How your expert thinks can determine methodology

The advent of inexpensive storage and accessible computing power has helped fuel the popularity of big data to support decision-making. Collecting, storing and mining data are now routine, and analysts at all levels of expertise can build data-driven models.

However, experience shows the perils of allowing purely data-driven models and artificial intelligence to totally drive the decision-making process. For example, Google's Flu Tracker missed the peak of flu season by 140 percent. Qualitative components of models cannot be ignored, and subject matter expertise continues to be needed to build models that support holistic decision-making.

The literature and practice support two major methods or approaches to subjective decision-making: utility-based approaches, such as multiple objective decision-making (MODA), and the analytic hierarchy process (AHP). Both approaches require subject matter experts (SMEs). In a utility-based approach, SMEs identify a value function for every attribute, or characteristic to be evaluated, of the model. These value functions can be risk averse (concave), risk seeking (convex), risk neutral or S-shaped. The SME then identifies 0-100 values for every point on the function. The alternatives are then scored against the attributes.

On the other hand, the AHP has the SMEs make pairwise comparisons on a scale of one to nine between the attributes (with respect to the goal) and alternatives (with respect to the attributes). The scale corresponds to qualitative assessments, such as equal, moderate or strong importance between the two attributes or alternatives being compared. Critics have argued the concern for potential rank reversal in the AHP and that the amount of pairwise comparisons needed in large models is overwhelming. A lesser argued concern of utility-based models is the danger of using a subject matter expert who doesn't have a decision analysis background or does not fully understand risk attitudes. In those scenarios, the 0-100 values may not be truly accurate or correctly reflect the attitude toward risk, sacrificing the integrity of the data being collected.

Both approaches have pros and cons. I have found appropriate uses for both methods in my work; I typically meet with the SME before the elicitation session to get an understanding of his or her decision analysis background. Typically, the SMEs have limited backgrounds in this area, and that is OK. Honestly, if they were decision experts, they wouldn't need a facilitator to build a model. However, the key, and this is not always made explicit in the literature, is to truly understand how a decision maker thinks about and approaches a problem. If he or she can think in terms of risk and value, then a utility-based approach may be best. If he or she thinks more qualitatively, the AHP may be best. The goal is to elicit data that is reliable and can be used in the model. All models have limitations, so the challenges of each method are inherent to the process.

Data elicited from SMEs can quantify qualitative aspects of the

decision process and support a human element to the model. Big data and artificial intelligence are clear paths to the future, but subjective components are often needed to ensure the models and algorithms work within the organization's culture and make reliable predictions. Utility approaches and the AHP can assist with this, and it is up to us, as engineering managers, to select the method that supports our SMEs and accurately incorporates their data into the model.

— Natalie Scala is an assistant professor in the Department of e-Business and Technology Management in the College of Business and Economics at Towson University. You can reach her at nscala@towson.edu.

Design thinking can bring great results to your improvement projects

Traditional problem-solving methods (lean, Six Sigma and PDCA) focus on improving processes by focusing on eliminating wastes and bottlenecks.

For example, kaizens are structured problem-solving events that focus on a problem and often involve a cross-functional team that brainstorms to identify solutions to improve the process. During the life cycle of a process, improvement ideas sometimes become redundant and lack a "wow" factor – in other words, the business leaders are underwhelmed by the results. This is where design thinking concepts can help practitioners to revive their change efforts.

Design thinking is a technique that has been around since the 1960s when industrial and product designers used it to differentiate themselves from engineers. However, it has evolved significantly since then and took its current shape when the global design company IDEO popularized design thinking by focusing on human-centric design for products. In recent years, design thinking has gained a foothold in industry primarily because of its focus on co-creation and partici-patory design with multidisciplinary teams. Numerous organizations, including Apple, Coca-Cola, IBM, Nike and Procter & Gamble, use design thinking to solve their client's complex problems.
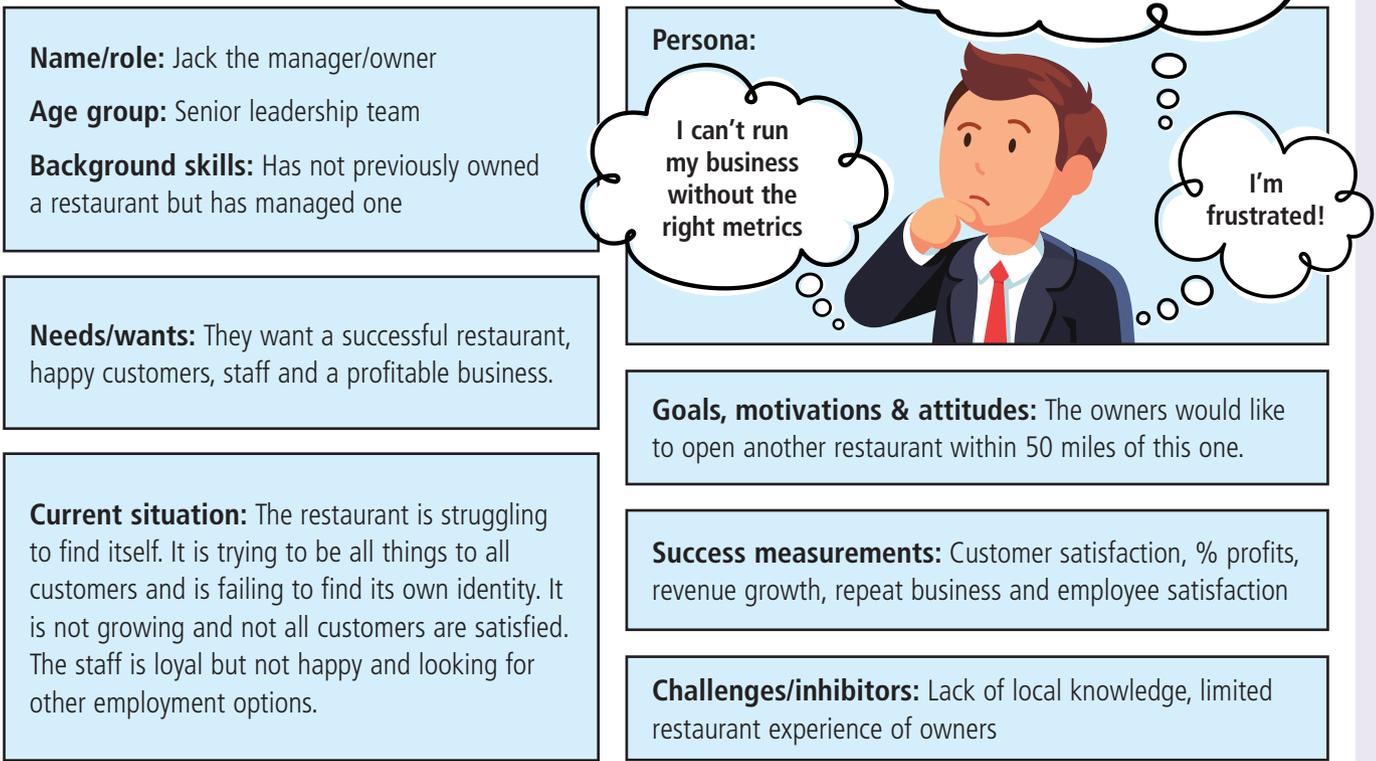
Why is design thinking different from traditional problem-solving methods? A key difference is that the design mindset, at least compared to the lean Six Sigma approach, is not problem-focused. Instead, it is solution-focused and geared toward creating a future state that will satisfy the end user. Additionally, the future state is defined by empathizing with the end user (qualitative aspects) rather than just looking at data and inferring needs (quantitative). A quote from Don Norman, the author of *The Design of Everyday Things*, summarizes this very eloquently: "Designers don't try to search for a solution until they have determined the real problem, and even then, instead of solving that problem, they stop to consider a wide range of potential solutions."

Lean Six Sigma practitioners can adapt many design thinking

FICTION IMITATING LIFE

Figure 1. Fictional personas can help engineers and designers understand the wants and needs from the perspective of people who use your product, process or service.

Name/role: Jack the manager/owner

Age group: Senior leadership team

Background skills: Has not previously owned a restaurant but has managed one

Needs/wants: They want a successful restaurant, happy customers, staff and a profitable business.

Current situation: The restaurant is struggling to find itself. It is trying to be all things to all customers and is failing to find its own identity. It is not growing and not all customers are satisfied. The staff is loyal but not happy and looking for other employment options.

Persona:

I don't feel I am leading effectively

I can't run my business without the right metrics

I'm frustrated!

Goals, motivations & attitudes: The owners would like to open another restaurant within 50 miles of this one.

Success measurements: Customer satisfaction, % profits, revenue growth, repeat business and employee satisfaction

Challenges/inhibitors: Lack of local knowledge, limited restaurant experience of owners

practices into their process improvement efforts. Below are a few thought starters:

- Persona development: Personas are fictional characters that represent the various types of people who use your product, process or service. They are developed primarily to understand your users' needs along with their goals and current experiences. This gives the team an appreciation for how different stakeholders have different needs and wants with respect to the product, process or service. Figure 1 is an example of a restaurant's manager/owner persona map.
- Empathy maps: After completing a persona, develop empathy maps to get a greater understanding of the needs, desires and emotions of the users. Designers use this technique to develop empathy for their end users, in essence trying to walk a mile in their shoes. For each persona, we document what the "person" says, thinks, does and feels about the product, process or service. Figure 2 is an example of an empathy map for a chef. The left side of the map is visible and spoken, whereas the right side are the "unspoken" aspects of the process, all of which need to be addressed by the new design. This map is typically then used as a starting point for documenting the pain points in the process.
- Storyboarding: This practice of design thinking ensures that teams communicate improvement ideas and scenarios by visually sharing stories that document the end-user experience. Storyboarding is simple. Each person gets six or nine Post-it notes. On each Post-it, draw a sketch and annotate with a caption. By challenging the teams to build an end-to-end story with characters, a plot, beginning, a middle part and a climax, team members have to view the process in its

GETTING IN THEIR HEAD

Figure 2. Empathy maps show your users' spoken and unspoken thoughts and feelings about your product, process or service.

Says:
- I need to know the best dishes so that we can keep them on the menu.
- Wait staff should keep orders FIFO.

I'm John the chef

Thinks:
- Not sure what I am doing wrong
- Should I quit my job here
- Wait staff and managers not working together with me
- Long wait for food to get out

Does:
- Continue cooking without complaining
- Constantly trying to improve and manage budget
- Orders supplies and updates menu

Feels:
- Very much unappreciated
- Wait staff always angry with me
- Good reviews of food
- Owner says food cost is high
- Frustrated with owners as they don't address issues

entirety to ensure the solution provides an improved user experience. Once each team member has completed his or her story, the team combines the best parts of the story to generate a final storyboard. This is the starting point for teams to capture feedback from its end users before prototyping and solution development.

Design thinking offers many other practices, but the ones discussed above complement lean and Six Sigma tools quite well. The emphasis, however, is to understand the process from a user-centric view by empathizing with the end user. Then we explore options by ideating around potential solutions to improve the user experience (using storyboarding).

Once the teams and end users are bought in to the future state, the design team quickly iterates through the prototypes of the solutions and evaluates them against performance measures. The understand-explore-prototype-evaluate steps are identical to the plan-do-check-act or Deming cycle.

In practice, teams can first use design thinking to generate the future state and then implement the changes quickly and correct course as needed. As engineering managers and leaders, adding design thinking to your buffet of practices will generate positive results for your organization's change management efforts.

— Sreekanth Ramakrishnan is a senior data scientist and net promoter score implementation lead with IBM Corp. He is a certified lean master, design thinking coach and lean Six Sigma black belt. He is also an adjunct faculty at the Lucas College and Graduate School of Business at San Jose State University. He is the current president of SEMS.