Creative Problem Solving

a quick, down-and-dirty handbook

INCLUSIVE INNOVATION

know innovation

Creative Problem Solving

What is CPS?

Creative Problem Solving is a proven method for approaching a problem or a challenge in an imaginative and innovative way. It's a process that helps people re-define the problems they think they face, come up with breakthrough ideas and then take action on these new ideas all with the same innovative spirit.

A noted CPS educator and practitioner, Ruth Noller, describes Creative Problem Solving as the sum of its parts:

> **Creative** means having an element of newness and innovation, and relevance.

> **Problem** encompasses any situation that presents a challenge, offers an opportunity or is a concern.

> **Solving** means devising ways to answer, to meet or satisfy the problem. It can also mean adapting yourself to the situation or adapting the situation to you.

CPS is a comprehensive system built on our own natural thinking processes that deliberately ignites creative thinking and produces innovative solutions. Through alternating phases of divergent and convergent thinking, CPS provides a process for managing thinking and action, while avoiding premature or inappropriate judgment. It is built upon a flexible framework that is capable of incorporating many creativity tools and approaches.

At the same time that CPS is a structured process, it's also a very flexible one. When you begin to use and internalize the CPS process, you find that it's cyclical. You begin to see how to move from step to step, and how to jump back and forth between steps. When using CPS becomes part of your own way of thinking and working, you can use one step at a time, as you need, when you need. It's so powerful because once you understand the fundamentals of how CPS works, you can adapt this process to every situation you encounter.

The Origins of CPS

The CPS process was conceived by Alex Osborn and Dr. Sidney Parnes. Osborn, the O in the advertising agency BBDO, actually coined the term **brainstorming**, a word now commonly used (and misused) in conference rooms all over the world.

In 1939, Osborn instituted the process of brainstorming at BBDO because the agency had serious financial and marketing problems. (He even hired a Vice President of Brainstorming.) The CPS process was born out of Osborn's search for a way to solve those problems. He'd always studied creative people to find out what happens, naturally, when they have good ideas. He incorporated what he'd learned into the first versions of the CPS process. His goal was to approach problems with greater imagination.

Ten years later, BBDO was revived, and in fact, recognized for its use of brainstorming. Then Osborn set out to teach people to be more creative. He believed that if people were going to be creative in business, you had to teach them creative thinking skills when they were in school. Osborn's Applied Imagination, published in 1953, was the first creativity textbook. He founded the *Creative Education Foundation* to promote teaching creativity in schools. Then Osborn met Parnes, and together they fine-tuned the CPS process that is now known as the Osborn-Parnes model.

The way that CPS has been understood and described has changed over the past fifty years of research, development and practice. Primarily, this continuous development has been conducted by the Center for Studies in Creativity through its ongoing activities in research and training related to CPS. The changes are related to the steps in the model and the language used to describe them. Each change also included the development of a set of basic divergent and convergent tools that were organized according to the step of the process considered to be most appropriate.

The *Sandpit* (also called *Ideas Lab*) process that Knowinnovation and Inclusive Innovation use is based on CPS and borrows many of its tools and techniques. CPS is embedded within the design of the African Science Leadership Project workshop, too.

A compendium of evidence on CPS: http://bit.ly/1dTB48O

How the process has evolved: http://bit.ly/1Rn0mvb

More research about Creative Problem Solving: http://bit.ly/1cypJdS

Fundamental Principles of CPS

Assumptions: CPS begins with two assumptions:
- **Everyone is creative in some way**
- **Creative skills can be learned**

Thinking: CPS requires a dynamic balance of two distinct kinds of thinking:
- **Divergent (creating options)**
- **Convergent (selecting from those options)**

Stages: CPS has four stages:
- **Clarification: Explore the Vision, Collect Data and Clarify the Challenge**
- **Ideation: Generate Ideas**
- **Development: Strengthen Potential Solution(s)**
- **Implementation: Plan for Action, flexibly**

Essentials: CPS requires two essential elements:
- **An open-minded environment**
- **A willingness to risk**

Objectives: CPS has three primary objectives:
- **New ideas and useful solutions**
- **A different way of thinking about problems and challenges**
- **A methodology for collaborative work that engenders group ownership and commitment**

Roles: There are three primary roles when using CPS in a group situation:
- **Problem Owner**
- **Facilitator**
- **Resource Group**

And two additional roles to help facilitate:
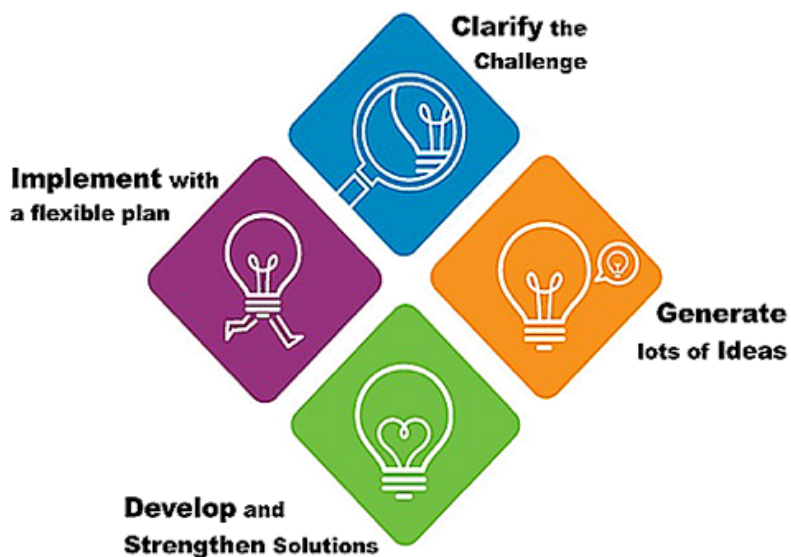- **Scribe**
- **Time Keeper**

Roles in a CPS session

There are specific roles in any CPS session; and many variations that result from the structure of the group involved, the number of participants, and their relationship to the challenge being addressed.

The table below lists some of the distinctions when comparing the implications of working with an individual acting as the client and working with a team
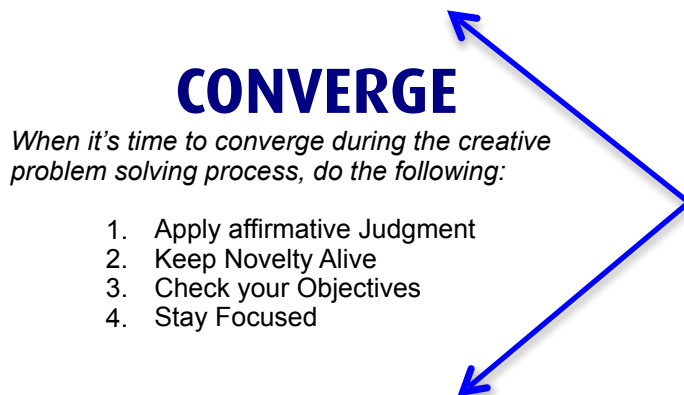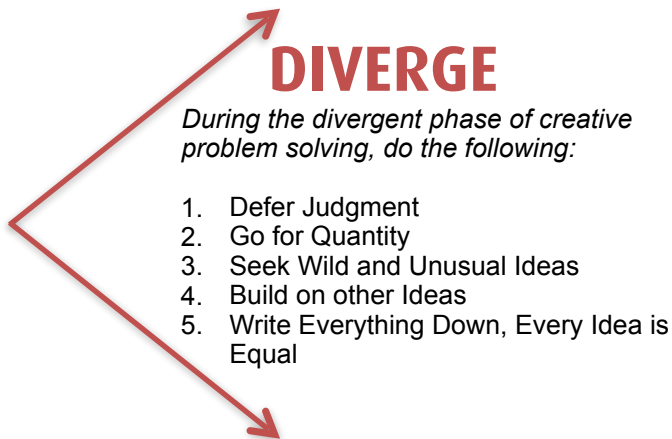
Actor(s)	Working With Individuals	Working With Teams
Client	• Owns the problem, shares background information, generates ideas along with the resource group, makes all decisions about the development of a solution.	• The group of people involved in a CPS session often shares ownership of the problem, and consensus building may be required. It's helpful, and more efficient, to have a project leader.
Resource Group	• The entire resource group provides additional input, perspectives and energy to support the client at different stages of the process.	• The group often overlaps with the Client, which can create conflict. Frequently, the resource group is not a separate entity.
Facilitator	• Manages the process with flexibility and applies specific tools and techniques to arrive at a solution. • Manages the process as an internal facilitator (member of the company) or an external facilitator	

The CPS Process

Clarify the Challenge

Generate lots of Ideas

Develop and **Strengthen Solutions**

Implement with a flexible plan

The Dynamic Balance

One of the key components of using the CPS process is shifting back and forth between two different thinking functions: divergent and convergent. During the divergent phase, we open up and accept all the data, problems and ideas that might be useful. This open stance helps us to consider things that we might otherwise dismiss too quickly, carving potential pathways to novelty. During the convergent phase, we make choices and selections and narrow down to advance toward a solution.

DIVERGE

During the divergent phase of creative problem solving, do the following:

1. Defer Judgment
2. Go for Quantity
3. Seek Wild and Unusual Ideas
4. Build on other Ideas
5. Write Everything Down, Every Idea is Equal

CONVERGE

When it's time to converge during the creative problem solving process, do the following:

1. Apply affirmative Judgment
2. Keep Novelty Alive
3. Check your Objectives
4. Stay Focused

The Principles of Divergent Thinking

1. Defer Judgment
This means stepping into an objective mental state and simply making a list of everything that comes to mind. Nothing is good. Nothing is bad. Everything is considered during the divergent phase; judgment is totally deferred until the appropriate time (during convergence). Basically, accept every offer.

Why? When judgment is deferred, more options are generated. The more options, the more chances for new connections. The best way to stop the creative flow is to make a judgment about what's been put forward for consideration. For successful innovation, it is critical to allow thoughts to flow unhindered and unmeasured.

2. Go for Quantity
The goal is to create a healthy number of ideas and options. It is important to keep adding ideas, even though it may seem that everything has been covered. Push for more thoughts and ideas.

Why? It's easy to stop after the first few options, especially if some of the things that have been recorded already seem useful. It's essential to push further because the first things that get written down are often the most obvious. They are usually the most familiar and culture bound. To find points of departure for new connections, you have to push through and beyond the obvious. As well, the more options you have, the more connections you can make.

3. Seek Wild and Unusual Ideas
Let the mind wander. Let whatever comes up be recorded. Let your craziest, most outrageous (even ridiculous) thoughts flow. In fact, be purposefully wild. If we don't ask for outrageous, we won't get it.

Why? It's hard to make new connections from the same old thoughts, facts, ideas and notions. Being outrageous makes it possible to make new links and connections. It's easier to tame a wild idea than it is to enhance a mundane one.

4. Build on Other Ideas
As your "list" gets longer, watch for possible connections and add them.

Why? Especially when working in groups, a new connection stated out loud can spark another new connection from a colleague. These combinations create new options, and add more meat to your output.

5. Write Everything Down
During the divergent phase, capture every contribution without editing. It helps to make a practice of writing everything down, so that everything is recorded. Also implied here is that everyone involved in the session is equal, and every idea should be considered, while diverging, of equal value.

Why? If everything gets written down, then you can see the information on the list and make new combinations. If something isn't written down, it implies judgment. During the divergent phase, judgment is suspended.

The Principles of Convergent Thinking

1. Apply Affirmative Judgment
Choose options that are most suited to the task at hand. The selection process seeks to affirm usefulness, interest, and pertinence, not to find reasons why certain ideas won't work. Focus on what you *want*, rather than focusing on what you don't want.

Why? Mental effort used to criticize and make negative judgments is most often a waste of time and effort. As you make selections in each phase of the process, focus on what you choose to use, and then move forward.

2. Keep Novelty Alive
As you review the options, consider those things that seem new and different – or put in a way you've not seen them stated before.

Why? Innovation implies newness, freshness, originality. Give weight to items that are more likely to take you along a new and different path. There is a tendency to for people to stay in their comfort zones.

3. Check Your Objectives
Remember the original point of departure. You may have taken a tangent during diverging. Be sure that's okay.

Why? The tangent you've taken may be exactly where you need to go. Or it might not be. During convergent thinking, you can check in to be sure you're still on the right track.

4. Stay Focused
Think about the task at hand, and make specific choices about what will be useful as you move forward. This also means checking in with the problem *owner* and being sure choices are meaningful to him/her.

Why? For anyone who might be nervous about the fact that deferring judgment earlier allowed some pretty outrageous notions to be submitted for consideration, here's a chance to be precise and certain that the items chosen from the list are appropriate.

Deferring Judgment

A key to success with creative problem solving and facilitation is your capacity to defer judgment. The ability to delay evaluation until a number of options or ideas have been generated increases the likelihood of achieving novelty. As a facilitator, your capacity to remain open-minded and accepting of the views, opinions and ideas of the participants in a group helps to create a climate that leads to more productive thinking and working.

Notice that the suggestion is not to stop judging. At some point, a critique and evaluation or ideas and working process are important and required. What's important is to be able to suspend your desire to judge or evaluate for a certain (can be designated) period of time, allowing for a flow of ideas or a fluent, uninterrupted discussion that unlocks ideas and helps people to make new connections.

A facilitator needs to be able to model this for the group, and to continuously invite people to do the same, or remind them of the consequences of making premature judgments. It is, perhaps, one of the most important skills of a facilitator, and can have a great impact on the working climate of a group.

Sometimes the idea of *not* doing something (i.e. deferring or suspending judgment) is harder than trying to *do* something. So another way to think about this concept is ***Accept Every Offer.***

CPS Process Components

Clarify   Ideate   Develop   Implement

Clarify
In this phase of the creative process, we explore the problem space and gain a greater understanding of the entire challenge, and all of its components. We clarify the starting point, collect facts and data and ultimately generate a good number of potential problems (best stated as questions) that might be the cause of the overall challenge. After we've explored thoroughly the landscape of the problem, we select the most intriguing or fruitful problem(s) to address.

Ideate
In this phase, we defer judgment and generate a number of ideas that might address the challenge. The more ideas you generate, the more you have to choose from. Remember, though, at this stage they are still ideas with potential, not yet solutions. When we converge, we select the top ideas that seem interesting and novel and worth developing further.

Develop
During this part of the process, we take an intriguing idea and enhance it to improve its chances of success. This means highlighting it's good points, looking at its potential and also making a list of its drawbacks or weak points, with an eye toward overcoming the problems rather than letting them keep the idea from becoming a solution.

Implement
A good action plan has taken into consideration all the things that need to be done to ensure successful implementation: the people and resources that need to be harnessed to move from solution to reality. This means looking at what can help you move forward and capitalizing on it, and anticipating what might stall your success, and being creative about overcome those obstacles and challenges and remaining poised to alter your plan if things go differently than you anticipate.

CLARIFY
a) Explore the Vision

Start with an Objective. It might a desire (I wish we worked better as a team) or an initial sense of dissatisfaction (we don't have the right equipment in our lab) that opens the door to using the CPS process.

Objective:	To establish an appropriate direction for the process.
Enter with:	A desire or a discomfort
Stems:	"I wish …" "Wouldn't it be nice if…"
Facilitator Role:	To help the problem owner expand and clarify the starting point. To help articulate a positive, productive challenge.
Diverge:	Add more wishes. Visualize the desire. Paint a slightly fuller picture of what you'd like to happen.
Converge:	Try to choose the best statement of the overall objective or challenge. Check in for ownership, motivation and the need for novelty.
Exit with:	A clear sense of the challenge that is being addressed, a strong wish. A *ripe* goal, wish or challenge.

CLARIFY
b) Gather Data

Reviewing the situation at hand. In this step we lay out all the information that needs to be taken into consideration as we review the objective: Who's involved, what's involved, when, where and why it's important. Collect all the facts, as well as any hunches, feelings, perceptions, assumptions and gossip around the situation.

Objective:	To understand, fully, the *situation* around a wish or challenge.
Enter with:	A "ripe" goal, wish or challenge statement, in the form of "I wish…" or "Wouldn't it be nice if…"
Stems:	Who? What? When? Where? Why? How? Feelings? What's happening now? What's not happening? What does a future-perfect state look like?
Facilitator Role:	Be curious, open, non-judgmental. Invite answers, listen carefully, probe. Model how comments can be recorded as data. Make sure no major data is missed. Help the problem owner identify tension between *what is* and *what could be.*
Resource Group:	Asks questions to fill in missing data. Those with challenge specific knowledge can help generate data.
Diverge:	*All* data is relative. Defer judgment by noting everything, like a stenographer. "Manage" discussion by inviting a list of facts. Allow questions that clarify and reveal new facts, but minimize dialogue that seeks to solve the situation.
Converge:	Point out key facts and essential data. Note that in this step, converging is less critical; so don't take a lot of time to do it. Simply highlight the most pertinent data.
Exit with:	A wide range of data, facts and information, some of which may be highlighted, that informs us about the situation surrounding the goal, wish or challenge, a common understanding of the situation by the resource group.

CLARIFY
c) Formulate the Challenge

Re-defining what you want or what hinders you. In
this step we explore the facts and data to find *all* the problems and challenges
inherent in the situation, and all the opportunities that they represent. We're
not yet looking for ideas or solutions.   We're hunting for all the problems.
When we make a long list, we might find that the root problem, the one that
really causes a chain reaction, is quite different from what we would have
expected.   This step is about making sure we're focusing on the right problem.
It is possible to come up with the right answer to the wrong problem.

Objective:	To define the problem, precisely.
Enter with:	A lot of data about the situation, some of it highlighted.
Stems:	"In what ways might we *(verb)* …" (IWWMW… or IWWMI…) "How might we *(verb)*?" (HMW) or "How to *(verb)*…" (H2…)
Facilitator Role:	Relentlessly push for a long *list* of *all* the problems inherent in the situation. Inspire the resource group to dig deeper in defining the component problems of this overall challenge.
Diverge:	Use facts/data as fodder for problem statements. Don't let up. Encourage the use of active, interesting verbs. Use techniques to see new problems that might not be apparent. Celebrate the discovery of problems.
Converge:	Look for root problems that if solved might address other issues. Balance cognitive with visceral. Stay specific. Look for ownership, motivation and the need for novelty.
Exit with:	A clear and compelling problem statement in the form of H2…HMW… , IWWMW… or IMMWI…

IDEATE
Generate Ideas

Freewheeling and making a long list of ideas. This is
what most people are thinking of when they refer to brainstorming. But
generating ideas is much more than brainstorming. (In fact, brainstorming is
one of many techniques for generating ideas.) During this step we need to be
continually vigilant about deferring judgment and coming up with wild,
outrageous, out of the box ideas. This is where we explore ideas that are
possible solutions and have the most fun. We really need to stretch to make
connections and take mental risks and try new combinations to find potentially
innovative solutions.

Objective:	Generate a *vast* number of ideas: different, new, inhabitual options.
Enter with:	A clear, specific and compelling problem statement in the form of H2, IWWMW or IWWMI.
Facilitator Role:	Vice-President of tools and techniques. Manage energy and flow. Take the group away from the problem. PLAY. Enforce (gently) the rules and guidelines of diverging.
Diverge:	Defer judgment, go for quantity, seek unusual ideas, combine ideas, write everything down. Relentlessly push for quantity, pull participants to new territory.
Converge:	Improve ideas first, judge affirmatively, be deliberate, consider novelty, check with objectives. Choose with imagination. Don't worry – yet – about feasibility.
Exit with:	A "short list" of the top ideas, the ideas that are most interesting and intriguing.

Develop
and Strengthen Solutions

Review the top ideas to see how they'll work. First take
time to strengthen and improve the best ideas. Then generate the criteria that
need to be considered to evaluate the ideas for success. Apply that criteria to
the top ideas and decide which are most likely to address your problem. The
best idea needs to meet criteria that make it actionable before it becomes the
solution. A creative idea is not really *useful* if it won't be implemented. The
difference between pure creativity and innovation is that key element: the fact
that the novel idea actually gets used.

Objective:	To improve and then evaluate ideas and select those which will be solutions to put into action.
Enter with:	A "short list" of the top ideas
Facilitator Role:	Protect precious ideas. Guide an affirmative evaluation of the ideas. Determine when and how to select and strengthen.
Diverge:	List criteria for evaluation. Stay open as you evaluate the strengths and weaknesses of each idea.
Converge:	Compare ideas, make affirmative choices, try to make courageous choices. Don't shy away from an intriguing idea because it makes you uncomfortable or nervous.
Exit with:	A well developed solution (or solutions, depending on the situation) that has been enhanced, improved and maximized as well as examined closely for potential downsides and pitfalls.

IMPLEMENT
with a flexible plan

What needs to happen to make this solution work? Here's where we differentiate creativity from innovation. Once there's "buy-in" to this idea because it makes sense and meets criteria, there needs to be commitment to implementing it. In this step, we look at who is responsible, what has to be done and by when – *exactly when* - and what resources are available in order to realize this idea as a full-fledged solution. This is where we bring the idea to life and commit to making it happen.

Objective:	To create an action plan that the problem owner is committed to executing.
Enter with:	A strong, well developed solution or solutions.
Stem:	"What I see myself doing is…"
Facilitator Role:	Inspire, suggest and guide the problem owner to take responsibility for implementing this solution. Break actions down into measurable chunks. Push for promise. Push for dates. Probe for factors that help and hinder.
Diverge:	List all the tasks that need to be addressed to implement the solution. Use tools like assistors/resistors and visualization to identify and mitigate blocks to success.
Converge:	Assign roles and responsibilities to people who must help to implement the solution. Assign a due date to each task. Make benchmarks. Fill in the action plan. Commit to a first-step action within 24 hours (even a simple one).
Exit with:	A thorough map for how to implement the solution.

Tools & Techniques

◆Posing Problems as Questions

During the creative process, it's useful to be deliberate about the language we use around problems, and to phrase them not as definitive statements, but rather as questions.

Invite ideas. A problem posed as a question invites you into the flow of divergent thinking by inviting ideas, actions and possibilities. A question asks not for sympathy, but for solutions.

Clearly state the challenge. Because there are many ways to describe a predicament or opportunity, make sure your questions identify the specific issues that need to be addressed, the sub-problems or root-problems.

Be concise. Focused questions should come right to the point. Write them so that they can be used as a starting point for generating ideas.

Keep them free of criteria. Criteria that are restrictive, limiting or qualifying tend to confine the quantity and quality of ideas, so challenge statements should be free from criteria.

Challenge statements should contain the following elements:

- **An invitational stem.** Challenge statements are phrased as a question and always begin with a stem that opens up the statement to many possible answers. The stems that are most often used are: "How might…?" "How to…?" and "In what ways might…?"

- **A problem owner.** Challenge statements clearly identify the individual or group responsible for the problem. Ownership is usually stated in the invitational stem, such as "How might _we_?" or "In what ways might _I_?"

- **An action.** For a challenge statement to be useful, there needs to be a verb that specifies the key action that is to be carried out in the challenge. It should be stated in a constructive and positive tone that describes the action. For example, "How might we decrease production down time?" might be positively restated as "How might we increase production efficiency?"

- **An object.** Challenge statements identify the specific focus for the problem solving activities that follow.

◆ Webbing (aka Ladder of Abstraction)

Webbing is a tool for moving towards either greater specificity, or the bigger picture. One can move both ways on the ladder depending on the questions one asks.

The tool is an adaptation of a tool called the *Ladder of Abstraction* by Samuel Hayakawa, a Japanese American psychologist, writer and professor of semantics. (He was also a US Senator from the state of California from 1977 to 1983.)   Mr. Hayakawa originally created the Ladder of Abstraction as a writing tool, to encourage writers to move from general to specific.   (For example, instead of writing 'a cow', write 'old man Washer's new red cow'.)

In the CPS process we often use the Webbing to make problem statements more or less specific.

Webbing for greater specificity,
- Take any problem statement and ask the question, "What's stopping you?"
- Respond to that question with whatever answers come to mind.
- Turn those answers into new questions, usually more specific problem statements using the stem of "How to…?" or "In what ways might we…"

Webbing for more general problem statements,
- Take any problem statement and ask the question, "Why?" and "Why is this important?" and "Why else?"
- Respond to that question with whatever answers come to mind.
- Turn those answers into new questions, usually more general problem statements with the stem "How to…?" or "In what ways might we…"

◆ Post-It™ Brainstorming

Instructions:

- Write down the challenge/problem statement you're working on.
- Remind participants to use the guidelines for divergent thinking.
- Give each participant a pad of rectangular Post-it notes and a dark, medium-sized marker. (We like Sharpies.)
- Write *each* idea, in big letters, on a Post-It note. You might use a "Headline" that captures the essence of the idea, but be sure to add a few words to give it specificity and ballast.
- Read *out loud* (shout it, even!) so the others in the group can hear it.
- Give the Post-It note to the facilitator to put on the flip-chart. (Or, in order to energize a group, the facilitator can also ask participants to stand up and put the Post-It notes on the flip-chart themselves.)
- Set a quota for the number of ideas and keep going until you meet it.
- Periodically check with the "problem owner" to be sure the options are going in the right direction.

◆ Brainwriting

Instructions:

- Give each participant a Brainwriting Form (Nine or twelve boxes on an A4-sized page; see next page for the lay-out).
- Write the challenge/problem statement at the top of the form.
- Remind participants to use the guidelines for divergent thinking.
- Invite participants to think of three ideas and write one in each separate box on the first open row of the worksheet.
- Pass the worksheet to the center of the table and pick up someone else's sheet.
- Read the ideas on the page and build on them, improve them, add to them – or else just come up with three more new ideas.
- Keep swapping worksheets until all the boxes are full.
- Add more worksheets if necessary.

Variations:

Prepare Brain-writing sheets using Post-its, placed side-by-side on the paper. An A4 sheet of paper can usually fit about 6 Post-its. Write a challenge on each sheet, and ask participants to add ideas, one per Post-it. With this method, best ideas can be pulled off the sheet and moved to other locations to be evaluated with other ideas generated using different techniques.

You may also take an idea and write it on the page, and invite participants to use the Post-its to suggest enhancements and additional ideas to make the idea more specific and actionable.

◆Brainwriting Worksheet

Problem/Challenge _____

◆Detours and Forced Connections

These diverging tools spark new ideas by making connections to a side-list of a related or un-related topic, or by making connections to an object or picture introduced as stimulus.

Step 1: Detour List
Make a side-list of activities, people, animals, objects, song titles, anything you can think of. Your list might be related to the task at hand (*things you do on your computer*) if you're working on a software development issue. The list can also be based on a totally unrelated topic (*things people do in cars* or *songs with the word "love" in the lyrics*), etc.

Step 2: Attribute List
Choose an item from your detour list. Make a second side-list of the attributes of this item. Don't give up too easily; make a long, healthy list. Or make an attribute list using an object or picture that people can see and touch. Use all of your senses: sight, sound, smell, taste and touch. Consider all the characteristics and functions of the item.

Step 3: Forced Connection
Force yourself to make connections, no matter how unrealistic, between the words or phrases on the attribute list and your challenge.

Variation: Hero Substitution (Virtual Consultant)
Make a detour list of your heroes or mentors – people who inspire you. Choose one, and then make an attribute list of his or her qualities (talents and shortcomings). Use the resulting list to spark ideas for the task at hand. Also pretend that person is standing beside you right now, what five ideas would he or she suggest to address your challenge.

◆S-C-A-M-P-E-R

Instructions:

Diverge to add or build new ideas using the following:

- **Substitute:** Insert something different, a person, an object, an outcome. What new ideas come to mind?

- **Combine:** Connect processes, combine parts, purposes, applications or materials. What new ideas come to mind?

- **Adapt:** What else is like this idea? What does it make you think of? What else does it suggest?

- **Modify**: Change the height, weight, color, sound, feeling or form. Change the meaning, the purpose. What ideas come to mind?

- **Put to other uses**: Think of how else this can be used, what other uses could it have if it were changed. What other people or markets might be interested?

- **Eliminate**: Try removing something to create a new idea. What can you discard or omit? What can you sacrifice? What can you give away?

- **Rearrange:** Reverse the idea. Implement the opposite action. Turn it, physically, upside down. Transpose something. Seek other patterns, rhythms or arrangements that might work.

◆Visual Connections

Have handy a collection of visuals: photographs, post-cards or random objects.

1. Ask the participants to relax for a few moments.
2. Remind them of the objective/problem.
3. Provide a visual and ask them to jot down what strikes them (observations, reactions, first impressions, related thoughts …)
4. Repeat step 3 with a few other visuals.
5. Now, provide them with some time to make forced connections between their observations, for each visual, and their objective or problem. Provide a worksheet if necessary.

Visual nº1
Observations on the visual   **Connections to**
                                                 objective/problem

_____   _____

_____   _____

_____   _____

_____   _____

Visual nº2
Observations on the visual   **Connections to**
                                                 objective/problem

_____   _____

_____   _____

_____   _____

_____   _____

Visual nº3
Observations on the visual   **Connections to**
                                                 objective/problem

_____   _____

_____   _____

_____   _____

_____   _____

◆Angel's Advocate

When people say, "let me play the devil's advocate," what they are really saying is, "I don't like your idea, here's why." The objective of Angel's advocate is to take the opposite stance and give a newborn idea an opportunity to develop before evaluating or dismissing it.

Instructions:

1) Among a list of ideas, choose one. You might make a random choice, or you might deliberately select an idea that seems to be "half-baked" or not fully developed.

2) Ask what's good about this initial idea and how can I build on that to improve it? What can I add to this idea to develop it and enhance it? How can I turn this into a better idea?

3) If you really can't think of a way to improve the idea, can you reverse or take the idea a different direction to create a new, usable idea or concept? Or is there one word from within the description of the idea that you can play on to make a new and potentially more viable idea?

4) Write your improvements and enhancements on the Post-It note or on a separate Post-It attached and return the idea to the general pool of ideas. Be sure to add at least one improvement to the idea before moving on to another.

Variation:
Using Brain-writing Sheets, write each idea at the top of a sheet of paper and put it in the center of a working table. Participants work off each other's sheets, adding to and improving the ideas.

You can use Angel's Advocate before you converge in idea generation, and again when you're strengthening ideas in the next phase of the process.

◆PPC/O
(Pluses, Potentials, Concerns / Overcomes)

Instructions:
Improve, evaluate and transform an idea, using the following steps:

1. **PLUSES**
   Use the phrase: "What I like about this idea is…"
   - What do you like about the idea?
   - Why does it work?
   - How is this idea original and innovative?

2. **POTENTIALS**
   Use the phrase: "This idea could…"
   - What opportunities might be created by this idea?
   - What potential spin-offs might come from this idea?
   - What future growth could result from this idea?

3. **CONCERNS**
   Use the phrase: "How to..." or "How might..." before each concern.
   - What concerns or worries you about the idea?
   - What might not work?
   - What are the disadvantages of the idea?
   - How is this idea limiting?

4. **OVERCOMES**
   Brainstorm ideas to address the concerns.
   - In what ways might we overcome concerns?
   - In what ways might we minimize or erase doubts about the idea?
   - How might we transform the idea to one that is more usable?
   - How might we make the idea easier to implement?
   - How might we overcome resistance to the idea?

◆Targeting

Targeting is a visual approach to evaluating and strengthening options. It is a flexible tool that helps groups cut through tension and adversarial debate to surface areas of agreement and opportunities for building consensus. Targeting is designed to be intuitive visual and interactive, letting you compare your current options to an ideal outcome and giving you an instant read on the gap between the ideal and the real.

Directions:

1. **Define the bull's-eye:** Start by articulating your ideal state or outcome. Generate all the attributes of your ideal state and place them in the center of the target. This is your bull's-eye.

2. **Throw your darts:** Write each option on a sticky note. Place this "dart" on the target in relationship to how close this option comes to meeting the ideal state. For instance, if you feel an option directly meets the qualities of the ideal state, put your dart in the bull's-eye. If it doesn't quite fit, locate the dart on one of the outer rings.

3. **Identify Pulls & Pushes:** Once the darts are on the target, identify those forces pulling the idea towards the bull's-eye and those forces pushing the option away from the bull's-eye. Pushes and pulls can be people, processes, systems, attitudes or other factors.

4. **Turn Pushes into challenge statements:** Identify the most important pushes on your list. Transform these pushes into challenge statements by using one of the following statement starters: "How to?" "How might?" "In what ways might?" What might be all the…?"

5. **Overcome challenges:** Start brainstorming on the most significant challenge. When you have enough ideas, look back at the target. Have these ideas helped move the dart closer to the bull's-eye? Continue to overcome challenges until the dart has moved into the bull's-eye.

6. **Ready, set, go!** Use the ideas generated to overcome challenges to strengthen your solution statement by rewriting your solution statement using the phrase, "What I NOW see myself doing is…"

◆Value vs. Do-ability

This tool permits you to evaluate many ideas at once, comparing them in terms of their strength and feasibility.

Instructions:

1. Cluster the ideas, remove duplicates.

2. For each idea, ask:
    ✓   Assuming it is possible to do this (i.e. ignoring technical issues etc for the moment), how valuable would this be (to us, to our customer, our stakeholder, etc)? *It is critical that the perspective is identified before you start.*
    ✓   Assuming that it is valuable, how easy would it be to implement this idea? *Sometimes groups find it helpful to give a 1-5 or 1-10 score on each axis.*

Higher value

Lower value

Lower
Do-ability

Higher
Do-ability
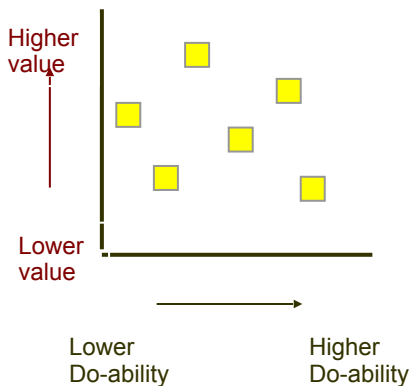
Key Points:

•No ideas need to be discarded; there is no loss of novelty.
•Anyone can take on an idea with the intention of making it more valuable and/or more do-able.
•Everyone can see which ideas should be immediately put into practice (i.e. very valuable and very do-able)

◆ Post-it Action Planning

Instructions:

1. Think of any and every task that must be done to realize your idea or project. Write each task, individually, on a Post-it note.

2. Don't worry about putting the tasks in any order, or thinking about what came first. Just do a brain-dump of any task that would be required to bring this idea or project to life.

3. Hang several flip-chart pages side-by-side on the wall.

4. Select an end-date, by which you'd like to see this idea or project put into action. Write that date on the far right side of the paper. Moving to the left, mark out the time between now and then.

Today/Tomorrow	Next week	Month 1	Month 3	Week of Deadline
🟨 🟨	🟨 🟨	🟨	🟨 🟨 🟨	🟨 🟨
🟨	🟨	🟨	🟨 🟨	🟨 🟨
🟨	🟨	🟨	🟨 🟨	🟨

5. Once the tasks have been organized chronologically, or as you order them, add the initials of the person who will be responsible for this task, and any other specific information about how it must be completed.

6. You can use different colored post-it notes for individuals or different departments, or add rows where Post-its are organized by person, team or any appropriate responsible party.

◆ Sticky Steps

1. Imagine that you have realized your idea or project, and you are looking backwards at what you did. Using this terminology, and inserting verbs in the *past tense*: "In order to have _____, we must have _____.

2. Think of the last thing you "did" before finishing. Write it on a Post-it note.

3. Ask the question again, "In order to have done that, we must have _____.

4. And so on, backwards in time, until you've noted all the tasks.

5. Now map these out on a time-line, as above, and assign dates and responsibilities.

Who is Knowinnovation?

We're a team of facilitators curious about creativity, problem solving, leadership, managing change, research, and technology – all the things that go hand-in-hand with innovation.

Our specialty is facilitating and accelerating academic, scientific, multi-disciplinary and interdisciplinary innovation. In the simplest terms: we help smart people have interesting conversations about complex questions, which leads to novel ideas and innovative research.

KI facilitates Sandpits and Ideas Labs, 5-day residential programs that pull together a multidisciplinary group of participants with the objective of generating radical and risky research ideas. We also designed shorter Sandpit events that allow Universities to launch into inter-disciplinary innovation even if they don't have the time or resources to organize a full Sandpit or Ideas Lab. We run CPS process and facilitation skill building, and an on-line self-study program called The Creative Thinking Course (TCTC).

What is Inclusive Innovation?

Knowinnovation is now applying its methodology to the realm of economic development with an initiative aimed to include individuals and communities who are often excluded from the innovation process. We've led successful innovation workshops for the International Fund for Agricultural Development (IFAD), the Consultative Group to Assist the Poor (CGAP) - a division of the World Bank – and the United Nations Population Fund (UNFPA). We've designed and facilitated strategic workshops for the World Food Program (WFP) and the Global Framework for Climate Services (GFCS), and for the Multilateral Investment Fund (MIF), a division of the Inter-American Development Bank (IDB).

The sweet spot for Inclusive Innovation is when an innovation project combines science *and* development. A three-year Africa Science Leadership Program (ASLP) has given us an opportunity to facilitate innovative leadership workshops in Africa. The Global Young Academy, together with the Royal Dutch Academy, invited twenty scientists to a workshop to put a fresh perspective on the Syrian refugee crisis in December of 2015. Inclusive Innovation worked with the US State Department to facilitate three networking workshops for women in science and technology in the Ivory Coast, Nigeria and Mozambique. And we ran another leadership program for Southeast Asian scientists (ASEAN-SLP) in June of 2016.

Further Reading

Some additional resources to explore if you want to learn more about Creative Problem Solving.

Csikszentmihalyi, Mihaly, Creativity: Flow and the Psychology of Discovery and Invention, Harper Collins, New York, NY, 1996.

de Bono, Edward, *Lateral Thinking, 1970,* also *Lateral Thinking for Management*,
    1971, Penguin Books, New York and London.

de Bono, Edward, *Six Thinking Hats*, Little Brown, Boston, MA,1985.

deHaan, Robert L., "Teaching Creativity and Inventive Problem Solving in Science," http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2736021/ published by the American Society for Cell Biology, 2009.

Hurson, Tim, *Think Better*, McGraw-Hill, New York, 2007.

Isaksen, Scott G., Dorval, K. Brian, Treffinger, Donald J., *Creative Approaches to Problem Solving*, Kendall/Hunt Publishing Company, 1994.

Lencioni, Patick, *The Five Dysfunctions of a Team,* Wiley, San Francisco, CA, 2002.

Michalko, Michael, *Cracking Creativity,* 10 Speed press, California, 1998.

Miller, B., Vehar, J., Firestien, R., Thurber, S., & Nielsen, D. Creativity Unbound. An Introduction to Creative Process (5th ed). Evanston, Illinois: FourSight, 2011.

Miller, B., Vehar, J., Firestien, R., Thurber, S., & Nielsen, D. Facilitation. A Door to Creative Leadership (4th ed). Evanston, Illinois: FourSight, 2011.

Moote, I. Design Thinking for Strategic Innovation. Hoboken, NJ: John Wiley and Sons, Inc, 2013.

Osborn, Alex F., *Applied Imagination*, 3rd Revised Edition, Macmillan, NY, 1979.

Parnes, Sidney J., *Source Book for Creative Problem Solving: A Fifty Year Digest of Proven Innovation Processes*, CEF, Buffalo, NY1992.

Parnes, Sidney J., OPTIMIZE *The Magic of Your Mind*, The Creative Education Foundation, Buffalo, NY, 1997.

Puccio, G.J., Murdock, M. & Mance, M. Creative Leadership: Skills That Drive Change. Sage Publishing, San Diego, CA. December, 2010.

Puccio, G.J., Mance, M. Barbero, L., Reali, P. Creativity Rising: Creative Thinking and Creative Problem Solving in the 21st Century, ISCS Press, 2012.

Segal, Marci, *Creativity and Personality Type*, Telos Publications, Huntington Beach, CA, 2001.

Stein, Morris, *Stimulating Creativity*, vol.1, *Individual Procedures*, vol.2, *Group Procedures*, Academic Press, New York, NY, 1975.

Torrance, E. Paul, *The Search for Satori and Creativity,* CEF, Buffalo, NY, 1979.

VanGundy, Arthur B., *Techniques of Structured Problem Solving*, Van Nostrand Reinhold, 1988.

Wycoff, Joyce, *Mindmapping*, Berkley Books, New York, NY, 1991.

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For more information:
Please contact info@knowinnovation.com

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