

Interview: Industrial Engineering in Healthcare Facility Design, Brent Petersen

Tell us about your background and how your got involved in facility design?

Well, for one, my Dad's an architect, so growing up I was always on a job site, playing with colored pencils, shooting rubber bands, tracing stencils or hitting my sisters with t-squares and triangles. Couple that with a love of Lego's and you have an architect in the making. Except for one minor thing, the University of Iowa didn't offer the program. No offense intended to my Iowa State brethren. So, I checked the box that said engineering. As college progressed, I moved from chemical to industrial with a brief stint in liberal arts. I was introduced to a management engineer at the University of Iowa Hospitals and Clinics the latter part my junior year. That spring, I interviewed with their department for a summer internship. I made the cut and spent the next two years supporting a number of improvement initiatives including a few capital expansion facility projects. University of Iowa Hospitals and Clinics was a test for a healthcare computer simulation application and I guess I really took to it, helping the planning architects with flow, sizing and the staffing component. I stepped up to a full-time position upon graduation where I continued to be actively involved in a few more expansion projects before I was courted to Minneapolis by an architecture and engineering firm. Then I learned the business on the consulting side, using modeling tools and process understanding to support design and planning. I've been at it ever since, from corporate and manufacturing environments to libraries back to my original specialization in healthcare planning.

How common is it for industrial engineers to work for architecture firms?

Industrial Engineering is not a traditional building engineering service. In our 550+ person national firm we only have three IE's. In the Twin cities where I came from, a few of the firms might have relationships with IE specific consultants, but few bring them in house. Much of that is changing. With the advent of "lean" in the healthcare arena, many of our customers have just started to hear of the philosophy's application and successes. Some are touching their toes into the water and want guidance. Others are already in and are looking for an interpreter to connect the dots synergistically between lean process and design. So instead of swimming up stream to stake our ground as we have had to do, clients and the proposals we respond to have called us out as a valued differentiator. I'd like to think we are ahead of our competition, but that distance between them and us will shrink as more and more customers and the architectural principals that serve them see the value of our contributions in cultural transformation and the resulting functionality in the buildings we design.

How are you able to add value for clients?

We have fundamentally changed the way we plan and design buildings. Following the principles of lean, in healthcare specifically, we start everything with a deep understanding of the patient and family experience. In fact, we just kicked-off 150 staff, physicians and community members on eleven different patient experience teams to interview, shadow and gather insights into what customers find exceptional in their healthcare journey. So, before we even talk process, we sense for the voice of our customers. Then we dive straight into current state. We use value stream mapping tools to understand where our strengths and gaps are in the process response. We provide our process teams with leading research in care delivery and safety as it relates to design to get them seeing beyond their walls. We structure conversations outside of the traditional department silos, so support areas understand the impact they have on a service line's success. And we bring it all together with a future state value stream complete with an action plan to deliver the design vision all before we put our pens to paper. If you know a Toyota A3, you know the progression. Know the problem first, create the vision where you want to go, set metrics so you know when you've arrived, see the gap and work the problem. In many cases, front-line staff is not given the opportunity to see differently. Fear of change resists innovative thoughts. That's our value proposition, get our customers learning to see first, use metrics to deliver outcome driven solutions and plant the seeds of cultural transformation. And by the way, build a high performing and incredible looking result.

What are some of the bigger (or more exciting) healthcare projects that you have been working on?

SSM St. Clare's, Fenton, MO – Moved us with the patient experience. This was our first major foray into the patient experience. We charged their staff and physicians to bring back the fundamental attributes of the ideal patient experience, creating a culture along the way that fosters creativity and innovation. I personally led a group of eight planners and hospital administrative interns in performing a current state assessment of 20+ department services, including process flows, shadowing and spaghetti mapping. At SSM we planted seeds for the pre-design process, which we follow today. This 158-bed replacement hospital project is well into the construction phase and opens in the second quarter of 2009.

Virtua Health, Voorhees, NJ – Taught us the power of lean. Those seeds took root with Virtua. We integrated our planning process with their lean and six sigma teams in collaboration with GE healthcare. We used photo journaling by staff and sensing teams from the six-sigma group to gather insights into the voice of the customer. We used high-level flow maps created by GE and Virtua's internal lean team to evaluate patient and staff motion across interdepartmental relationships in what we call the "extreme" schemes phase of the master planning effort. They taught us tools to frame problems and "force-rank" alternatives.

As a part of the schematic design phase, Virtua prepared mini-kaizen toolkits for our planner groups with current state value streams, spaghetti maps, swim-lane flows and a high-level pain point assessment; helping the design team participants leave convention behind. This 400-bed replacement hospital is scheduled for opening towards the end of 2010.

Sutter Health, Prototype Competition, Sacramento, CA – Changed the way we think with some really BIG metrics. We are in the intermediate design phases of the first Sutter Prototype adaptation for Sutter Elk Grove. We were a part of a three team “Co-opetition” for Sutter Health to design a 60 to 120 bed sustainable healthcare platform of the future. As a part of the competition, Sutter provided five metrics of team evaluation:

- Improve Workflow per adjusted patient discharge by 40%
- Reduce Aggregated Clinical Procedure Cycle Times by 50%
- Reduce Area per adjusted patient discharge by 30%
- Reduce Natural Resource Use per adjusted patient discharge by 25%
- Reduce Time to Build by 50%

Teaming with our partners at Virtua, our submission, in theory, accomplished the goals and actually delivered a facility program over 35% smaller per adjusted discharge than the benchmark. We are now adapting the Big Ideas of the prototype to the unique service needs of the Elk Grove customer and accompanying site, moving the theory into actualization of the BIG metrics.

Has lean changed how people are looking at hospital design?

The answer is “profoundly, yes”. We have been working with ThedaCare in Appleton, WI for years. They are in year four of their lean journey and are having huge success in sustaining results in productivity increases and defect reduction. The reason behind it all is simple; leadership is investing in a philosophy of thinking, not just a set of tools. Lean pulls all the pieces together from patient safety to motion to inventory management to reduction of space. Look at the metrics Sutter set down as the challenge. As we dive into the value streams you see all the connections between the patient experience, the care model, waste, people, technology and the physical environment. Once our customers learn to communicate within this philosophy, change and innovation happen. They see the connections. They see the opportunities. And what was once, “my work space” is now being designed as “my patient’s space”. That’s a compelling change in thinking around the voice of the customer and a simple philosophy of eliminating waste.

What are some examples of lean concepts that are being designed into healthcare facilities?

To answer this question I'll try and use four big buckets:

- Design and delivery
- Technology
- Operations
- Design of space

We are designing lean into our product development process learning from the Toyota knowledge based design system (KBD). In KBD, we use set-based alternatives as we move through the design process, collapsing the sets in integration events with our content experts. In doing so, we gather the essence of each challenge to learn from in future efforts. We are integrating lean thinking into the construction process using contractual agreements known as integrated project delivery (IPD). In IPD, we are using contracts that share responsibility for performance and rewards between the owner, constructor and the design firm to minimize the hand-offs, design to targets, pull the schedule, increase the speed of communication and shift work to the appropriate resource player to optimize the whole of the value stream.

As it relates to actual design components, on the technology front, the electronic medical record is a big enabler of process change. There are other technology tools in voice recognition, patient status and location tracking, hands-free communication, virtual monitoring that enable process. All these technologies show up in the value streams everywhere, from patient access, to registration, to care delivery to post-care transition. This technology provides information real-time, in more places at once, attacks batching practices, makes status visible and captures the data to report our results to the metrics we set.

From an operations standpoint, organizations are moving caregivers to positions of their highest clinical value. The collaborative care unit at ThedaCare is just one example of moving the nurse from a primary provider of care to a collaborative value stream owner of a patient's evidence based medicine care plan. We are seeing many activities moving to the point of care. Imaging modalities, point of care specimen collection and testing systems and treatments are moving to the bedside. Medications, materials, linen, protective gear, charting systems are becoming no farther than 5-seconds away from the caregiver and their patients. This eliminates waste and the opportunity for interruption and distraction, one-piece flow if you will. Supply chain strategies are another major operational driver. Inventory, transportation, overproduction and over processing are big generators of waste in healthcare facilities. From lab and pharmacy to materials and even dietary services, a lean supply chain is essential in the design of a lean hospital. All of these concepts are directly related to throughput.

Moving more patients, materials and/or products through the same space with less adverse events, building in quality outcomes is happening in lean organizations across the county.

So, finally get to what we do, design the platform for care. In the Sutter prototype and Elk Grove adaptation we incorporated a universal care platform with private standardized rooms that can shift with the day's needs from pre and post surgical recovery, outpatient diagnostic testing, outpatient infusion or procedural treatments, direct admission assessments, ED admission observation, to peak ED overflow capabilities.

We created a time flexible environment using interdisciplinary care teams dedicated to specific patient populations to deliver the care. On the inpatient front, the patient rooms are designed to accommodate a host of point of care diagnostics and treatments, and storeroom side medication, supplies, equipment and information. Support items are room based and kitted based on a specific patient's care needs linked back to the evidence based care plan. At this project's bed level, we kept everything one-story to eliminate needs for vertical circulation saving space, saving time in waiting for elevators and brought nursing units into a more physically integrated configuration to enable staff sharing across units to address variable census demands. The logics platform is located in closet proximity to surgery and the supply chain components to minimize the distance of the high-volume distribution system.

What would you like to tell students interested in your line of work facilities?

The four attributes I'll look for in my next hire are 1) passion, 2) marketability, 3) creativity, and 4) a unique perspective. We are fish out of water in a traditional sense, so the value proposition has to be that more compelling to our customers. That requires passion to get you through the traditional barriers of "what do you do again?" Think about it, we are not the core competency of our firm. We as a group may add 1% directly to our gross revenue stream, but through the contributions of our efforts we positively impact the firm up to 10 to 20 times that. And that's just the start.

Marketability is fundamental. In our business, we have to communicate, coach and lead. Facilitation is a big part of what we do. This requires getting people you just met to believe in you and follow in the direction of the vision. Whether you are interviewing for the project, kicking-off your first event or working through an action plan, you have to be able to sell your passion and make change happen.

Creativity is everything in the design of systems. Start to think of all the sub-components involved in healthcare design. The physical response is just one small piece. We have to consider people, process and technology too. So, on-the-fly creativity is an absolute must.

Ask yourself how great could it be, how might we do this differently, ask why, why, why at least five times, think “fail often to succeed sooner”, to see it and approach it in a different light.

We all found our calling in process improvement a different way for essentially the same reasons. We have a blend of creative and analytical talents and we yearn to know how all things could work better. Although sharing the same vision, our perspective is unique and different from the architects and planners we work with. We have skill sets, training and tools they don't have. The key is collaboration and teamwork. Our perspective naturally builds on the ideas of others. The synergies are right there.

For whatever reason, the buildings we design become symbols for change. For many of our customers, a new hospital is a one-time investment in the community. A legacy if you will for the hospital boards we work with. This symbol, however, has a deeper connotation. It is not only a beautiful object; it is a place where lives of everyday people are changed, a place where caregivers are heroic every day. Our talents and solutions we help create directly affect that outcome. So, if you played with a lot of Lego's as a kid and see the building beyond its physical presence, your passions might be best satisfied in our line of work.

Resume, Brent Petersen

BSIE University of Iowa, 1994

ME Internship, University of Iowa Hospitals and Clinics, 1992 -1994

Management Engineer, University of Iowa Hospitals and Clinics, 1994 -1996

Industrial Engineer, OSM and Associates, Minneapolis, 1996 - 2000

Industrial Engineer, HGA Architects and Engineers, Minneapolis, 2000 - 2006

Healthcare Transformation, HGA Architects and Engineers, Milwaukee, 2006 - Present