APPA's Information and Research Committee has worked diligently to create a quality tool, the Facilities Core Data Survey, to help our membership focus on the data points that can be indicators of a quality organization. This data collection effort and the resulting Web-based *Facilities Performance Indicators* reports and dashboard indicators help improve our members' competency, credibility, and ability to converse compellingly with campus decision makers. The committee continues to improve the thought process and the focus of the survey and introduces a new way of looking at our Needs Index that makes the indicator more strategic and much more compelling.

How many times have you heard campus decision makers comment that the Capital Renewal and Deferred Maintenance (CRDM) problem is just too large to deal with? It makes more sense to come to the table not only with a picture of the entire need, but also a picture of the need most critical to the organization; hence a proposal to introduce the concept of Mission Centered Asset Management Plan (MCAMP).

Mission-Centered Asset Management

by Harry Singh and Maggie Kinnaman

An MCAMP is required to ensure expenditure of scarce resources through the use of a decision-support tool called the Mission Dependency Index (MDI). MDI is a performance metric that streamlines the process of determining project funding priorities based on mission criticality. It helps with investing funds where they are most needed to support mission critical functions. It is aligned with the Facility Condition Index (FCI), Needs Index (NI), and the metrics of the Strategic Financial Perspective of APPA's Facilities Core Data Survey. The facility needs are related with their relative importance to the mission, instead of being based solely on condition, which helps in assessing facilities' performance from a mission criticality point of view.

Historically, the conditions of facilities have been determined through continuous condition assessments. These assessments provide a source for identifying the exist-

Harry Singh is a project director for Woolpert, Inc., Arlington, Virginia; he can be reached at harry.singh@woolpert.com. This is his first article for* Facilities Manager. *Maggie Kinnaman is director of business administration, division of facilities management, for the University of Maryland, Baltimore. She can be reached at mkinnaman@af.umaryland.edu.

ing physical condition and functional performance of buildings and infrastructure as well as their maintenance deficiencies, also called deferred maintenance, or backlog of maintenance and repair. From the information gathered, a Facility Condition Index is calculated by dividing the cost of repairing all of these deficiencies with the Current Replacement Value (CRV). All deficiencies are assigned the same weight value, irrespective of their relationship to the organization's mission. A maintenance action plan is developed as shown in Figure 1.

Figure 1.

The reality is that only a small amount of these deficiencies are funded on a regular basis. As a result, the backlog of maintenance and repair continues to grow instead of going down. Therefore, a prioritized Mission Centered Asset Management Plan is needed to ensure mission critical deficiencies are addressed in a timely manner. The most important metrics of the Facilities Core Data Survey's Strategic Financial Perspective are FCI and NI. FCI is expressed as a ratio of the cost of remedying all maintenance deficiencies to the current replacement value (CRV).

Equation:

$$FCI = \frac{\text{Deferred Maintenance Deficiencies (\$)}}{\text{Current Replacement Value (CRV)}}$$

This calculation also provides a corresponding rule of thumb for the annual reinvestment rate (funding percentage) of deferred maintenance deficiencies. The Needs Index is expressed as a ratio between the sum of Capital Renewal, DM, Plant Adaptation, and Renovation and Modernization, divided by CRV. NI is an indicator that determines the overall condition of the campus, which is an indicator of how well the physical space supports the academic program. It is influenced by resource availability and utilization.

Equation:

$$NI = \frac{\text{Capital Renewal + Deferred Maintenance + Plant Adaptability + Renovation/Modernization (\$)}}{\text{Current Replacement Value (CRV)}}$$

As reported in APPA's 2004-05 FPI report, the average Needs Index for private institutions is approximately 13.9 percent; for public institutions, 19.5 percent; for all institutions, a startling 18.3 percent. This indicates that on average, 18.3 percent of our campus buildings and infrastructure do not appropriately support our academic missions, creating an incredible opportunity.

Linking Facilities Condition with Mission Criticality

As stated above, the Needs Index is the indicator that highlights the overall condition of the campus as influenced by resource availability and utilization. But in today's funding environment, there will never be enough funding to repair all the deficiencies. Therefore, an alignment of deficiencies with the mission is needed to ensure proper expenditure of scarce resources to fix what is most essential in meeting the mission. This is accomplished by linking the condition with its mission criticality using MDI, calculated as a numerical number from 0-100, determined through various levels of surveys. The three levels of surveys are shown in Figure 2 (on page 40) and defined below.

Level 1 - (Modeling): This is a knowledge-based level that utilizes the existing information/knowledge about the mission of various functions at a campus. Modeling provides sufficient information for programming and budgeting at a high level. It relies on the knowledge of the operators and available databases to assign a rating of mission criticality and condition as defined below.

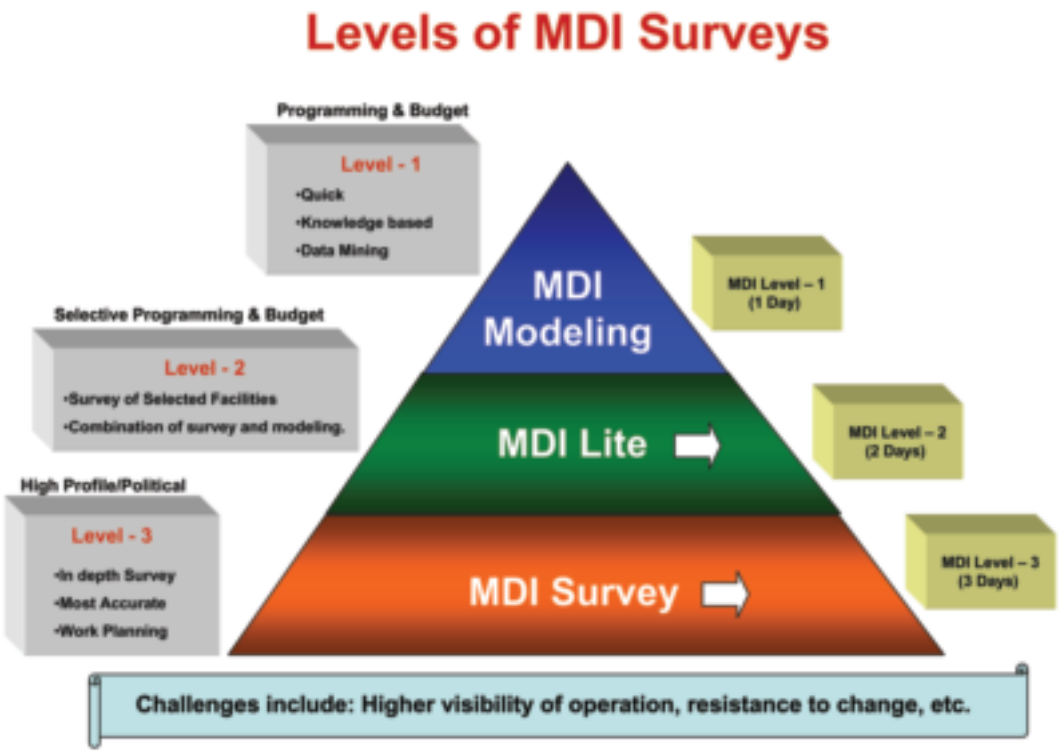
Criteria for Levels of Mission Criticality

- **M1 (Highly Mission Critical, Score 75-100):** Failure to fix the deficiency will significantly contribute to major interference or total loss of assigned mission capability and could cause catastrophic damage.
- **M2 (Significantly Mission Critical, Score 50-74):** Failure to fix the deficiency will significantly contribute to interference or partial loss of assigned mission capability and could cause further damage.
- **M3 (Critical, Score 25-49):** Failure to fix the deficiency will contribute to interference or some loss of assigned mission capability and could cause some damage.
- **M4 (Not Critical, Score 0-24):** Failure to fix the deficiency will contribute little loss of assigned mission capability and could cause minimal damage.

Criteria for Levels of Condition

- **C1 - Excellent.** Only minor deficiencies with negligible impact on capability to perform required functions.

Figure 2.



- **C2 – Good.** Some deficiencies with limited impact on capability to perform required functions.
- **C3 – Fair.** Significant deficiencies that prevent performing some required functions.
- **C4 – Poor.** Major deficiencies that preclude satisfactory functions accomplishments.

Level – 2 (MDI Lite): This level focuses on surveying 20-30 percent of the most critical buildings on campus, such as medicine, nursing and pharmacy. These surveys utilize formal interviews with the representatives of specific professional schools. It provides information on the most mission-critical schools at the campus and raises the level of programming and budget accuracy. For the rest of the inventory, the criteria from level one are used to calculate the MDI ratings.

Level – 3 (MDI Survey): This survey uses the operational risk management techniques of probability and severity and applies them to facilities in terms

Figure 3.

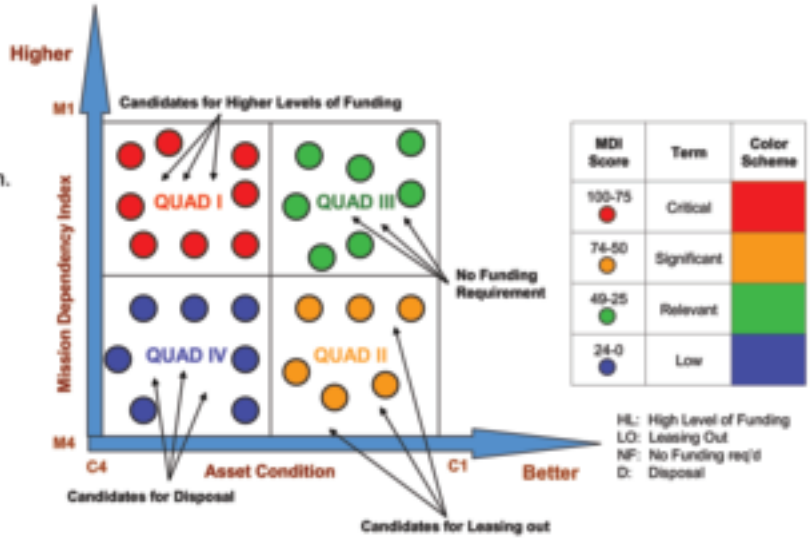
Mission Centered Asset Management Plan

Quadrant: I: Candidates for higher levels of funding. These assets are highly mission critical and are in bad condition.

Quadrant II: Candidates for leasing out if there are enough of these types of assets. These assets have low mission criticality and they are in good condition.

Quadrant III: Candidates do not require any funding because they are in good condition and are highly mission-critical.

Quadrant IV: Candidates for disposal because they have low mission criticality and they are in bad condition.



of ability to sustain interruption, relocation, and replacement of functions. It also takes into account mission dependencies residing within an organization and between other organizations, through structured interviews with the institution's representatives of individual units that cover a finite geographical area. Based on the answers, mission criticality values of MDI are calculated using an algorithm. They are then mapped against the condition or deficiencies to generate a mission centered funding plan. The idea is to fund those deficiencies first that are highly mission critical and are in bad condition and then fund those that are in relatively bad condition and less mission critical. MDI is applied at all levels of the facility, building, system, and component and is a driver for prioritizing projects. The MDI can also be applied to facilities at a portfolio level.

MDI was developed in the Navy's military environment to assist the "war fighter" in prioritizing its highly mission-critical functions including, antiterrorism and force protection (AT/FP) issues. For the academic environment, levels 1 and 2 can be equally effective.

The MDI is a decision support metric that helps to relate condition of facilities with the importance of the mission of the facility. The condition of the facility is determined through continuous inspections. However, criteria for the condition levels highlighted above can be utilized for mapping with the mission criticality. Based on these criteria and actual surveys, a prioritized MCAMP can be

developed based on the importance of the deficiency as it relates to the institution's core business as shown in Figure 3.

Figure 3 describes that each deficiency does not carry the same weight value and priority when it comes to funding decisions. For example, deficiencies in Quadrant I require the highest levels of funding and should receive the highest priority, because they directly affect the accomplishment of the core business. The deficiencies in Quadrant II and IV can guide decisions to generate income to fund some of the deficiencies in Quadrant I. The deficiencies in Quadrant III do not require any funding.

A prototype to validate the concept was tested by inserting actual information at one of the campuses as shown in Figure 4 (pages 44 and 45), which highlights application of the MDI filter. The overall NI is 36 percent, whereas the NI for the most mission-critical buildings goes up to 62 percent. The alignment of the condition with the mission requires funding, shown in red, due to their higher mission criticality. Those requiring relatively smaller amounts of funding for facilities are shown in orange, green, and blue. The analysis also highlights those facilities that are least mission-critical and those that are in relatively bad condition. These could be considered for disposal or leasing, thereby reducing overall cost of ownership.

Final Implications

The Mission Dependency Index was refined and implemented by Coast Guard and NASA. GSA is also considering its use. The MDI's true power is that it is straightforward and eloquent in its simplicity. By linking facilities to the core business of the institution, MDI scores simply communicate a critical and heretofore missing detail in infrastructure-related decision making. MDI is currently being deployed worldwide at U.S. Naval installations, all U.S. Coast Guard installations, and at 11 NASA Centers.

Implementing the MDI in educational facilities would give APPA members a new tool to more compellingly present the overall picture of the campus need while also demonstrating a keen understanding of the realities, finite resources and competing interests. The MDI helps to focus the institution's scarce resources on the greatest academic need. It also helps the institution demonstrate its commitment to frontline services first: education, research and community service. After all, an institution cannot say it strives for excellence when the realities point to a mission-critical facility with an NI of 62 percent.

Facility managers have the information at their fingertips to help paint the real picture of need and collaborate with the affected academic arm of the institution to strategically influence the outcome. Use of the MDI can truly help our members become more credible partners at the campus decision-making table.

References

Antelman, A., and C. Miller. 2002. *Special Publication SP-2113-SHR, Mission Dependency Index Validation Report,* Naval Facilities Engineering Command, Naval Facilities Engineering Service Center, Port Hueneme, CA.

Dempsey J., and A. Antelman. 2003. *United States Coast Guard Mission Dependency Index Procedural Guidance.* http://cgweb.cetc.uscg.mil/gsec/sec/ (accessed May 20, 2004).

Cable J. H., and J.S. Davis. *Key Performance Indicators for Federal Facilities Portfolios.* Washington, DC: The National Academies Press, 2005.

Cain, David A. 2001 Strategic Assessment Model, second edition. Alexandria, VA: APPA.

Cain, David, and Margaret Kinnaman. A New and Improved FCI, *Facilities Manager* 20 (March/April): 44-49.

Rose, Rodney. Forthcoming. *Buildings…The Gifts That Keep on Taking: A Framework for Integrated Decision Making.* Alexandria, VA: APPA.

Needs Index Sorted by Mission Dependency and Condition Codes

Updated: September 18, 2006

Figure 4

BUILDING	YEAR BUILT	LAST RENO	GSF	RENO GSF	AGING FACTOR	CRDM BACKLOG	CRDM BKLG/INFR	COST GSF	CRV	CRV w/ INFR	COND CODE	MISSION CODE	Quad No.
Building 1	1920	1992	33,009	$135	52%	$2,317,232	$2,458,815	$180	$5,941,620	$7,427,025	C3	M1	I
Building 2	1976	1976	334,571	$263	100%	$87,824,888	$93,190,988	$350	$117,099,850	$146,374,813	C3	M1	I
Building 3	1978	1978	314,158	$263	100%	$82,466,475	$87,505,177	$350	$109,955,300	$137,444,125	C3	M1	I
Building 4	1970	1970	67,283	$203	100%	$13,624,808	$14,457,283	$270	$18,166,410	$22,708,013	C3	M1	I
Building 5	1982	1982	103,166	$263	92%	$24,914,589	$26,436,870	$350	$36,108,100	$45,135,125	C3	M1	I
Building 6	1983	1983	72,176	$169	88%	$10,718,136	$11,373,014	$225	$16,239,600	$20,299,500	C3	M1	I
											62.00%	**Needs**	
Building 7	1993	1993	84,391	$193	48%	$7,807,855	$8,284,915	$257	$21,688,487	$27,110,609	C2	M1	III
Building 8	1993	1993	56,759	$263	48%	$7,151,634	$7,588,599	$350	$19,865,650	$24,832,063	C2	M1	III
Building 9	1959	1998	232,384	$263	28%	$17,080,224	$18,123,826	$350	$81,334,400	$101,668,000	C2	M1	III
Building 10	1968	1968	8,096	$135	100%	$1,092,960	$1,159,740	$180	$1,457,280	$1,821,600	C2	M1	III
Building 11	1995	1995	214,946	$263	40%	$22,569,330	$23,948,316	$350	$75,231,100	$94,038,875	C1	M1	III
Building 112	2003	2003	191,572	$263	8%	$4,023,012	$4,268,818	$350	$67,050,200	$83,812,750	C1	M1	III
Building 13	2006	2006	322,000	$263	0%	$0	$0	$350	$112,700,000	$140,875,000	C1	M1	III
Building 14	1998	1998	15,621	$169	28%	$738,092	$783,190	$225	$3,514,725	$4,393,406	C1	M1	III
Building 15	2002	2002	256,353	$135	12%	$4,152,919	$4,406,662	$180	$46,143,540	$57,679,425	C1	M1	III
Building 16	1998	1998	151,824	$203	28%	$8,608,421	$9,134,395	$270	$40,992,480	$51,240,600	C1	M1	III
Building 17	1932	1972	22,704	$169	100%	$3,831,300	$4,065,392	$225	$5,108,400	$6,385,500	C4	M2	I
Building 18	1900	1985	75,513	$135	80%	$8,155,404	$8,653,699	$180	$13,592,340	$16,990,425	C3	M2	I
Building 19	1990	2005	3,779	$135	0%	$0	$0	$180	$680,220	$850,275	C1	M2	
Building 20	1995	2000	6,912	$135	20%	$186,624	$198,027	$180	$1,244,160	$1,555,200	C2	M3	IV
Building 21	1993	1993	16,828	$203	48%	$1,635,682	$1,735,622	$270	$4,543,560	$5,679,450	C1	M3	IV
Building 22	1840	2000	18,528	$135	50%	$1,250,640	$1,327,054	$180	$3,335,040	$4,168,800	C3	M4	IV
Building 23	1878	1991	9,028	$450	56%	$2,275,056	$2,414,062	$600	$5,416,800	$6,771,000	C2	M4	IV
Building 24	1998	1998	175,961	$169	28%	$8,314,157	$8,822,152	$225	$39,591,225	$49,489,031	C1	M4	IV
Building 25	2004	2004	7,838	$135	4%	$42,325	$44,911	$180	$1,410,840	$1,763,550	C1	M4	IV
Building 26	2004	2004	98,901	$135	4%	$534,065	$566,697	$180	$17,802,180	$22,252,725	C1	M4	IV
Building 27	1970	1983	301,181	$263	88%	$69,572,811	$73,823,710	$350	$105,413,350	$131,766,688	C4	M5	IV
Building 28	1894	1970	46,850	$193	100%	$9,030,338	$9,582,091	$257	$12,040,450	$15,050,563	C4	M5	IV
Building 29	1950	1950	10,600	$135	100%	$1,431,000	$1,518,434	$180	$1,908,000	$2,385,000	C4	M5	IV
Building 30	1950	1950	10,000	$135	100%	$1,350,000	$1,432,485	$180	$1,800,000	$2,250,000	C4	M5	IV
Building 31	1950	1950	3,051	$135	100%	$411,885	$437,051	$180	$549,180	$686,475	C4	M5	IV
Building 32	1950	1950	2,840	$135	100%	$383,400	$406,826	$180	$511,200	$639,000	C4	M5	IV
Building 33	1950	1950	2,840	$135	100%	$383,400	$406,826	$180	$511,200	$639,000	C4	M5	IV
Building 34	1950	1950	10,830	$135	100%	$1,462,050	$1,551,381	$180	$1,949,400	$2,436,750	C4	M5	IV
Building 35	1950	1950	6,980	$135	100%	$942,300	$999,875	$180	$1,256,400	$1,570,500	C4	M5	IV

BUILDING	YEAR BUILT	LAST RENO	GSF	RENO GSF	AGING FACTOR	CRDM BACKLOG	CRDM BKLG/INFR	COST GSF	CRV	CRV w/ INFR	COND CODE	MISSION CODE	Quad No.
Building 36	1900	1900	25,172	$135	100%	$3,398,220	$3,605,851	$180	$4,530,960	$5,663,700	C4	M5	IV
Building 37	1950	1950	3,061	$135	100%	$413,235	$438,484	$180	$550,980	$688,725	C4	M5	IV
Building 38	1950	1950	2,973	$135	100%	$401,355	$425,878	$180	$535,140	$668,925	C4	M5	IV
Building 39	1950	1950	2,938	$135	100%	$396,630	$420,864	$180	$528,840	$661,050	C4	M5	IV
Building 40	1950	1950	4,028	$135	100%	$543,780	$577,005	$180	$725,040	$906,300	C4	M5	IV
Building 41	1950	1950	4,929	$135	100%	$665,415	$706,072	$180	$887,220	$1,109,025	C4	M5	IV
Building 42	1950	1950	5,000	$135	100%	$675,000	$716,243	$180	$900,000	$1,125,000	C4	M5	IV
Building 43	1950	1950	5,000	$135	100%	$675,000	$716,243	$180	$900,000	$1,125,000	C4	M5	IV
Building 44	1981	1981	26,177	$135	100%	$3,533,895	$3,749,816	$180	$4,711,860	$5,889,825	C4	M5	IV
Building 45	1960	1985	80,727	$135	80%	$8,718,516	$9,251,217	$180	$14,530,860	$18,163,575	C4	M5	IV
Building 46		1980	4,132	$135	100%	$557,820	$591,903	$180	$743,760	$929,700	C3	M5	IV
Building 47	1950	1950	6,844	$135	100%	$923,940	$980,393	$180	$1,231,920	$1,539,900	C3	M5	IV
Building 48	1812	1983	19,490	$450	88%	$7,718,040	$8,189,612	$600	$11,694,000	$14,617,500	C3	M5	IV
Building 49	1884	1972	7,277	$135	100%	$982,395	$1,042,419	$180	$1,309,860	$1,637,325	C3	M5	IV
Building 50	1984	1984	1,882	$263	84%	$414,981	$472,101	$350	$658,700	$823,375	C3	M5	IV
Building 51	1990	1990	36,806	$135	60%	$2,981,286	$3,163,443	$180	$6,625,080	$8,281,350	C2	M5	III
Building 52	<1900	1998	800	$135	28%	$30,240	$32,088	$180	$144,000	$180,000	C1	M5	III
					Subtotal	$439,312,759			$1,043,360,907				
Infrastructure	1900	1972			100%	**$27,500,000**			$260,840,227				
TOTAL			3,526,709			**$466,812,759**	**$466,186,533**		**$1,304,201,134**	**$1,304,201,134**			
						0.36	**Needs Index**						

Note: School Backlog is inflated 6.11% for infrastructure, CRV inflated 25% for infrastructure

Current Replacement Key

Classroom/Admin	$180
Hi-Tech Admin	$225
Admin/Research	$270
Research	$350
Historic	$600

Renovation costs are generally 75% of construction costs

LEGEND:

Quad 1	High Mission Dependency (M!) and Lower Levels of Condition - Higher Levels of Funding Required
Quad III	High Mission Dependency (M1) and Good Condition - No Funding Required
	Medium Level of Mission Dependency (M2) and Good Condition - Funding required for Repairs & Replacements
Quad IV	Lower Levels of Mission Dependency (M3, M4, M5) and Lower Levels of Condition (C3) - Candidates for Disposal