



PROJECT MANAGEMENT
CENTER FOR EXCELLENCE

A.J. CLARK SCHOOL OF ENGINEERING
Civil & Environmental Engineering Department



OPTIMIZING DECISION MAKING – FACILITY LIFE CYCLE CONSIDERATIONS

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2019 Project Management Symposium

Introduction*

“ ... an organized effort directed at analyzing the functions of systems, equipment, facilities, services, and supplies for the purpose of achieving the essential functions at the lowest life cycle cost consistent with the required performance, reliability, quality, and safety.”

Source: Office of Management and Budget

VIRGINIA BEACH CITY PUBLIC SCHOOLS

Since 2006, Virginia Beach City Public Schools has utilized MBP team members to conduct facilitated workshops on capital projects, evaluating complete new campus designs as well as major renovations and design of new prototype schools.

PRINCESS ANNE
MIDDLE SCHOOL

10%
in savings

ROI 100:1



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*Facility Management Bias

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Framing the Issue – Portfolio Asset Management



- Real estate and facilities are among the top four expense categories.
- Initial cost is only 10% to 13% of the life cycle cost of the facility.
- Initial design input has dramatic and incalculably large cost savings over the life of a facility and portfolio.



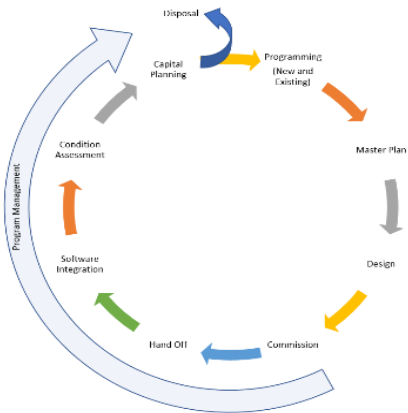
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Asset Management (Creation)

- Planning and budgeting pipeline
- Immediate need
- Separate funding streams
- Restrictions on bond funds



8 stages

8 task bars

Task	0 Strategic Definition	1 Preparation and Brief	2 Concept Design	3 Developed Design	4 Technical Design	5 Construction	6 Handover and Close Out	7 In Use
Core Objectives	Identify client's Business Case and Strategic Brief and their core project requirements.	Develop Project Objectives, including Quality Objectives and Project Outcomes, Sustainability Aspirations, Project Budget, other parameters to constraints and Develop Initial Project Brief. Undertake Feasibility Studies and review of Site Information.	Prepare Concept Design, including outline proposals for structural design (building) and services systems, outline specifications and preliminary Cost Information, along with relevant Project Strategies in accordance with Design Programme. Agree alternatives to brief and issue Final Project Brief.	Prepare Developed Design, including coordinated and specialist proposals for structural and building services systems, outline architectural, structural and building services information and Project Strategies in accordance with Design Programme.	Prepare Technical Design in accordance with Design Programme and Construction Programme and establish Design Outcomes from site as they arise.	Obtain manufacturing and on-site Construction in accordance with Construction Programme and establish Design Outcomes from site as they arise.	Handover of building and conclusion of Building Contract.	Undertake In Use services in accordance with Behaviour of Services.
Procurement Variable task bar	Initial considerations for awarding the project.	Prepare Project Briefs, Tender and Contractual Tree and criteria awarding the project team.	The procurement strategy does not fundamentally alter the progression of the design or the level of detail prepared at a given stage. However, Information Exchanges may require alignment on the procurement route and Building Contract. A bespoke RIBA Plan of Work 2013 will set out the specific tendering and procurement activities that will occur at each stage in relation to the chosen procurement route.		Administration of Building Contract, including regular requirements and review of progress.	Conclude administration of Building Contract.		
Programme Variable task bar	Establish Project Programme.	Review Project Programme.	Review Project Programme.	The procurement route may dictate the Project Programme and may result in certain stages overlapping or being undertaken concurrently. A bespoke RIBA Plan of Work 2013 will clarify the design overlap. The Project Programme will set out the specific stage-wise and detailed programme duration.				
(Town) Planning Variable task bar	Pre-application discussions.	Pre-application discussions.	Planning applications are typically made using the Stage 3 output. A bespoke RIBA Plan of Work 2013 will clarify when the planning application is to be made.					
Suggested Key Support Tasks	Review Feedback from previous projects.	Prepare Handover Strategy and Risk Assessments. Agree Schedule of Services, Design Responsibility Matrix and Information Exchange and prepare Project Execution Plan including Technology and Communication Strategies and consider of Common Standards to be used.	Prepare Sustainability Strategy, Maintenance and Operational Strategy and Review Strategies and Risk Assessments. Undertake third party consultations as required and any Research and Development aspects. Review and update Project Execution Plan, including Change Control Procedures. Consider Construction Strategy including off-site fabrication and Health and Safety Strategy.	Review and update Sustainability, Maintenance and Operational and Risk Assessments. Undertake third party consultations as required and any Research and Development aspects. Review and update Project Execution Plan, including Change Control Procedures. Review and update Construction Strategy including off-site fabrication and Health and Safety Strategy.	Review and update Sustainability, Maintenance and Operational and Risk Assessments. Prepare and submit Building Regulations submission and any other third party submissions requiring consent. Review and update Project Execution Plan. Review Construction Strategy, including off-site fabrication and Health and Safety Strategy.	Review and update Sustainability Strategy and prepare Handover Strategy, including information required for commissioning testing, Health and Safety Strategy, and any other relevant information. Update Construction and Health and Safety Strategies.	Carry out activities listed in Handover Strategy including Project Outcomes and Research and Development aspects. Update off-plant information as required.	Conclude activities listed in Handover Strategy including Post-occupancy Evaluation, review of Project Outcomes and Research and Development aspects. Update off-plant information, as required, in response to ongoing client Feedback and maintenance or operational developments.
Sustainability Checkpoints	Sustainability Checkpoint – 0	Sustainability Checkpoint – 1	Sustainability Checkpoint – 2	Sustainability Checkpoint – 3	Sustainability Checkpoint – 4	Sustainability Checkpoint – 5	Sustainability Checkpoint – 6	Sustainability Checkpoint – 7
Information Exchanges (at stage completion)	Strategic Brief.	Initial Project Brief.	Concept Design including outline structural and building services design, associated Project Strategies, preliminary Cost Information and Final Project Brief.	Developed Design, including the coordinated architectural, structural and building services design and updated Cost Information.	Completed Technical Design of the project.	'As-constructed' information.	Updated 'As-constructed' information.	Updated 'As-constructed' information updated throughout ongoing client Feedback and maintenance or operational developments.
UK Government Information Exchanges	Not required.	Required.	Required.	Required.	Not required.	Not required.	Required.	As required.

*Variable task bar – in creating a bespoke project or provide specific RIBA Plan of Work 2013 via www.ribaplanofwork.com a specific bar is selected from a number of options.



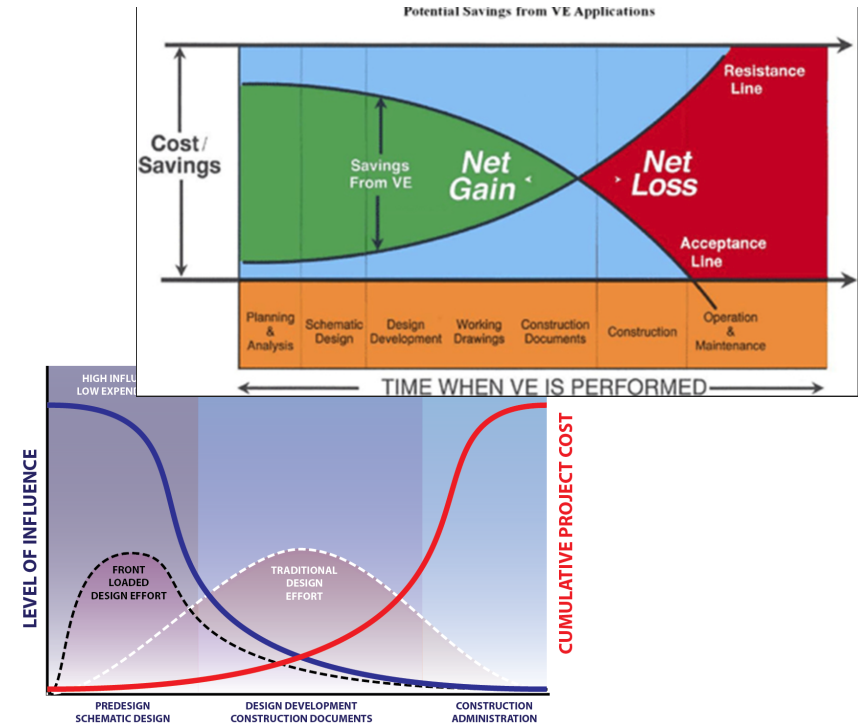
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Facility Optimization

- Maintainers and Operators participate in design reviews and equipment selection (Stockham™ syndrome).
- Operations and Maintenance software considered during design
- VE workshops or interactive sessions held during design phases



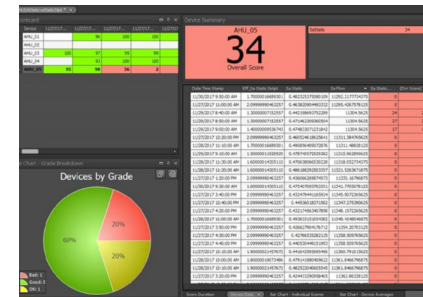
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Operations and Maintenance

- Operations and engineering design standards
- Service contractor considerations
- Training
 - IFMA
 - APPA



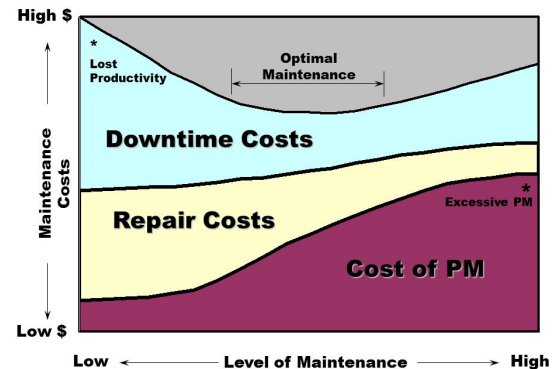
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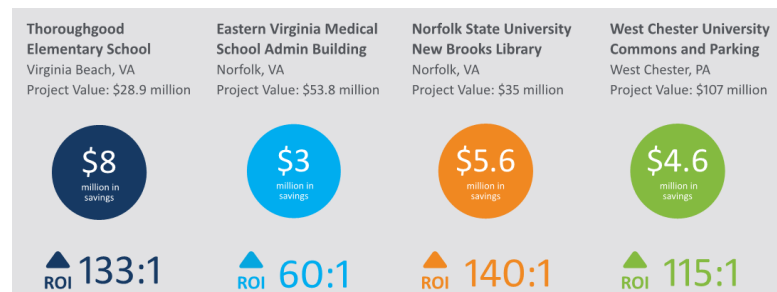
Operations and Maintenance Software

- BIM value beyond commissioning
- Asset management including inventory and GIS
- Reliability Centered Maintenance



Value Engineering Facility Optimization

- Typically done after schematic design or 35% (late)
- Assist designer earlier in the process (ROI)
- Support the balance of requirements, future needs, sustainability, O&M and design excellence



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Optimization Beyond Creation

Proposal Number: **A4**



A&E Present Design:

The proposed design of the roof system is a combination of a pitched standing seam metal roof (mansard type) with concealed gutters. In addition, the center of the roof is a recessed flat membrane roof to conceal the roof top HVAC equipment.

Advantages:

- Reduction in initial/first cost.
- Reduction of operating/maintenance costs.
- Ease of construction/quicker to install - schedule savings.
- Green design - LEED point.
- Esthetically pleasing.

Workshop Proposal:

Change the design of the roofing systems to a single system. Eliminate the sloped standing seam metal roof. Consider a low slope, white TPO roof, with vertical screen walls and a sloped roof over the stairway that resembles the circular element from the new Library building.

Disadvantages:

- Additional redesign time and cost.
- Different appearance from the present building design.

Example 1. A three-phase circuit feeding a 125 H.P. 460 V motor, operating at 75% load, 250 ft. from the load center, running 8,000 hours per year. Draw is assumed to be 75% of 156 full-load amps (FLA).

	3/0 wire	4/0 wire
Conduit Size	2 in.	2 in.
Estimated Loss (at 75% load and 44°C and 40°C, respective conductor temps.)	708 W	554 W
Wire Cost	\$991	\$1232
Conduit Cost	\$365	\$365
Incremental Cost		\$241
Energy Savings: at 75% load		1,237 kWh/year
Dollar Savings: at \$0.07 per kWh Payback		\$86.59/year 2 years, 9 months
Dollar Savings: at \$0.10 per kWh Payback		\$123.70/year 1 year, 11 months

In this example, the payback is under 3 years, and the savings continue indefinitely into the future.

Annual Cost Savings	Initial Cost Savings
\$0	\$1,113,000
	\$303,000
	\$810,000
Estimated Initial Cost Savings:	\$810,000

Balancing Value and Desirability

ORIGINAL DESIGN: The current design includes linoleum flooring in the science laboratory and prep room spaces.

PROPOSED CHANGE: It is proposed to utilize stained/polished concrete floors in the science labs and science prep rooms in lieu of the linoleum flooring.

JUSTIFICATION: The polished/stained concrete floors are a more durable finish and would appear to be a more appropriate flooring for the laboratory spaces.

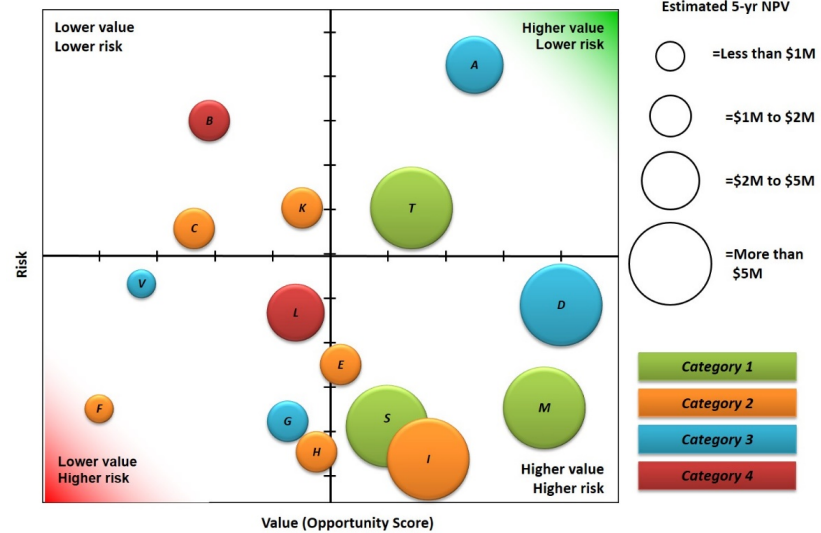
ADVANTAGES:

- Reduces construction costs
- Reduces life cycled costs of future replacement
- Concrete is easier to clean

DISADVANTAGES:

- Concrete will have differences in appearance
- Some hairline cracks may be visible

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 171,648	\$	\$ 171,648
PROPOSED CHANGE:	\$ 72,000	\$	\$ 72,000
SAVINGS:	\$ 99,648	\$	\$ 99,648



Optimizing Decisions for Portfolios

- Develop Clear and updated design guides and standards
- Involve O&M staff and IT in the design process
- Create portfolio level value engineering initiatives for educational clients
- Address contractual reality (LPTA or DBB...)
- Allow for creativity where possible



The Indiana Album: Juan Francisco Collection

Questions?

