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The Innovation Canvas - A Tool to Develop Integrated Product Designs and Business Models

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Abstract

The innovation canvas is a tool for teams to develop integrated product designs and business models. The canvas focuses attention on critical technical, market, resource, and execution issues that can determine the success of a new design or venture. The canvas inspires innovation by examining the difficult challenges from multiple perspectives and encouraging the rapid association, revision, and alignment of critical themes.

The design process is often presented as a sequential or structured process with the common understanding that, in practice, the process is anything but structured with iterative decisions and tradeoffs made among a variety of technical, production, and market issues. The canvas includes themes from product design and systems engineering processes and merges them with themes from the popular Business Model Canvas from the entrepreneurship field. By focusing attention on key design and market themes and not process steps, the proposed canvas presents an innovation inspiring approach to design that is more closely aligned with the realities and complexities of developing a successful product, process, or service.

In practice, a team interacts with a poster sized version of the canvas and populates it with Post-it® notes containing relevant information associated with each theme. The process is team oriented, engages all participants, and encourages iterative development and alignment of multiple themes across the canvas.

For educators, the innovation canvas is a teaching tool for design and entrepreneurship courses that integrates technical and market content. In design courses, the canvas can improve product and service development by including business and market issues in the development process. In entrepreneurship courses, the canvas can improve business model generation by incorporating high level design themes as integral components of the venture vision.

As the canvas concept and tools are rapidly being adopted by practitioners, this prototype innovation canvas is presented to disseminate the tool to a broader group of engineering educators, designers, and practitioners and to encourage use and feedback on its utility.

Importance of Innovation

The term “innovation” has become a priority for all types of organizations (corporate, academic, and government) to ensure prosperity and future success. In a Boston Consulting survey[5] of corporate executives, innovation was named as a top three corporate priority by 72% of respondents. A recent Ernst and Young report notes that “it is not enough to just be innovative, it is essential to be innovative *all* the time” and they further their argument by presenting a spiral model for business model innovation[35 p.3]. Wagner notes that “the solution to our economic and social challenges is the same: creating a viable and sustainable economy that creates good jobs without polluting the planet. And there is general agreement as to what that new economy must be based on. One word: innovation." [64p.2] Wagner also notes that parents, teachers, employers, and our education system in general must take bold steps to develop the capacities of young people to become innovators. As the field of innovation emerges as an organizational competency, it has become essential for engineering educators to ensure that their graduates enter the workforce with skills that will allow them to be effective innovators and to be able to function effectively in innovative organizations. Innovation can take place at a variety of levels and during many activities within an organization including business model innovation, product and process innovation, and enabling and managing for innovation. In this paper, we consider innovation in the context of developing innovative designs in the context of business and market factors.

In Schoen et al.[54], innovation and invention are viewed as distinctly different activities. Both are viewed as cyclic processes with the "innovation cycle" translating inventions and ideas into tangible products and services that have value to the marketplace and customers. An "innovation stage" project starts with a concept, an invention, or intellectual property but the project often lacks a detailed specification for development. The challenge is to evaluate a variety of design concepts and implement the best result in practical and innovative ways that moves the concept toward commercialization. Kline et al.[40] captured eight best practices of innovation from managing innovation stage projects in a technology commercialization program. These best practices include focusing on speed, teamwork, allowing project scopes to creep, and cracking the tough problems first. They are applicable for the individual or the organization wanting to be more innovative. Further, in *The Innovators DNA*, Dyer et al.[21] identify five discovery skills of successful business innovators. These skills include associating, questioning, observing, experimenting, and networking. It is noted that these traits can be developed and strengthened through practice.

The theme of innovation has come to academic organizations as well. In *The Innovative University*, Christensen and Eyering[17] urge universities become more innovative through online and other delivery approaches, use of technology, and improved utilization of resources. Universities across the nation have developed centers, institutes, programs and courses that focus on innovation. Despite the attention to innovation, the philosophies and best practices of being innovative, developing innovative designs, and teaching innovation skills are still emerging. Just as the philosophies and academic discipline of leadership have emerged over the last decades, it is believed that innovation will follow the same path. The presentation of the innovation canvas in this paper, even though still a prototype, is intended to spur further work by the engineering education community to develop teaching tools that enhance students' design abilities and inspire innovative designs.

The Engineering Design Processes

Design is a fundamental skill in engineering. It is essential that teaching tools be developed that promote the skills of design and innovation within design[1,56]. The engineering design process has been the subject of many studies of how best to teach the concepts, tools, and processes[11,20,22,25,29,32,40,42,54,60]. In a comprehensive review of design teaching and learning, Dym et al. note that designing "effective solutions to meet social needs"[(22 p.103)] is a fundamental skill for engineering graduates and that "design thinking is complex" [(22 p.103)]. The process of design is often taught in a "crawl, walk, run" approach by introducing fundamental concepts that are applied in a number of project based learning (PBL) experiences of increasing complexity throughout the curriculum[43]. These experiences may range from reverse engineering exercises[19], small design projects, to capstone design experiences[20,43] with a corporate partner.

The methods and tools we use as engineering educators to describe the design process often fall short of capturing the complexities and context of the process as it happens in practice[56], and the complexities of the design process are often not fully understood by students until they are revealed through design projects and experiences[55]. In the popular text by Ulrich and Eppinger[60], models for the product development and concept generation processes are presented describing the design process in block diagram form with sequential paths sometimes including feedback and looping. Ulrich and Eppinger also note that "rarely does the entire process proceed in a purely sequential fashion, completing each activity before beginning the next. In practice, front-end activities may be overlapped in time and iteration is often necessary."[(60 p.16)] This thought is also accepted by other design researchers and educators[6]. Sheppard et al. state more generally that students' transitions from novice to competent practitioners require "not a once-and-for-all movement from theory to application, but a continuing back-and-forth between general theoretical principles (i.e., design and innovation skills) and the particularities of the problem situation (i.e., design and innovation skills in authentic contexts) as the student builds more sophisticated skills through experience."[(56 p.24)]

The interconnection and overlap between steps and need for iteration have been recognized in several works. The simultaneous engineering concept[24] overlaps engineering and business steps throughout the development process to both accelerate and improve the quality of results. The interconnections between design process steps are noted in Ford and Coulston[26] where a web model for the design process is presented which denotes all the possible connections and loops between the design steps. In a study of student performance in design projects[55], Figure 1 below shows the design paths taken by freshman students in a design exercise. The charts show a variety of paths taken and significant iteration and looping in certain steps. In another study of freshmen and senior design students, the number of transitions (or iterations) between phases of the design process was positively correlated to the quality of both freshmen and seniors' final design products[6].

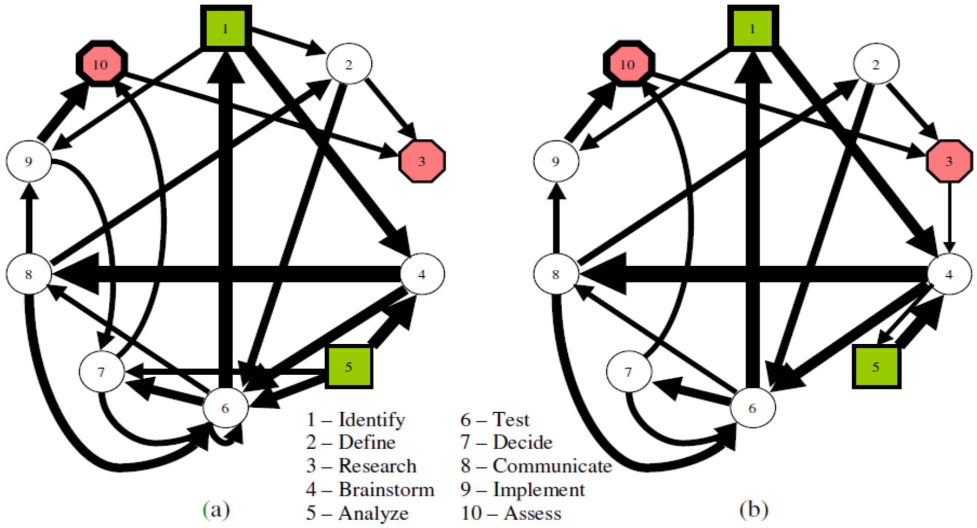

Figure 1 Two graphical representaitons of student design paths

a) Overall most likely paths (indicated by a 6 or more in Table VI)

b) Most likely entrance or exit path to a step (indicated by the largest number in a row or column in Table VI and those at least 90% of that value)

Figure 1 – Student Design Paths in a Design Exercise[55]

In addition to iterations, Dym notes that some literature characterizes " 'design as a social process' in which teams define and negotiate decisions. … each participant possesses an ingrained set of technical values and representations that act as a filter during design team interactions, and that the resulting design is an intersection—not a simple summation-of the participants' products."(22 p.107) This social component emphasizes the use of teaching tools that encourage students interact, discuss, and explain their ideas and understanding. Ulrich suggests thinking of "design as a collection of decisions"(61 p.398) and that decisions in product development extend beyond basic design decisions and are "contextual and are boundary-spanning, forming the backdrop against which product design is performed. Other decisions are ancillary to product design, but central to the commercialization of a new product."(61 p.395) Here the extension beyond basic design decisions calls for teaching tools that encourage students to explore both the boundaries and the core of their designs. In Guerra et al.[29], a new model for design is proposed by reviewing twelve previously published models and developing a new process model. The design steps are grouped into five 'super-steps' to describe the process at the highest level. Perhaps the most comprehensive models for system design are available from the field of systems engineering[10]. Developed to be applied to large scale, complex systems such as military and space program applications, the processes include detailed and traceable steps from stakeholder input to design documents to an integrated and tested system. In the field of systems engineering, attention has been applied to developing metamodels for systems design and the smallest model possible to most efficiently contain the essential design content for a system[52,53]. Themes from these metamodels could provide value to design students and have been selected for inclusion in the innovation canvas.

The Business Model Development Process

Historically, the education of students for entrepreneurial activity has taken a reductionist approach. The goal has been to collect and organize information for a group of tasks in different business areas which collectively should result in a successful venture. Through a written business plan, the entrepreneur or venture team describes the business model for the venture, plans for commercializing the product offering, and develops strategies for maintaining a sustainable advantage in the marketplace[2,14,59]. The plan also includes operational and financial details including projections of revenue, costs, and funding needed. In practice, successful ventures and commercialization do not work this way. Ventures succeed as a result of dynamic and complex processes that rapidly adapt to new information as it becomes available. New businesses with meticulously documented plans often fail while others with gaps and obvious weaknesses manage to survive and thrive.

Blank and Dorf[8] distinguish this discrepancy by separating new venture development into two phases: search and execution. In the search phase, a new venture searches for a real and viable value proposition (i.e., product, service, or other customer value-add). In this phase, extensive research is completed by contacting potential customers, stakeholders, partners, competitors, etc. and a minimum viable product (basic feature set or service components) is developed. This minimum viable product is tested with potential customers and key stakeholders to seek early and cost effective feedback to validate the ventures' assumptions. After the search phase and confirmation of a value proposition, new ventures enter the execution phase where they develop a business plan and execute on that plan towards successful venture. The search and execution phases can and should be done with any new venture, be it a new company or a new product/service within a company. Innovative companies should be continually iterating between the search and execution processes.

Emergence of the Canvas Concept

The evidence that business plans and their central core, business models, are dependent on the broader context in which they are applied has led Osterwalder[46] and others to search for more powerful tools to integrate content and context into the business development process. These tools in turn lead to better models and decision making. In developing a 'metamodel' for the business model, Osterwalder considered many business model representations in the literature and proposed nine metathemes to encompass the main elements or building blocks in the models considered. These nine themes are the blocks included in the Business Model Canvas[47] which has been widely adopted by practitioners and educators including the NSF I-Corps program[45].

Additional canvases have recently appeared including the Lean Canvas[42], Product Canvas[49], Customer Journey Canvas[18], and Value Proposition Canvas[62]. In addition to the canvas models themselves, a number of software tools have appeared to facilitate their use including iPad app versions of the business model canvas and websites devoted to developing, sharing, and analyzing canvases[13,15].

While the business model canvas and lean canvas have become popular with entrepreneurship practitioners and educators, the canvases only include a cursory reference to design themes. A successful design, project, or venture often comes as a result of a number of considerations and tradeoffs including technical, market, resources, and execution. Design of products and processes and development of business structure, strategy, and operations are inextricably linked and must be developed in simultaneous, connected ways. A framework for inspiring innovation must include both design and market issues to encourage integrating and making tradeoffs among these themes.

Development of a Canvas to Develop Integrated Product Designs and Business Models

The goal of developing the innovation canvas has been to create a tool to develop successful product designs and business models in a framework that integrates design and market themes, encourages innovation, and more closely represents the process as it occurs in practice. In addition, the canvas should provide benefit for educators or practitioners in design or entrepreneurship fields. Specifically, it provides a means to help both novice and expert designers and entrepreneurs organize, communicate, refine, and reflect on their ideas. The canvas also provides a means of design-thinking documentation in which comparisons between initial, mid, and final versions of the canvas could be used to assess student learning.

The prototype version of the innovation canvas is shown in Figure 2 below and is available online for educators and practitioners to test, evaluate, and provide feedback[36]. In addition to the details presented in the remainder of this paper, a brief description of the canvas's themes can be found in the appendix of this paper. The canvas is shared under a Creative Commons (CC) license allowing users to distribute and build upon the work provided they share alike and credit the author. It is a derivative work of the Business Model Canvas which is also shared under a CC license.

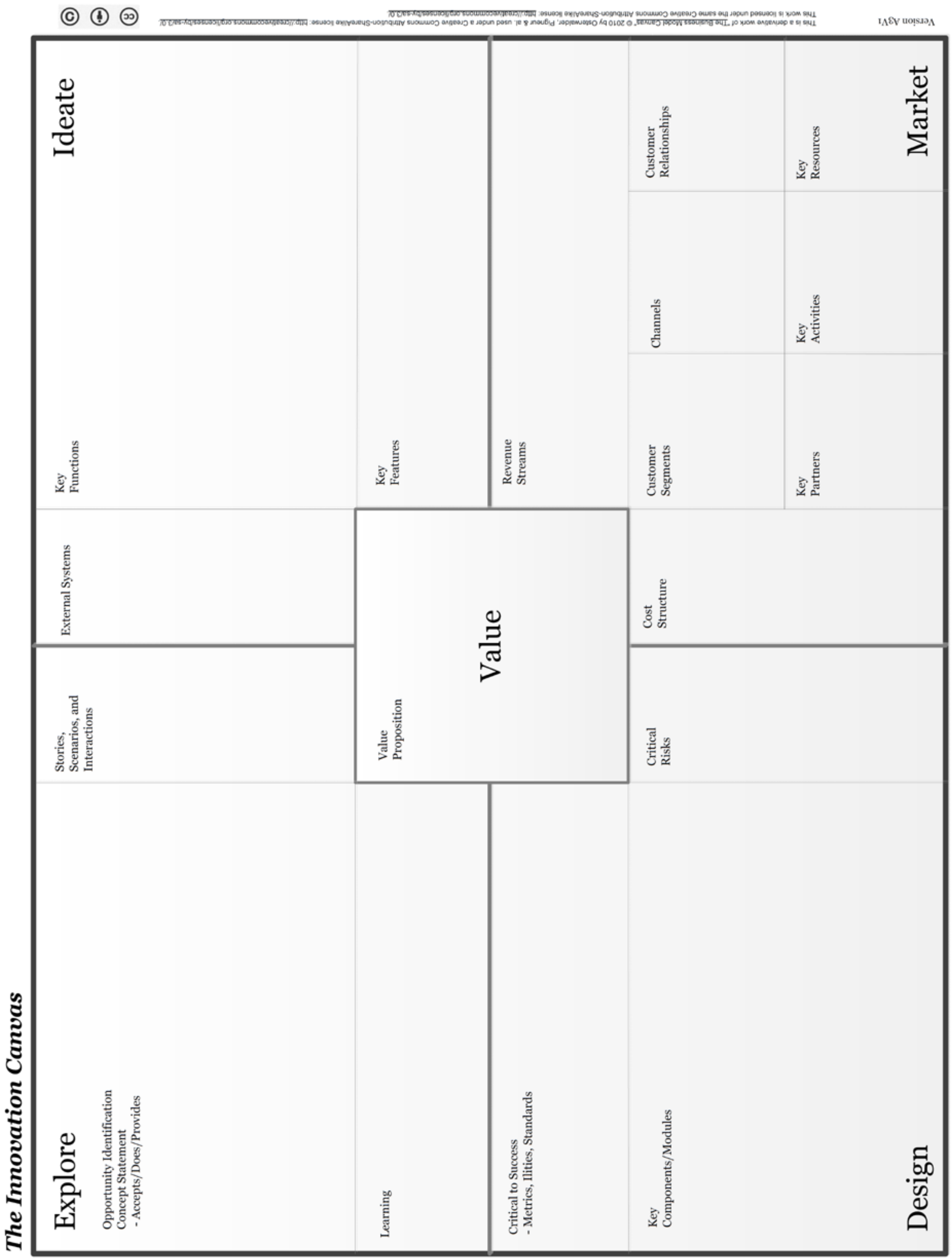

Figure 2 – The Innovation Canvas

During the development of the canvas, the following key thoughts were identified to be woven into the overall design:

- Including key design content and themes applicable to a range of situations from simple mechanical designs, the design of complex electro-mechanical software products and the development of services or processes. The themes selected support a variety of design processes, tools, and methods. The themes include stakeholder input, interactions with external systems, key functions, features, and components, and risks and key measures of success. While not explicitly included as themes, concept generation, modularity, make vs. buy, and product version decisions naturally arise through the use of the canvas. It is noted that the themes included in the canvas are design content and not process steps or categories of information.
- Including key market and business model themes applicable to a wide range of situations. The themes from the Business Model Canvas have been used.
- Creating a tool that is applicable at several levels including product, service, and process design and from the design project to the new product and venture level.
- Establishing connections between product design and business model themes thereby creating a multidisciplinary framework enabling the alignment and association of themes between the two. The ability to associate and align information from diverse sources has been identified as a trait of innovators[16]. In addition, this is well aligned with Ulrich who notes decisions in product development are contextual and boundary spanning.
- Creating a framework that supports a variety of design tools, models, and best practices[3]. As a template, the framework should accommodate a variety of paths through the design process but also support a particular path should the instructor specify one.
- Being extendable to include other context themes such as cultural, societal, environmental, sustainable, and ethical. A key measure of design process success is developing a solution in a broader market and societal context.
- Creating a framework to encourage creativity and innovation by emphasizing teamwork, taking a fast and iterative approach, and integrating team input. This is well aligned with Dym who notes design is a social process and the resulting design output is the intersection of participants' contributions.
- Developing a framework that captures the complexities and realities of the design and development processes in practice.

In practice, a team interacts with a poster sized version of the canvas and populates it with Post-it® notes containing relevant information associated with each theme. The process is engaging, team oriented, and encourages revision and alignment of content across the canvas. The instructor may either directly suggest a process and steps for using the canvas or allow students to independently find their own way. The process is somewhat similar to the group oriented 'charrette' which is used in architecture, industrial design, or urban planning settings.

As can be seen in Figure 2, the innovation canvas is arranged in four quadrants surrounding a center theme of value. Creating value is the primary objective of any design project or venture.

The value proposition is a statement that describes how something of value is provided to customers or stakeholders and is one of the primary measures of success. The project may provide value for a number of stakeholders, and the concept of value may have meaning beyond just financial value to include societal, cultural, environmental, sustainable, or ethical considerations.

In the Explore quadrant, the main blocks include the concept, customer stories and scenarios, and learning. The idea or spark for a new venture may come from a wide range of sources. It may arise from an identified need, technical or market circumstances, new inventions, regulatory policies, or other sources. In the Explore quadrant, the concept or opportunity may still be emerging and a clearer view of it is created. Often a new venture begins to take shape through conversations and discussions that over time begin to develop a clearer picture of the opportunity. Customer stories and scenarios are a created to describe what the system or product does, who it interacts with, and how it might provide benefit or value. This is typically a 'words and pictures' process of bringing some clarity to the envisioned venture. Going through the process, feedback on the venture is received at various points and can be collected as learning to motivate further revisions to the venture concept. This feedback and revision is a central element in the lean startup approach and the minimum viable product[51].

In the Ideate quadrant, the main blocks include the key functions, external systems, and key features. The key themes in the Ideate and Design quadrants have been inspired by common design process themes and a model based systems engineering approach. In the Ideate quadrant, the focus is on considering what the system should do, not how. The key themes in the Ideate quadrant include the key functions of the system, the external systems that it interacts with, and the key features that will be marketed to the customer. There are several benefits to this approach. Functions and features are the basic building blocks of the design process[10,48,60]. The creativity approach 'Scamper'[23] suggests adding, subtracting, or combining functions for concept generation and to develop an innovative new design. Many other creativity and problem solving approaches such as TRIZ[3,4] are also well supported by a functional analysis approach. Considering external systems helps to reveal the inputs, outputs, and interfaces of the system of interest necessary to implement the scenarios and stories collected in the Explore quadrant.

The key features are the operating behaviors or traits of the system that are marketed to customers. A feature is realized by the available functions. Implementing a new feature is either easily accomplished by the available functions or more difficult as new functionality must be developed. Connecting to the Market quadrant, different features may be necessary in the business offering for different customer segments. Connecting to the Design quadrant, different physical modules and components may be required to support certain features. While a large number of concepts, functions, and features may be identified in exploring the business venture, the lean startup approach suggests offering only the minimum set of features necessary to introduce an offering to the market. The canvas supports this approach of adding/subtracting features as the market responds to the system offering.

In the Design quadrant, the main blocks include the key components and modules, the critical to success factors, and the critical risk factors. As in the Ideate quadrant, the key themes have been inspired by common design themes and a model-based systems engineering approach. Here, the concepts, functions, and features identified in the Ideate quadrant are evaluated and prototypes may be developed. A final concept is selected and realized in components or modules. The focus is on a physical implementation or instantiation and how the system will accomplish the functions and features. Development considerations in the Design quadrant include integral and modular approaches, make vs. buy decisions, product line considerations, and satisfying the critical to success performance metrics and 'ilities' such as manufacturability or sustainability. While two products targeted at different channels and customer segments may provide similar functions and features, they may appear very different in their realization to achieve acceptance in their target markets.

In the Market quadrant, the main blocks include the nine themes from the business model canvas. These include revenue and cost considerations along with customer themes and key activities, resources, and partnerships. In the Market quadrant, the focus is on the business model for the venture and information entered here directly feeds back to the other three quadrants. As noted above as an example, decisions about target customer segments and channels to reach the market often have direct implications for the features, functions, and components necessary in the design. For a new product development project, all themes in the market quadrant would be relevant. For a smaller design project, all themes may not be relevant but cost and revenue would be at a minimum.

Tools and Approaches Supported in Each Quadrant

The canvas itself supports a number of design tools, methods, and approaches as summarized in Table 1 below. Possible tools and methods for use in each quadrant are noted. As a teaching tool, instructors may suggest a process and steps for working with the canvas which may vary depending on the situation. For a new product development exercise, initial attention may focus on the Explore/Market quadrants to develop background, needs, and concepts before proceeding to Ideate/Design. For a device redesign or reverse engineering project, initial attention may focus on the Design/Ideate quadrants to fully understand the current realization before considering the needs and context for improvements. However, after students gain some experience with the canvas, the instructor may leave it to students to determine their approach. The potential of the innovation canvas lies in its ability to be used as a structured design tool (in classrooms) or as an open, flexible, and unstructured design tool (for skilled students and practitioners) depending on the setting.

Table 1- **Possible Tools and Methods for Use in Each Quadrant**	
Explore Opportunity Identification [2,14] Voice of the Customer [50,60] Scenario and Sequence Diagrams [10] Needs-Metrics Matrix [50] Trends and Convergence Opportunities [2,14] Lean Start Up [51] Market Feedback [51] Buyer Utility Map [38,39] Voice of the Product [27] Jobs to be Done [16] Value Stream Mapping Environmental Scanning Ethnography	**Ideate** Product Design [34,48,50,60] Model Based Systems Engineering [10] Systematica [52,53] Context or External Systems Diagrams [10] Feature Library [52] Functional Architecture Diagrams [10,60] Functional Decomposition [10,50,60] Concept Generation [10,60] Morphological Matrix [10,60] SCAMPER [23] Axiomatic Design [57] TRIZ [3,4] Biomimicry [10]
Design Product Design [34,48,50,60] Model Based Systems Engineering [10] Needs-Metrics Matrix [60] Quality Function Deployment [50] Concept Selection [34,48,50,60] Pugh Matrix [26,50,60] Physical Architecture Diagrams [10] Modularity [60} Prototyping [34,48,50,60] Product Family [60] Minimum Viable Product [51] Taguchi Methods [60] Design of Experiments [60] FMEA [50]	**Market** Technology Ventures [2,14] Business Model Generation [47,59] Market Size/Segment Research Mass Customization Product Globalization Marketing 5P's Cost Models Revenue and Pricing Models Production Strategies and Models Supply Chain Strategies
Value Proposition Value Proposition Templates [28] Value Proposition Designer Canvas [62] Jobs to be Done [16]	

In the table, the tools and methods are assigned to a quadrant, however, it is often the case that they are applied or illustrated across quadrants. For example, modularity decisions are often made by considering feature, function, and component mappings together with needs from customer segments and product line decisions.

Scenarios for Use of the Innovation Canvas

The utility of tools for development of designs or business models is often best established through case studies or scenarios. In engineering education, the capstone design experience is the focal point and culminating experience for students to practice their design skills. Capstone design problems are often selected to suit the time constraints of the course and to challenge the emerging design skills of students. Also, previous research reveals that faculty members' motivation associated with teaching approaches used in the capstone course are largely connected to the course's usefulness in relation to students' current and future goals. The innovation canvas is ideally suited to support the capstone experience, provide market (and other) contexts to the project, and further increase the usefulness for engineering students.

It is also envisioned that the canvas could be useful in general design courses or more advanced situations including, but not limited to the following:

- Solving a design problem or revising an existing design
- Developing a component design or redesign at the project level
- Developing a new product design at the project level
- Developing a new product design for a new venture
- Characterizing an existing product or product line
- Evaluating extension of an existing product into a product line or new markets
- Comparing multiple products for strengths, weaknesses, and market potential
- Evaluating successful/unsuccessful products and designs
- Evaluating and comparing product and market strategies for different companies
- Development of new product and market strategies

Initial Testing and Feedback

Initial testing of the canvas has taken place in several courses at Rose-Hulman. In an entrepreneurship course, the canvas has been used by students to characterize the product offering and business model for the AgriQuest case study[14]. The exercise revealed that the risks of the venture centered around regulatory and market acceptance issues as well as the ability of the firm to discover new bio-based, safer and cleaner solutions in crop protection and animal health markets.

In another class example, Apple was presented as an example of an innovative company. Teams of students were asked to develop separate canvases to characterize the Apple offerings of iPod, iTunes, iPhone, and iPad. The completed canvases revealed a high level of functionality shared among products (functions, features), effective connections between products (external systems), and a comprehensive approach to take the products to market (channels, customer segments).

A sample innovation canvas has been developed (see Figure 3 below) for the well-known IDEO Deep Dive[58] video as part of teaching materials for class case study presentation. The canvas provides an efficient and effective framework to capture the critical information from the story and to illustrate the key function, feature, component decisions and tradeoffs made in the case.

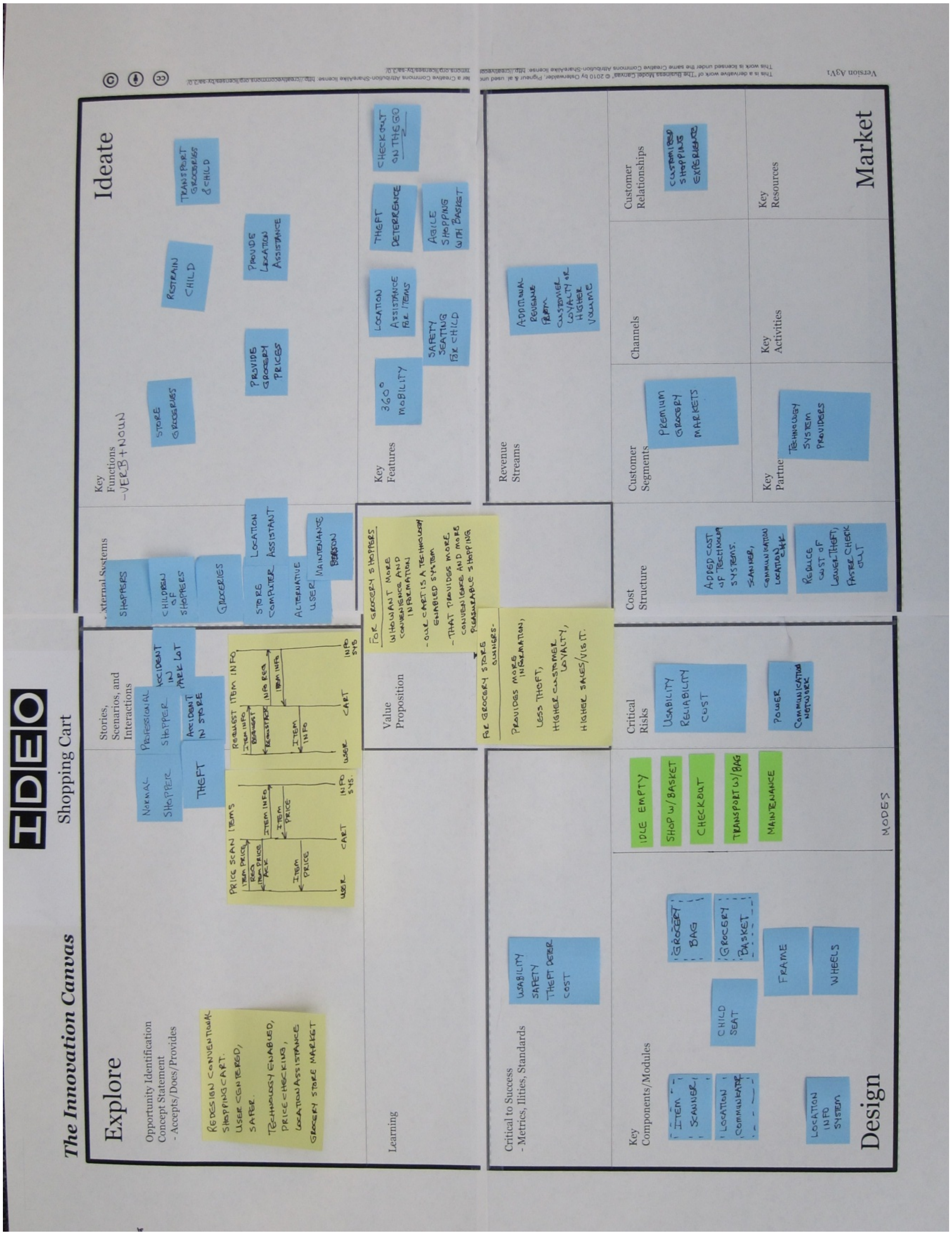

Figure 3 – Innovation Canvas for IDEO Shopping Cart Example

In this case, considering modes of use is important to the design and are included in the Key Components block. With the elimination of the basket to provide theft deterrence, the 'store groceries' function is implemented differently when the cart is in the store (groceries stored in modular baskets) versus after checkout (groceries stored in plastic bags). The canvas highlights that the desired features of 'assistance with item location' and 'item pricing/checkout' require significant functionality that may not provide a cost/benefit advantage. The canvas also illustrates that the primary market segment targeted is premium grocery stores, and the design would not be successful if taken to different market segments where the items stored in the cart are much larger than grocery items.

Additional testing is underway in course projects for entrepreneurship and systems engineering courses and with several capstone design teams. A graduate level entrepreneurship course currently underway will have students prepare both an innovation canvas and a traditional business plan for a new venture of their choosing. Initial use has indicated some challenges in teaching with the innovation canvas. Because it combines a broad range of design and market themes, it is challenging for the instructor to be well versed in each theme as well as the interactions among them.

Need for Further Development and Assessment

The canvas concept in general and the Innovation Canvas in particular represent intriguing new approaches and tools for developing integrated product designs and business models. While preliminary summative feedback on the utility of the canvas is positive, further testing, assessment, and refinement is needed to more clearly evaluate the educational benefits.

An extended version of the canvas is currently being developed to include broader cultural, societal, sustainable, legal, and ethical themes. Different versions of the innovation canvas are envisioned with varying level of detail and sophistication to span introductory design courses through capstone design projects. It may also be possible to create versions of the canvas tailored for the Grand Challenges or other similar settings. Additionally, it is also postulated that creating computer based tools for the development of canvases could facilitate the completion of the canvas, interaction among teammates, navigation of complex interrelationships, and coach the users in identifying important interconnections.

Conclusions

The innovation canvas has been developed for educators and practitioners as a tool to support the creation of successful product designs and business models. The canvas creates a framework that integrates design and market themes, encourages innovation, and more closely represents the processes as they occur in practice. For educators, the canvas is envisioned to be applicable in design, entrepreneurship, and capstone design courses. It is particularly promising for making courses truly interdisciplinary, rather than simply collecting together the individual contributions from the specialists in separate disciplines.

The canvas concept and tools are rapidly being adopted by educators and practitioners in the entrepreneurship and new venture fields. This prototype innovation canvas is presented to make the tool available to a broader range of engineering educators as well as designers and practitioners with the objective of encouraging use and seeking feedback on its utility.

The canvas concept and associated tools represent an intriguing new approach for design education and for developing integrated product designs and business models. By integrating design and market content into a single canvas, the innovation canvas offers educators and practitioners both structure and flexibility at the same time. While preliminary feedback on the utility of the canvas is positive, further testing, assessment, and refinement is needed to more clearly evaluate the benefits in education and industry settings.

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Appendix

A brief description of the innovation canvas themes are provided below.

1. Value Proposition – Text – The value proposition for a product is an expression of the target market segments, the benefit it provides, and the price. Questions commonly considered include - what value is being provided or what customer need is being solved.

Approach 1: Jobs to be Done, Christensen[16]

Approach 2: Crossing the Chasm Value Positioning Statement[28]

Template

For _____________ (target customer)
who _____________ (statement of the need or opportunity)
our (product/service name) is _____________ (product category)
that (statement of benefit) _____________ .

Sample(s)

"For non-technical marketers
who struggle to find return on investment in social media
our product is a web-based analytics software
that translates engagement metrics into actionable revenue metrics."[28]

In many projects, there may be multiple customers and stakeholders, and the concept of value may extend beyond financial to include personal, cultural, environmental, or ethical factors.

2. Concept – Text – A general description of the venture or project, what is unique about it, what it does or produces, who are target customers, how value is produced.

3. Stories and Scenarios – Text, Sequence Diagrams, Input/Output Traces – A collection of stories illustrating how a customer would use the product, different usage conditions, different types of customers using it, etc. May be described in more formal sequence diagrams or input/output traces. Also a collection of desirable properties as described or requested by customers.

4. Learning – Text – A collection of important feedback and learning from early product trials that influences further development of the product and venture.

5. External Systems – Text, List – A list of the key systems that the product interacts with – it both receives inputs from and provides outputs to these systems. May be described with a context diagram.

6. Key Functions – Text, List – A list of the top level functions the product performs. Usually two word statements – Verb+Noun. Examples are ‘Accepts Customer Input’, ‘Provides Paper Output’, ‘Converts Energy to Heat’, ‘Processes Signals’, etc. Considering ‘energy/materials/signal flows’ is often a key way to identify top level functions and what they do.

7. Key Features – Text, List – A list of the important features that will be recognized by and promoted to the customer as providing value. Examples might include ‘rapid setup’, ‘fast download’, ‘simple diagnostics’, etc. Features can often arise as collections of similar scenarios or interactions with the user or other external systems.

8. Key Components/Modules – Text, List – A list of the top-level physical hardware components that will comprise the product. These components implement the product functions described above. Modes of use are identified if relevant. Make vs. buy considerations for each component are identified. Decisions about modularity arise in the mapping of functions to components. In the case of a product line or multiple versions, the product architecture and components included in each version are identified.

9. Critical to Success – Text, List - A collection of the key factors or measures critical to success of the product. These critical to success factors include performance criteria, constraints, technical metrics, ‘ilities’, or conformance to standards. The technical metrics may come from a needs/metrics analysis. The ilities include: reliability, manufacturability, usability, security, serviceability, interoperability, etc.

10. Key Risks – Text, List – The top few risks of product failure that require special attention. The key risks may come from FMEA or other risk studies.

    The following themes come from *Business Model Generation*[47] and additional information can be found in the text.

11. Revenue Streams – Text, List – The sources of revenue that the venture intends to capture. Examples might include sales, service, or licensing revenues.

12. Cost Structure - Text, List – The components of cost that the venture is built upon. Examples might include salaries, manufacturing overhead, consultants, licensing fees, etc.

13. Key Partners – Text, List – A list of the key partners or suppliers to the venture.

14. Key Activities
15. Key Resources

16. Customer Segments – Text, List – A list of the key target customer groups described by demographic measures – age, gender, geography, interests, spending habits, desired features, etc. Different customer segments may have expectations for different product features or versions.

17. Channels – Text, List – A list of the envisioned channels to reach customers – direct sales, online, distribution, etc. Different channels may have expectations for different product features or versions.

18. Customer Relationships – A list of the type of relationship that each of our segments expects.