

An abstract graphic in the top left corner of the page. It features a large, light gray circle. A thin line extends from the bottom of this circle to a smaller, medium-sized light gray circle. Another thin line extends from the right side of the large circle to a medium-sized light gray circle. From this medium circle, three more thin lines extend to three smaller, small-sized light gray circles, one above, one to the right, and one below. The overall effect is a network-like structure of circles and lines.

## **Building Design to Improve Outcomes**

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## **Abstract:**

### **OBJECTIVE**

The building is one of the most instrumental components to the success of a business and the occupants that strive within it. As we spend more than 90% of our time inside, the building is one of the most important, and largest, single investments a business can make (EPA, 93-007). Just as a critical piece of equipment is necessary to the operations of a business, the building itself should perform and meet the criteria of the business. Since the 1960's, Post-Occupancy Evaluations have been used as a tool to help identify the human aspect of the built environment and add a standard rigor to the evaluation of a building's performance (Preiser, 1989). Society has become accustomed to measuring success and encouraging lean processes, which has led to increased pressure for immediate outcomes. The rapid changes and new developments in technology and industry have created a faster pace of change than ever before. This new focus on the built environment, the pervasiveness of measurement, and the pace of change are requiring new ways of understanding "success." Success can be measured both directly and indirectly. While economic factors are still strong indicators of success, there are "softer" measures that can also indicate success – such as satisfaction and engagement. A major benefit that we have added to the anticipated outcome of the POE is that it can help us identify financial as well as "softer" measures of success.

Finding new ways to measure success and apply it to the field of healthcare is at the heart of a new field called Evidence Based Design (EDAC, 2011). Researchers in this field are taking the time to rigorously study how the built environment is impacting the people who inhabit it. The Post-Occupancy Evaluation (POE) is re-emerging as a useful tool to help create a systematic method for measuring the effect of an environment on its occupants, blending social and behavioral science into the more technical realm of built environment science. Building performance must be examined not just technically but functionally and behaviorally. With the continued push towards sustainability and the superior efficacy of the workforce, we are seeing a much greater need for the alignment of a building to its functional purpose than ever before.

We will discuss using the POE as it specifically relates to the staff and the relationship to the business – aligning the product to the function. We are operating under the assumption that if we improve the staff then we ultimately

improve patient care. A case study is provided in which we demonstrate findings in three areas:

1. Staff satisfaction
2. Wellness and sustainability
3. Business performance through staff

We will make the case that the POE is a good tool for owners, consultants, and researchers, as well as noting where the tool needs refinement. POE helps demonstrate healthcare environment success, problems, and misaligned priorities, and it is able to do so in an ongoing and flexible manner. In a world of rapid change and compounded problems, we need a tool that will continually help to evaluate and modify our processes. The POE is one such tool.

## Methods

The goal of this study was to identify ways in which the Post-Occupancy Evaluation (POE) can help hospitals identify success, concerns, and unexpected trends specifically relating to culture, staff, and wellness. A literature review of peer-reviewed journal articles and research reports provided guidance on how such measures are typically gathered, as well as their impact on the overall success of a hospital system. A partnership was formed between Enviah and Saint Mary's Health Care in Grand Rapids, Michigan to use several recent building projects as case studies. Quantitative data from hospital throughput logs, Press Ganey surveys, and the H-CAHPS survey was collected. In addition, qualitative data in the form of interviews and quotes, as well as secondary sources such as hospital business plans and strategy documents, were analyzed. Statistics were performed on the quantitative data, with levels of 0.5 listed as statistically significant.

## Key Findings

1. Reflection is essential to identifying real business performance.
2. Growth of a program can be done through staff and process optimization without necessitating additional space.
3. There is an ambiguity between the pre and post evaluation. An ability to support the transition/immediate returns cannot be expected during the ambiguous period. Hearing from the occupants through comments, rather than from hard measures, is the best way to identify needed improvements.
4. Not all metrics improve as expected, but outcomes overall are better in the entire program. Tools must be more nuanced to pick up on the cultural and

behavioral aspects – only then will the environment be truly understood.

## Introduction

Healthcare systems and facilities are continually challenged with changing practices and variations in volumes. The new economy has supported a perfect storm of changes: consolidation of services and facilities, various health systems mergers, new acquisitions, new measurements of performance and reimbursement with CMS meaningful use and value based purchasing, the continuing emergence of evidenced based design and it's impact of the environment, the aging of the Baby Boomers, increased demand in experience-based healthcare, excess building capacity, and an ever changing environment. To weather these changes, knowing how to create performance is crucial. Understanding how to identify the measures, and validate that those measures perform, will be essential to an organization's ongoing success.

Healthcare business planning is always a part of the process of identifying a need for healthcare design within a specific department. Typically, this is a precursor to the identification of the need to expand a department to allow for growth or secure more revenue. Metrics are established for target volume, market share, and overall growth during the business planning process. These items need to be translated and reflected upon to determine if they will really provide overall improvement to the organization.

The architectural design process historically includes identifying space based on volume, defining peaks, and building space to support that need. In the last decade, architectural work has begun to shift away from the more traditional planning models of Chi and Dickerman (Dickerman et al, 2008) to a model which focuses on operational and evidence based planning. Traditional models also factor in operations but always use space to resolve any issues. Recent studies have been looking not just at space but how that space may impact a specific desired outcome, for example medical errors or worker injuries. There has been a shift in the industry, especially in the new economy, which warns we will not be able to build our way into improvement. To really make an improvement, businesses must look at overall operations. Operational assessments through LEAN and Six Sigma are just a few tools that have taken hold in the healthcare planning process. However, this process rarely ties itself to the business performance plan, nor does it identify ways to demonstrate that overall operations have been improved.

Once a space has been newly built or renovated, a frequently missing

component is the ability to evaluate the environment and retrain the staff to work in the new environment in the most effective manner. The staff and patients will hold onto their habits from the old environment and modify them to fit the new, creating workarounds that do not align with intended operations. Taking the time to evaluate the space post-occupancy is imperative in confirming that the space is performing as designed— in a sense, the built environment must be commissioned. Without continued evaluation and training, the space will not perform optimally. Evaluation, along with a clear understanding of the intended internal operations and business performance, is therefore a cornerstone to success (Sadler & Zimring, 2008).

Financial first-cost thinking, or the cost-effective approach, can affect the anticipated outcomes. Executives push to have outcomes anticipated within six months of occupancy. Often, the impacts of a new space will not be demonstrated in improvements until the second or third year of occupancy. The impacts can vary from unanticipated benefits, to reduction in work related injuries or reduced medical errors. The Post-Occupancy Evaluation may initially identify that there could have been a failure based on the environment. However, the purpose of the POE is not to identify failure but to identify possibilities for continual improvement. The work of the Center for Health Design is aimed at demonstrating the importance of the environment and how its impact on an occupant can be monumental. For example, the Sound Sleep study illustrates the importance of noise control in healing environments in order to reduce stress and improve outcomes (Anjali & Ulrich, 2007).

Saint Mary's, a member of Trinity Health, is a culture-based organization that strives to achieve continuous improvement. During recent renovations many departments were reviewed in the hopes of refining operations. Departments identified and reviewed include: Outpatient Surgery, Surgery, Family Birthing, PET/Nuclear Medicine, Emergency Department, Intensive Care Inpatient Unit, and the Neurosciences Inpatient Unit.

This report will cover several renovations at the Grand Rapids and Muskegon campuses of Trinity Health. We looked at several departmental renovations, from small remodels to entire newly constructed departments. The overview of the various departments will help to identify the importance of Post-Occupancy Evaluations and the need for continued improvement.

The key is to empower staff, and the analysis of culture and behavior is the missing link.

## **LITERATURE REVIEW**

### **New Focus**

In the arena of evidence based medicine, the design field has finally begun to answer the oft repeated question of many clients; why? We now have a field that is attempting to answer this question, with over twelve hundred credible studies on how an environment can impact its occupants. The Center for Health Design states “The purpose of the work is to create change in the healthcare industry by providing researched and documented examples of healthcare facilities whose design has made a difference in improving patient and staff outcomes, as well as operating efficiency” (CHD, 2011). Currently, these studies have been created by working from a system of identification of hypothesis and then combing the evidence that is available in the area. They then take time at the conclusion of the project to evaluate the impact and success of the outcomes.

### **New Policy**

The role of sustainability in healthcare has taken center stage in regards to policy, with the recent release of LEED for healthcare and The Green Guide for Healthcare (GGHC, 2011).

### **BPE and POE**

The Building Performance Evaluation (BPE) is a systematic way of evaluating a building from strategic planning to occupancy, through the creation of a feedback loop in areas that impact human interactions and their performance. Performance levels of the human interactions and the environment were further defined through the three priority levels below. This assimilation of requirements were formed by some of the leaders in multiple fields of study – Lang and Burnette (Lang et al, 1974), Preiser (1983), Visher (1988) and Vischer & Preiser (2004). They are:

1. Health, safety, and security performance
2. Functional, efficiency, and work flow performance
3. Psychological, social, cultural, and aesthetic performance

The Post-Occupancy Evaluation got it's name from the permit that was issued

at the time of occupancy (Bechtel 1980). Beginning in the 1960's as a result of major issues in mental health hospitals and prisons, people began to look not only at a building's infrastructure but at the health, safety, security, and psychological effects of the building on it's occupants (Preiser, 1989). Building analysis through the use of Post-Occupancy Evaluations was the process by which feedback was obtained, through user surveys and interface with the occupants.

## Case Study

Two year Case Study: Saint Mary's Hospital, Grand Rapids, Michigan

In collaboration with Thomas Stankewicz, Director of Strategy and Innovation for Trinity Health West Michigan

- Strategic Planning
- Seamless Care
- Changes in Environment
- Operational Excellence/LEAN
- Employee Empowerment
- Sustainability/Green Commitment

Evaluative Measures	%Change	System Change
Physician Engagement Satisfaction	4.2%	new facility, staffing change, business
Physician Overall Partnership	6.3%	new facility, staffing change, business
Patient Satisfaction		
Overall Rating of Care	146.9%	Environment, Staffing, and Operations
Likelihood to Recommend	23.6%	Environment, Experience
Technology Productivity	10%	Business operations
Quality – Error rates	50%	Operational process, space and noise
Productive hours per unit of service		
Volume	7.6%	Business Market
CM/Case \$	7.7%	Business Market
Healing Environment	80%	Noise, Views, VOC's
Revenue per SF	20%	Business and Environment
Distance walked to deliver Care	50%	Operational Process/Environment
Distance walked to receive Care	10%	Universal private room
Inventory	15%	Par level stocking

## Staff Findings

Staff members are the key operators of the system in a hospital. If the staff does not have the ability to see workarounds occurring, then there will be no opportunities for continued improvement. As described in *Assessing Building Performance* “evaluation contains the word value” (Preiser & Visser, 2004). This inherently means the objectives and goals of all users of the facility need to be the focus of scrutiny. Looking to establish environments of care that support operations and occupants is crucial to success. Teaching occupants the intended outcomes and allowing them to help modify the system in order to reach the anticipated outcome is very important.

Measuring how and when staff are able to create workarounds, whether they understand the intended outcomes, and whether they feel empowered to modify the system is difficult. The POE provides one lens through which to measure staff satisfaction, as demonstrated in the following case study. In addition, qualitative data from open-ended staff questions on satisfaction, interviews, and focus groups provide additional insight. One benefit of the POE is its ability to point out significant trends. If POEs were administered regularly and staff satisfaction was to suddenly drop, these deeper qualitative methods of understanding could be immediately deployed to ensure that the negative trend does not impact other areas of measurement, such as patient satisfaction

## Physician Engagement and Satisfaction

Saint Mary's has partnered with Press Ganey to measure physician engagement and satisfaction over the last several years. Surveys were conducted in 2008 and 2010 among all active and active affiliate physicians on the medical staff. Overall, Saint Mary's results improved significantly in virtually all areas, including the overall partnership score (a roll-up of all core survey items), overall physician satisfaction score (roll-up of those items measuring satisfaction), and overall engagement score (roll-up of those items measuring physician engagement). Specific Emergency Department physician results are presented (refer to table) and indicate that while their overall partnership score increased slightly in 2010 over 2008, their overall satisfaction score increased significantly. Results among Neurologists and Neurosurgeons increased significantly in many areas in 2010 compared to 2008. In particular, overall partnership scores and overall engagement scores increased significantly.

## Patient Satisfaction

Saint Mary's new Emergency Department opened in the end of February



2009. For the 12 months (March 1, 2008 to February 28, 2009) prior to its opening, patient satisfaction for two key metrics – Overall Rating of Care and Likelihood to Recommend- were at the 44th and 57th national percentile rankings (per NRC+Picker National Database). Patient satisfaction, for similar metrics, during the first full 12 months post opening (March 1, 2009 – February 28, 2010), measured using Press Ganey’s survey and benchmarking against the Press Ganey national database, were at the 60th (Overall Rating of Care) and 70th (Likelihood to Recommend) percentile. Given the change in survey vendors during the time period, we have been careful to review the results as proxy estimates and feel substantial improvements were made. This is further supported by the qualitative feedback received from patient comments.

Saint Mary’s new Neuroscience Inpatient Unit also opened the end of February 2009. For the 12 months (March 1, 2008 to February 28, 2009) prior to its opening, patient satisfaction, as measured by the H-CAHPS survey for two key metrics – Rate Hospital and Would Recommend – were at the 62nd and 58th national percentile rankings (NRC+Picker National Database). Patient satisfaction, for similar metrics, during the first full 12 months post opening (March 1, 2009 – February 28, 2010) using Press Ganey’s survey and benchmarking against the Press Ganey national database were at the 90th (Rate Hospital) and 80th (Would Recommend) percentiles. While Saint Mary’s changed survey vendors during the time period, using the standardized H-CAHPS survey allowed us to compare performance as we employed the same methodology for both surveys. Significant improvements were made – this too is further supported by the qualitative feedback received from patient comments.

## **Business Findings**

### **Volume Growth and Productivity**

Total emergency department volumes have increased substantially (9.6%) since the opening of the new center – some may be attributed to shifts in where patients are receiving care given the economic climate in the state of Michigan. Given the number of Emergency Department visits among all Grand Rapids hospitals, it appears that a substantial portion of volume growth can be attributed to the new center. In addition, productive hours of service per unit of service decreased from 2.54 to 2.40 (a good thing). For neuroscience and spine services combined, inpatient volumes declined by 5.9% and productive hours per unit of service increased from 9.24 to 10.81. Relocation out of

the area of one neuro-spine surgeon contributed to the volume decline (we anticipated more) and the increase in productive hours per unit of service occurred due to higher acuity inpatients and the desire to improve the patient experience and service.

## **Key Findings**

### **The Pros and Cons of the POE**

**Pros** – Often the necessary numbers are already being collected, so even owners can do a POE internally. The numbers speak to what the stakeholders find important. The POE is a fairly quick and easy assessment. The tool works in two beneficial ways – it can be used to spot problems/successes (when you notice the numbers have changes), or backwards to allow you to ask the right questions to explain problems/success (when you look into the numbers for more specific information or ask the staff why they believed the numbers dropped). The POE is agile and quick – healthcare is constantly changing and agility is necessary in the environment to adapt to the changes. As it is refined, the POE could be used to educate owners about the many variables that contribute to the success of our hospitals – thus linking it back to Evidence Based Design and the new movement that aims to understand the built environment.

**Cons** – The POE measures some variables better than others. Staff satisfaction surveys are fairly standard, but how do you measure other, more difficult aspects? There are often multiple variables, and the real correlation is hard to extract based solely on one tool. To be most efficacious, the POE would need to be paired with other evidenced based tools. In order to be properly executed, the POE requires commitment from the staff in charge of the data as well as executives. It is a surface-level view without nuances and requires interpretive aid by people intimately familiar with the situation in question. The POE cannot be simply thrown onto a web survey, filled out, and provide an instant “answer.” Variables are often too different for simple evaluation and must be paired with other tools (such as ethnography and interviews).

### **Need for Refinement/Research/Improvement**

The POE could possibly be improved through the creation of a toolkit. Past examples from owners, consultants, and researches could provide insight as to what “triggers” to watch for, and these examples would also provide

indications that the POE is a powerful tool. For example, if your numbers stay the same through pre and post-occupancy evaluations, you can identify what was changed (new staff workstations, for instance) and note that there was not a correlated, positive change in staff satisfaction. The problem then becomes how you deal with this disparity after it is identified by the POE. It necessitates the development of other evidence based design tools that can be used in conjunction with the POE.

## **Measuring the many variables of success**

There are many variables, both financial and “soft,” that play into the outcomes and success of an organization. The potential of the Post-Occupancy Evaluation as a tool is great, but it needs refinement. Reflection is the key to improving business performance. In healthcare, there is an urge to show a return on investment within six months to one year. However, many changes can take several years to be fully understood. The POE can provide yearly snapshots, showing these incremental changes over longer periods of time.

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