

LEAN START-UP IN LARGE ENTERPRISES USING HUMAN-CENTERED DESIGN THINKING: A NEW APPROACH FOR DEVELOPING TRANSFORMATIONAL AND DISRUPTIVE INNOVATIONS

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Introduction

Delivering breakthrough innovations often requires companies to reach beyond the technology itself to rethink the business model using an iterative or probe and learn approach which represents a key tenet of design thinking. Corning's optical fiber program, General Electric's development of computerized axial tomography, Motorola's development of cellular phones, and Searle's development of NutraSweet (Lynn, Morone, & Paulson, 1996) created entirely new markets to achieve success. The technical innovation in each of these cases was accompanied by a new business model, as these new products required different operational competencies, vendors, and customer channels than the companies' existing offerings.

However, large enterprises, which are particularly adroit at exploiting their existing business models, often have considerable difficulty in developing new business models. For example, Sony developed the Walkman audio player, establishing the market for portable music devices. But Apple displaced it in the portable audio space with a new business model that included a new delivery channel—iTunes. Kodak, which dominated the film photography market, failed to embrace the business models needed to support digital photography and ultimately ceded the market to companies such as Canon and Nikon.

The lean start-up process, with its iterative learning cycles, is particularly suited to breakthrough innovations that require an iterative process and a new business model. Sustaining innovations, which represent the majority of product development activities in large companies, don't require a lean start-up process since customer needs are well understood and companies are able to exploit their current business model. Most large companies have a well-honed process and a formal Stage-Gate process that comprises a set of serial activities (i.e., stages) and decision points (i.e., gates). An iterative process, embraced by the lean start-up process, could be counterproductive to the sequential Stage-Gate process.

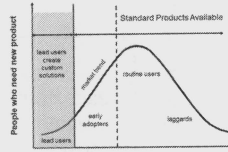
The lean start-up process is beginning to be used at enterprises (Blank, 2013a), such as GE and Intuit. The methodology has some unique features that are congruent with both the probe-and-learn process as well as design thinking, but its most important contribution is its focus on the business model. This is an artifact of its origins in entrepreneurial start-ups, which all need to create a new business model. In contrast, enterprises already have business models for their sustaining business, but those sustaining business models may not be appropriate for breakthrough innovations. Thus, the lean start-up process provides a needed focus on business model development.

The objective of this chapter is to introduce the lean start-up process, integrate it with key concepts in human-centered design, and show how it can be used for developing breakthrough innovations. The chapter is broken into five sections. In the first section, the principles and methodology of the lean start-up approach is discussed. In the second section, breakthrough innovation is defined within the context of sustaining, transformational, and disruptive innovation. The third section provides a definition of what a business model is and demonstrates how the lean start-up approach makes the business model a key outcome. The fourth section discusses the lean start-up approach through the lens of human-centered design principles and evaluates the attributes of different business model canvases. The final section offers a discussion of lessons learned from implementing the lean start-up approach in enterprises.

19.1 Lean Start-up

The Lean Start-up Process

The lean start-up process, schematized in Figure 19.1, involves four parts. Three were described by Blank in his explication of the model: the business model, customer development, and agile development; the fourth element, the minimum viable

Business ModelOsterwalder Business
Model CanvasMaurya Lean
CanvasJohnson and
Koen FEI
Canvas**Customer
Development**

Lead users, early adopters,
extreme users in performance and
low cost (NOT routine customers)



**Minimum Viable
Prototype**

Figure 19.1: Schematic showing the four elements of the lean start-up approach: the business model, customer development, the minimum viable prototype (MVP), and agile development.

prototype (MVP),¹ is added here since it is the main experimental tool used by lean start-up teams to validate their hypotheses. The process involves continuous iterations of customer development, MVP, and business model changes, repeating until a scalable, repeatable business model emerges. The value of the lean start-up approach is that the business model, which is schematized using the business model canvases, is the principle convergence point of the process.

In the customer development stage, the team validates its business model through ethnographic studies of customers in relation to their environments. Visiting customers is a central theme of both the lean start-up approach and human-centered design. Start-ups often make the mistake of visiting “routine users” (Figure 19.2). These customers are often satisfied with the current solutions and product offerings, and thus provide limited insight. Lead users or early adopters who are not satisfied with current solutions offer far more potential for real insight and learning. Lead users (von Hippel, 1986) and early adopters are different from other customers because they are at the leading edge of an emerging product or process need and have a high incentive to find original solutions to meet their own needs. For example, a team developing new farm irrigation systems would benefit from spending time with farmers who are in the

¹ The lean start-up movement defines MVP as “minimum viable product.” The author prefers “minimum viable prototype” because the term *product* implies something that can be sold. In contrast, a prototype incorporates only the feature set necessary to get a response from the customer and often is not a full, saleable product.

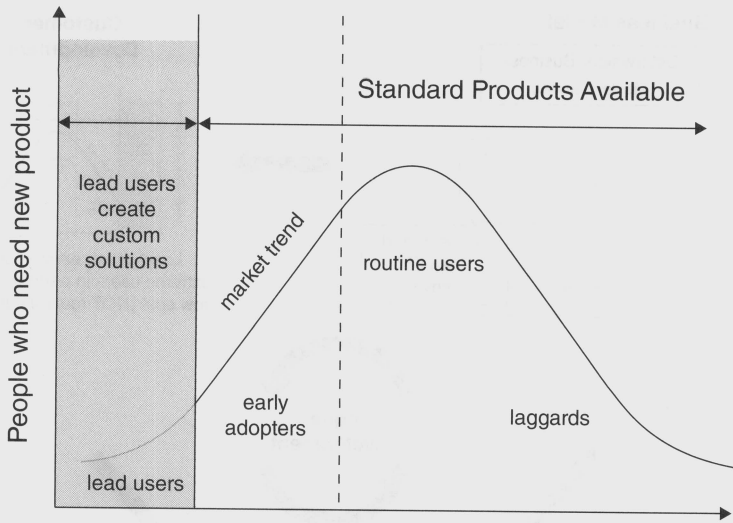


Figure 19.2: Schematic of the differences between lead users, early adopters, routine users, and laggards; lean start-up teams should focus on lead users and early adopters.

midst of a drought or who operate in areas where irrigation costs are high, rather than farmers who have access to sufficient affordable irrigation using current solutions.

The third part of the lean start-up approach is the development of an MVP. There is frequently confusion around what exactly constitutes an MVP. Most, when first confronted by the concept, believe that the MVP is actually a minimal-featured version of the final product. This is not the case. Rather, *the MVP incorporates the minimum set of features necessary to get early customer validation that the company's long-term vision makes sense*. MVPs may take many forms, depending on the stage of development and the information the prototype needs to yield. For example, the MVP shown in Figure 19.3a illustrates only the basic design features for a new nasal debrider; the final version of is shown in Figure 19.3b.

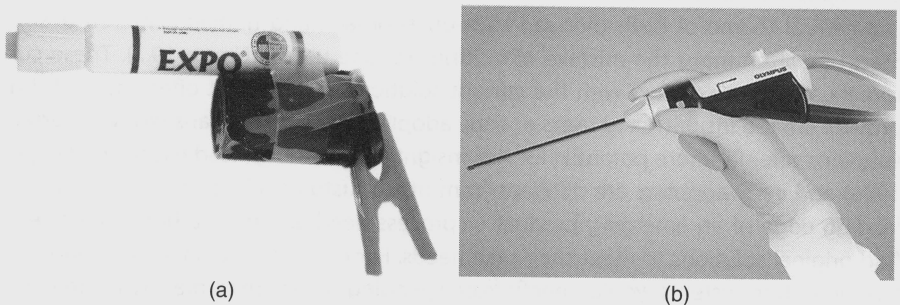


Figure 19.3: Example of an MVP. (a) A very rough prototype, constructed to demonstrate the minimum feature set in terms of look and design needed to get rapid, candid feedback from ENT surgeons). (b) Picture of the final Diego Gyrus ENT debrider.

Source: (a) Image courtesy of IDEO; (b) courtesy of Olympus.

Blank (2013b) offers an illustrative example demonstrating the need to focus the MVP on the customer needs. A California-based start-up planned to develop a series of unmanned serial drones to carry hyperspectral imaging cameras that could tell farmers where their land required more fertilizer or water. The team envisioned the MVP as a drone equipped with a hyperspectral camera. Their business model was to build a fleet of drones with hyperspectral imaging cameras. The farmer didn't really care how the data was collected—just wanted the data. The team confused the MVP in trying to develop an early working prototype of their envisioned product as a drone with a hyperspectral camera. In fact, the farmers didn't really care if the data was collected with a drone, or a plane, the MVP, for this customer set, was the data. In the end, the team rented a hyperspectral camera and leased a crop duster single-engine plane that flew over the fields to collect data, which they then showed to the farmers in their target market.

The final component of the lean start-up process is the iterative cycle of developing and testing MVPs, which can be described either as agile development or as build-measure-learn feedback loop (Reis, 2011). A key metric for this process is how quickly the team loops through the process, developing successive MVPs.

19.2 Transformational and Disruptive Innovation: Defining the Domain Where the Lean Start-up Process Should Be Used

In order to see where the lean start-up approach can be most productively implemented in enterprises, it is important to develop a common framework and typology. Not every radical innovation will benefit from a lean start-up approach. For example, Intel's dual-core processor doubles performance while reducing power consumption. This is a radical innovation, but it doesn't require a new business model: Intel can leverage its current business model since the product is sold to its current customers using the company's existing channels. Technology project management tools designed for high-risk projects, such as Technology Stage-Gate (Ajamian & Koen, 2002), are more appropriate to manage these kinds of innovations. In contrast, Intel might have found the lean start-up methodology to be valuable in its failed attempt to get into the mobile phone market, with chips built using existing technology but sold through a new channel to new customers based on a new value proposition.

Innovating outside an existing business model has always been difficult for large companies. In a study of 154 companies, Bain and Company found that the odds of success dropped as low as 10 percent when large companies tried to develop products two steps from their core, where one step was a single change in the business model (Edwards, 2012).

The principle area that causes problems for large enterprises is innovating into a new value network. Many schematics of the innovation space map two dimensions, with newness of the market and the technology as the two critical axes. Christensen

and Raynor (2003) and Koen, Bertels, and Elsum (2011) suggest a value network dimension that is more encompassing than the traditional market dimension, capturing the unique relationships enterprises build with both their upstream (supplier) and downstream (distributor and customer) channels.

Koen et al. (2011) suggest a three-dimensional innovation typology that captures value network, newness of the technology, and the financial hurdle rate; Figure 19.4a shows the value network and technology dimensions of this model. Within the technology dimension, incremental, architectural, and radical innovation are demarcated. Incremental innovation involves the refinement and improvement of existing technology. Architectural innovation involves new ways of integrating existing components into a system, but no new technology. The iPod, for instance, incorporated no new technology but provided an entirely new design. Finally, radical innovation, exemplified by Intel's dual-core processor, incorporates new core technology.

Procter & Gamble developed its own definitions for the different types of innovation: sustaining, transformational, and disruptive (Brown & Anthony, 2011); these are overlaid on Koen et al.'s model in Figure 19.4a.

Sustaining innovations bring incremental improvements to existing products; they may include radical technology innovations, as in the case of the dual-core microprocessor chip.

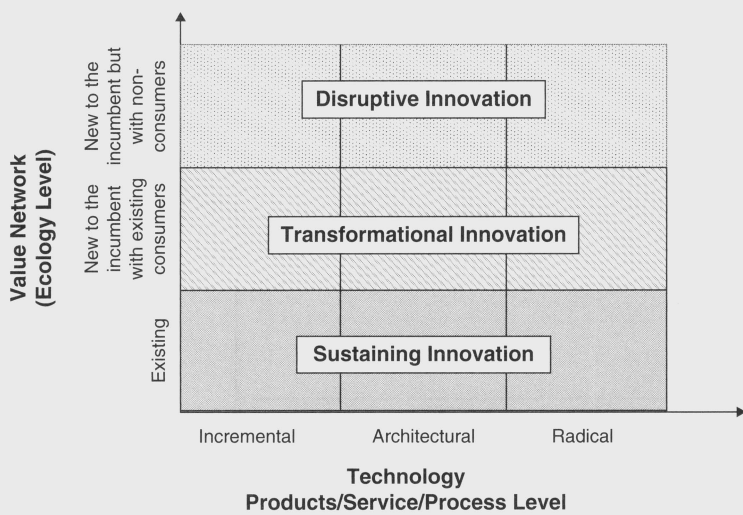
Transformational innovations, sometimes called *adjacencies*, bring a significant improvement to the existing product line and often direct the company into new value networks. An example is Nespresso, which engaged Nestlé's coffee business into a new value network focused on young urban professionals willing to pay a premium price for fine coffee.

Disruptive innovations establish an entirely new value network that involves nonconsumers—customers who have not entered the market. Sony's Walkman is an example of an architectural innovation focused on teenagers who had not previously owned audio playing devices.

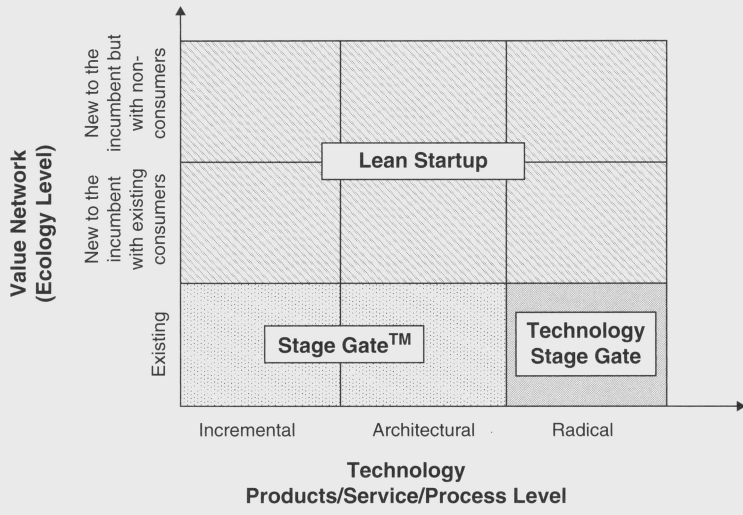
Different combinations of innovation and value network require different project management tools, as shown in Figure 19.4b. Stage-Gate and Technology Stage-Gate should be used for projects in the sustaining space, as the company already has intimate knowledge of the value network and the iteration required by lean start-up will add costs and time to the process. In contrast, a lean start-up approach should be used for the transformational and disruptive innovation, where a probe-and-learn approach is required to glean needed customer insight.

19.3 Why Is a Business Model a Valuable Part of the Lean Start-up Process?

The concept of a business model was first mentioned in an academic article in 1957 (Bellman, Clark, Malcom, Craft, & Ricciardi, 1957) in the context of building business games for training purposes. The term continues to confuse academics and



(a)



(b)

Figure 19.4: (a) Business model typology showing the relationship between sustaining, transformational, and disruptive innovation (b) and the areas where the lean start-up methodology may best be applied to.

practitioners alike. Wirtz (2011), reviewing the academic literature around business models, showed that there was little, if any, agreement in the academic literature to what constitutes a business model.

The business model canvas (Figure 19.5), introduced by Osterwalder and Pigneur (2010), addresses this confusion by providing a visual encapsulation of the business

model and a clear vernacular, which facilitates discussion and debate without sacrificing the complexities of the business. The business model canvas allows the development team to evaluate the different parts first separately and then together, thereby facilitating new insights that would not have been possible. As part of a lean start-up approach, the business model canvas helps the team validate business model hypotheses until it finds one that is repeatable and scalable.

Edward Tufte (1997), a renowned scholar in the area of information design and visual literacy, encourages the use of data-rich illustrations and emphasizes the importance of being able to see all of the key data “in one common eye span.”² Exploring the decisions leading up to the 1986 explosion of the space shuttle *Challenger*, in which seven astronauts died because of leaking O-rings, Tufte posits that the disaster could have been predicted had the critical information all been plotted in one descriptive illustration that could be surveyed within a single eye span (Tufte, 1997, p. 49). The business model canvas provides just such a layout for the team, capturing all the data needed to visualize the business within one easily viewable graphic.

Because the business model canvas functions as a convergence tool for the project team, it is a critical element of the lean start-up process. But most teams, in the beginning, fail to understand its value, feeling that the canvas contains no new insights and replicates what they already know. Teams quickly come to understand its value when they begin to use it as a tool to organize and test hypotheses while simultaneously accounting for the linkages that connect the different elements of the business model.

19.4 Lean Start-up through the Lens of Human-Centered Design

Lean start-up codifies many elements of the human-centered design process, which solves problems by matching people’s needs with what is technologically feasible by developing simple prototypes and then iterating them until a viable business strategy emerges that can be converted into customer value.

To accomplish this goal, the human-centered design process always begins with a focus on the central question: what is the business problem? This approach helps teams avoid the typical error of focusing too quickly on the idea or solution. Many innovations fail not because of a fatal flaw in the solution, but because the company fails to understand what problem it is solving. The team developing Newton, Apple’s PDA, was so enamored with the technology underlying the concept that they failed to consider the unique set of problems that the mobile user needed to solve. Segway failed because its development process was focused on transportation for everyone and not on particular jobs to be done for specific users; the company built a huge plant at the outset—based on the idea of transportation for everyone—and ended up with significant overcapacity.

²E-mail communication between Tufte and the author, January 10, 2014.

Getting to the right problem represents the pinnacle of the design process used by the iconic design firm IDEO. IDEO's methodology consists of three critical questions:

1. What is the right problem?

As indicated in the preceding discussion, Apple's Newton and Segway failed since they did not understand the problem they were solving. A quote from Einstein further emphasizes the importance of understanding the problem:

If I had only one hour to save the world, I would spend 55 minutes defining the problem and only 5 minutes finding the solution.

2. Who has the problem?

The heart of the human-centered design process is a focus on human values and a deep empathy with users. Thus, it is necessary to identify which customers the team plans to spend time with.

3. What is the value to the user in solving the problem?

The value of a solution for the customer is determined by observing what people do, how they think, what they need, and what they want. These determine the attributes of the solution (as opposed to the solution itself).

The business model canvas allows teams to track the interactions between the various elements of the emerging business model. When the business model canvas is used in the context of a human-centered design method, it is extremely valuable to separately evaluate these three core questions and the solution, so that the solution attributes are not confused with the solution. Keeping the problem, the customer, the solution attributes, and the solution separate in the canvas allows the lean start-up team to build on the key tenets of the human-centered design process.

Unfortunately, Osterwalder and Pigneur's (2010) canvas does not allow for this to the extent that Maurya's (2012) lean canvas and the FEI canvas³ do. The lean canvas, shown in Figure 19.6, was specifically developed for the start-up entrepreneur and is intended to better capture the uncertainty and risk of the start-up (Maurya, 2011). The FEI canvas, shown in Figure 19.7, was developed to support the front end of innovation in large enterprises.

The attributes of the three canvases are compared in Table 19.1. The lean and FEI canvases share five attributes with the Osterwalder and Pigneur canvas, but also encompass a number of other attributes. These differences reflect the different intents of the three canvases. For example, the lean start-up canvas does not have a box for external resources, as Maurya (2011) believes that entrepreneurial start-ups should focus on customers before looking at developing partnerships. In a similar vein, the FEI canvas includes additional boxes intended to capture the particular context of front-end innovation in a large corporation. Osterwalder and colleagues (2014) recently published the value proposition canvas (Figure 19.8), which fill many of the gaps in the original version.

³<http://www.frontendinnovation.com/media/default/pdfs/fei-canvas.pdf>

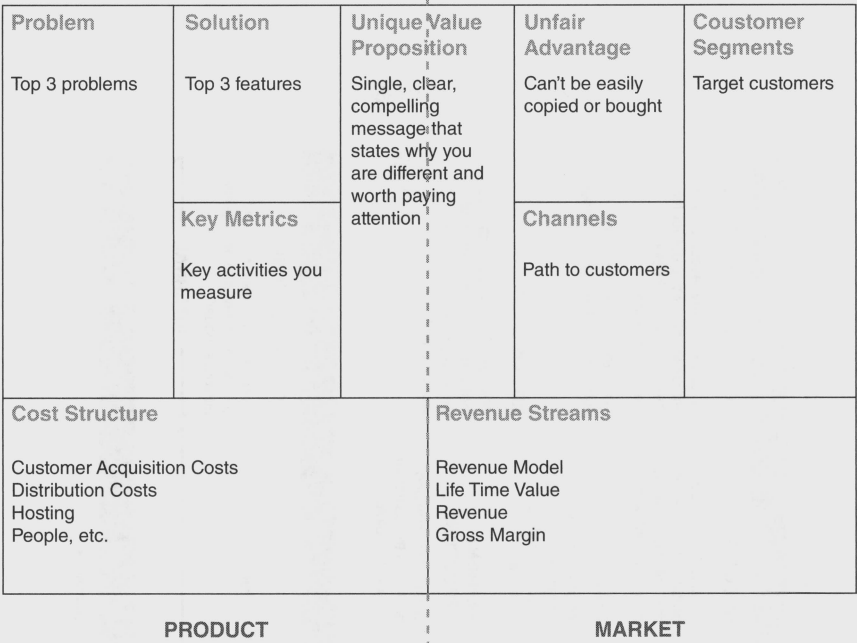


Figure 19.6: The lean canvas.
Source: Maurya (2012).

Each of the three canvases aligns with the human-centered design approach to varying degrees, as illustrated in Table 19.2. In the original business model canvas, three of the four building blocks of human-centered design are not accounted for, although the value proposition canvas addresses all of these shortcomings. For instance, the problem definition is included in the customer segment portion of the value proposition canvas using “jobs to done” language and the value to users in solving the problem, captured only generically in the original business model canvas, is expanded with its own box in the value proposition canvas. The solution is also missing from the original canvas, but detailed in the value proposition canvas, although the need to pair the original business model canvas with the value proposition canvas violates Tufte’s (1997) insistence that effective tools must capture all critical information in a single eye span.

The lean canvas separates the problem, which customers have the problem, and the solution into separate boxes. Solution attributes are not assigned to a particular box; presumably, they should be included in the value proposition box, which calls for a “single, clear, compelling message that states why you are different and worth paying for” (Maurya, 2012, p. 5). The FEI canvas, which was designed with the human-centered design perspective in mind, has separate boxes for all four of the core design principles.

In summary, the human-centered design approach evaluates the project through the lens of the problem, asking the development team to define the problem, identify

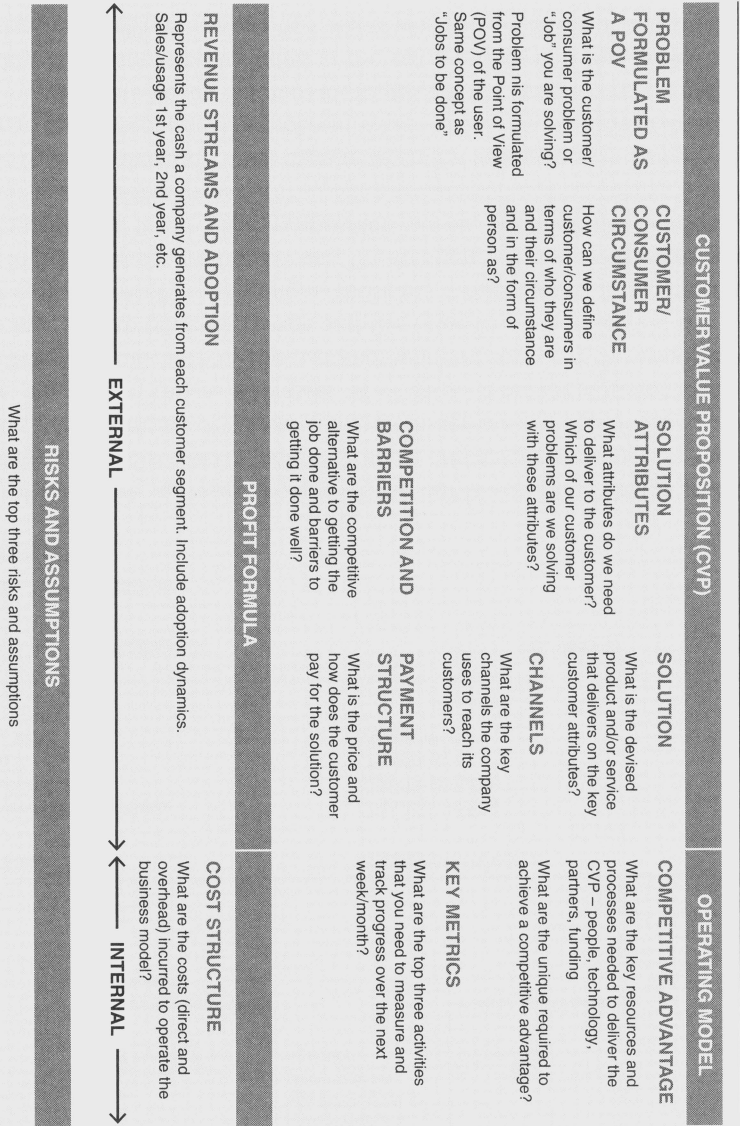


Figure 19.7: FEI canvas.
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Table 19.1: Attributes of Business Model Canvases

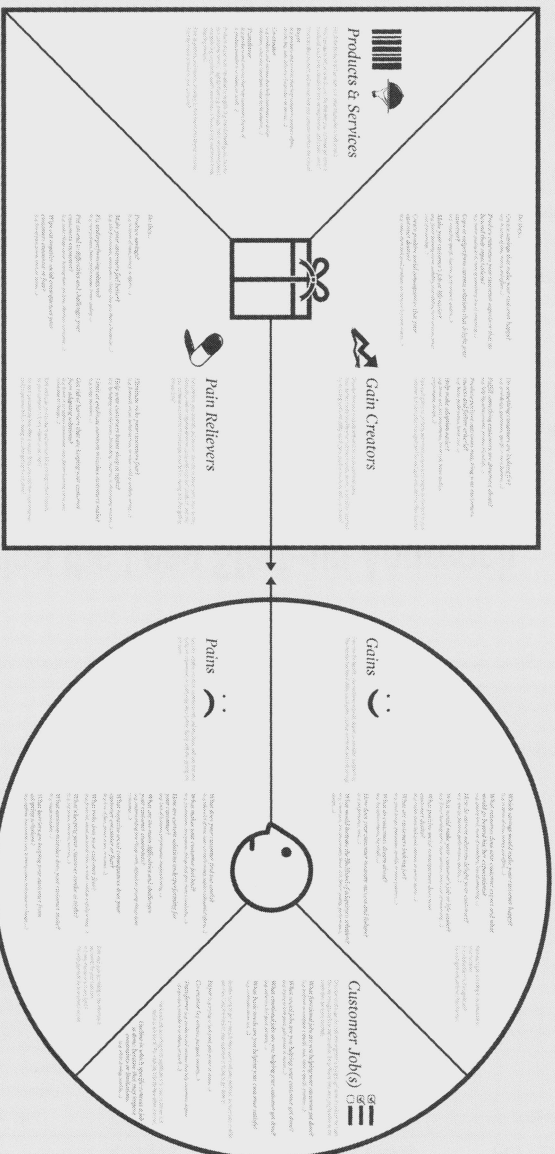
Attributes	Areas which are unique	Maurya's (2012) Lean Canvas	FEI Canvas
Major Focus	Sustaining projects	Start-ups	Transformational and disruptive innovation in large enterprises.
Key Partners	1. Who are the key partners, suppliers? What key resources and activities are we acquiring from the partners?	Missing since the start-up should first focus on customers rather than partners.	Partners are included as part of the redefined key processes box.
Key Activities	2. What are the key activities that our value proposition, distribution channels, customer relationships, and revenue streams require?	Missing since the key activities can be determined once you know the solutions.	Key activities required to accomplish the business model are embedded in the other elements of the canvas.
Key Resources	3. What resources do our value proposition, distribution channels, customer relationships, and revenue streams require?	Replaced by Unfair Advantage box since many key resources—but not all—create competitive advantage.	1. Key resources needed to deliver the customer value proposition (CVP).
Value Proposition	4. What customer value do we deliver? What problems are we solving? What solutions are we offering? What customer needs are we satisfying?	1. Value proposition: restated in terms of a compelling message that states why you are different and worth paying attention to.	The value proposition is the CVP, which is captured in elements 1 through 8.
Customer Relationships	5. What type of relationships do our customer segments expect?	Captured in the customer segment box.	
Channels	6. Through which channels do our customer segments want to be reached?	2. Channels	2. Channels
Customer Segments	7. Who are we creating value for, and who are our most important customers?	3. Customer segments	3. Formulated as customer circumstance
Cost Structure	8. What are the most important costs inherent in our business model?	4. Cost structure	4. Cost structure
Revenue Streams	9. What are our customers willing to pay?	5. Revenue streams	5. Revenue streams and adoption

(continued)

Table 19.1: (continued)

Attributes	Areas which are unique	Maurya's (2012) Lean Canvas	FEI Canvas
Unique to both Maurya Lean Canvas and FEI Canvas			
Problem	What is the problem you are solving?	6. Problem, separate box highlights fact that most start-ups fail because they fail to understand what problem they are solving.	6. Problem, formulated as either a POV or "job to be done" statement.
Solution	What is the solution?	7. Solution; broken out from the problem and value proposition boxes to help teams focus.	7. Solution
Key Metrics	Defines the key metrics that the start-up should be addressing.	8. Key metrics; encourages selection of three key metrics to foster focus.	Missing since this is not sufficiently important for enterprises.
Unfair Advantage	Competitive advantage or barriers to entry.	9. Unfair advantage: elements of advantage (or other firms' advantage) that can't be easily copied or bought.	8. Competition and barriers
Unique to FEI Canvas			
Key Processes	These are the key processes that a company uses to deliver its customer value proposition in a sustainable, repeatable, scalable, and manageable way.		9. Key processes—processes that are unique to the corporation and needed to deliver the value proposition and enable competitive advantage
Solution Attributes	What are the attributes which you need to deliver to the customer? Which problems are you solving with the attributes?		10. Customer attributes—separates solution attributes from the solution
Payment Structure	What is the price and how does the customer pay for the solution?		11. Payment structure
Risks and Assumptions	What are the top three risks and assumptions?		12. Risks and assumptions—All FEI projects have risks and assumptions that must be made explicit

who has the problem (i.e., who the customer is), and map the value proposition or the attributes required in the solution. Osterwalder and Pigneur's original business model canvas was designed to be used in a sustaining business, where it is less important to define the problem. This could limit its use as a brainstorming tool in transformational and disruptive innovations, where it is critical for teams to be able to work on problem, the customer, the solution attributes, and the solution separately. In contrast, the lean and FEI canvases separate out these four human-centered design attributes into separate areas.



Value Proposition

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www.businessmodelgeneration.com

Customer Segment

Use in Conjunction with the Business Model Canvas



Table 19.2: Comparison of Human-Centered Design Attributes with the Different Business Model Canvas

Human-Centered Design Attributes	Osterwalder & Pigneur (2010) Business Model Canvas	Osterwalder et al. (2014) Value Proposition Canvas	Maurya (2012) Lean Canvas	FEI Canvas
What is the right problem?	Included in the value proposition part of the canvas	Customer jobs, included as part of customer segments	Problem box	Problem box
Who has the problem (i.e., who is the customer)?	Captured in customer segments	Expanded definition of customer segments	Customer box	Customer Segments box
What is the value to the user to solve the problem (i.e., what are the solution attributes)?	Presumably included in the value proposition box, though it's not exactly clear what "value proposition" encompasses	Gain creators and pain relievers	Presumably included in the value proposition box, though it's not specifically identified as such.	Solution Attributes box
The solution	Missing from the canvas	Highlighted as products and services	Solution box	Solution box

Note: Shaded areas indicate that the canvas has a separate box congruent with the human-centered design attribute.

19.5 Implementing the Lean Start-up Approach in Enterprises

Based on the author's experience implementing a lean start-up approach in three Fortune 100 companies and teaching lean start-up as part of several 14-week executive MBA course, companies consistently stumble in five ways:

1. Companies struggle at getting to the right problem.

Even experienced teams are often unsure what problem they were working on—even as they are typically clear about the unmet customer needs and the solution. The practice of formulating the problem from the point of view of the user, or POV, promoted by IDEO's process (Bootcamp Bootleg⁴), is a powerful reframing methodology that is grounded in the needs and insights of users.

The POV has three elements: (1) the user, (2) the user's need, and (3) observation of the user in his or her environment and interpretation of the observations. IDEO teams often take weeks and sometimes even months to get the POV right. For example, a typical problem statement for a group working on developing nutritious food might be "A teenage girl needs more nutritious food because vitamins are vital to good health." The same problem formulated as a POV could be "A teenage girl with a bleak outlook needs to feel socially accepted when eating healthy food

⁴<http://dschool.stanford.edu/wp-content/uploads/2011/03/BootcampBootleg2010v2SLIM.pdf>

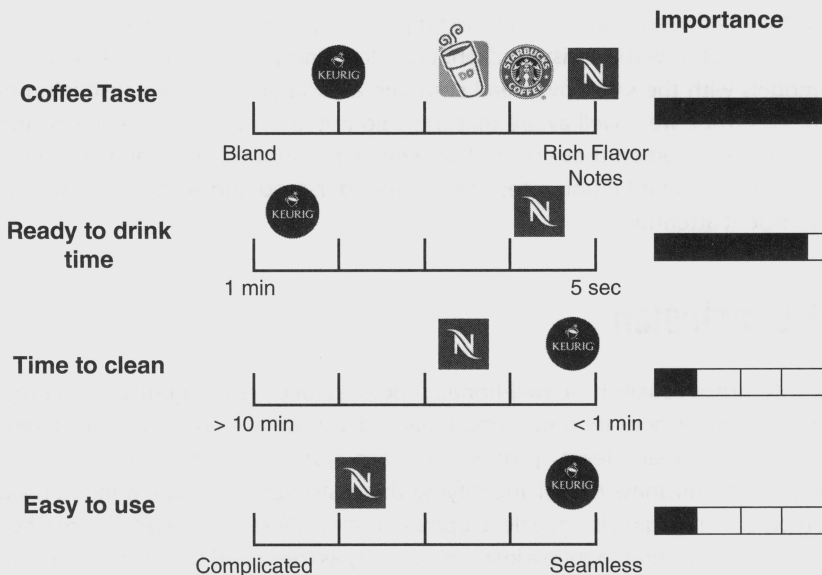
because in her group a social risk is more dangerous than a health risk" (Bootcamp Bootleg, 2010, p. 21.) The first formulation is a statement of fact, while the second POV formulation is an actionable description that drives empathy, provides direction for the effort to develop solutions, and serves as a defining vision for the team.

2. Companies often confuse solution attributes with the solution.

It is difficult to separate out solution attributes without falling into the trap of talking about the value of different solutions. The use of a solution attributes map, illustrated in Figure 19.9, can keep teams from falling into this trap. In the example diagram, which offers a hypothetical map for a single-use coffee product, the four key solution attributes are coffee taste, ready to drink time, time to clean, and easy to use. The map illustrates how each competitor measures up on each attribute and assesses the relative importance of each attribute to the user. In the example, the attributes, competitor ratings, and relative importance ratings are all illustrative; in actual use, these factors would be derived from customer feedback.

3. Teams focus on the wrong customers.

In almost all of the projects the author worked with, teams interviewed routine customers rather than lead users or early adopters. Routine customers typically want the same product or service they are currently using with higher performance or at a lower cost; they typically don't see the value of a transformational or disruptive innovation. Steelcase made this error in developing their Aero chair, which eventually turned out to be one of their most successful products. Many of the company's mainstream customers disliked the new chair's design, commenting that it looked like a lawn chair skeleton that was yet to be finished. The chair found an audience among customers who had difficulty being



comfortable in the existing chairs, some of whom had back problems—in other words, the users with the biggest problems unaddressed by current solutions.

4. Most teams envision the prototype as a fully featured solution.

In most cases, team members wanted to show potential customers a fully featured prototype, presumably to avoid embarrassing themselves or offending their users. As one team remarked, “How can we show this very rough prototype to an experienced surgeon? After all, we are a high-quality medical device company.” Teams had difficulty understanding that the value of the prototype was to invite conversation and feedback. Proponents of design thinking advocate low-resolution prototypes made up of paper, pipe cleaners, cardboard, and Lego bricks to rapidly depict the solution along a tangible dimension. The objective of the prototype is to test particular solution attributes of the product being developed, *not* to offer a realistic model of the final product.

5. Teams consistently make incorrect assumptions about channels, cost structure, and adoption rates.

Based on an in-depth retrospective study of three large enterprises developing business models outside their core, Bertels, Koen, and Elsum (2015) identify three components of the new business model that are most susceptible to false assumptions: channels, cost structures, and product adoption rates. The enterprises had fewer false assumptions in other areas of the canvas, primarily because these changes are relatively easy to identify and firms can, with effort, resolve known uncertainties. For example, one of the new businesses studied involved a large change from the traditional market; the company spent six months conducting sophisticated ethnographic studies to determine the needs of the market. However, companies had ingrained ways of thinking about cost structures, tended to expect similar adoption rates for new products, even breakthrough innovations, as they had seen with their sustaining products, and thought that the new products would fit within existing channels. Accordingly, they adopted new business models with the same overhead structure associated with their sustaining businesses. They were well aware that they did not know their new markets, and so extensively studied those users. However, they assumed channel dynamics, cost structures, and adoption rates were well understood and so failed to give them sufficient attention.

19.6 Conclusion

Large enterprises usually have well-honed processes for developing sustaining projects but lack similar methods for transformational and disruptive innovations, which require an iterative “probe-and-learn” process. The lean start-up process, which consists of developing the business model, identifying the customer, building a minimum viable prototype, and engaging in agile development cycles, offers a gold-standard methodology for innovations that require a learning strategy as they need to search for a business model while sustaining innovations execute on their current one. Human-centered design, which at its root focuses on solving problems by matching needs with what

is technologically feasible, moves toward these goals through an iterative approach involving customer empathy and the use of simple prototypes; this iterative approach embodies many of the characteristics of the lean start-up methodology. Just as the lean start-up process focuses on the business model, the human-centered design approach begins with a focus on the problem, building its exploration around four key questions: What is the business problem? Who has the problem? What is the value to the user in solving the problem? What are the attributes of the solution?

The business model canvases used in the lean start-up process accommodate these questions to varying degrees. The original, and very popular, business model canvas (Osterwalder & Pigneur, 2010) does not allow teams to separate out these areas, although the new Osterwalder and colleagues' (2014) value proposition canvas does. The lean canvas (Maurya, 2012), which was developed specifically for start-ups, separates out the first two items, and the FEI canvas, which was developed to support the FEI in large enterprises, offers separate spaces for all of them.

Large enterprises implementing a lean start-up approach struggle in five areas: getting to the right problem; focusing on the right customers; separating solution attributes from the solution; envisioning the minimum viable prototype; and questioning assumptions around channels, cost structure, and adoption rates for the new innovation. The lean start-up process has the potential to become the gold standard project management process for transformational and disruptive innovations in much the same way that the Stage-Gate process is the gold standard process for sustaining innovations.

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