

# **Primary Techniques for Concept Generation in the Product Development Process**

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## **Abstract**

The paper/presentation will describe the two most critical elements of creative problem solving within the concept development process: problem definition and criticism of the concept. The paper describes the value and the need for the Industrial Designer to generate innovative solutions to the design problem and the importance of creative problem solving techniques in fulfilling that goal. The paper describes the importance of clearly defining the design problem when the Industrial Designer is generating conceptual solutions and the necessity to withhold criticism during the concept generating process. Failure to follow these two practices will surely lead to difficulties in generating salient concepts. The paper uses two examples from industry to support this premise and examples the use of techniques to aid the definition of the design problem and control the premature criticism of the design concept.

# **Primary Techniques for Concept Generation in the Product Development Process**

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A primary activity of the Industrial Designer is to develop alternative solutions to the design problem in order to design innovative, new products that offer improved function, new technology, and a more attractive appearance to a target market. In Industrial Design education, projects are constructed to mimic this activity so the students can develop their abilities to generate concepts and develop new product ideas and as such enhance their potential in the work place and project the profession forward. There are many conceptualization techniques that are valuable in the classroom but none are more important to the success of a project and the development of the student designer than the definition of the product and controlling criticism. Without these primary techniques, additional concept generation practices will not be as useful and the project will not reach its greatest potential.

This paper addresses the two key techniques of concept generation: defining the product and controlling criticism and identifies techniques that can be used to enhance the concept generation process. The paper concludes with detailed descriptions of the design process at Zura Sports and Greybridge—two organizations where strong concept generation

techniques were employed and resulted in innovative products that positively impacted the marketplace.

### **The Design Process**

A product development process provides a flexible structure that guides the development of an idea from a loose collection of concepts to a tangible product solution. The basic design process is constructed of four steps or phases: Research/Definition, Concept Development, Concept Refinement, and Finalization. The activity of the Research/Definition Phase will produce design objectives that define the new product in terms of what it will do, who will purchase/use it and what it will communicate. The implementation of concept generation techniques in the Concept Development Phase optimizes the development of alternative solutions. The last two phases will further develop and prepare the concept for manufacturing and release into the marketplace.

Within the process of generating concepts and developing alternative solutions the two most important practices are starting with a well defined product and controlling when a product concept will be criticized and evaluated. When these practices are not emphasized, it is much more difficult to address the problem/design objectives and to generate new solutions that will lead to innovation.

### **Problem/Product Definition**

The design of a new product is a compromise among how the product functions, how it is made, what it looks like, how much it will cost and who will buy it/use it. These attributes or objectives must be defined clearly because it is nearly impossible to generate a solution to an undefined problem. In addition, the objectives must be prioritized, as not all of them can be resolved completely or perfectly, and a prioritization will enable the development of a product with the strongest attributes. Moreover, prioritizing objectives assists the concept generation process in that prioritizing enables designers to focus on one objective at a time.

Product definition and objective prioritization depends on the experience of the design team and the information gathered in the Research/Definition Phase. In academic situations the research is completed by members of the design team with goals to gather as much information as budget and schedule will allow. Design research techniques are critical to the process of defining the product and may range from ethnographic research and observational studies to user interviews and role playing exercises. For the student designer it is useful to define the product in terms of questions or statements. Examples of this technique are:

- Can basic objectives be determined, such as what does it do, what does it look like, how does it work, how is it made, who will use it, who will buy it, how much will they pay for it, how can it be broken or fixed, and/or how can it be recycled?
- Can the product's most important element be described? For instance, a bicycle must roll first and foremost, unless the goal is to display it.
- Can the product definition be addressed as a four year old might, constantly asking the question "Why?"
- Is the product a new idea or will it compete in an existing market? Visiting stores or websites can help to locate and compare competitive products by feature and cost?
- Are there publications and market specific magazines that can add pertinent information?

- Are there government regulations that will influence the design of the product?
- Try to think innocently and ask, “what if it could do that.”
- Create a scenario or story board for a specific task, clearly describing the steps that people will take in completing the task.
- Try to describe the purchasers of the product according to their age, ability and income.

In this manner the design team can construct a clear product definition and a prioritized list of design objectives that specifically describe what the new product must do first and foremost and what additional features and attributes will aid its success in the market. Describing the product in a clear fashion in the Research /Definition Phase of the project is mandatory for the success of the next phase, the Concept Generation Phase.

### **Concept Generation**

The goal in designing a new product is to create an innovative solution that will be sold in the marketplace and produce revenue. The goal of concept generation is to produce new ideas by looking at different ways to solve a problem. There are many activities and techniques that aid in the generation of ideas, but none is more important than controlling the criticism and evaluation of the concepts.

It is vitally important to evaluate product concepts in order to determine the solutions that will result in the best possible product. However, evaluation is best conducted in terms of the design objectives and at the conclusion of the Concept Development and the Refinement Phases. At these points, product concepts are sufficiently developed enough to be judged and improved to the next phase. Criticism or evaluation before the conclusion of the Concept Development Phase impedes the focused and uninhibited sort of thinking that is needed to generate new ideas. If ideas are criticized as they are generated it becomes very difficult to think conceptually. In that case, the person generating ideas will concentrate more on the judging criteria and less on forming ideas. Criticizing and evaluating new ideas can act as a correctness filter at a stage in the process that requires loose, quick, not fully developed ideas in order to avoid reapplying existing solutions.

Criticism here includes self as well as team criticism. Self-criticism occurs for several reasons. One reason is that self-criticism may provide a way to avoid others’ criticism or being embarrassed by others’ criticism. Another reason is that self-criticism may be based on the drive to be competitive and the thought that an idea is not useful or “no good” if it is not seen as a “winner.”

In concept generation exercises it is critical to withhold evaluation and all types of criticism until an appropriate number of ideas are generated or a predetermined time has past. In this way students gain valuable experience in generating ideas freely, exploring alternative solutions and synthesizing strong, fuller solutions. Some techniques that will aid student designers to control and relocate criticism/evaluation during concept generation activities are as follows:

- Think of ideas as not having value and that the task at hand is to generate a quantity of ideas.
- Remember that innovation can come from reiteration and the more solutions generated the greater the chance for a new solution.

- Use a “worry sheet” to record distracting, outside concerns during the idea session so your “worries” will not be ignored but addressed later.
- Generate many ideas in order to understanding the interrelationships of the design objectives.
- Remember that criticism at the right moment is a useful tool for idea generation and that idea generation and selection is somewhat Darwinian, the most capable concept will move forward.
- Remember that preventing self-criticism takes practice. Start by recording the amount of critical comments that creep into the concept generation process. Then begin a concept generation session by wanting to not judge your ideas. There is not a magic solution. It will take focus, effort, and practice to change the habit of early criticism.
- Remember that it is nearly impossible to juggle different objectives of a product in your mind simultaneously; therefore, an initial idea cannot be complete and, as such, cannot be judged.

When the students are conducting group concept generation sessions there are useful techniques that will aid the success of the activity. It is very useful to use an environment that will allow one to five people to focus for an hour, have the participants well fed but not sleepy, discuss the design objectives so that the group is better able to focus, and take as many breaks as necessary. Additional techniques that will encourage success include:

- Select one person to be aware of time, and help the group to remain focused.
- Encourage the group to be open and share ideas and thoughts. Have the members of the group share a personal thought or concern in order to encourage camaraderie.
- Enforce the evaluation of the ideas in terms of the design objectives at the appropriate time.
- Focus on one particular aspect of an objective for a specific amount of time, +/- twenty minutes to facilitate the generation of solutions.
- Use a comfortable medium-- pen, pencil, tape recorder-- to record every idea.
- Make a Problem Sign and put it in front of the participants in order to help the group focus on the objective.
- When the participants seem stuck or out of ideas, it is best to take a break, change the subject, medium and/or location.
- To conclude the session, ask the participants to consider the most ridiculous idea. This will permit and encourage free thinking as the idea is considered useless from the start.

There are countless examples from industry that show the benefit of successful concept generation in the product development process. Two have been chosen for inclusion in this paper. Both examples show the importance that product definition and concept generation in a criticism-controlled environment can have on the process of developing new products.

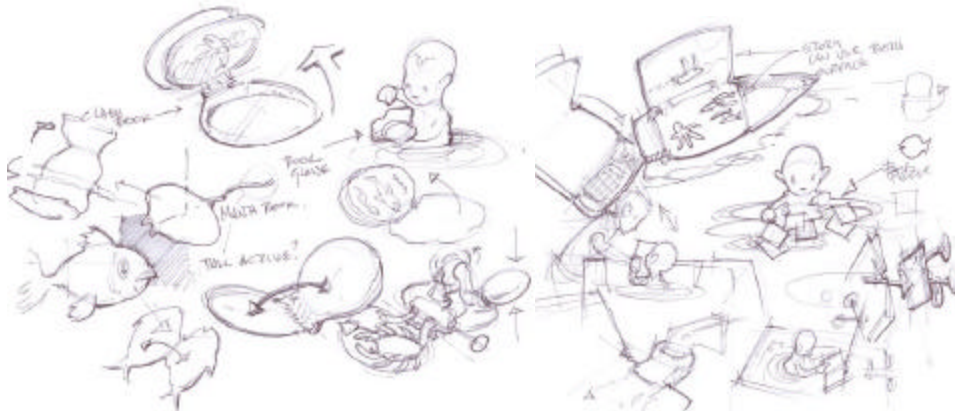
### **Book in the Tub Club by Greybridge**

The design group at Greybridge, a start-up toy company, thought that bath-related books and toys could be a successful market segment since the currently available product range was somewhat limited. To develop a winning product, the team first researched items that deal with water, such as boats, plumbing, fountains, and yard and garden equipment. Next,

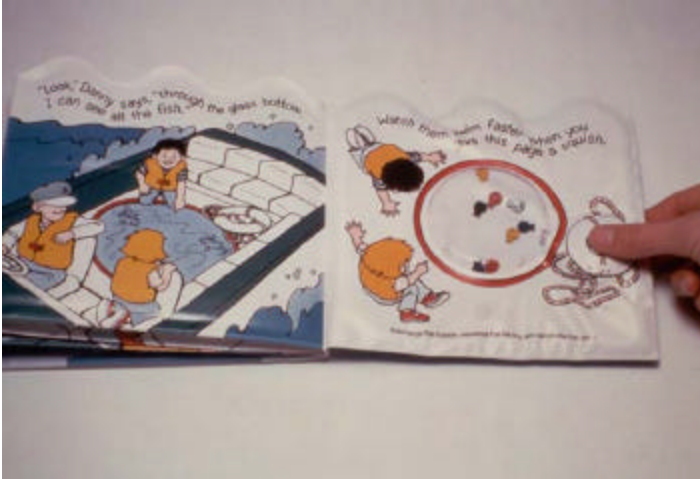
they spoke with parents to understand the concerns of both participants in the bathing process. Then, they looked at books and the reading process of preschool age children.

From their research, the design team defined the tub product as being 1) safe (which meant rounded corners in case the child would fall on it), 2) floatable in order to stay within a seated child's reach, 3) having a play pattern that would focus on the qualities of water, and 4) fun and educational. With the product defined, the team schedule several brainstorming/idea sessions of three to four people with a moderator. In idea sessions, critical comments were controlled by tallying the amount and asking the participants that surpassed six such comments to leave the session. In addition to this, when voices or egos became disruptive the session's moderator would call for a break, change the discussion topic or ask the participants to work individually for thirty minutes. The team worked together and individually to produce concepts that were squeezable, wearable, washable, drinkable and pourable. Concepts that were generated from the sessions ranged from rainforest showers with twirlers, waterfalls with sparklers, water squirting fish and sea turtles, boats and periscopes that explored, and suction-cupped water dishes and floating platforms that channeled water for sound and color events.

The concepts were reviewed against the design objectives and from the review the team decided on a concept of book pages that would float in the tub, produce different water activities and, include a simple explanation in a story format. The concept was quickly modeled and reviewed with parents. The team then refined the concept to emphasize a story and, turned the concept into the Book in the Tub Club series. The book series was accepted with enthusiasm by participants in market studies and by buyers at trade shows.



Book in the Tub Club Concepts



Book in the Tub Club

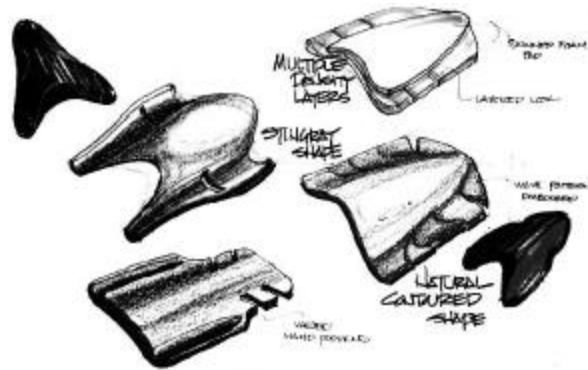
### **Speedray by Zura Sports, Inc.**

The Speed-Ray kickboard was designed by Design Axis, Inc for Zura Sports, Inc. When the Speed Ray was developed, Zura Sports was a new entrepreneurial company staffed by designers with a strong personal experience in competitive swimming. The design team identified the swimming kickboard market as static and unchanging and, as such, ripe for innovation. The team defined the product through examining the practice techniques of coaches and the body dynamics of competitive swimmers. In addition, the team researched floating materials, water flow, manufacturing practices, and aquatic creatures.

Based on their research, the design team defined the kickboard as being able to 1) enhance the swimmer's grip, 2) support the swimmer's elbows, 3) encourage changes in kick patterns, and 4) present a quick, aquatic image. With the product defined, the design team set to the task of generating ideas. The designers pretended to swim in order to visualize practice routines and encourage the generation of concepts. Pictures of fish were posted on the wall as reference material for the development of forms and colors. The concept generation sessions were focused and stayed to the prearranged schedules with critical comments being noted and promptly negated. Additionally, all the participants in the concept generation sessions agreed that the concepts would not be evaluated until the wall in the conference room was filled with product ideas. This practice aided the group to focus on generating many ideas and not generating a single, best idea. The concepts were wide-ranging; some rugged and finned, others were dramatic, resembling a manta ray, others exhibited pronounced grips or specific body contact areas. The team generated concepts that reflected the vividness of the sport and the aquatic nature of the environment. After many reiterations and tested study models, the design team built a near-production prototype and introduced the Speed-Ray at a trade show. The response was beyond expectations and the kickboard moved directly into production. The Speedray has been noted by Popular Science magazine as the "Best of What's New," and has received an IDEA Gold Award from the Industrial Designers of America and Business Week magazine. Zura Sports continues to push for innovation and currently offers over twenty aquatic fitness products for swimmers of all ages.



Speedray concepts



Speedray, Concept Testing

In Industrial Design education, students learn that innovation is critical to the success of a new product and that innovation can be accomplished through a design process that facilitates the development of alternative solutions and the refinement and finalization of the most appropriate product concept. Students also need to learn that a clear definition of the product and diligent control of criticism is germane to the process of generating product concepts. These two elements will not guarantee the product's nor the student's success in the marketplace, but they will enhance the student's concept generating activities, ensure innovation in the product's development, and enable the best possible solution to move forward.