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## Condition Assessments

Kaiser, 2009 (APPA)

“A process of developing a comprehensive picture of physical conditions and the functional performance of buildings and infrastructure; analyzing the results of data collection and observations; and reporting and presenting findings.”

**FCAs are resource intensive, subjective, time-consuming, and costly.**

**However, the importance of the FCA in the asset management process is integral to the overall performance of buildings.**

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## Submitted Research Statement

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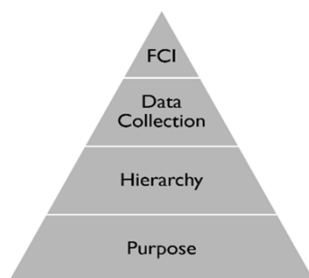
Many owners use Facility Condition Assessment templates generated within the organization or, alternatively, look externally toward consultancy firms that have individual templates.

The purpose of the research is to establish a current "state of practice" with regards to where industry currently stands in their levels of conditions assessments.

What are they reporting? Why? How is that information used? How often are assessments conducted and how? What do the literature and industry experts state that may help to improve the current levels of practice?

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## Approach



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## Condition Assessments

One of the greatest obstacles to the development of an efficient condition assessment process is the subjectivity and ensuing lack of accuracy.

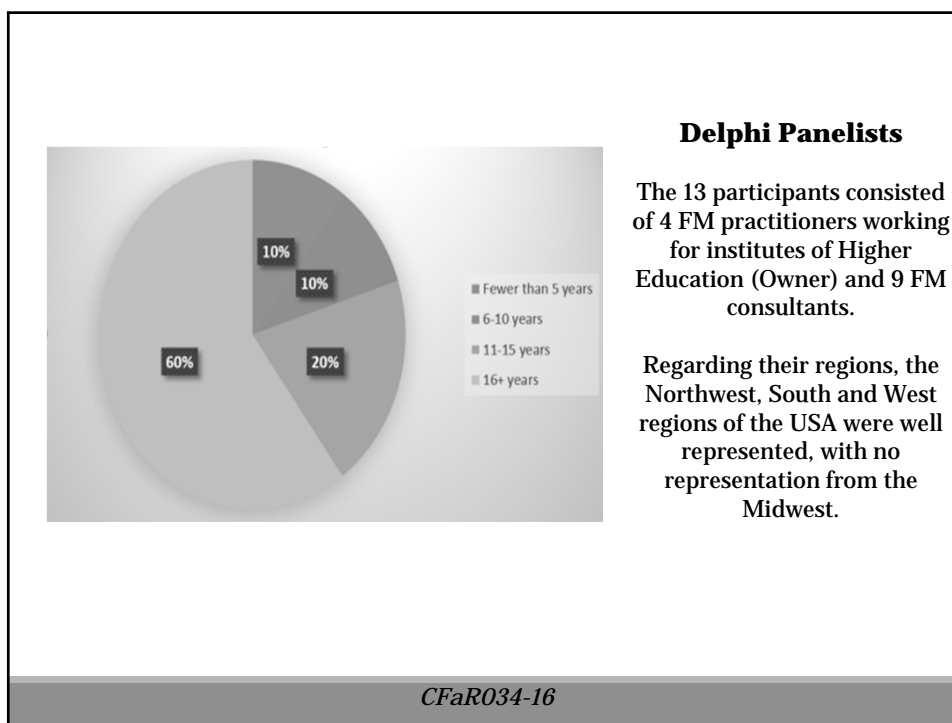
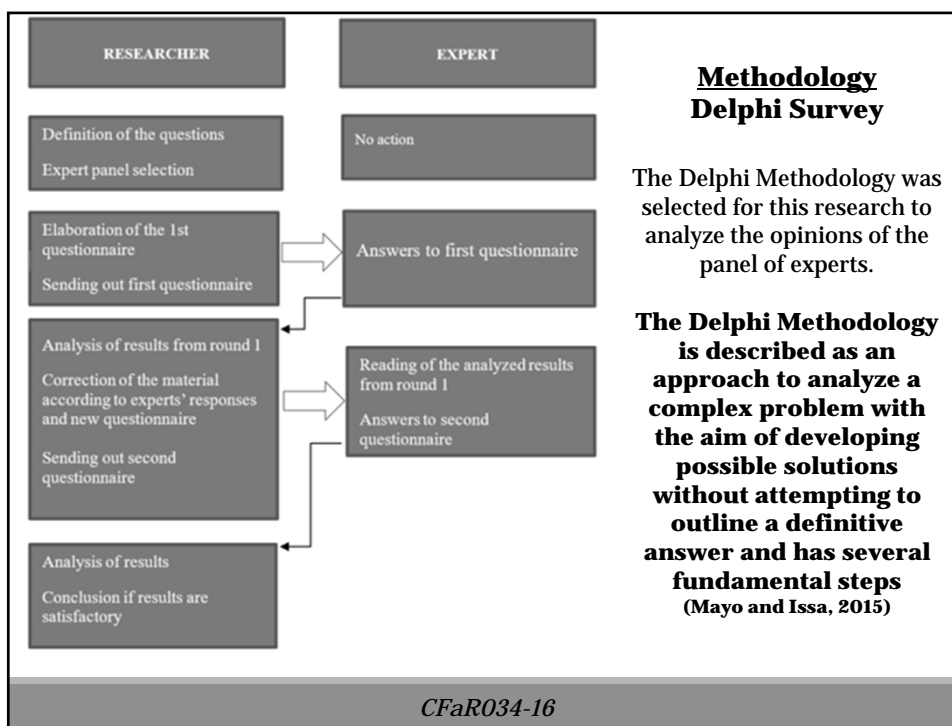
Reference	Asset Type	Condition Scale	Representation
Lee and Aktan, 1997	Buildings	1 – 4	Deterioration: (1 = no, 2 = slight, 3 = moderate, and 4 = severe)
Elhakeem & Hegazy, 2005	Buildings	0 – 100	Deterioration: (0 - 20) = no, (20 - 40) = slight, (40 - 60) = moderate, (60 - 80) = severe, and (80 - 100) = critical
Lounis et al., 1998	Any Asset (roofing)	1-7	Condition category (1 = failed, 2 = very poor, 3 = poor, 4 = fair, 5 = good, 6 = very good, and 7 = excellent)
NCES, 2003	Buildings	1-8	Condition category (1 = excellent, 2 = good, 3 = adequate, 4 = fair, 5 = poor, 6 = non-operable, 7 = urgent building condition, 8 = emergency condition)
DfES, 2003	Buildings	A-D	Condition category (grade A = good, grade B = satisfactory, grade C = poor, grade D = bad)

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## Condition Assessments Obstacles

- ❖ Unstructured, time-consuming, and expensive processes
- ❖ Lack of a mechanism for standardizing and prioritizing inspections
- ❖ Subjectivity of the assessments
- ❖ Lack of time-related condition records
- ❖ Inspection Levels and Techniques
- ❖ Analysis and metrics used

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# Interpreting Results

## Delphi Survey

We looked for agreement with the panel members as well as their actual response frequencies to each question.

### Agreement

Level of Agreement	Conditions
Consensus	<ul style="list-style-type: none"> <li>IQR <math>\leq 1</math> and a percentage score <math>\geq 60\%</math> in a single level on all scales including yes/no</li> </ul>
Strong Agreement (Round 2 only)	<ul style="list-style-type: none"> <li>IQR <math>\leq 1</math> and a percentage score <math>\geq 67\%</math> in combined adjacent levels, for a Likert scale of 7</li> <li>IQR <math>\leq 1</math> and a percentage score <math>\geq 61\%</math> in combined adjacent levels for a Likert scale of 5</li> </ul>
Disagreement	<ul style="list-style-type: none"> <li>Remaining items (Met either IQR or % score but not both)</li> </ul>
Total Disagreement	<ul style="list-style-type: none"> <li>IQR <math>&gt; 1</math> and a percentage score <math>&lt; 60\%</math> on all scales</li> </ul>
Split Disagreement	<ul style="list-style-type: none"> <li>Regardless of IQR, percentage scores <math>&gt; 25\%</math> on extreme ends of all scales</li> <li>Regardless of IQR, percentage scores <math>&gt; 40\%</math> on both ends of yes/no questions</li> </ul>

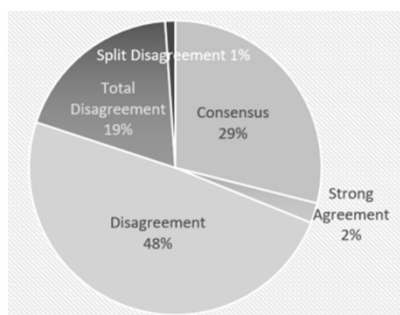
### Frequency

IQR	% Score	Level of agreement
1.25	80	Disagreement

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## Results

### Agreement



### Delphi Survey

Disagreement also is an indicator of the current state of practice.


For each questions, the researchers also attempted to collect qualitative comments from the panel pertaining to each of the topics to understand "why".

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Question ↓	Results ↓		Agreement ↓
Survey Response (Purpose)	IQR	% Score	Level of agreement
Ranking based on opinion:			
FCI is typically the overall desired metric	1	60	Consensus of “yes”
FCI provides a good overall indication of the structure's condition level	0.25	70	Consensus of “yes”
FCA should be tied to a scorecard or KPI	1	50	Disagreement
One of the difficulties of an FCA is the subjectivity of the assessments	1.25	80	Disagreement
Most FCAs are conducted because there is a mandatory requirement	1	60	Consensus of “neither agree nor disagree”
The resulting information from an FCA is used at the administrative level only	1	70	Consensus that it is not

**Yes - subjective**


One of the panel members commented that in their opinion, the subjectivity of the FCA could be overcome with third party involvement, or by the process being more data driven.



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Survey Response (Purpose)	IQR	% Score	Level of agreement
FCA format			
Excel spreadsheet	0	69.2	Consensus on “useful” format
Word or PDF Report	1	53.8	Disagreement
Database	1	69.2	Consensus on “best” format.
Hard copy binder	0.5	76.9	Consensus on format to avoid

Regarding whether data from an FCA should go into a database, 69.2% of the panelists responded that it was best format. The comment here was that putting it into a database allows for periodical real-time updating of data.



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Survey Response (Purpose)	IQR	% Score	Level of agreement
FCA report distribution once provided			
Sits on a shelf	0.25	80	Consensus that report does not sit on a shelf
Disseminated to few users	1	70	Consensus that the report is distributed to at least a few users
Disseminated to multiple users	1.25	80	Disagreement
Effort is made to make the information widely available to those in the organization	1.25	80	Disagreement

“Unshared data is a waste of money and resources.”



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Survey Response (Purpose)	IQR	% Score	Level of agreement
Owner use of the FCA			
Added manually to a computerized tracking system	2		Total Disagreement
Imported into a computerized maintenance management system or Integrated with a Capital Plan Management System	2.25		Total Disagreement
Used to prioritize Capital spending.	1.25	80	Disagreement

Data entry after an FCA survey is a labor-intensive exercise that requires a dedicated member of the FM personnel to upload the data and keep it updated.

To overcome this shortcoming, a member of the panel commented that the FCA data should be “loaded automatically and integrated with a Capital Plan Management System”.



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Survey Response (Hierarchy)	IQR	% Score	Level of agreement
Formats most often used for categorizing assets in an FCA			
UniFormat (ASTM E1557)	3	60	Disagreement but 60% for "I'm not sure"
MasterFormat	3		Total Disagreement
OmniClass	1.25	70	Disagreement but 70% for "I'm not sure"
ASTM FACTS (GSA)	1.25		Total Disagreement
No standard format	2		Disagreement
Our own internally developed format	2.5		Disagreement

One of the panelists made an accompanying comment that the classification standards available are limited in their effective granularity which brought forth a probable reason as to why these standard formats are not used consistently.



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Survey Response (Hierarchy)	IQR	% Score	Level of agreement
To obtain a better idea of the overall content for an FCA, which of the following are titled headings in your report?			
General Building Information	1	66.7	Consensus
Detailed Assessment Summaries	0.5	75	Consensus
Inspection Team Data	1	75	Consensus
Detailed Assessment Totals	1	66.7	Consensus
Facility Condition Categorization Descriptions	1	61.5	Consensus
Building Summary	1		Disagreement
Deficiency Audit Report	1	66.7	Consensus
Photographs and Drawings	1	66.7	Consensus

There was however disagreement on whether the building summary is included in the FCA report with 42% of the panelists indicating that they do not include one, while 58% indicated that they do.



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Survey Response (Data Collection)	IQR	% Score	Level of agreement
Tools used for collecting data during FCAs			
Forms	1	61.5	Consensus
I-Pad	0.5	76.9	Consensus
Handheld computers (Tablets, phone apps, laptops)	1	69.2	Consensus
Cameras	1		Split Disagreement

Survey Response (Data Collection)	IQR	% Score	Level of agreement
Use of technologies utilized while conducting FCA surveys?			
Infrared thermographs	3		Total Disagreement
Handheld laser measurements	3.25		Total Disagreement
Moisture analyzers	1	90	Consensus that they are used.
Smart level	2	70	Disagreement
Tape measure	5		Total Disagreement

How do we collect the data? And what tools are used?



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Survey Response (Data Collection)	IQR	% Score	Level of agreement
Are facility users consulted during the FCA process to identify deficiencies or functional issues of the spaces they occupy?			
User Consultation	0.5	76.9	Consensus

The panelists were in consensus on the need to consult occupants. Occupants may provide insight to an ongoing problem that is not evident visually during an assessment. However, one of the panelists stated, “even as the occupants are consulted, their perception of issues lacks building and system knowledge and therefore needs to be researched”.

Survey Response (Data Collection)	IQR	% Score	Level of agreement
Estimate of the time required to carry out an FCA survey 35,000 sq. Ft. Space in a 15-year-old building.			
Complex Building e.g. laboratory, theater, with a complex MEP system	2		Total Disagreement
Typical Commercial Building e.g. standard office building	2.75		Total Disagreement
Light Commercial e.g. warehouse	3		Total Disagreement



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*FCI Formula*

The formulae given for calculating the FCI was identified in the literature as:

$$FCI = \text{Deferred Maintenance (\$)} / \text{Current Replacement Value (\$)}$$

Survey Response (FCI)	IQR	% Score	Level of agreement
The standard formula for the FCI is Deferred Maintenance (\$) / Current Replacement Value (\$). Which formula does your organization utilize?			
Deferred Maintenance (\$) / Current Replacement Value (\$)	4.25		Total Disagreement
Deferred Maintenance (\$) + Renewal Costs(\$) / Current Replacement Value (\$)	3.25		Total Disagreement
Deferred Maintenance (\$) + Renewal Costs(\$) + Regulatory Compliance(\$) + Adaptation (ADA) (\$) / Current Replacement Value (\$)	5		Total Disagreement
Deferred Capital Renewal (\$) + Current FY Recapitalization Costs/CRV for total Database Value	1	90	Consensus that it is not used



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*CRV Computation*

The panel came to a consensus regarding the fact that the CRV formula is used for as a standard calculation. The formula provided to the panelists:

$$CRV = \text{gross square footage of the existing building} \times \text{estimated cost (per sf) to design and build a new facility}$$

Survey Response (FCI)	IQR	% Score	Level of agreement
The standard formula for calculating CRV is given as Gross square footage of the existing building multiplied by the estimated cost (per square foot) to design and build a new facility. Is this the formula adopted by your organization?			
CRV formula	1	69.2	Consensus
Standard for calculating CRV			
As an estimate by an internal estimator (using a standard)	1		Disagreement
By a formula determined by insurance requirements	0.25	80	Consensus that this is not the case
Using industry determined cost per square foot building models	1		Disagreement



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# Benefits and Limitations

Regarding the benefits of the FCI, the panel members were in partial agreement that the metric should be used as a KPI (but 50% of the panel was neutral on the issue).

It is, however, not surprising that the panel did not find the FCI to be ideal as a benchmark that assists in reducing the backlog and a comment by a member of the panel indicated that FCI has too much variance to be used as a benchmark.

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Benefits	Survey Response (FCI)	IQR	% Score	Level of agreement
	Benefits of the FCI			
	Is a tried and tested metric	1.75		Total Disagreement
	The FCI creates a common language among organizational staff to describe the condition of assets	2.25	75	Disagreement
	With a limited budget, the FCI can be used as a key performance indicator to identify buildings that need to be prioritized in terms of repair, maintenance and capital renewal	1.75		Total Disagreement
	Industry has an acceptance of the thresholds set for good, fair, poor and critical conditions	2.50	75	Disagreement
	The FCI is used as a snapshot in time to compare similar assets	1.0	87.5	Strong Agreement
	The FCI as a benchmark assists FMs reduce a backlog in deferred maintenance through its use in calculating "catch-up" costs and therefore assisting in getting budget approval	2.0	62.5	Disagreement
	The FCI is a good indicator of whether maintenance is being carried out	.75	62.5	Consensus
	The FCI is a good indicator of renovation opportunities	1.75		Total Disagreement

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# Limitations

Survey Response (FCI)	IQR	% Score	Level of agreement
Concerns of the FCI			
The FCI does not account for the condition of a facility's critical components and fails to capture the important distinction between the condition of the facility and the condition of its <u>individual components</u>	2.75		Total Disagreement
The FCI cannot be used to compare diverse assets	2.5	62.5	Total Disagreement (but most state that it cannot be used)
The FCI does not include future renewal projects	.75	62.5	Consensus
Values become rapidly outdated due to factors such as deterioration; is always relative to the year of the survey	2.75		Disagreement
CRV calculation is fluid and can differ year on year resulting in an inconsistent FCI and difficulty in benchmarking	1.75		Total Disagreement
The deferred maintenance aspect of the standard FCI formula does not prioritize relative importance of backlog associated with each system	1.75	75	Disagreement
The industry is moving past the FCI and towards more predictive approaches to managing deficiencies	1.0	87.5	Strong Agreement

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## Results Summary

The results of this study provide a clear indication that the disagreement levels in the categories may also represent the overall industry in terms of the lack of standards in how the FCA is carried out, how it is reported and the varied computation of the FCI.



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