Creativity and Innovation

- In the technology professions, as has been said before, "It's all about creativity."
- Creativity is about ideas – new ideas, better ideas, profitable ideas.
- Robert Epstein* call creativity, "The ability to express ideas that are new and valuable."
- Those companies with the best ideas – e.g., Apple – are the ones that get ahead, the ones that are successful and profitable, and that hire lots of engineers and computer professionals.

Editor-in-Chief of *Psychology Today* and noted behavioral expert.

Innovation

- But successful ideas are more than just invention.
- The dictionary defines invention as "a creation of the imagination," i.e., a new idea.
- The dictionary also defines innovation as "introducing something new."
- Thus innovation is not just about invention – getting a new idea – but about introducing new products based on that idea that will be profitable and useful.

Innovation (2)

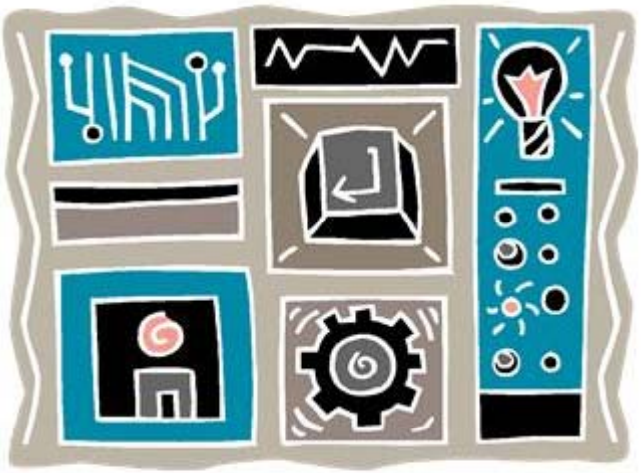
- At Texas Instruments (TI), where I worked for a considerable length of time, we took the term innovation VERY seriously.
- We did not consider it just having a new idea.
- It was about exploring it, and extending our understanding of it, and then using it in new, exciting products that customers would be willing to pay for.
- As we consider creativity today, then, remember that "creativity" is not just about great ideas; it's about the profitable, useful results of great ideas.

Creativity

- **Still, to utilize great ideas as the basis of innovation, you have to have the great ideas!**
- **This opens up the idea of creativity – coming up with new and useful ideas – and how one becomes creative.**
- **How do you become creative?**
- **Are creative people made and not born?**
- **Is there a secret formula to gain creativity?**

Myths About Creativity

- **Creativity is rare. The act of thinking (neural processes) is creative. Most of us have the creativity potential of Mozart or Einstein.**
- **Only high IQ's have creativity. Creativity is related to intelligence, but highly creative people do not necessarily have high IQ's.**
- **Creativity can't be studied. In fact, it has been, since the 1950's!**



Myths (2)

- **Creative people are right-brained. Not really. Despite all the research, nobody has ever located the "creative center" of the brain.**
- **Creativity is mysterious. Uh-huh. Although there is a lot we do not know about creativity, we have also learned a good deal. Some of the basic "laws of creativity" are now known!**
- **Creativity cannot be learned. Although some people will always be better at creativity (just as they are at singing or baseball), virtually everyone can learn how to be more creative.**

"Generativity" Theory*

- **In the 1980's due to a great deal of research on creative ability, Generativity Theory was born. Expressed as a series of equations and computer models, it shows that the creative process is orderly and predictable.**
- **What these basic equations show is:**
  - **Competing behaviors produce new behaviors.**
  - **The combinatorial process is orderly and predictable.**
  - **By influencing the type and number of competing behaviors, we can accelerate and direct creativity.**

Note: Much of the following is based on Epstein's work, primarily *The Big Book of Creativity Games*.

Implications of Generativity

Building ideas like people build with LEGO's.

- **Everyone has roughly equal creative potential.**
- **"Creative" people have special skills.**
- **Anyone can learn these skills.**
- **The creative process can be accelerated and directed.**

Lessons from Generativity Research

- People need to learn to pay attention to and preserve their new ideas.
- Failure is invaluable for creativity, because it causes ideas to compete.
- Broad (extensive) training is important for creativity, because it makes diverse ideas available to compete.
- Properly-designed physical and social environments can stimulate creativity by causing ideas to compete.

Four Core Competencies for Creativity

- **Capturing: Preserving new ideas.**
  - **"Noticing" ideas – in sleep, daydreams, idle thoughts, etc.**
  - **Preserving them by recording (personal recorder, notebook, iPad™, etc.).**
- **Challenging: Seeking challenges and managing failure.**
  - **Having controlled-failure systems.**
  - **Attacking open-ended problems.**
  - **Considering "problems with no solution."**
- **Broadening: Broadening skills and knowledge.**
  - **Training in new fields.**
  - **Entering into an area outside one's expertise.**
- **Surrounding: Changing Physical and Social Environment.**
  - **Relocating.**
  - **Making cross-functional teams.**
  - **Reading magazines and journals (especially in new areas).**

Are You Creative?

- **Of course you are!**
- **Sure, some of us seem to have a "knack" and do a little better at it than others.**
- **I am a good example of a non-creative guy! More "left-brained" (evaluative) than "right-brained" (creative).**
- **However, there are ways, as we have just seen, to enhance our creativity.**
- **The four competencies that we discussed, if implemented, can be a big help.**
- **Let's consider a couple of them. →→ →→ →→**

Focus on Competencies

- **Capturing ideas:**
  - **This is a group exercise.**
  - **Assignment: Come up with a name for a new brand of chewing gum.**
  - **Odd numbered groups – make a careful list of the names.**
  - **Even numbered groups cannot write anything down! Memory only.**
  - **You have five minutes.**
  - **Most (valid) names wins the prize!**

Competencies 2 – Challenging

- **Selling a Graphitron zydeckiphone.**
  - **A team competition.**
  - **You will see a picture of a zydeckiphone.**
  - **You have five minutes to come up with a pitch to sell them.**
  - **All ten teams compete.**
  - **One minute to do your pitch.**
  - **Best pitch wins the competition.**

And Other Skills

- **We could also cover the other two competencies that we discussed, but there is not enough time in one lecture.**
- **Remember, with the four competencies that we have discussed, anyone can improve creativity skills!**
- **When you have to get the creative juices flowing, review the competencies, set up the environment, and prepare to be creative!**

Brainstorming

- **A way to enhance creative abilities is effective brainstorming.**
- **What is brainstorming?**
  - **Brainstorming combines an informal approach to problem-solving with lateral thinking. In general, a group of people compete to generate as many ideas and thoughts as they can, regardless of how crazy some may seem, in a limited amount of time.**
  - **Some of these ideas may then result in solutions to the problem being addressed. Some "silly" ideas may lead to other, valuable ideas.**
  - **This approach gets people away from their normal thinking process.**

Brainstorming Ground Rules

- **During brainstorming, there should be no criticism of ideas.**
- **You are opening up possibilities and breaking down wrong assumptions. Judgments at this stage stunt idea generation.**
  - **As noted earlier, there is no known "creative area" in the brain. There is also no known "evaluative" (judgmental) area, either.**
  - **Nonetheless, judging or criticizing in a brainstorming group will instantly kill the creative flow!**
- **Ideas should only be evaluated at the end of the brainstorming session. Then is the time to seek real solutions from the ideas that have been generated.**

Group Brainstorming

- **Group brainstorming can bring the experience and creativity of all members of the group to bear on an issue.**
- **When some group members get stuck with an idea, another member's creativity and experience can move the process on.**
- **Group brainstorming helps everyone involved to feel that they've contributed to the end solution, and it reminds group members that other people have creative ideas to offer.**
- **Brainstorming is also fun, and it can be great for building team cohesion!**
- **Brainstorming in a group can be risky for individuals. Valuable but strange suggestions may appear stupid at first sight. Thus, members must never criticize, as this can stifle creativity.**

Steps in Brainstorming

- **Define the problem or issue as a creative challenge. Extremely important, as a badly designed challenge could lead to ideas which fail to solve the problem.**
- **Creative challenges typically might start as: "How could we...?" The wording should be concise, e.g., "How can we move an egg a meter?"**
- **Have a time limit. For a group of 5-10, about 25 minutes is good.**
- **Once brainstorming starts, participants shout out solutions while the facilitator writes them down on a white board or flip-chart.**
- **There must be absolutely no criticizing of ideas. No matter how daft, how impossible, or how silly an idea is, it must be written down. Laughing is to be encouraged. Criticism is NOT.**

Steps in Brainstorming (2)

- **Once time is up, select five ideas which you like best. Make sure everyone involved in the brainstorming session is in agreement.**
- **Write down about five criteria for judging which ideas best solve your problem. Criteria should start with the word "should." E.g., "It should be simple to build." "It should be legal." Etc.**
- **Give each idea a score of 0 to 5 points depending on how well it meets each criterion. Once all of the ideas have been scored for each criterion, add up the scores.**
- **The idea with the highest score will best solve the problem. But keep a record of all of the best ideas and their scores in case the best idea turns out not to be workable.**

Brainstorming Experience

- **My first introduction to brainstorming was an exercise in a seminar.**
  - **We had about 40 people in the group.**
  - **Our instructor posed the following problem:**

    You are one of the organizers of a technical conference. There will be about 300 people, many of which are bringing spouses. You have been informed that about 30 children (ages 11-14) will also be accompanying their parents, and you are responsible for baby-sitting them for two hours while the attendees and spouses go on a cruise and dinner party. How do you manage this terrifying chore?
  - **Many suggestions, some far-out.**
  - **Final activity based on "wildest" suggestion.**
- **This was an excellent demonstration of brainstorming!**

Brainstorming Exercise

- **The next class period, you will be assigned your class project (team project).**
- **The basic idea is that you must move an egg one meter horizontally, without touching it (you may place the egg at the starting point). The vertical distance is open.**
- **You must use at least five distinct steps and two kinds of engineering (electrical, mechanical, chemical, software) to do the move. More steps are okay.**
- **You have fifteen minutes to brainstorm ideas to use for this assignment.**

Creativity Summary

- **Although as with many other skills (music, sculpture, electronic design, software development) some people have a "knack" for it (learn it more easily), creativity, like many skills, can be learned.**
- **Regardless of basic skill, the ability to be more creative can be improved with the basic competencies discussed.**
- **When the creative juices are needed, the technique of brainstorming can help to generate a host of new ideas to jump-start the creative activity.**