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Making Sense of Canvas Tools: Analysis and Comparison of Popular Canvases

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Making Sense of Canvas Tools – Analysis and Comparison of Popular Canvases with an Emphasis on Educational Use

Introduction

The business and entrepreneurship education communities have embraced the concept of the one-page canvas as a way to help students explore new ventures and teach entrepreneurial thinking. The movement toward the canvas approach was sparked by Osterwalder's (2004) decomposition of business ventures and subsequent publication of *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers* (Osterwalder and Pigneur, 2010) which focuses on a specific canvas—the Business Model Canvas. While the Business Model Canvas has become a gold standard in many business and entrepreneurship education circles, a wide range of additional canvases have emerged since the Business Model Canvas was first introduced (see www.canvanizer.com). In this paper, we discuss our analysis of several canvases and propose a framework for selecting and using existing canvases, as well as creating new canvases. While canvases have value in both corporate and academic settings, we place a particular emphasis on their use in educational settings.

The Idea of a Canvas

The Business Model Canvas (BMC) simultaneously questioned the formal business plan and proposed a more flexible and iterative tool for developing and executing on a value proposition. The BMC's was very timely in that it offered a way to balance long-term planning with the adaptability needed to respond to rapidly changing technological and market landscapes. The Business Model Canvas has helped stimulate and popularize new understandings regarding how to use a canvas. For example, some advocated that the process of venture creation should follow a version of the scientific method – hypotheses about a market are proposed and then it is up to the entrepreneur to verify or refute those hypotheses with real data (Neck and Greene, 2011; Blank, 2013). Progress toward a value proposition is therefore an iterative process. A second example is the merger of the canvas concept with lean principles, such as Six Sigma. The idea of Lean Launchpad is one where the entrepreneur intentionally minimizes resource usage, while attempting to learn quickly and maximize impact.

The Business Model Canvas also sparked the creation of many new canvases. Examples of canvases emerging after the BMC include the Value Proposition Canvas, the Service Model Canvas, and Lean Canvas. One interpretation proposes that a canvas is simply a framework, organized into conceptual boxes that help the user collect, organize, and understand information critical to their given objective. For example, the BMC is intentionally focused on developing and evaluating business models and therefore has conceptual boxes to support users as they collect, organize, and understand information such as sources of revenue, customers, and ways to deliver value. While the BMC has proven effective at business model development, it does not cover in depth all aspects of making and delivering products and services. It is therefore not surprising that new canvases were created to explore other arenas of business in more detail such as product-market fit, product design, service, training, and manufacturing. Other canvases have even extended outside of business to areas such as self-improvement and education (see www.canvanizer.com).

Given the growing popularity of the development and use of canvases, it is important to understand the allure and begin to evaluate them through a more thoughtful approach. To begin, a canvas is more than a framework. It is a one-page visual tool. Unlike writing, which necessarily lays out information sequentially, a visual representation enables, and even encourages, non-sequential exploration of information. The power of showing information on one page facilitates a holistic and non-linear view of interactions between the elements (Livingston, 2002; Roam, 2009; Ramachandran and Blakeslee, 1999). In this way, a canvas enables 'conceptual prototyping' which is building a realistic conceptual model (both mental and as a tangible canvas artifact) for a product, business model, or system without consuming significant resources.

To illustrate, rather than customers being discussed on one page and finance on a later page of a business plan, a canvas allows an entrepreneur to quite literally step back and explore the intersections between customers and finance in a single view. Whereas a traditional business plan is printed and bound, a canvas is often displayed publically on a wall. The result is that, unlike the business plan, which can easily become a rigid or forgotten formula, a canvas can inspire adaptation and iteration (Kline, et al. 2013).

The Business Model Canvas and related canvases have emerged rapidly and often in isolation from one another, without the benefit of agreed upon definitions or best practices (Zott, et al. 2011). As such, there has been little rigorous academic evaluation. This rapid adoption of canvas approaches has been noted (Duval-Couetil and Wheadon, 2014) with the recommendation that traditional business plans still play a role in entrepreneurship education. The idea of a canvas, however, has achieved widespread adoption by programs such as NSF I-Corp (McKenna, et. al 2015) and many university entrepreneurship programs and classes (Selig, 2014). As a first step toward more rigorous evaluation, creation, and usage, a unifying framework will be necessary.

Canvases as Representations of Systems

Our top-level analysis recognizes that a canvas is a visual tool for decomposing a system. We observed large variation in content, purpose, usage and format in our survey of popular canvases. For example, some canvases are a collection of related boxes, while others are clearly algorithmic flowcharts arranged in box form. While some canvases aimed to provide a holistic view of a complex domain, such as the Business Model Canvas, others focused very narrowly and deeply on some specific domain. The authors developed a general framework adapted from the field of Systems Engineering for thinking about the purpose and utility of any canvas. A 'system' is considered to be an entity that accepts inputs, performs processing, and provides outputs and interacts with systems around it (Buede, 2016). Given this broad definition, systems can be natural or man-made, conceptual or physical. For example, a conventional product or device, such as a laptop computer, is clearly a system because it takes in audio, visual, mechanical, and digital input; processes that input; and provides various forms of output. In the business world, the business model system would describe how resources and inputs interact with customers and stakeholders, process information, materials, and money, and ultimately provide outputs that have value. In a systems view, a graphical canvas is a convenient way to

collect and organize information on inputs, outputs, processing, and flows that represent some worldly system.

This type of systems thinking was used by Osterwalder in the creation of the Business Model Canvas. In his thesis he reviewed a large body of literature to uncover the "ontology" (as he states it) of business ventures (Osterwalder, 2004). Essentially, he was trying to uncover the basic system elements that enable a new venture to be successful. We are simply expanded Osterwalder's idea into the realm of system dynamics so that it can be applied to all canvases.

It is a tenant of systems thinking that boundaries must be placed on what is and what is not within the system. For the purposes of this paper, we will consider the generation of value through products and services, and therefore will focus on life cycle stages. Most of the canvases studied, therefore represent systems in the operation or use life cycle stage. They describe how the system will behave in normal interaction with the user or stakeholders. Other possible life cycle stages include concept, develop, produce, operate/use, and retire.

Beyond the Business Model and Desired vs. Real System States

After adopting the perspective that canvases represent a system, thought was given to the possible types of systems that could be modeled using a canvas. In a comprehensive study of the business model literature, (Zott, et al. 2011) concluded that business models generally emphasize a system-level, holistic approach to explaining how firms "do business" but that scholars do not agree on a common business model definition or scope. The business model often focuses on the opportunity, sales, marketing, financial, and operational aspects of the venture with limited detail on the product or offering. (Byers et al. 2011). This is the perspective found in the BMC. While the BMC can be used to evaluate 'product-market fit' (as Blank puts forth in the Lean LaunchPad approach), it includes a very limited representation of system details associated with the product or offering. This is especially important for educators working in engineering design or technical disciplines who are attempting to incorporate business thinking into their existing courses. Therefore, our initial analysis of the range of canvases and the systems they represent revealed to us that both business model and product/offering systems can be modeled using a canvas approach.

System dynamics begins by assuming that any system moves through a series of states that represent snapshots of the system at any given time. From the perspective of an innovator or entrepreneur, or more generally any change agent, these states can be thought of as a current real world and a desirable imagined world. The purpose of a canvas is then to assist in the transition from the current to the future state. Of course this view is dependent upon that change agent's internal model of the system, which may or may not be shared by others. In fact, a functional rationale for empathy is to be able to adopt the world view (or systems view) of another. That change agent, however, finds some component of the world that does not seem right or as good as it could be. The entrepreneurial literature would call this opportunity recognition (Byers et al. 2011). They then focus on the difference between their perceptions of the real-world as it is, and an imagined-world as they hope it could be – noted as creativity or vision. The role of the change

agent is then to take actions to move the real-world model closer to their imagined-system model –noted as this change being the value proposition of the change agent.

There is another body of literature that follows this same idea of taking actions to transform the real system into a desired system. The literature on system controllers (Dorf and Bishop, 1998) states that the change agent of the system senses some parameter in the system and then takes a series of iterative actions, called perturbations, to move that parameter closer to some desired set-point. The canonical example is the use of the thermostat in a house to control the internal temperature, despite an external temperature.

Unlike the control systems studied in textbooks, most systems of the world, including business, are very interdependent and non-linear. An effective change agent must therefore sense many parameters (summed up in their model of the system), coordinate many actions (perturbations), and predict how their actions will interact. Canvases help change agents consider all (or many) of the critical parameters of the system, the interactions between those parameters, and the necessary actions required to move the system closer to their desired system state.

Based on this initial analysis, we hypothesized a model that visualizes the potential benefit a canvas offers its users - moving from a real-world (or current) state to a desired (or future) state (Figure 1). In some sense, this represents the process of innovation – developing and implementing a new offering or business model that provides value. Also included in this model is the idea that canvases can, and should, represent a wide range of systems (e.g., business models, products, services, processes, etc.).

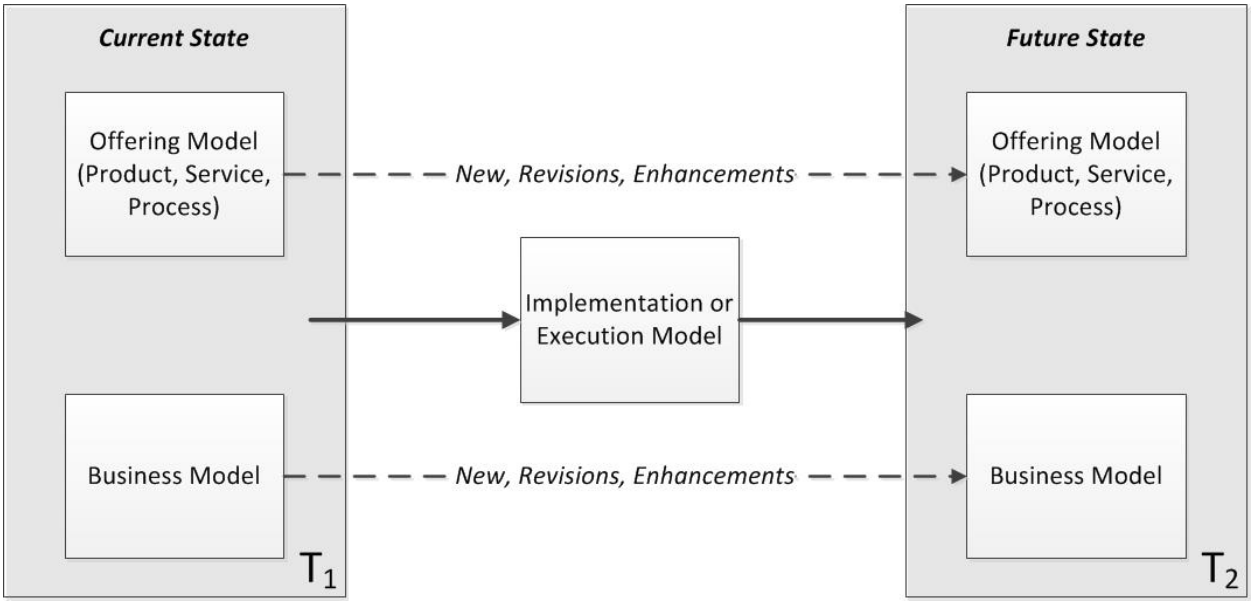

Figure 1: A generalized model for using a canvas

Attributes for Characterizing Canvases

Our second level of analysis defines a set of attributes that enable the characterization and comparison of canvas diagrams. Based upon Figure 1, a set of attributes were developed that reveal differences and enable useful comparisons between canvases. The general categories of attributes proposed include appearance, application, and systems related attributes as shown Table 1 below.

Table 1: General attributes for assessing and comparing canvas tools

Attribute	Description	Business Model Canvas Example
Name	Title of canvas tool	The Business Model Canvas (BMC)
Number Boxes	Number 1 to N	9
Prompts included	Each box on the canvas includes prompts or descriptions	Yes
Problem being solved	A description of the problem being addressed by the canvas	Supports the development, evaluation, and/or validation of business models
Type of System – product, concept, or something else	The canvas represents a system (business model or product design) or a concept (such as strategy).	System: a business model for a venture
Multiple systems	One or multiple systems are represented.	One system
What aspects represented (Decomposition approach)	The canvas represents key elements or subsystems of the system represented.	Major components or elements of a business plan.
Life Cycle Phase	The canvas represents the system in one or more life cycle phases including concept, develop, produce, operate/use, or retire.	Primarily Operate/Use
Time and change perspective included	The canvas represents the system at static condition or it includes elements of time or state change.	Static (time & state change arise by comparing canvases at different time states)
Suggests a process to the user?	The canvas suggests a sequence of steps or a process for its use.	No
Suggests that the user integrate and align elements?	Integration and alignment of information across the canvas is encouraged.	Yes
Similarity to other canvases	Describe if the canvas is similar to another canvas.	Because the BMC popularized canvas use, it is similar to many canvases.

As an example of how these attributes might be specified, the BMC has nine boxes and provides prompts for use in each box. The BMC represents the system of a business model for a venture in the use or operate/use life cycle stage. It does not have any numbering or recommendation for how it should be used, whereas some canvases are numbered and do suggest processes for use. The remainder of the BMC example is provided in Table 1. Having defined the attributes, we will next explore the utility of these attributes by characterizing and comparing a collection of popular canvases.

Applying the Attributes to Study Popular Canvases

Our third level of analysis is to apply the attributes proposed above to twelve popular canvases. Many practitioners have been inspired by the Business Model Canvas to develop their own canvas that specifically targets the system they are conceptualizing. The development and promotion of a new canvas is relatively easy with most developed by practitioners and made available on websites. A review of primarily web sources revealed more than 75 canvases, most developed by practitioners, with more than 25 being focused on technical and business systems. More are being posted and revised each month.

Of the businesses or technology canvases found, we applied our attribute analysis to a reduced set of 12 canvases with the purposes of determining whether the attributes could compare and how each canvas might be used. The set of canvases selected represents different product, service, and design applications including the canvases developed by the authors of this paper. For each canvas, the authors reviewed available background information from websites and other references, and classified each canvas using the attributes described in Table 1. Table 2 summarizes the attributes for each canvas. Due to its size, Table 2 has been presented in two parts.

To provide a visual representation of how the attributes can be used to compare canvases, the attributes of “Type of System” and “Life Cycle Phase” were chosen to be plotted against one another. Each canvas was classified into one or more positions as shown in Figure 2.

There are some key takeaways from the analysis. First, most of the canvases studied represent one system but a few represented two or even more. Second, only three canvases studied have fewer than nine boxes and the maximum number of boxes was 18. Third, there is broad coverage of the ‘canvas use’ model presented in Figure 1. While most canvases fall broadly into product/device or business model categories, surprisingly few include service as a central component. Lastly, most canvases focus on the operational or use life cycle phase, with only a few explicitly considering other life cycle phases, such as refine or produce.

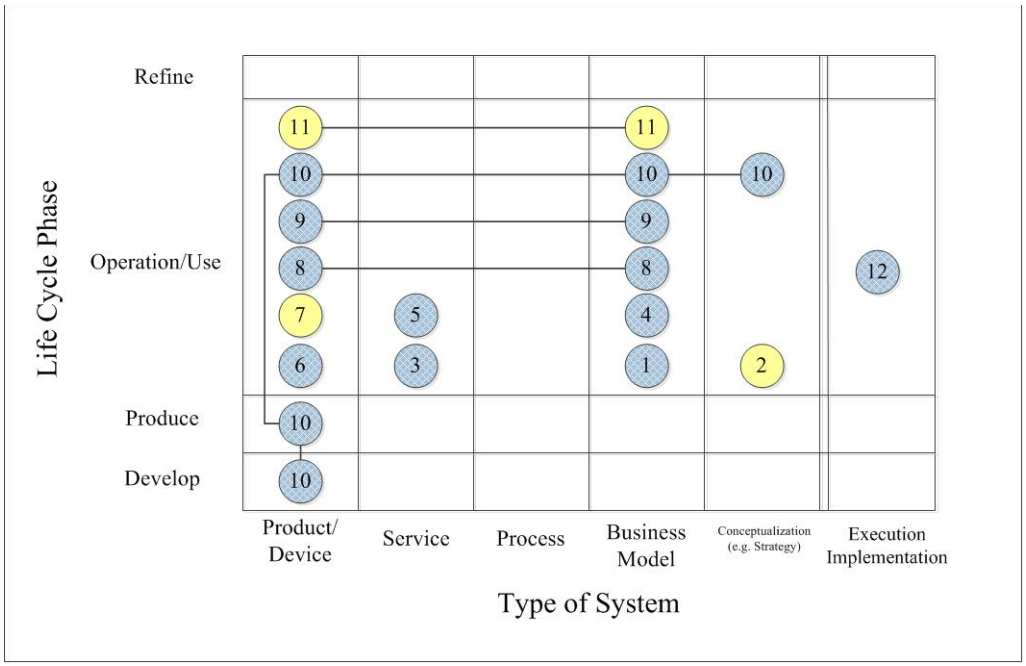

Figure 2: Analysis of 12 Canvases – Type of System vs. Life Cycle Phase
Numbers are canvas numbers from Table 2, Dark circles are canvases with ≥ 9 boxes

The Development of New Canvases

From our analysis, it becomes clear that not all canvases are suited for every situation or life cycle phase. We strongly suspect that new canvases have arisen because the developer could not find, or adapt, an existing canvas that expressed their own view of how to represent and conceptualize a system of interest. Below are two examples.

Product Archaeology Canvas

The Product Archaeology Canvas (Tranquillo, 2015) (Figure 3) grew from a frustration with the Business Model Canvas and its focus on starting new businesses in hot markets where the founders can quickly pivot to the most economically viable product and business model. This seemed at odds with the medical device design process where one must consider FDA regulations, a changing health care system, reimbursement, industry standards, patient privacy and safety, intellectual property, clinical trials, the technical complexity of the devices, and our evolving understanding of disease diagnosis and treatment – the path to innovation seemed long and the barriers high. Furthermore most biomedical engineering students will become intrapreneurs at large or mid-sized companies. But going where the barriers are high and the pathways to innovation are challenging seemed to provide an excellent pedagogical opportunity to impart a deep entrepreneurial mindset and spirit.

The Product Archaeology Canvas was created in an effort to mirror in the classroom the complex decision making process that takes place inside mature medical device companies. Constraints come from within the company (e.g. path dependencies, personnel, existing processes,

stakeholders, mission, values and culture), as well as from outside the company (e.g. legal, regulatory, macroeconomic, ethical, and market dynamics). In using the Product Archaeology Canvas, students must "excavate" public information on all of these factors for an over-the-counter medical device. Like an archaeologist, they needed to create a plausible and coherent narrative of the decisions the company made in moving that product idea to the customer. With this background they become forward-thinking intrapreneurs – proposing a way to increase the value of their product but in a way that balanced all of the various constraints and perspectives.

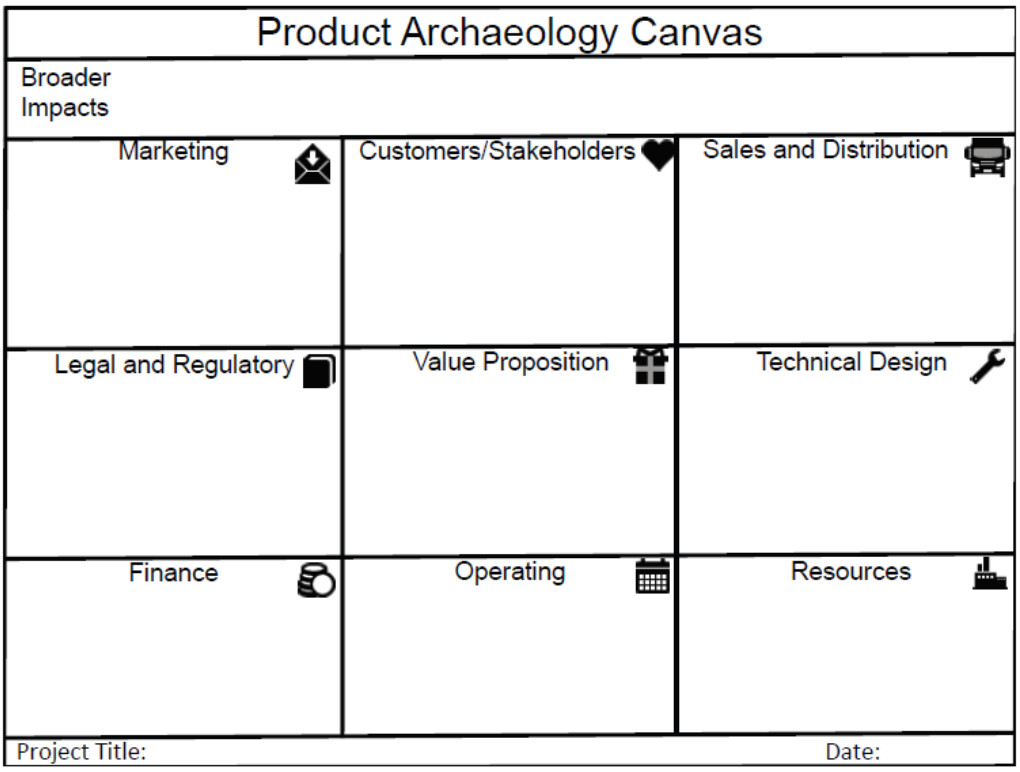

Figure 3 – Product Archeology Canvas

Innovation Canvas (IC). The Innovation Canvas (Kline, et al. 2011) (Figure 4) was developed as an extension of the Business Model Canvas to include product design themes. While the BMC can be applied with the concepts of product features and 'product/market fit', it was not found to be comprehensive enough to be useful in a technical entrepreneurship or product design settings involving complex electro-mechanical-software systems and considerations of world context. The goal for the development of the IC then became the development of a canvas merging comprehensive models for a product or device and a business model. The canvas includes a representation of the BMC in the lower right quadrant. The three remaining quadrants include themes from a meta-model for a system design (Schindel, 2011) that are directly applicable to product design. While comprehensive and the canvas with the largest number of boxes, the IC

can be used in many settings including product design including market context or in a business model prototyping exercise for a new venture including detailed product design themes.

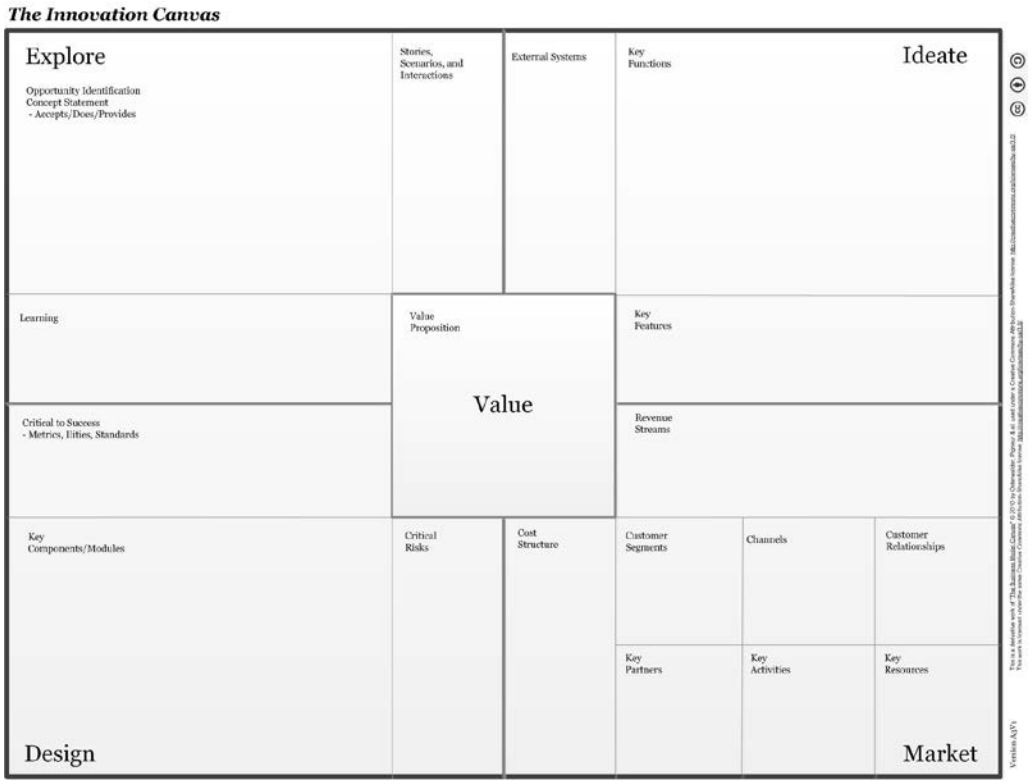

Figure 4 – Innovation Canvas

Using Canvases in the Design or Entrepreneurship Classroom

The pedagogical purpose of a canvas is not to focus on a particular product, as it would be for an entrepreneur, but rather to help students learn the skills, knowledge, attitudes and world-view that is necessary to form and execute on their own value propositions. In this section, we explore some of the reasons an instructor would use a canvas in their classroom.

<u>Balancing Telling and Discovering</u>

A pedagogical decision that every instructor confronts is how much of a domain to reveal to their students and how much to let them discover on their own. There seems to be a balance between the efficiency for the instructor in covering information, and the depth of learning for the student. Much of the educational literature wrestles with this question. What is not debated is that education is a change in an individual, and it is achieved through a non-linear and non-sequential learning process. What is necessary to make forward progress is some type of framework. On one end of a spectrum an instructor can provide the framework and fill it in with information. On the other end of the spectrum a student can create their own framework and then fill it in themselves. A canvas is an extraordinary balanced tool in this regard. It provides enough structure to explore a complex domain but not so much as to render it simplistic or prescribed.

Just as it does for entrepreneurs, a canvas can serve as a framework for student-driven discovery and practice.

Interconnected Domains

Most traditional engineering courses have a tightly focused domain of content that has been well established and refined. Some domains, however, are inherently transdisciplinary, meaning that they are formed from a diverse range of concepts that interact in complex ways. In an engineering curriculum, design, entrepreneurship, ethics, and economics are good examples. What a canvas offers a learner is a way to organize information that comes from many sources and that at first glance may appear to be unrelated. At the same time, the blank spots on a canvas enable a deep dive into a specific example, such as a particular product or process. This is especially important in domains that are inherently non-linear, non-sequential, iterative and quickly changing, where a learner needs concrete examples.

The interconnections between elements of a canvas also naturally foster critical thinking, communication, critique and other higher levels of Bloom's Taxonomy. Students must consider many variables at once, rather than focus on one at a time. A canvas can quite literally stretch a student's ability to contain within their mind several different, and potentially conflicting, considerations. A great deal of business and leadership literature cites this type of cognitive capacity as underlie the ability to make good decisions in complex situations. What a canvas can do is help train students to develop a complex internal model of the world that will help guide them in the future.

Student navigation of a non-algorithmic processes

We have become conditioned to think of many things in the world as unfolding through an algorithm. Even the common view of DNA, although incorrect, is as a code that deterministically drives forward the development of an organism. This same view, unfortunately, is often applied in teaching business and design.

A canvas can suggest a more emergent process for achieving goals. Emergent processes can succeed where strictly algorithmic processes fail, because real world decisions must often be made in a path-dependent, complex and time-dependent way. The result is a series of decisions that could not have been made, or even anticipated, ahead of time. This is a particularly important lesson for students, as many professional and personal decisions after college will not be algorithmic. What is more, the reason these decisions are not algorithmic is that they are a combination of being proactive and reactive and are made in tight communication with the real world. The fact that there is mostly blank space on a canvas invites entering in real world information.

More specifically, a canvas can be used to expose students to design, not as a process but rather as model building where a series of complex decisions must be made in the absence of complete information. In design education, the design process is sometimes presented with a linear flowchart, with mention that in reality there is looping, feedback, and integration of information along the way (Ulrich and Eppinger, 2012). Using a (non-numbered or flow diagram) canvas

puts the pathway to designing a product in the hands of the students. Furthermore, the use of a canvas in a design course can also suggest a natural division of labor for a team.

For the Instructor

A canvas can also aid in building a course and suggest powerful pedagogical techniques. First, a canvas can be a simple way to organize the topics in a class and also serve as a visual reminder of the wider picture of what is being covered. Second the use of a canvas can inspire a faculty member to develop new pedagogical approaches. For example, a canvas can work in synergy with many forms of active and inductive learning. Third, a canvas can stretch a faculty member to learn about an area that is unfamiliar to them. For example, using the Business Model Canvas might inspire a faculty member to learn more about the financial aspects of product design. Fourth, in a co-collaborative classroom, students will make connections between elements of the canvas that were not considered by the faculty member.

Our suggestion to an instructor is to use Figures 1 and 2, as well as Table 2, to help understand which canvases might map to the learning goals of the class. The authors of canvases often are receptive to emails and a short conversation can help elucidate the way a canvas was envisioned by the author. Questions in such an exchange can be guided by the general systems view of canvases and the list of attributes in Table 1. An excellent list of canvas tools can be found at www.canvanizer.com.

Future Work

There is much room for future work, of which only three will be mentioned. First, as pointed out by Zott et al., there is little agreement on definitions within the business model and consequently canvas communities. As a result, there are few rigorous studies of canvas use in business or education. We hope that this work is a first step in the direction of more rigorous definitions that can lead to more robust research in the future. Ultimately best practices for canvas design, evaluation, and use could be established. Second, the whitespaces in Figure 2 suggests several areas where new canvases may be created. For example, one with the right knowledge and experience could develop a very useful manufacturing canvas. Third, the authors have begun to experiment with several other pedagogical uses of a canvas. For example, one author challenges students to create their own canvas in a design course. Students identify the 10-15 attributes of a solution concept that they will use as selection criteria. They can then print out several copies of their blank canvas and apply it to each solution concept. In this way, they can compare solutions side-by-side and on equal terms. Student-generated canvases can also be created for all phases of the design of a product and allow students to more easily see where a particular solution is lacking.

Conclusions

Our intent in this paper was to clarify the structures and processes that make canvases useful in various settings. It was noted that canvases support conceptual prototyping and the realities of iterative decision making. We presented a unifying framework based upon systems thinking including the proposition that a canvas represents the structural or subsystem elements of one or more systems in a life cycle stage. A series of canvas classification attributes were developed.

These attributes were then used to analyze several popular canvases to create a framework for comparing and selecting canvases. This analysis reveals that these canvases have been developed for different types of systems in different stages of their life cycle. Lastly we discussed how our general canvas framework could be used to enhance student learning in an educational context.

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http://www.uxforthemasses.com/updated-service-model-canvas/. (3)

Table 2A: Comparison of 12 canvases against canvas attributes

		1	2	3	4	5
Canvas / Attributes	**Possible Values**	**Business Model Canvas**	**Value Proposition Canvas**	**Service Model Canvas**	**Platform Design Canvas**	**Customer Journey Canvas**
Number Boxes	Number 1-N	9	6	12	11, Multiple Canvases	11
Prompts	Yes/No	Key words, questions, examples	Key words	Key words, questions	Key words and questions	Key words and questions
Problem being solved		Development of business model	Development of value proposition, Achieve product-market fit	Development of service model (UX) in business context	Development of business platforms for networked businesses	Development of service process steps in context
Includes Value Proposition or Theme	Yes/No	Yes	Yes	Yes	Yes	Yes
Represents system or concept	Model for product, device, service, business model, development, execution, etc.	Business model system	Value proposition concept	Software Service system	Business Model for Networked Businesses	Service system and customer relationship, emotions
Multiple systems	Yes/No	No, business model - but subsystems include customers, channels, partners, etc.	Yes, business value proposition and customer jobs and pains	No, service model - but includes customers, channels, partners, etc.	No	Yes
What aspects represented		Key elements from business plans	Key elements from value proposition and customer jobs and pains	Key elements from business plans	Key elements of stakeholders, services, and exchanges	Key elements from process flowchart
Life cycle phases included	Concept, Development, Production, Operation, Retirement	Operation phase of business	Operation	Operation	Operation	Operation
Time and change perspective included	Yes/No	No	No	No	No	Yes, pre, during, and post service
Suggests a process	Yes/No	No	No	Yes, boxes numbered	Yes, priorities suggested	Yes
Similar to				Business Model Canvas	Business Model Canvas	

Table 2B: Comparison of 12 canvases against canvas attributes

6	7	8	9	10	11	12
Product Design Canvas	**Pilcher Product Canvas**	**Innovation Canvas**	**Product Archaeology Canvas**	**Innovation Project Canvas (Morley)**	**Customer Value Proposition Canvas**	**Innovation Value Prop Canvas**
11, Multiple Canvases	6, Multiple Canvases	18	9	15, Multiple Canvases	5	5
Key words	Key words and definitions	Key Words	Key Words	Key Words and questions	Key Words	Key Words
Design of a product including scope, user needs, and context	Design of a product with 'great user experience and right features'	Development of product and business models	Development of product in business model and business operations context	Development of innovation project in business case and project planning context	Development of product and business model	Development of implementation or execution model
Yes (less visible)	Yes (less visible)	Yes	Yes	Yes	Yes - External, Customer Value Proposition	Yes, Internal Value Proposition
Key concepts related to product design and use	Key concepts related to product design and use	Business model and product model	Product model and Business operations model	Product, Business and Project Plan Models	Product model and Business Model - Simplified	Implementation Model - Simplified
No	No	Yes, product and business model	Yes	Yes	Yes, product and business model	No
Key concepts, interacting systems, context	Key concepts, experiences, and interacting systems	Key elements from business plans and systems model		Key elements from product, business, project plans	Key elements from business and product models	Key elements of implementation system
Operation and some Development	Operational	Operation	Development and Operation	Development, Operation, Production	Operation	Development, Production
No	No	Yes		No	No	Yes
No	No	No	No	No	No	No
Business Model Canvas		Expanded Business Model Canvas		Business Model Canvas	Business Model Canvas	Business Model Canvas