecycle forecast based on observed/reported condition issues.

Critical information such as quantity, date of installation/construction, Remaining Useful Life (RUL), etc. is gathered on each element allowing for a full lifecycle model of a building or a portfolio to be developed. This means that your planning horizon is in theory, infinite. This process also allows for the most accurate results when using the Sum of the Parts methodology to calculate the Current Replacement Value (CRV) of individual buildings, since you have a real-world understanding of each element present within the building.

If you are going to do a longer-term projection of capital renewal, you need to also decide if you are going to include Cyclical Renewals (CRs) in your forecast, based on your ELI. CRs represent multiple future replacements of elements that have an EUL that is shorter than the timeframe of your forecast. For example, an element with an EUL of 10 years would be replaced potentially three times during a 20-year evaluation period (Year 0, Year 10 and

Year 20). CRs allow you to include future lifecycle replacements of elements, but do not take into account the potential deferral of the replacement, or extension of the lifecycle of elements based on preventative maintenance, etc.

Element-Level Inventory – Chapter #2

The upsides and downsides of the ELI approach.

The level of effort to collect an ELI is higher than a Time-Limited Forecast (TLF) in most cases. For example, if a building is in good or near-new condition overall, the level of effort to gather an ELI would be the greatest as very few elements would require attention within the near term and therefore be captured in a TLF. This increased level of effort requires more internal resources at a higher cost if you are using an outside consultant to gather the data. However, the older a building is and the worse the condition it is in, the less the incremental increase in effort is. In theory, if all the elements in the building are old and require attention within the next 10 years they would be captured as part of a TLF and it would essentially be the same dataset as you would capture if you did an ELI. Additionally, the ELI will provide you with the most robust dataset in terms of granularity. The upside is the defensibility of the dataset and the available planning capabilities. The downside is that maintaining the dataset will require additional time/resources given the level of detail.

One other key benefit of an ELI dataset is that it can most easily and effectively be integrated with your Operations and Maintenance program. An Equipment Inventory (dataset used to populate a Computerized Maintenance Management System (CMMS) and as the foundation of a Preventative Maintenance (PM) Program) is more granular as it is based on individual pieces of equipment, whereas Elements will bundle similar pieces of equipment together based on like age/condition, etc.

Since an ELI dataset is the most granular condition dataset available (but is still not as detailed as an Equipment Inventory), it is the easiest to align with your Equipment Inventory data. However, it is important to note that equipment inventory data is generally not collected on all elements. It is typically reserved for (major) mechanical and electrical elements and roofs (sections).

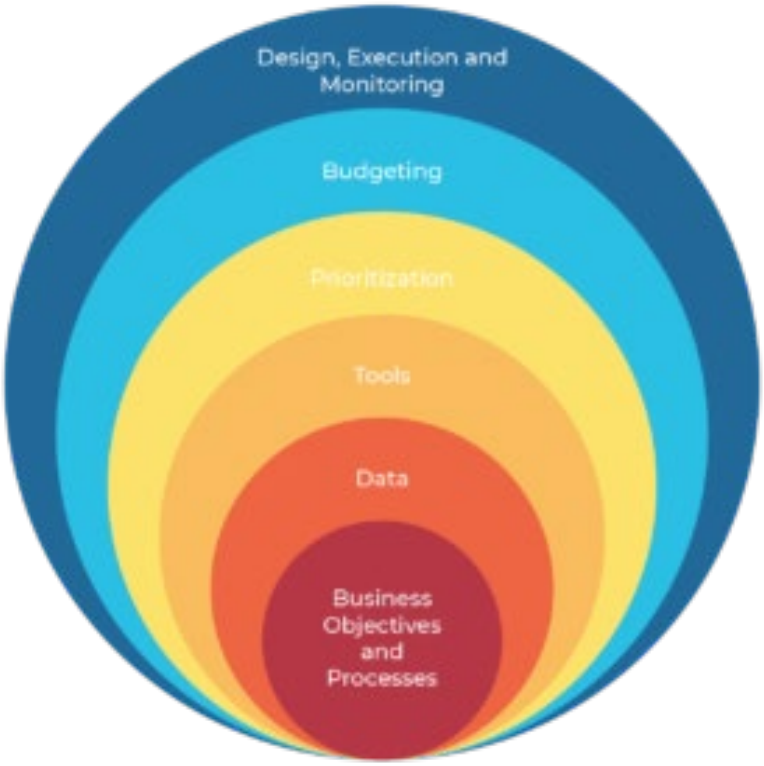
For organizations that have a sophisticated facility Asset Management (AM) program and the resources to gather and maintain an ELI, it is our opinion that it is the best-in-class solution for your organization. An ELI dataset provides unlimited forecasting ability and a granular dataset that can integrated with other critical elements of your AM program allowing you to take a more whole-asset view of your portfolio and spend your limited capital dollars more wisely.

Putting it All Together – Chapter #1

Now that we have introduced and explored the details of each of the different types of facility condition datasets, it is important to circle back

around and look at how you and your team can make the right decision for your team today, as well as decide if/how you want to evolve your program over time.

To help in this process, I want to reference the Integrated Asset Management Framework or as we like to call it “The Onion”>



The core of the onion represents an understanding of your current business objectives and processes. This is where we recommend everyone start each time they are looking to develop or enhance their Asset Management (AM) program.

It is critical that you understand the following factors when deciding what condition dataset to gather.

- Are you trying to provide a high-level forecast of future renewal needs for the first time?
- Do you need to develop a prioritized multi-year capital plan?
- What resources (staff and financial) do you have to gather and manage the dataset?
- How quickly do you need answers to your critical questions?

With answers to these and other key questions, you are in a better position to start to address the second layer of "the Onion", determining your desired dataset, which for capital renewal planning, is picking the methodology to get your condition dataset. Jumping straight to the data question without understanding your current state risks building the wrong dataset for where you are today.

When making the critical decision of how deep to go with your condition dataset, there is one other key thing that you want to understand which is the ability of your team to adapt to change. AM is Change Management in many ways. AM is all about continuous improvement, which requires constant change as you continue to stretch and evolve your program and practices.

If your team is open to change and adaptable, you can probably take a larger step from where you are to where you want to go in terms of your condition dataset. If your team is more "steady as she goes", then you may want to start smaller and build some momentum before you go for a more detailed and resource intensive approach. Finding the "goldilocks" point for your dataset, based on your team's capacity for change is as much art as science. You don't want to bite off more than you can chew, but you also don't want to take it too easy, or you risk a lost opportunity to advance your program.

Based on looking inwards, you will be in a much better position to decide where to start or evolve your current program and pick the condition dataset that is right for you today. However, the decision you make today should just be the first of many decisions on how to evolve the capital renewal planning aspect of your AM program.

Putting it All Together – Chapter #2

Once you make your initial decision regarding what condition dataset is right for you today, you then want to turn your attention to the future as today's decision is not the final decision that will lock you in forever. If you are early in your AM journey, you may decide to go with a modeled dataset as it is the quickest and cheapest dataset to collect. However, as you learn, gain wisdom, and evolve your program, you will likely come to realize that you need a more granular dataset to answer the new questions that arise on your journey.

For some, a modeled dataset may be sufficient based on the overall objectives of the program. If your main objective is to provide a high-level financial forecast of renewal needs, the modeled dataset may meet all your needs.

One of the things that we are seeing a lot more with our customers that are just starting their journey of gathering a condition dataset for their portfolios is the combination of a modeling approach, followed by an Element-Level Inventory (ELI). For example, if you have a large portfolio and cannot afford to do detailed Facility Condition Assessments (FCAs) on your entire portfolio, you may decide to phase the program in over multiple years (often 3 to 5).

However, many organizations don't want to wait 3 to 5 years to have a complete dataset for their building based on an FCA. In this case, we have developed building-type and/or client-informed models for the entire portfolio during the initial phase of the program and then validate the model with a detailed ELI over the course of the subsequent phase (e.g. 20% per year for 5 Years). In the long run, the overall cost of this approach is slightly higher as you are both modeling and assessing the entire portfolio. However, it provides a starting point in fairly short order that is built upon and enhanced over the subsequent phases (years).

With the future assessments, the dataset gets more consistent and defensible each year as the FCAs are conducted.

Not all organizations go deeper with their dataset overtime. I have seen instances where organizations have "dialed back" the granularity of their dataset. In most cases, this is the result of not factoring in the level of commitment and effort required to maintain and update the dataset. An initial decision was made to gather more granular data than an organization was able to maintain given all the other responsibilities of their team. As such, a simpler, higher-level dataset is built that is more easily managed. More data is only valuable if you have the capability to keep it up-to-date. Although this is a very important question for you and your team to answer, it is vital that you remember that there is truly no right or wrong answer to the question. There is only the right answer for your organization right now. Additionally, the answer you give today can be changed as you take your AM program into the future. That is what continuous improvement is all about.

Bill Roth is the CEO of Roth IAMS and the Co-Founder of SLAM Technologies. He has 27 years of experience collaborating with public and private sector clients across North America to design, execute and monitor Integrated Asset Management. Bill has unprecedented experience managing Facility Condition Assessments (FCAs), having overseen over 20,000 FCAs for all types of buildings and campus infrastructure. Bill's experience working with government clients has given him unique insight into institutional Asset Management.