iCPS: Delft's Expansion of the Classical CPS-Approach

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Abstract

The roots of C(reative) P(roblem) S(olving) can be found in the USA back in the fifties of the past century. So rather USA culture biased and rather classical the original CPS approach is a challenge for European CPS practitioners in our days. *Integrated Creative Problem Solving (iCPS)* is the attempt of the Delft University of Technology (DUT) to cope with these challenges. Building on the classical CPS approach in this article the Delft *iCPS* approach will be explored.

The main characteristics of *iCPS* are:

- Instead of concentrating on the *Content Finding* process only
  iCPS consist of the four interdependent sub-processes of *Project Management*, *Acceptance Finding*, *Content Finding and Information Finding*.
- Adding a step of Clustering in the classical Creative Diamond that only consists of a Divergent and Convergent step. This 3 step Creative Diamond is called Creative Diamond 2.0.
- Expanding the Creative Diamond 2.0 into the *iCPS basic module*. On top of Creative Diamond 2.0 a step called *Task Appraisal* is added. After the convergence step a *Reflection* step is added. Thus the *iCPS basic module* consists of five steps: (1) Task Appraisal – (2) Divergence – (3) Clustering – (4) Convergence – (5) Reflection.
- Emphasizing the active role of the Creative Facilitator and the need of content knowledge to be a good leader in the creative process.
- Above all we added some Delft design thinking flavor to all steps and actions.

Keywords: *Creativity, Facilitating, Creative Sessions, European style*

INTRODUCTION

We will challenge the field of CPS based on our practical experiences in running several thousands of creative sessions for companies and other organizations over the last forty years. Based on these experiences we will introduce some additions to the field. By adding those additions to the well known basic CPS methods and techniques we have developed our Delft Integrated Creative Problem Solving (iCPS) approach.

Our home base is the Delft University of Technology, Faculty of Industrial Design Engineering. In colloquial language the Delft

School of Product & Service Design. It is one of the largest academic design schools in the world. The school exists since 1969 and has now more than 5500 alumni. Some are well known like Adrian van Hooydonk, the VP Design at BMW or Laurens van den Akker the design chief at Renault. Most of them work anonymously inside large design teams at for instance Microsoft, Frog or Philips.

The school is offering four educational programs: one general bachelor program (in Dutch only) and three international master programs Integrated Product Design (IPD), Design for Interaction (PfI) and Strategic Product Design (SPD). The school has about 220 fte international staff, about 2000 students, half of the master students come from abroad. All education is research based. Since 1984 more than 200 PhD's have been produced. The Delft Design School is really challenging the borders of the design domain.

REFLECTIONS ON OUR PRACTICES

Background

Our iCPS-approach is, as most creative problem solving approaches, rooted in the American traditions of a.o. Brainstorming and Synectics. Two creativity techniques developed in the middle of the last century. Although some purist will say that Synectics is not just a creativity technique; it involves much more. For now that is enough. Brainstorming was developed by Alex Osborn and Synectics by Bill Gordon and George Prince.

Over the years, one of the authors started as a Creative Facilitator already in 1975, we have added some special elements based on European traditions in this field. Sources for inspiration came from the Manchester Business School (MBS) (Tudor Rickards) UK, the Battelle Research Institute (Horst Geschka& Helmut Schlicksupp) from Frankfurt Germany, the Netherlands Organisation for Applied Scientific Research (TNO) from Delft in The Netherlands (Hans Bakker and Patrick Colemont), the Centre for the Development of Creative Thinking from Antwerp, Belgium (Igor Byttebier) and from the Delft University of Technology (DUT) also from The Netherlands (Frido Smulders and Marc Tassoul). Most of these European develop-

ments came together in the European Association for Creativity and Innovation (EACI) for which we served for many years as president and secretary-general. So we are also aware of the developments in Scandinavia, France, Poland, Italy and Portugal.

The development of this iCPS approach stretches a period from 1975 till 2015. The core team consists of the two autors together with many colleagues and many (international) master students (Buijs, Smulders & Van der Meer, 2005). We experimented within our courses, in company trainings, in real client sessions and in experience labs. We did literature studies, we attended courses of other international professionals in the field, we invited them as well to our courses and we had many deep discussions during our many international professional meetings. Often difficult to say who added what or what event was earlier or more effective. We are grateful that those others wanted to share their knowledge, experiences and ideas. It is a joint effort, but all the errors are ours.

Project management is the basis

During executing creative problem solving sessions we discovered over the many years that knowledge about the different steps in the process, the role of divergence and convergence nor the knowledge of the different creativity techniques are enough to run and organise successful creative sessions. The session itself is a challenging endeavor. As a creative facilitator you first have to convince the Problem Owner that a creative session could help to solve his problem. Secondly you have to agree on which people both of you want invite to become members of the Resource Group. And thirdly you have to organise and manage all the mundane stuff like setting a date, hiring facilities, finding the right resources and of course the budget and the deadlines. These practical aspects of organising and running a creative session are mostly ignored by the traditional CPS-schools. Coming from a practical engineering and design school we found it necessary to incorporate these project management aspects into our overall iCPS-approach. So we introduced the *Project Management* process as one of the sub processes of our approach. This is our first addition.

Acceptance Finding is a separate and a main activity

In the classical Buffalo tradition of CPS*Acceptance Finding* is the last step in their five step approach (Parnes, 1967& 1985). The five steps are:

1. Mess Finding
2. Problem Finding
3. Idea Finding
4. Solution Finding
5. Acceptance Finding.

Again in our own practices we discovered that Acceptance Finding is not the last step in the process but often the first step in the row. As soon as you start talking to the Problem Owner about the composition of the Resource Group you are already busy with the Acceptance Finding. We, as the creative facilitators, put a lot of effort in finding out who are the relevant stakeholders of the solved problem. Both upstream as well as downstream of the problem. Inviting the relevant stakeholders to become members of the Resource Group influences the acceptance of the solution immensely.

We see Acceptance Finding as a form of co-creation. You co-create the solution together with the future users of the solution. It is a form of early user/stakeholder involvement. Of course there are also content related aspects to the acceptance of the solution, but we found out that this organisational aspect is much more of importance. That is the reason we separated the step Acceptance Finding from the overall CPS process and promoted it to become a separate, interdependent sub process alongside the earlier Project Management sub process.

Content Finding

To distinguish our new process without the Acceptance Finding from the traditional five step CPS process we gave it a new name: *Content Finding*. Due to our European practice we limited this Content Finding sub process to only three diamond shaped steps:

1. Defining the Problem
2. Generating and selecting Ideas
3. Improving the Ideas.

In the first creative diamond the Resource Group explores and reframes the problem. In the second diamond they generate and select promising ideas. In the third diamond they make the transition from this promising idea to implementation into the real world.

Creative Diamond 2.0

Talking about the creative diamond we have changed the diamond as well. Based on the Guilford notion of the early fifties the creative diamond consists of two sub steps: one for diverging (getting as many options as possible) and one for converging (selecting the most promising options out of that many options) (Guilford, 1950). In our practices an in-between step has been developed. If the Resource Group has generated many options, say more than 100, the group and the facilitator is losing the overview of this many options. So we introduced a kind of mental pause in which we asked the participants to look to all the options and to produce a systematic overview in the form of five to seven clusters of groups of comparable options. There will always be a rest category of a small number of options that have no similarities with any of the other options. So we end up with this in-between step with an overview of five to seven categories based on the content of the options and one Rest category of non-related options. Because we do not generate new options, neither do we throw out options this in-between step is neither divergence nor convergence. So we decided to enlarge the creative diamond with this extra in-between step. We like to call this extra sub step "*clustering*". To distinguish our new three step creative diamond from the original two step diamond we have called it "*Creative Diamond 2.0*". See the figure 1 (Tassoul & Buijs, 2007).

An interesting side-effect occurred during many clustering actions. The first thing the group notices is that not all clusters or categories are evenly filled with options. This often leads to go a step back to the earlier divergence stage to generate new options for the clusters with fewer options. And of course that will also generate options for the other clusters as well. So this leads to an iteration of the earlier divergence stage.

Another thing that happens often is that due to the categorisation the group discovers that there are also other categories possible they completely
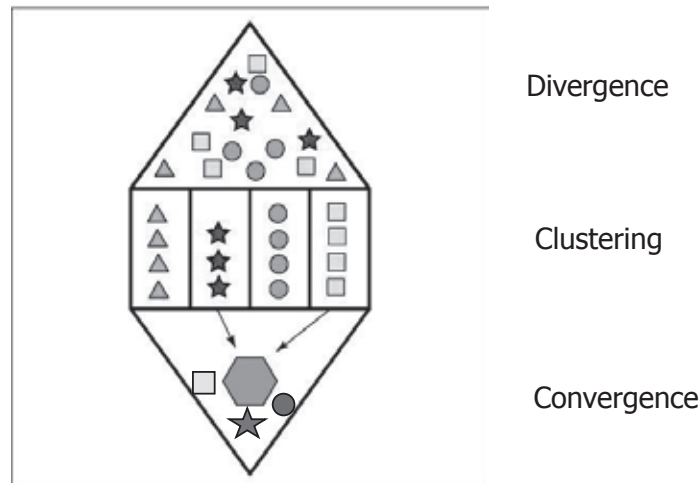
Figure 1: The Creative Diamond 2.0

missed. This is once again a reason to go back and generate new categories and within those categories they are generating new options. This process is encouraged if the group gives the original categories intriguing names or labels. These labels are the stepping stones for finding new categories.

The third thing that often happens is that in the next convergence stage the categories are used for selecting the promising options. For instance: allow each participant to select three options per category for all categories.

So the Clustering in-between stage has value for its own, as it can help to improve both the divergence as well as the convergence stage. We think our three step creative diamond is a valuable addition to the original two step diamond.

Information Finding

Also based on our practices is that a creative session is often a part of a much longer creative trajectory. In its simplest form there is (1) a prepatory part before a session takes place, there is (2) the session itself, followed by (3) a communication part to bring the ideas from the session to the real world. The (4) real implementation is the last part of the trajectory.

However the real word is not as simple as this. The prepatory part has many faces and has its own problems. It can take weeks to get started. The session is seldom one single session. Usually we run a series of sessions. Sometimes with the same

Resource Group, sometimes with different ones. Sometimes brilliant ideas come up in between sessions, or after participants come home and talk to their loved ones or when they are walking the dog. This should also be included in the total creative project.

This brings us to the next addition. During a creative session the participants are relying on their own knowledge, skills and experiences, stored into their brains. Sometimes they just say something without really knowing the truth or the value of what is being said. Sometimes they say wrong or even non-sense things. Often without realising it. So there is a need to check ideas on their realistic qualities. For instance if you are participating in a session which is looking for new ways to make "openings", someone could say "do it like Woody Woodpecker". But if nobody in the group knows anything about how woodpeckers make holes this saying is a kind of a non-information. Although it could lead to other animals making holes, which could lead to a new idea. Checking this kind of information during the session is non productive . It will change the working climate from generating to analysing and will stop the production of new options. Therefore we introduced the extra sub process of *Information Finding*. Information Finding is an action carried out out-side the creative session to check whether certain ideas are realistic and feasible. Sometimes just a short Google session is needed, sometimes a telephone call to a specialist, but it
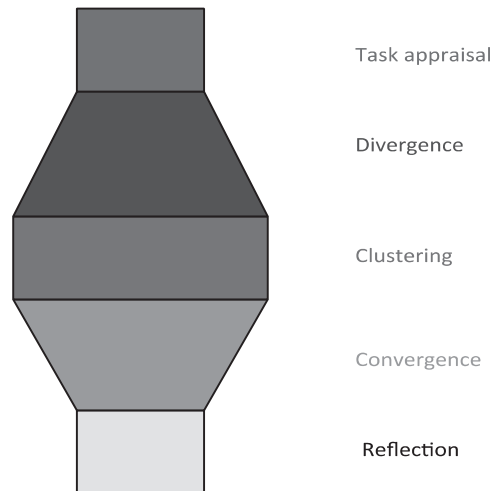
Figure 2: The iCPS Basic Module

could also take months or even years to check certain ideas. Because of this special nature of Information Finding we also raised this sub process on the same level as Project Management, Acceptance Finding and Content Finding. Now we have come to our basic iCPS approach: the four interdependent sub processes (1) Project Management, (2) Acceptance Finding, (3) Content Finding and (4) Information Finding will have to be managed properly to execute a creative project on the right way.

iCPS basic module

Two more things about our expansion of the original CPS-approach.

Sometimes when there is more than one session part of the overall creative project there is a need to manage each creative diamond as a separate independent organisational element. In order to do so you have to expand the creative diamond with two extra steps. One at the beginning and one at the end. In the beginning there is the need for finding out what this next diamond is all about. Is it for defining the problem (the first diamond), is it for improving the ideas (the third diamond) or is it for getting ideas (the second diamond)? This first extra step we call *Task Appraisal*. The resource group including the facilitator has to find out and agree on what this next task is.

After executing the content related divergence, clustering and convergence steps for this specific

diamond the group has to decide at the end whether they are happy with the results of their execution. If yes they can step over to another creative diamond, if no they can decide to re-do this diamond (iteration) or make a step back to an earlier diamond. This is done in the *Reflection* step. The group reflects on what has happened in the execution of this diamond. Both on content as well as on process. Based on this reflection they can make the next move. We owe credit to Horst Geschka for this addition (Geschka & Lantelme, 2005).

So for managing the different diamonds we expanded the creative diamond into the *iCPS Basic Module* with five sub-steps:

1. Task Appraisal
2. Divergence
3. Clustering
4. Convergence
5. Reflection.

See figure 2.

The role of the Creative Facilitator

The last aspect we like to talk about is facilitation. We consider facilitation as a part of the Project Management sub process. The creative facilitator is the project manager of the total overall creative project, including the running of all the sessions. In his task as the professional organiser and manager of the total creative process it is his or her duty to manage the process and the group of participants to the maximum to get the optimal results. S/he is

not just the "pencil" of the group. No s/he manages and steers the group to get the most out of them. In order to do so the creative facilitator has the need for content knowledge. In the Buffalo traditions the facilitator has no interests in the content. It is true that the Resource Group is primarily responsible for solving the problem and that the facilitator is primarily responsible for the process. But in order to do so s/he needs to understand the problem. If you do not know what the group is discussing about you cannot interfere and steer the group in another direction. If you do not know what the box is how can you help them think outside-of-the-box? Analogies are great for helping a group. To know which analogy could be of help you should understand the original problem. This is content. So we stimulate facilitators to be very active, both in process as in content. Content knowledge not for solving the problem, but for being the better process consultant.

INTERRATED CREATIVE PROBLEM SOLVING (ICPS)

All these reflections from our practices have come together in one new integrated approach. *Integrated Creative Problem Solving (iCPS)* is a specific methodic approach to organise and run creative sessions on a professional way. It has been described in an extensive way in our book published in 2013 (Buijs& Van der Meer, 2013). The story behind the book is summarised in this sentence: "To break the rules, you must first master them." This is a sentence that appeals to us. It is from an advertisement campaign from 2014 for a Swiss watch brand: Audemars Piguet. They look back on their history since 1892. Creativity and innovation have to do with breaking the rules, about doing things different. Unfortunately some people think because you have to break the rules anyhow, you do not have to learn them anymore. But the contrary is true. You can only break the rules if you know them quite detailed. To put it stronger: you should know the mechanisms behind those rules.

The iCPS approach and the iCPS book is focused on the right rules and why you should apply them. After getting more experience you are able to play with the rules, to finally develop your own rules in

the iCPS field.

Summarising iCPS: it is a coherent set of four interdependent sub-processes:
- The *Project Management* sub-process (each creative session is a kind of a project), including facilitation;
- The *Acceptance Finding* sub-process (the results of a creative session have to be shared with others and probably more and different others will be needed to implement those results);
- The *Information Finding* sub-process (you have to check in the outside world (outside means here outside of the session) whether what has been said before, during and after the session on the content of the session has some real value. A kind of reality check on the ideas that have been generated;
- The *Content Finding* sub-process (that is solving the problem at hand). This runs from investigating the problem and its stakeholders to detailing the suggested solutions and dealing with the implementation.
See the figure 3.

The four sub-processes have no fixed order in which they should be handled. Although we always suggest to start with the *Project Management* sub-process. Because as soon as there is a deal between the Problem Owner and the professional Creative Facilitator to start a creative problem solving process the project has been started. The other three sub-processes will, dependent on the situation and the content on that moment in time, have different sequences.

There is, besides this process side, also an organisational side to iCPS. We distinguish at least four different roles:
- The Problem Owner (PO). That is the person who has an open problem and is or feels responsible for solving it. He or she is seeking for professional help to get it solved.
- The Creative Facilitator (CF). That is the professional organiser and leader of the session. He or she is an expert on the four sub-processes and knows the relevant creativity techniques. The Creative Facilitator is the prime responsible person for organising and
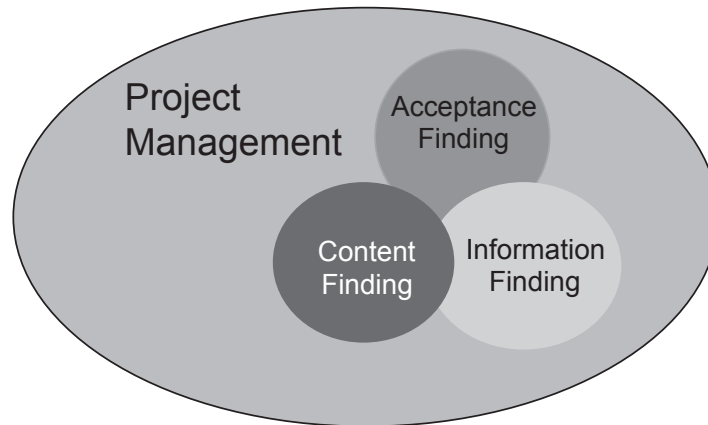
Figure 3: The basic principle of the iCPS-approach

running the creative session. Including all prepatory and logistic actions.

- The Resource Group (RG), the professional participants of the session. They are willing and ready to use their knowledge, experiences and skills to help to solve the problem of the Problem Owner. They are, together with the Problem Owner responsible for the content of the problem solving process.

- The "Others". Not all stakeholders of the problem will be able to join the session, but later on in the implementation stage they will have to live with the consequences. Sometimes it is only later in time that all stakeholders will be known. So this group of "others" can be a constantly changing group of people. These "Others" play an important role in the *Acceptance Finding* sub process.

Sometimes we distinguish a fifth element:

- The Outsiders, the Extra's or the Add-ons. People with special qualities in relation to the problem, who might be interesting to ask to contribute to the creative session. In most cases it is about their content knowledge, like their knowledge of the same or analogue problems or situations.

  Sometimes we use them also for their process knowledge. For instance in the role of "buddy" for the facilitator. As a kind of sounding board and sparring partner. Sometimes we gave them the role of "standard-lay man" within the Resource Group. In this situation they do not need to have

specific knowledge about the problem at hand, but they have many experiences of participating in creative sessions. They are a kind of "secret agent" of the facilitator; able to support and help the facilitator from within the Resource Group. For instance to pose "strange" questions or to produce extreme ideas, which can help to open up the box for the other participants. They are part of the Resource Group and are introduced due to other qualities than being a "buddy" for the facilitator.

It is important to differentiate those roles and to manage them. Do not get them mixed up.

THE DELFT TOUCH AS AN UNDERLAYER

As said before we are active members of the Delft Design School. We teach our students a "designerly way of doing, thinking and acting". It is practice oriented. Students learn hands on design work. Making prototypes, experimenting often and easy, dealing with real companies and real people. Using all the senses. The outside world is the laboratory for our students. So we stimulate them to bring in this concrete outside world into their creative sessions. We stimulate them to communicate as visual and concrete as possible. We hate reports, but we love drawings, posters or animations. This Delft touch is sensible in all the aspects of iCPS, but is difficult to pinpoint at concretely. It functions as a basic under layer for all our iCPS actions.

Out target audience for iCPS is primarily the

future professional creative facilitator. Resource Group members can learn a lot from the book, but we want to stimulate and motivate the organisers of creative sessions.

To symbolise this we have chosen the explicit metaphor of a juggler balancing on a tight rope with a bicycle, throwing different objects in the air.

DISCUSSION

Is our Delft iCPS approach just a matter of fine-tuning or is it a much more radical change for the CPS domain? The prime target of the traditional CPS approach is tackling the problem by going through a series of diamond shaped steps. Reaching the content is leading.

Based on our European practices we zoomed out of this prime content orientation to a higher level of abstraction of viewing the problem solving process in its wider context. This wider context includes not only the wider context of the problem itself, like for instance investigating all relevant stakeholders before you start the overall creative project, but it also includes all the contextual, situational and organisational aspects of the creative project itself. Which in our opinion automatically leads to the separation of the Content Finding process from the Project Management process and the Acceptance Finding process.

By the way separation does not mean independent: all (four) sub processes within the iCPS approach are mutually interdependent. The addition of the Information Finding process on the same higher level of abstraction is indeed new, but a consequence of seeing creative problem solving not as being executed in just one session but as integral part of a much larger creative trajectory or creative project. It may look like a big step, but it is only the consequence of viewing CPS on this higher level of abstraction.

Besides zooming out we also zoomed in to a lower level of abstraction: the level of the creative steps itself. First we added "clustering" as an extra in-between step to the original two step creative diamond. We see it as a three step diamond: (1) divergence – (2) clustering – (3) convergence. Clustering or categorising is neither diverging nor converging. Therefore it is really a separate third in-between step of the creative diamond.

Since the introduction of the ecological model of CPS (Isaksen & Dorval, 1993) the strict logical order of the different steps within the CPS process (in our terminology Content Finding) has been opened up. The present view is that depending on the circumstances you find you just start with one creative diamond and depending on the results you step over to another diamond (which does not have to be the next logical one). Again in our opinion the consequence of this separately managing of different creative diamonds in parallel or in situation based different order is that you have to add two extra steps to the diamond. One up front: Task Appraisal and one at the end: Reflection. This was our reason to come up with the iCPS Basic Module. Maybe for some a big change, for us just the logical consequence.

The hottest and sharpest discussion point seems to be the role of the creative facilitator. We propose a very activist way of working of the facilitator. Based on the professional contract the creative facilitator has with the Problem Owner and the Resource Group s/he is entitled to use all of his or her power to manipulate the group to the utmost. It is his or her task to get the most out of the group and to deliver to the Problem Owner an astonishing result. This manipulation is based on her or his iCPS-process knowledge, her or his experiences with the different creativity techniques and his or her understanding of the problem and its context. Yes, we see content knowledge as equally essential and important for the success of the creative facilitator as the process knowledge!

When we introduced this notion for the first time in Buffalo during the 2008 conference we were more or less killed. They shouted to us "go back to school" and "you don't understand the basics of CPS". And they refused to start a discussion with us. But if you look at the original books of Osborn, Parnes and Gordon you will see that they suggest that facilitators should have in depth knowledge of the problem and its context. For example: "each panel leader (= facilitator) should develop in advance of each session his own list of suggested solutions to the problem. Then, if the stream of ideas slows down, the leader can boost the flow by interpolating suggestions of his own." (Osborn 1953,

page 172). And Gordon (1961) says: "the leader should have the widest experience in life and in industry so he can best integrate and interpret all possible concepts and associations." Is not that content? We still disagree with our Buffalo friends that facilitators do not need content knowledge. We are convinced that a good creative facilitator needs content knowledge to manage the creative process. Fine-tuning or a fundamental expansion? It is up to you to make up your mind.

CONCLUSIONS

The Delft iCPS approach stands on the shoulders of the original American CPS hero's. During our 40 years of experiences we gradually introduced small changes into our practices. Sometimes it became a normal way of working for us, like the clustering step. Most of the changes are practice based. They were introduced as small experiments, they were changed based on the results and re-introduced in different forms. Often we discussed our changes with our European colleagues during the EACI conferences (ECCI 1 till ECCI 13). For us all those small changes were just a way of fine-tuning the overall classical CPS way of doing. May be in hindsight it can be seen by others as a number of big steps. Some may even see it as a fundamental rethinking of CPS. For us however it is just the result of reflecting on the great way of working with the CPS-approach.

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