

## **AC 2010-398: IDEATION TO INNOVATION (I2I) WORKSHOP**

**Daniel Raviv, Florida Atlantic University**

**David Barbe, University of Maryland**

# **Ideation to Innovation (I2I) Workshop**

**Daniel Raviv**  
**Florida Atlantic University, Boca Raton, FL**  
**ravivd@fau.edu**  
and  
**David F. Barbe**  
**University of Maryland, College Park, MD**  
**dbarbe@umd.edu**

## **Abstract**

This paper describes an on-going NCIIA-sponsored project titled “Ideation to Innovation.” The goal is to design, develop and test an innovation-focused interactive program aimed at future national dissemination at different colleges and for multidisciplinary audiences.

For engineers of the future, technical capability alone will no longer be a distinguishing feature. Clearly, a broader-based educational experience must teach leadership, innovation, and entrepreneurship. There is a need to focus on thinking outside-the-box, taking risks, and being critical thinkers who are creative and imaginative.

For the past several years, The National Collegiate Inventors and Innovators Alliance (NCIIA) has supported the development and implementation of workshops on “Invention to Venture” (I2V), and more recently the “Advanced Invention to Venture” (AI2V). The proposed workshop is based on a need for an additional type of workshop modeled in part after the I2V and AI2V: an innovation-focused workshop. The new workshop can be offered independently, or as an add-on to (or part of) I2V or AI2V workshops.

The program consists of two parts:

1. Traits of Innovative Individuals

Participants will learn about:

- (a) Traits of innovative individuals, and (b) enhancing individuals’ innovative skills.

Innovators share some common traits, many of which can be learned and enhanced. In particular, this part of the workshop will present traits such as observing, thinking, experimenting, teaming, dreaming, persisting, having fun, and being passionate about the work. Hands-on exercises would allow participants to experience innovators’ skills.

2. Traits of Innovative Companies

Participants will learn about:

(a) Traits of innovative companies, and (b) building and sustaining innovative environments.

Participants will gain knowledge of what's common to many innovative companies, such as Gore, P&G, Google, Apple, 3M, FedEx, Ideo, and Samsung, as well as how to become one. Companies can become more innovative by adhering to specific clear company and leadership values, and by providing an open-minded, risk-taking, and knowledge-sharing based enjoyable environment. This part of the workshop will emphasize (i) vision, values, and leadership, and (ii) environment and culture, keeping in mind the importance of innovation as a continuous process and not as an "agenda item."

In this paper we report on the status of the program, its content, outcomes, development and testing, while focusing on its first part (Traits of Innovative Individuals).

## **Introduction**

The goal of the "Ideation to Innovation" (I2I) program is to share with different audiences: (a) Traits of innovative individuals and some tools for how to become one, and (b) Traits of innovative companies and how to become one. The workshop attempts to get to the essence of some aspects of the "innovation" buzzword while avoiding definitions of creativity, innovative individuals, and innovative companies. Innovation has many definitions in the literature, and readers can easily find them and choose one, combine some, or even make their own. We found it a bit difficult to write about a Power Point presentation, so the way this paper is presented is by mixing description of elements of the presentation along with some actual slide images.

Due to the variable final desired length of the presentation, it is designed in such a way that elements can be added or eliminated as needed. In particular, the "how to become innovative individual" and "how to become an innovative company" elements can be omitted to meaningfully cut the presentation time almost in half, leaving about 2 hours for each of the two sections. The complete presentation covers a one day workshop (6-8 hours).

In this paper we focus on the first half of the project, i.e., "Traits of innovative individuals and how to become one." It was tested twice, at Johns Hopkins University and at the University of Maryland. The work on "Traits of innovative companies and how to become one" is on-going and we hope to finalize it soon. The paper includes some information on the second part of the project (the company part) as it is still in the making and was not tested yet. The presentations are meant to be interactive and suitable for large as well as small audiences. This is a challenge since it requires activities to be held in different and sometimes limiting settings. We kept in mind the need to end up with a presentation that is useful, transferable, and teachable.

**Resources:** An important issue is the resources used in preparing the presentation. A lot has been written on innovation, and trying to reference even a small portion of the literature is a challenge that will cause injustice to the rest. Instead, we chose to discuss the resources that we used, mostly in general terms. Furthermore, they have been immersed in the text to provide them where relevant, rather than append an exhaustive list.

Finally, perhaps the most important resource is the 15-year accumulated experience of interactive teaching of creative, inventive, and innovative thinking, at FAU, UMD and JHU. The material is based on a continuously improved/modified curriculum. This includes common sense, intuition, imagination, teaming, thinking, diversity, and communication activities; problem exploration, risk taking activities, and team-based competitions; student presentations and discussions; projects, teasers and 3-d puzzles.

Students helped in putting these sources together. We learned a lot by observing students discovering problems, trying to solve them, facing and resolving difficulties, taking risks, struggling under time constraints, and presenting their work. Of great advantage was an exercise where student teams prepared videos on their perception of innovation (published on YouTube).

We used reports and case studies on innovation as published by various institutions such as Harvard University, the American Management Association, and the Boston Consulting Group. Articles from journals and magazines, e.g., Inc. and Entrepreneur were very helpful.

Problem solving methods and approaches, for example, deBono's Lateral Thinking and PMI, Brainstorming, TRIZ, and the 8D methodology for innovative thinking (developed by the first author of this paper) have been used as a set of tools that help people to become more innovative.

The presentation includes video clips of different types, from Stanford University Educators' Corners clips such as talks by Tom Kelley, Guy Kawasaki and Judy Estrin, to elements from Steve Jobs keynote talk at Stanford University in 2005, to Ideo's Deep Dive program on ABC, to... Charlie Chaplin (assembly line episode in "Modern Times") and Bugs bunny (bull fighting episode). Media ads and commercials were analyzed to extract innovative pieces out. We used YouTube presentations on creative/innovative topics and products, and discussed the project with people to obtain some personal views. Analysis of counter examples on companies that faced paradigm shifts (in particular the Swiss Watch industry, and the US Auto industry) helped in crystallizing our examples.

There is abundant information on companies such as Gore, Google, Samsung, P&G, and Apple, considered by many as innovative. Relevant information about them was extracted to make the presentation more meaningful and focused. Many relevant books were used to try to extract elements of innovation as related to the project. For example, we used *Blink*, by Malcolm Gladwell, *Applied Imagination*, by Alex Osborn, *Ten Faces of Innovation*, by Tom Kelley, *The art of Innovation*, by Tom Kelley, *Five Dysfunctions of a Team*, by Patrick M. Lencioni, *How to think like Leonardo De Vinci*, by Michael Gelb, and *Total Creativity*, by David Tanner.

When dealing with innovative individuals we looked at methodologies that "type" people such as MBTI, The Enneagram, True Colors, and Kirton's Adaptation Innovation (KAI) measure. This helped us to consider the subject from a different angle.

## **The presentation**

**Warm up exercises (See Appendix)**

We introduce a set of activities, some of which can be used, if time permits, to get people into a different kind of thinking mode. They include pattern breaking and communication activities to make people aware of their day to day behavior, divergent thinking (“inventing”) activity to make people aware that most problems have more than one solution, a counter-intuition activity, and an imagination exercise. Each exercise is followed by a brief discussion. Over the years we have tried many kinds of exercises. Those listed in the Appendix are some of what we felt “the more successful and relevant” ones.

Interesting self exploration exercises push the audience to think about themselves: do they consider themselves innovators? Can they describe themselves? Are they willing to share their “findings” with people next to them?

An example of such an exercise is “Describe yourself using three adjectives.” It helps individuals to appreciate diversity in thinking. This exercise is followed by an open discussion about the need of different kinds of thinkers, choosing different kinds of team members in a group, and appreciation of each other’s thinking.

### **Some relevant books**

The presentation continues by referring to some books and concepts that relate to innovators. Specifically we refer to “*Plenitude*,” “*How to think like Leonardo da Vinci*,” and “*Ten Faces of Innovation*.”

## Eight traits of innovators

The eight traits are summarized as:

- Observe It
- Think It, Brain It
- Do It
- Team It
- Love It, Be Passionate
- Dream It
- Adapt to It
- Fun It

The following is a more detailed explanation of the traits, each of which is followed by a few relevant few slides and a relevant activity.

Perhaps the most important characteristic of an innovator is to be observant: Ideo's Tom Kelley put it as "Think like a traveler: be in a hyper aware state; the 'vu ja De' vs. 'Déjà vu.'" This is also the anthropologist mode, where you learn, observe, compare, spot opportunities for improvements, watch for things that bother you and others. Inconveniences are clear signs of problems: Can people tell whether they should push or pull a door? Are doors too narrow? Are there too many speed bumps in a certain area? Part of being an innovator is to be continuously bothered and frustrated by what you see, looking for ways to improve. You must continuously challenge the status quo, be dissatisfied with current reality, ask "why?", challenge assumptions, question authority and routines. Observers watch what other do and how things work. For example, Seinfeld's observation that most people eat only the muffin top has led to a new product, called the... Muffin Top.

Observers see the big picture, integrate, connect the dots including the "missing dots," make new connections, synthesize odd combinations, and notice organizing principles and trends. Innovators are paradigm shifters: They actively explore, discover, and look for patterns; they are curious, aware, and alert. They investigate new possibilities, spot problems and opportunities, and find the overlooked.

Good observers create a list of ideas, occasionally review it and choose some.

The image shows a presentation slide with a blue background. On the left, there is a white box containing text and images. The text reads: "Seinfeld observed", "Top of the Muffin, To You!...", and "This led to the 'Muffin Tops' Product". There is a small photo of Jerry Seinfeld pointing, a photo of a muffin top, and a photo of a box of Muffin Tops. On the right, there is another white box with the title "Be an observer" in green and the prompt "Write down three things that bother you and need to be fixed" in purple. The slide numbers "35" and "36" are visible at the bottom of the left and right boxes respectively.

The "be an observer" or "what bothers you?" exercise helps participants to find problems that require solutions. This activity leads to a long list of problems that later can be

redefined and solved. An example that we shared with the audience is the “speed bumps problem,” where the first goal is to define it.

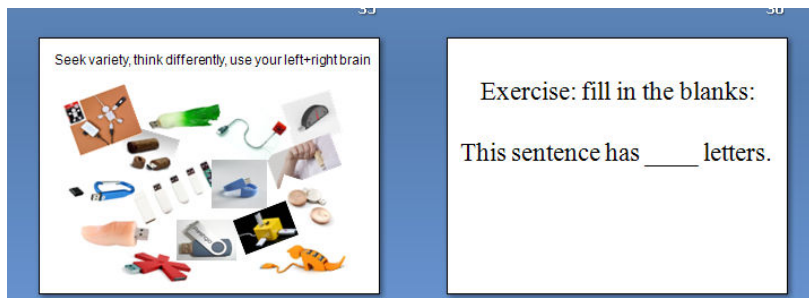
To observe, innovators use all their senses to gather information. They balance and alternate between divergent and convergent thinking, intuition and analysis, logic and imagination, and science and art.

They are whole-brain thinkers, and they keep fine-tuning their brain. They think laterally and vertically (breadth and depth), and like to extract the essence and get to the core of problems. They use intuition, visualization and imagination, their inner voice, common sense, and gut feeling. Innovators can think in system level, and have a good sense of “blink.” They have their unique focused “thinking time” and use it wisely.

Thinkers like to be engaged in activities that are seemingly unrelated to what they try to achieve, like day dreaming, listening to music, and engaging their “back brain,” as some thinking processes need incubating time.

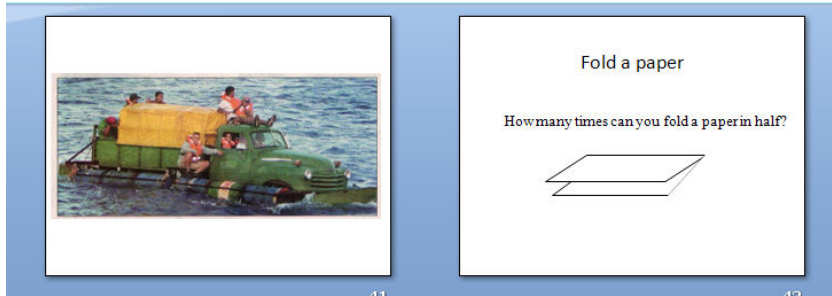
Innovators look for diverse opinions and multiple ideas. They self reflect, self criticize, and develop good balance between confidence and distrust. They tend to withhold compulsive criticism of their own ideas, while at the same time make sure that they do not feel that they are experts or are overconfident.

(By the way, the following “fill in the blanks” exercise resulted in more than 120 meaningfully different solutions.)



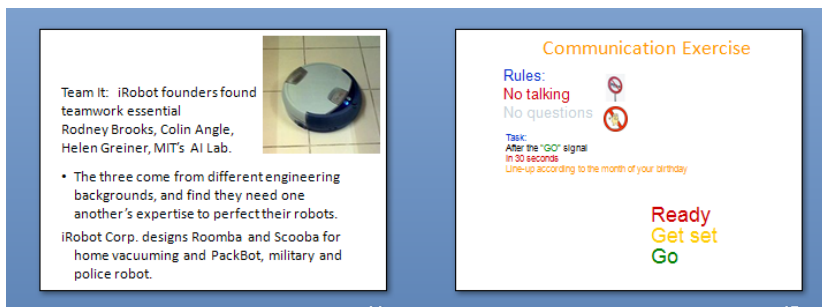
Observing is not enough. Innovators know they must also get their hands dirty. They are experimenters. They are goal oriented and like to take an idea to its prototype. They have no problem failing as they see it as part of success, an opportunity to learn from and improve in the future. WD-40 so named, since the first 39 formulas failed. They do not get discouraged, they accept criticism, have a can-do attitude, and are resilient.

Innovators like to champion ideas. They take action, take risks, get beyond their comfort zone, “fail forward” to succeed. They keep competing with themselves, and do not feel that they are experts. They improvise, create, make something from nothing, act it, draw it, and play it. The following slide is an example of a “product” developed by determined freedom seekers to escape from Cuba to the USA by sea using a 1951 Chevrolet.



Contrary to popular belief in the “genius” alone in his laboratory, innovators do not work alone. Successful innovators know how to team up and that they need to collaborate with others’ brains. Teammates share, collaborate, communicate ideas effectively, translate abstract concepts into meaningful language, and create prototypes. They do not think of themselves as experts and are aware that their prior knowledge might be obsolete.

The key in working as part of a team is to work with the best people at the best places. Innovators are open to coaching and support, and perhaps most importantly they listen!




Long ago a salesman in a mattress store tried to convince me (the first author of the paper) to buy an expensive mattress. The presentation was focused on the number of springs inside the mattress, a fact that did not help to convince me. Instead I suggested to him to tell future customers “You spend 8 hours a day in bed, you better buy a great mattress.” This I felt was more convincing to buy a better and more expensive product. Similarly we can extend this kind of thinking to the workplace: “You spend 10 hours a day at work, you better love it!”

Love what you do and hopefully do what you love! If your work coincides with your hobbies, you win! Find your playground, be playful/humorous, stay a child, be excited, smile, laugh easily and often. Try to follow your passion.



Innovators continue to be motivated; they proactively initiate new projects, reward themselves for efforts, and are open-minded and enthusiastic.

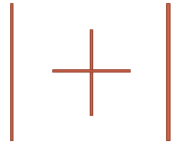
(2 different video clips showing Tom Kelley and Steve Jobs are shown during the presentation to illustrate the point.)




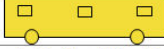
	<p>Write down what you'd like to do when you grow up...</p> <p>Share with the person next to you</p>
---	--

Furthermore, Innovators think big, imagine the impossible, sing while showering, and evaporate temporarily in their prime time/space. They are visionary, highly imaginative, think in mental pictures, entertain the ideal, fantastic and the unfeasible, look for outrageous scenarios, see possibilities within the seemingly unworkable, and respect dreams and daydreams (they write them down whenever they can).


<p><b>Dream It: Walt Disney</b></p>  <ul style="list-style-type: none"> <li>• Mickey was created in 1928 while Disney was on a train from NY to CA</li> <li>• 2008 revenue was just under \$38 billion</li> <li>• There are theme parks in 5 different world locations-Paris, Hong Kong, Tokyo, California, and Florida</li> </ul>	
--	--

	<p><b>Complete.</b></p> <p>No constraints. No assumptions. Enjoy! Share with others</p>
---	---

Mental flexibility is a key to becoming innovative. Innovators adapt and accept constant change, uncertainty, diversity and flexibility. They are open to serendipity, able to adjust the “game plan” as needed, and consider multiple ideas and solutions. They tolerate ambiguity, are comfortable with chaos and uncertainty, are able to entertain paradox, and don’t accept the first “right idea.” They are willing to change work environments as needed, and they constantly adjust their point of view.

<p>The persistence of memory by Salvador Dali</p> 	<p>Here is a forward moving school bus in the USA.</p>  <p>Is it moving to the right or to the left?</p> <p>What's unique about this bus? The doors are on the other side... It must be moving to the left...</p>
---	--

Taking a step back, it becomes apparent that innovators do not simply focus on the practical. Innovators do more than work; they have fun! They do things that they like, and other things that are not necessarily related to their work. They like arts, music, movies, sport, travel, and love to read and laugh. Innovators are committed to learning, continually seek knowledge, synthesize new input quickly, and balance information gathering and action. They familiarize themselves with the latest developments in relevant fields, and wander, walk or travel to inspire fresh thinking.

<p>Crayons</p> <p>Binney and Smith: Experiments with slate waste, cement, and talc, led to the discovery of the "dustless" chalk</p> 	<p><b>FUN Homework assignment</b></p> <ul style="list-style-type: none"> <li>• Drive home in a different way</li> <li>• TODAY: force your self to drive below the speed limit...</li> <li>• Tomorrow: Drive as if a policeman is driving behind you...</li> </ul>
---	---

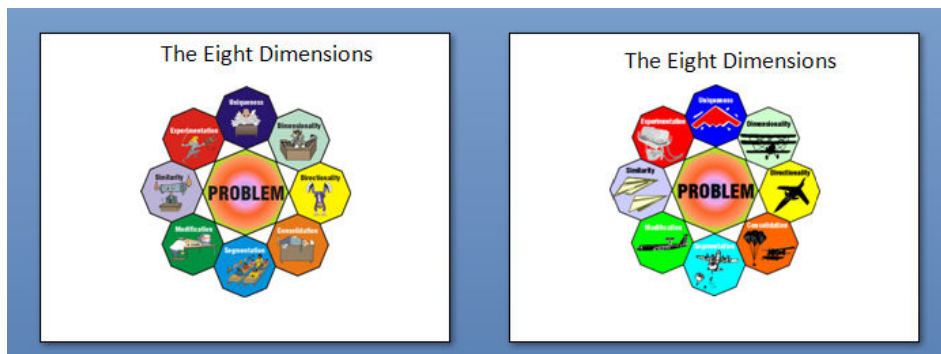
## Pointing Our Minds in a Creative Direction

To get thinking right away, there are many tools to stimulate creative questions and directions of the mind. In the workshop, we briefly refer to 2 ideation tools, the Eight Dimensional Methodology for Innovative Thinking, as well as TRIZ.

### The Eight Dimensions for Innovative Thinking

The eight-dimensional methodology for innovative problem solving is a unified approach that builds on comprehensive problem solving knowledge from industry, business, marketing, math, science, engineering, technology, arts, and daily life. The methodology approaches problems systematically, and stimulates innovation by quickly generating unique “out-of-the-box” unexpected and high-quality solutions. The combination of people’s knowledge and experience with this new thinking tool is a very promising one. The methodology provides top leaders, managers, and problem solvers with new insights and thinking strategies to solve everyday problems they face in the workplace.

An example-based pictorial presentation of the methodology is shown below:



The eight dimensions’ questions:

**Uniqueness:** What is unique about the “processes, objects, dimensions, situations, resources, concepts, principles, features, patterns, problems, or solutions”? Could these observations be used to find solutions?

**Dimensionality:** What could be done with space, time, cost, color, temperature, or any other dimension?

**Directionality:** Could things be done from different directions or points of view? If so, how?

**Consolidation:** Would it be helpful to consolidate “processes, objects, dimensions, situations, resources, concepts, principles, features, patterns, problems, or solutions”? If so, in what way?

**Segmentation:** How could segmentation of “processes, objects, dimensions, situations, resources, concepts, principles, features, patterns, problems, solutions” or dimensions help?

**Modification:** What if modifications to the existing “processes, objects, dimensions, situations, resources, concepts, principles, features, patterns, problems, solutions” are introduced?

**Similarity:** Why not look at similar “processes, objects, dimensions, situations, resources, concepts, principles, features, patterns, problems, or solutions”?

**Experimentation:** Could estimating, guessing, simulating, or experimenting help? If so, how?

In summary, the Eight Dimensional Methodology unifies existing problem solving knowledge, techniques and solutions from different disciplines including Engineering and technology, Inventions, Business and Marketing, Industry, Math and Science, Art, and Daily life. Well known methods like Analogy, TRIZ, SCAMPER, Lateral Thinking, etc., are embedded in it. Furthermore, the methodology is discipline independent. The nature of its construction implies that it can be used to generate ideas for problems from Engineering to Business to daily life. It is comprehensive and systematic, and thus allows anyone to be creative in the idea generation process, a key step in innovation.

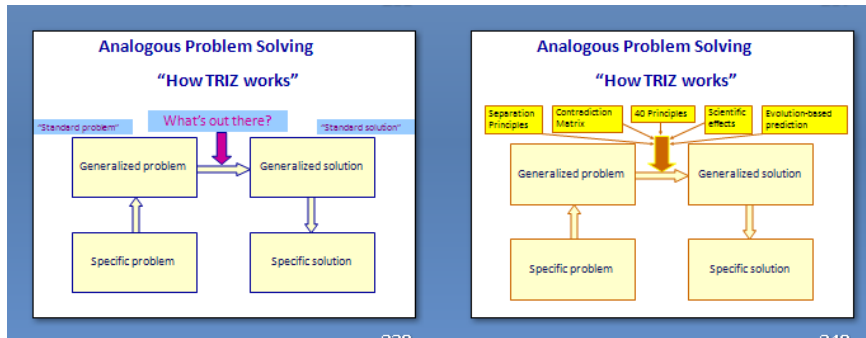
The subdimensions stimulate thinking by focusing on eight different problem solving strategies... one at a time. They allow innovators to generate many out-of-the-box and high quality ideas in a short period of time. In keeping with the teamwork nature of innovation, the methodology may be used by individuals/teams anytime. It is in particular useful in increasing efficiency in both quality and quantity of brainstorming and similar team setting methods. It should be emphasized again that the methodology focuses only on the process of idea generation step of the problem solving process. In addition, it is important to clarify that it is not a problem-solving cookbook.

The unifying theme of the methodology is its goal to reduce and even eliminate psychological inertia. Like innovation, it is fun to think through. The methodology is not cumbersome, rather it is easy to learn and to use. After all what innovator is interested in learning a complicated process for innovation?

### **The TRIZ methodology**

TRIZ is a Russian Acronym for the theory of inventive problem solving. Genrikh Altshuller and his colleagues studied over two million patents and identified the main principles and knowledge that define the process for solving inventive problems. TRIZ makes use of the global patent collection and the known effects of science (physics, chemistry and geometry) as a database to support the needs of problem solvers. TRIZ has been used internationally, leading to a substantial increase in the number of patents by many corporations including Motorola, Proctor and Gamble, Xerox, Kodak, McDonnell Douglas, Hughes, AT&T, General Motors, General Electric, and Ford.

Sample slides for “How TRIZ works: solution by abstraction/ analogy”



## Traits of Innovative Companies

The following is the highlight of traits of innovative companies. The work is ongoing and we hope to complete it soon. Therefore, we only list the sub categories without elaboration.

There are two major characteristics of innovative companies. They have to do with:

- Vision, Values, and Leadership
- Environment and Culture

### 1. Vision, Values, and Leadership

Belief/ Conviction/ Entrepreneurial Spirit

Vision: clear, unambiguous

Externally open and focused

Commitment/ Perseverance

Uniqueness/ Differentiation/ Focus

Value to society

Great leadership/Management team

Integrity

Winning strategy and attitude

Sustained sense of crisis/ urgency

### 2. Environment and Culture

Environment that encourages and is committed to innovation; environment where innovation flourishes; part of actively maintained culture

Flat-lattice environment

Diverse environment

Encouraging risk taking and learning from failure

Encouraging new ideas

Team-based

Communicative

Collaborative

Get best and culture-fit people

Max individual potential  
Reward mechanism in place  
Dedicated to continuous development  
Fun place to be

## Conclusion

The first part of the workshop presentation, i.e., “Traits of Innovative Individuals,” is almost final. We plan to further modify it as needed after further testing, and receive more feedback from participants. We anticipate that it will continue to change over the years, as more innovators and innovations hit the market. Based on current student feedback and some outside observers, there is reason to believe that no major modifications will take place.

We hope that the second part of the presentation will be completed within a few weeks, and we should be able to report on it in more details as well.

We have to admit that we found it a bit strange and difficult to write about an interactive, activity based and movie clips based Power Point presentation. We hope that the reader got the flavor of what’s in the real presentation.

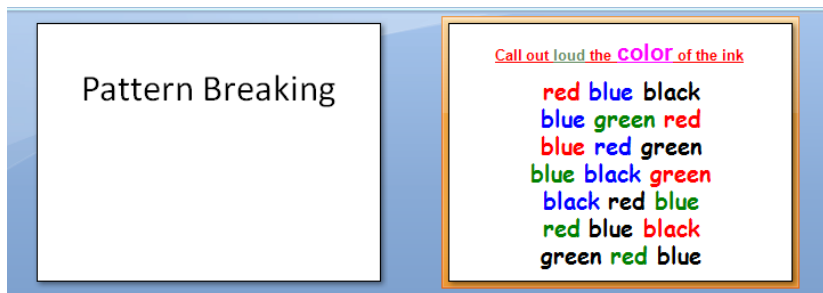
Together with NCIIA, we hope to run it at several different locations nationwide, followed by a Train the Trainer course, to allow others to run it as part of a one day Ideation to Innovation workshop, or as an add-on to the Invention to Venture (I2V) program.

## Appendix

### Warm up exercises

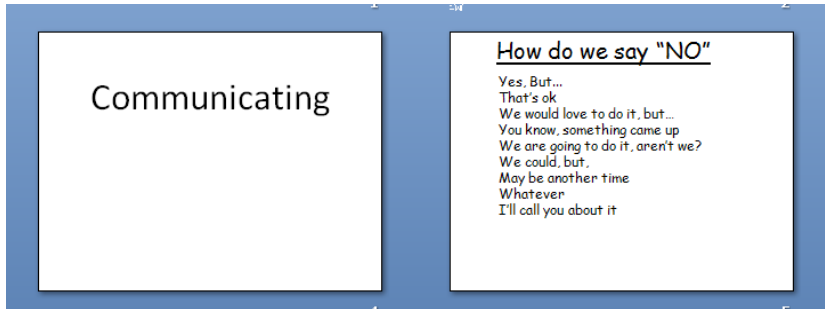
#### Pattern breaking

The audience is asked to call out loud the color of the ink. The lines are shown one at a time followed by audience response. As can be seen in the following slide, in lines 3 to 7 there is a conflict between the actual color and its word that describes it.



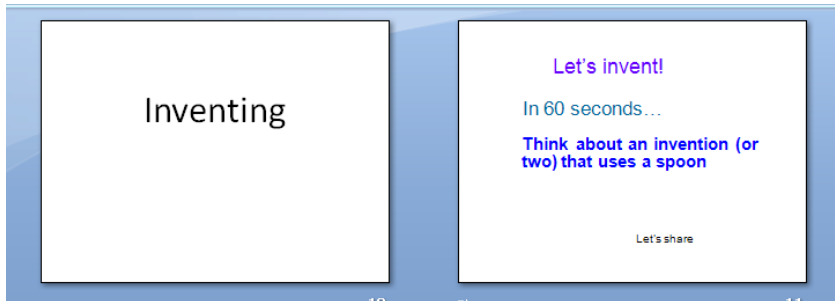
Communication

On a separate piece of paper participants are asked to write down “how people say ‘no’.” Here are some examples of what they write:



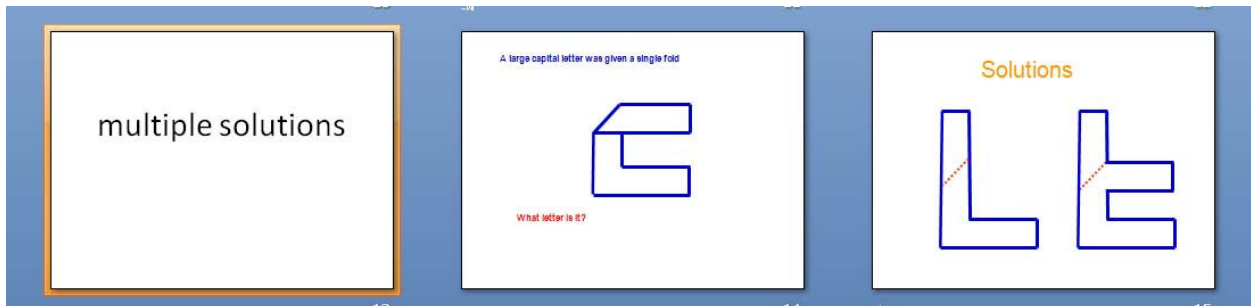
### Divergent thinking

Participants are given 60 seconds to come up with different uses of an object. Ideas are shared following the activities.



### Multiple solutions

In this exercise the audience is asked to find a solution to a problem: “A large capital letter was given a single fold. What letter is it?” Usually the first response is the letter “L.” When asked for a second solution some come up with the letter “F” – a solution that results from the unexpected overlapping piece.



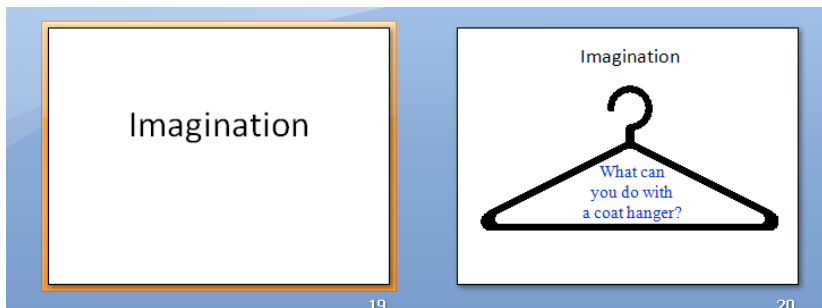
### Intuition

This is an example that reminds the audience to use intuition very cautiously. “Joe attached a helium filled balloon by a string to his seat. After driving for a while at a constant speed, he braked the car. Question: Relative to the seat, did the balloon move forward backwards, or not at all?” (The answer is .... backwards.)



## Imagination

“What can you do with a coat hanger?” Participants are shown a coat hanger and asked to individually list different possible uses. They are given the freedom to use any kind of material, size or shape of a hanger; they may imagine cutting it, shrinking it, using many of them, etc. Amazingly, in a short period of time each participant comes up with many ideas. They later take turns to mention them. (The coat hanger may be substituted with any other basic familiar object such as a book or a mailbox.)



## Problem exploration

**What bothers you?** This is an exercise that helps students think about problems. The instructor asks them to simply write down answers to the “what bothers you?” question, i.e., find problems that require solutions. This activity leads to a long list of problems that later can be redefined and solved. An example that we give the students on “what bothers me” is what we call the “speed bumps problem.”





92

**Define the  
Speed bump  
problem**

96