"SUSTAINABILITY" IN A HEALTHCARE SETTING:

RENOVATE OR BUILD NEW?

Peter L. Bardwell, FAIA, FACHA

Introduction

- "*Sustainability*" represents more than just energy efficiency in the built environment.
- It's about wise use of resources.
  - In a healthcare facility, those resources can also be measured in very human terms.
  - Among other driving factors, sustainability is a function of efficiency, safety, and competitiveness in a highly regulated, cost-driven marketplace.

Complex Issues And Hard Decisions

Complex Issues And Hard Decisions

- Given the challenge to deliver efficient, safe, competitive care in an outdated facility, healthcare organizations and their architects must be prepared to quantify the desired outcomes and the array of solutions leading to a decision to re-use or to build new.
- For many institutions, the extension of this process is, *"Do we just walk away?*

Complex Issues And Hard Decisions

- The issues are complex --- and the process of addressing those issues can be daunting --- but there are, in fact, methodologies that can be employed toward making that process as *objective* as possible.
- Foremost in that course of action is to define "*sustainability*" and to identify measurable desired outcomes from a renovation or new construction venture.

Success Measures

Success Measures

- *"The hospital's clinical and operational priorities come first".*

  Chris Press, President, Blanchard Valley Medical Center

- In order to achieve a truly sustainable building solution, planners and designers must understand the success measures of their clients.
- For healthcare organizations, those measures can include fewer adverse safety events, financial stability, shorter patient length of stay, decreased expenses, and growth in patient volume.

Success Measures

- But aren't those *operational* measures? Can an architect or an engineer contribute to the desired success?
- The answer, of course, is not only, "*Yes*" but also, "*We must*".
- Hospitals designed and constructed for earlier paradigms of patient care, staffing, and funding struggle to achieve the aforementioned success measures.
- In a published commentary on "*Can Better Buildings Improve Care and Increase Your Financial Returns?*" this author notes that in many current healthcare environments, "*the status quo … is unacceptable.*"

Success Measures

- A body of evidence is emerging that confirms that each of the previously-noted operational success measures is directly and/or indirectly affected by the physical environment.
- Design teams can and should play a far greater role in addressing the operational outcomes of their healthcare clients.

Success Measures

- But are those efforts compatible with efforts toward "*sustainability*"?
- Again, the answer is, "*Yes*".
- It's essential, however, to define the elements of "*sustainability*" in order to move forward successfully.

“Sustainability” Defined

"Sustainability" Defined

- According to the Sustainability Discussion Group of the American Institute of Architects (AIA), "*Sustainability envisions the enduring prosperity of all living things*", and "*Sustainable design creates communities and buildings that advance enduring public and environmental well-being.*"

"Sustainability" Defined

- Yet another effort on the part of the AIA, co-published by the Facility Guidelines Institute, is the widely-referenced *Guidelines for Design and Construction of Health Care Facilities (2006)*, which identifies the following basic components of sustainable design:

  Site selection and development

  - Waste minimization
  - Water quality and conservation
  - Energy conservation
  - Indoor air quality

"Sustainability" Defined

- The U. S. Green Building Council (USGBC) further identifies three broad areas to be addressed:
  - Environmental benefits:
    - Enhance and protect ecosystems and biodiversity
    - Improve air and water quality
    - Reduce solid waste
    - Conserve natural resources
  - Economic benefits:
    - Reduce operating costs
    - Enhance asset value and profits
    - Improve employee productivity and satisfaction
    - Optimize life-cycle economic performance
  - Health and community benefits:
    - Improve air, thermal and acoustic environments
    - Enhance occupant comfort and health
    - Minimize strain on local infrastructure
    - Contribute to overall quality of life

"Sustainability" Defined

- And the Green Building Committee of the American Society of Healthcare Engineering (ASHE) notes the manner in which building design and construction practice can be shaped to protect health at three scales:
  - Protecting the immediate health of building occupants
  - Protecting the health of the surrounding community
  - Protecting the health of the larger global community and natural resources

"Sustainability" Defined

- In its *Green Healthcare Construction Guidance Statement,* ASHE further addresses nearly 100 key strategies for integrating "green" principles into the design process within the following broad areas:
  - Integrated Design
  - Site Design
  - Water
  - Energy
  - Indoor Environmental Quality
  - Materials & Products
  - Construction Practices
  - Commissioning
  - Operations & Maintenance
  - Innovation

"Sustainability" Defined

- Lastly, one measure of sustainability is the "Carbon Footprint". A Carbon Footprint is a measure of the impact human activities have on the environment in terms of the amount of green house gases produced, measured in units of carbon dioxide.
  - A Carbon Footprint is, moreover, made up of the sum of two parts: the direct / primary footprint and the indirect / secondary footprint.
  - The primary footprint is a measure of our direct emissions of CO_2 from the burning of fossil fuels including domestic energy consumption and transportation.
  - The secondary footprint is a measure of the indirect CO_2 emissions from the whole lifecycle of products we use - those associated with their manufacture and eventual breakdown.

Renovate or Build New?

- Given, therefore, the depth and breadth of guidance on strategies for sustainability offered by the aforementioned leading organizations, should those strategies not lead to an unequivocal answer to our question of *"renovate or build new?"*
- The harsh reality is that institutions for healthcare delivery are complex --- and so are the answers.

Paradoxes

Paradoxes

- The complexity of the issues faced is a result of no fewer than two key paradoxes --- each the result of contrasting a *near*-term outcome with a *long*-term outcome.
- Returning to the earlier view of success measures from the institution's perspective, strong financial outcomes are imperatives.
- If, therefore, the single *near-term* result of a capital project to upgrade existing facilities were least costly, the solution would predict renovation --- *minimal* renovation.

Paradoxes

- And from a sustainability perspective, if one were to focus on the success measures offered above --- leading to a minimal Carbon Footprint --- again, the solution would *seem* to predict a minimal renovation.
- But --- it's not that simple.

Paradoxes

- If we were to take a *long-term* perspective and measure those same outcomes, we may arrive at a different answer.
- From the perspective of the healthcare institution, initial capital cost may represent less than 10% of a full life-cycle cost --- the majority of which is in labor --- and only a small minority of which is directly focused on energy consumption.
- And from a sustainability perspective, renovations may represent only a temporary Band-Aid, at best, toward achieving long-term reduction in the Carbon Footprint.

Paradoxes

- Perhaps the ultimate paradox --- and challenge --- lies in the aforementioned well-crafted *Green Healthcare Construction Guidance Statement*.
- Of the nearly one hundred strategies offered, two specifically recommend reuse and renovation of existing facilities. A cursory review of those strategies, however, could conclude that the primary means to achieve true sustainability is through new construction --- by a margin two to one!
- How, therefore, do we determine which alternative is best?

Measurement --- Addressing the Paradoxes

Measurement --- Addressing the Paradoxes

- Just as it was essential to define institutional success measures and to define sustainability, it is appropriate to define the range of physical solutions to a needed facility upgrade. In the broadest sense, therefore, there are no fewer than five approaches:
  - Renovation
    - large-scale *retention* of existing building systems
    - large-scale *replacement* of existing building systems
  - New construction
    - expansion of an existing facility *extending* an existing component
    - expansion of an existing facility *replacing* an entire existing component
    - replacement of an existing facility on a new site

Measurement --- Addressing the Paradoxes

- Importantly, as the following chart implies, any given programmatic predictor of area is *location dependent*.
- Depending upon variables including availability of existing space within or adjoining the department to be upgraded --- and including the suitability of the existing space for renovation --- the actual square footage involved can vary dramatically.

Measurement --- Addressing the Paradoxes

- In the following example, for a hypothetical predicted additional need of 500 Departmental Gross Square Feet (DGSF), the actual resultant Building Gross Square Feet (BGSF) may range from 700 SF (for an expansion and related infrastructure requirements to *extend* an existing department) to over 3,000 SF (for an expansion and related infrastructure requirements to *replace* an existing department).
- Notably, in some instances, to build new predictably requires *fewer* square feet than to expand and renovate --- predicting a cascading series of outcomes (in site, building, and human terms) that arguably reduce the Carbon Footprint.

Measurement --- Addressing the Paradoxes

The following numbers are simply **EXAMPLES** of how predicted new and renovated areas are a function of location.

				Available adjoining interior space	X	X			
				Available adjoining exterior space			X		
				Ability to expand incrementally	X		X		
				Existing space suitable to be retained	X		X		
				Renovate or Relocate	Minor Renovation	Major Renovation	New Expansion (Extend Existing)	New Expansion (Replace Existing)	New Replacement (Freestanding)
	Current SF	Projected SF by Program	**Net Apparent Add**	➔	**Potential Actual Add**				
Target Area	1,000	1,500	**500**		500	1,500	500	1,500	1,500
"Trickle-down" (replacement of adjacent space)					500				
"Trickle-down" (backfill of vacated space)								1,000	
"Trickle-down" (impact on Building Gross SF)							200	600	600
					Resultant SF to which $s are applied				
Total New							700	2,100	2,100
Total Renovation					1,000	1,500		1,000	
Grand Total SF					**1,000**	**1,500**	**700**	**3,100**	**2,100**
				Resultant Conceptual Multiple of Incremental Need	2	3	1.5	6	4

Measurement --- Addressing the Paradoxes

- *"Some rules of thumb must be altered when considering whether to renovate existing facilities or embark on new construction."*
- *"The old rule of thumb was that expansion of departments into adjacent areas was the most cost-effective alternative. The new rule of thumb is that new construction is often the best solution. In fact, new construction occurs in 50 percent of cases involving primary outpatient and ancillary departments and nursing units."*

Gary Vance of BSA LifeStructures in the 2006 issue the (AIA/AAH) *Academy Journal*

Measurement --- Addressing the Paradoxes

- And, again, it may be helpful to restate the range of institutional measures of success:
  - Least initial cost (capital cost only)
  - Least long-term cost (capital cost and ongoing operational costs)
  - Least time to occupancy
  - Least disruption to existing operations (lost staff efficiency, lost market share)
  - Increased patient satisfaction
  - Increased patient/staff safety
  - Increased staff productivity
  - Increased staff/physician recruitment/retention
  - Increased market share

Measurement --- Addressing the Paradoxes

- Using the aforementioned criteria, it is then possible to evaluate a wide range of options relatively quickly and --- importantly --- relatively objectively.
- Yet another tool available to evaluate these criteria is shown below. In this example (which can be used as a real-time tool available to be downloaded from www.bardwellassociates.com), a series of attributes can be introduced and assigned ranks and weights. Each alternative can then be scored on three planes independently:
  - the institution's stated operational success measures (from above)
  - sustainability goals (with weight assigned)
  - initial capital cost goals (with weight assigned)

Measurement --- Addressing the Paradoxes

Favorable Attributes	Rank (1 - 10)	Weight Factor	Minor Renovation	Major Renovation	New Expansion (Extend Existing)	New Expansion (Replace Existing)	New Replacement (Freestanding)
STEP ONE: Completed previously in Part 1 to determine attributes for ranking and scoring			**STEP THREE: For each Site and each Attribute, enter 1 through 5 below with 5 being the most favorable ▼**				
STEP TWO: Completed previously in Part 1 to determine ranking and weight factor							
Least initial cost (capital cost only)	2	5	5	3	3	2	3
Least long-term cost (capital cost and ongoing operational costs)	1	5	2	2	3	4	5
Least time to occupancy		1	5	2	2	2	2
Least disruption to existing operations (lost staff efficiency, lost market sh	3	4	3	2	3	4	5
Increased market share	4	4	2	3	4	4	4
Increased staff productivity		1	2	3	3	4	5
Increased staff/physician recruitment/retention		1	2	3	4	4	4
Increased patient satisfaction		1	2	3	4	4	4
Increased patient/staff safety		1	2	3	3	3	5
Other:							
Other:							
SUBTOTAL based upon **operational goals**			68	59	74	74	96
			4	5	2	2	1
			WORST				BEST
STEP FOUR: Assign a weight factor of 1 through 10 with 10 being the most favorable ▶							
STEP FIVE: For each Site, enter 1 through 5 at right with 5 being the most favorable site ▶		Weight Factor	Minor Renovation	Major Renovation	New Expansion (Extend Existing)	New Expansion (Replace Existing)	New Replacement (Freestanding)
Favorable impact on **sustainability**		8	3	2	3	4	5
TOTAL			92	75	98	106	136
			4	5	3	2	1
			WORST				BEST
STEP SIX: Assign a weight factor of 1 through 10 with 10 being the most favorable ▶							
STEP SEVEN: For each Site, enter 1 through 5 at right with 5 being the most favorable site ▶		Weight Factor	Minor Renovation	Major Renovation	New Expansion (Extend Existing)	New Expansion (Replace Existing)	New Replacement (Freestanding)
Favorable **construction cost**		10	5	3	3	2	2
TOTAL			118	89	104	94	116
			1	5	3	4	2
			BEST			WORST	

The accompany numbers are simply **EXAMPLES** of an evaluation process

Measurement --- Addressing the Paradoxes

- As noted earlier --- operational goals, sustainability goals, and initial capital cost goals may predictably not align.
- The true value of the exercise, nevertheless, is to promote dialogue, deeper investigation of alternatives, and more informed decision-making.

Measurement --- Addressing the Paradoxes

- Importantly, this deeper investigation may dispel notions that sustainability initiatives are costly --- evidenced in a recent McGraw Hill survey sponsored by Turner Construction Company, Johns Manville and the U.S. Green Building Council.
- The report, based on a survey of 95 health care executives, indicates that many executives perceive sustainable building as costly endeavors without significant return on investment.
- Paradoxically, more than half of the respondents consider the lack of information about sustainability to be the biggest hurdle in the effort to go green.

Measurement --- Addressing the Paradoxes

- Fortunately, however, with each new "*green*" project, the body of information increases.
- "*We feel, as a result of our experience on Dell, that this can be accomplished at no additional cost to a project.*"

Tom Snearey, AIA, LEED AP, referencing LEED Platinum recipient, Dell Children's Hospital in Austin

Measurement --- Addressing the Paradoxes

- And the question of build new or renovate has an added dimension, offers.
- *"Generic or 'universal' design concepts for new construction can allow flexibility to limit the extent of inevitable future renovations."*

  Mike Haemmerle, PE, LEED AP of Korda/Nemeth Engineering

Conclusions

Conclusions

- Again, sustainability as applied to a healthcare facility is more than simply the achievement of a "*green*" building.
- A truly sustainable solution extends to the long-term measures of success for each given institution.

Conclusions

- The decision to renovation or to build new must address a broad range of characteristics and targeted outcomes --- and the answers will be unique to each project and each institution.

Resources

Resources

For additional information, readers are referred to the following:

American College of Healthcare Architects (ACHA): www.healtharchitects.org

American Institute of Architects, Academy of Architecture for Health (AIA/AAH): www.aia.org/aah

American Institute of Architects, 2006 Guidelines for Design and Construction of Hospital and Health Facilities: www.aia.org/aah_gd_hospcons

American Institute of Architects, SustAIAnability 2030: www.aia.org/susn_default

American College of Healthcare Executives, Health Administration Press, *Frontiers of Health Services Management*, "Can Better Buildings Improve Care and Increases Your Financial Returns?", Volume 21, Number 4, Fall 2004. http://www.ache.org/pubs/frontiers.cfm

American Society for Healthcare Engineering (ASHE): www.ashe.org

American Society for Healthcare Engineering, Green Building Committee; *Green Healthcare Construction Guidance Statement:* www.premierinc.com/quality-safety/tools-services/safety/topics/construction/downloads/ashe-guide-sustain-const-rev02-0410.pdf

Center for Health Design: www.healthdesign.org

Green Building News, Emlen Publications, www.greenbuildingnews.com

"The Health Care Green Building SmartMarket Report", McGraw Hill Construction: http://construction.ecnext.com/coms2/analytics

"Factors of Sustainability", Peter L. Bardwell, *Health Facilities Management* magazine, September 2007: www.hfmmagazine.com

U.S. Green Building Council (USGBC): www.usgbc.org

Resources

Acknowledgements

The author wishes to acknowledge the significant contributions of the following individuals:

Mike Haemmerle, PE, LEED AP – Korda/Nemeth Engineering, Columbus, Ohio

Roger Himes – Turner Construction Company, Columbus, Ohio

Chris Press, FACHE – President, Blanchard Valley Medical Center, Findlay, Ohio

Tom Snearey, AIA, LEED AP – Anshen + Allen, Columbus, Ohio

Gary Vance, AIA, ACHA, LEED AP – BSA LifeStructures, Indianapolis, Indiana

PETER L. BARDWELL, FAIA, FACHA

Principal
BARDWELL+associates, LLC
Columbus, OH

614-239-1639
pbardwell@bardwellassociates.com
www.bardwellassociates.com

With over 30 years of experience exclusively dedicated to healthcare planning and design, Peter Bardwell is honored to be among fewer than 40 practicing architects nationwide to have been named a Fellow in both the American Institute of Architects and the American College of Healthcare Architects. In addition to serving as 2008 President of the national AIA Academy of Architecture for Health, he serves in leadership roles on the Academy Foundation Board and on the Board of Regents of the American College of Healthcare Architects.