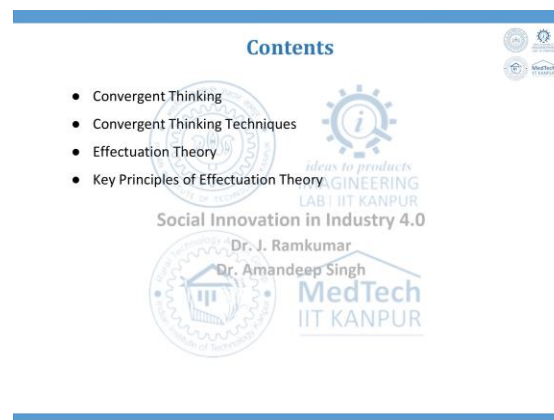


Social Innovation in Industry 4.0
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Lecture 27
Creativity Tools and Techniques (Part 3 of 4)

Welcome to the next lecture on Creativity Tools. In the previous lecture, we were looking into Divergent Tools. Now, divergent means, you have generated more and more ideas. Now, how are you going to use all these ideas and come to a unique or optimum solution? Unique and optimum are two different aspects. Unique is one putting all constraints you come up with one. Optimum is where there can be two possible two solutions, where one constraint gives you one optimum, the other constraint gives you another optimum.



So, now in this lecture, we will try to see convergent thought process. Divergent is over we have seen four powerful tools. The most important and which I use is Brainstorming. Then you have Mind Mapping.

I have tried these two and it both are very impressive. Then, you can also have that opening a book and looking for words and then associative behavior, that is also one thing which you can try. So, all these things tries to give more and more data. Now with that, how am I going to consolidate and how am I going to come out with the best solution? That is what we will try to see in this lecture. So, in this lecture, we will try to have Convergent Thinking, then Convergent thinking Techniques, Effectuation Theory, then key principles of Effectuation Theory.

Convergent Thinking

Convergent thinking is a cognitive process that involves narrowing down possibilities to find the best solution or idea.

Opposite of divergent thinking, which is a type of thinking that focuses on generating multiple possible solutions to a problem.

Convergent thinking is helpful in evaluating, analyzing, and selecting the best ideas or solutions, it can help to-

- Prioritize
- Make decisions
- Analyze

(Analyze strength, weakness, risks & potential outcomes)

Utilize decision-making framework for informed choices



Convergent thinking, which is an opposite for divergent thinking, is also a cognitive process. This helps in narrowing down the possibility to find the best solution or the idea in the lot whatever you have done. This is opposite of divergent thinking, which is a type of thinking, that focuses on generating multiple possible solutions to a problem. Convergent thinking is helpful in evaluating, analyzing evaluation, analyzing, selecting the best idea or solution three important things, Evaluation, Analysis and Selecting. So, it can help to prioritize.

What prioritize means, you can rank the ideas based on, I can put it like relevance, then I can say feasibility, then I can say impact. You just put a ranking for example, a shirt is there what is the importance of this button? If the button is not there, would not you wear a shirt? No, you will still go ahead. So, if the pocket is torn would you still go ahead? I will try to stick it, I will try to stitch it, but if it is a torn pocket, I can even tear the pocket and make it a pocket less shirt and then still wear it. So, is the pocket very important? Is the pocket stitching very important? No, compare two button this is not so very important.

Now, I move to a pant. Pant zip is it important? It is only occupying 10 percent of the total cost of the pant, but if the pant zip fails, the entire pant is not worn. So, now, you have to rank with respect to the importance or with respect to impact that is what is ranking. Ranking is also not easy, I buy the shirt. Is the color important?

For me, the comfort is important rather than the color, but maybe for somebody else, the color is important as compared to that of the comfort. For example, tight jeans, you wear it is very tight to the skin, comfort wise it is not so good, but it gives you a feel good factor when you start wearing it and somebody seeing it.

So, look at it the priorities change, the ranks change and you are supposed to give the ranking based on the relevance, feasibility and impact. For a youth, certain things will be

relevant, for a age people certain things will be relevant, for a health care certain things, that social innovation in health care, the color does not matter at all, the functionality matters. But whereas, when I sell the same product at a higher segment, the color plays an important role. Functionality, Yes! but not so much as compared to that. When it was in a lower bottom line permit if you are trying to hit.

Next is make decisions, these are are, we try to utilize decision making framework for informed choices. So, that is decision making you utilize decision making framework there are frameworks, we will see that and then, analysis is nothing, but you look for assess strength, weakness, risks and potential outcomes. So, these are the analysis. So, what I do is, I take an idea, I try to prioritize the idea, I try to make a decision with the decision matrix or decision making framework. I try to take a decision and I also analyze its strength, weakness, risk and potential outcomes.

So, you try to put all these filters, you have a basket of lot of ideas. Take an idea, put this filter, try to see which filter sets where and try to evaluate each ideas under this three and then, you try to get whatever is the best. You try to take it to the next level.

Convergent Thinking Techniques

Convergent thinking techniques help us effectively evaluate and refine ideas to make informed decisions.

By employing these techniques, we can narrow down the possibilities and identify the most promising solutions.

Convergent Thinking techniques includes:

- Six Thinking Hats
- SWOT Analysis
- Decision Matrix

The slide features a graphic of four blue arrows pointing towards a central red arrow. Text overlays include 'Social Innovation in Industry 4.0', 'Dr. J. Ramkumar', 'Dr. Amandeep Singh', and 'MedTech IIT CAMPUR'. Logos for 'IIT CAMPUR' and 'MedTech' are also visible. A small URL is at the bottom: 'Image source: https://images.app.goo.gl/kuPAQmlyqA79565'.

So, the Convergent Thinking Techniques help us to effectively evaluate and refine ideas to make informed decisions. Your output is known because you have done a need analysis.

From the need analysis, you know what is to be done, your definition of the problem is there. So, from there, you are trying to diverge and then you are trying to converge. So, you try to refine ideas, to make a informed decision by employing these techniques, we can narrow down the possibility and identify the most promising solutions. You will see, when you try to diverge and when you try to converge out of this filter, you might have

some four ideas which come out. So, now, what you do is, you try to look at promising solutions and push them out of the funnel.

The techniques, which are used for convergent are Six Thinking Hats, SWOT Analysis and Decision Matrix. SWOT analysis, you would have heard behind every notebook of ITC, they write something about SWOT analysis. SWOT analysis strength, weakness, opportunity and threat, it is good that you make it for yourself also. In fact, the assignment now I am going to give for this lecture is make a SWOT analysis for yourself. What is your strength? What is your weakness? What is the opportunity for you? What is the threat for you? For example, if there are two brothers in the house and you have a single cake, the threat is the elder.

One will eat the cake and the younger one will think the elder one will eat the cake. That is the threat. The opportunity is if these two people gang up together, they will eat the entire cake and not say, who ate the cake because if you would have been a male and a female, maybe they would have said. So, that is opportunity of the same sex. I am just putting it in a fashion such that, you can appreciate and understand.

Weakness is if they eat more and more cakes, they will get into diabetic or they will have health problems. The strength is, if they want, they both of them can keep themselves happy by sharing the cake strength. So, this is a simple thing. You can do it for your college, you can do it for your innovation, you can do it for yourself, you can do it for a car what you buy anything and everything, SWOT analysis can be done. If your SWOT analysis is very serious and sincere, you will get the best out of it.

Six Thinking Hats

Edward de Bono's Six Thinking Hats is a powerful technique that promotes structured and holistic thinking

It provides a framework for exploring different perspectives during

- Brainstorming
- Decision-making

The Six Hats are:

- White Hat: Facts and Information
- Red Hat: Emotions and Intuition
- Yellow Hat: Optimism and Positivity

Dr. J. Ramkumar
Dr. Amandeep Singh

fact + information
to produce
IMAGINEERING
LAB IIT KANPUR
Social Innovation in Industry 4.0
- What is known of what additional information is needed.
(Explores personal reactions + perspective)

homepage: <https://www.debonogroup.com/services/core-program/six-thinking-hats/>

So, let us move to Six hat thinking. This is hat 1, 2, 3, 4, 5 and 6, you wear a blue-white hat, you wear a red hat, you wear a green, you wear a yellow hat, you wear a green, you wear a black, you wear a blue. So, Edward's Six hat is a powerful technique that promotes structured and holistic thinking. So, it provides a framework for exploring different perspectives during brainstorming and decision making. Why is brainstorming coming here? Because you have generated lot of data, it provides a framework for exploring different perspectives during brainstorming session and decision making session.

Brainstorming, more and more ideas are created. The six hats are white hat for facts and information. When you wear this white hat, you will talk only facts and information, you will talk only about this. Then, when you wear a red hat? So, what are facts? So, these are, you try to what is known and what additional information is needed. So, this is from facts and information, whatever you do, this you try to wear the white hat and you will keep on between.

When you look at the red hat, you look for emotions and intuitions. So, here you try to explore personal reactions and the perception. So, this is what you try to do it. When you are trying to do the yellow hat, you try to look for optimum and positivity in the idea or in the solution from the idea, whatever you have generated.

Six Thinking Hats

- Black Hat: Critical Thinking (Weakness, limitation & potential drawbacks)
- Green Hat: Creativity and Innovation (alternative approaches, possibilities & solutions)
- Blue Hat: Meta-cognition and Process Management (Set objectives, directs the discussion & summarize outcomes)

Benefits of Six Thinking Hats:

- Enhanced creativity (structured approach promotes focused & productive discussions)
- Balanced decision-making (difficult issues, ensuring comprehensive assessment)
- Efficient collaboration (Dr. Amandeep Singh)

Dr. Amandeep Singh
IIT Kanpur

When we go for black hat, you look for weakness, examining the weakness, limitation and potential drawbacks, you look for that.

And, when you are looking for green hat, you look for creativity and innovation. So, what do you look for creativity and innovation? You will look forward for alternative approaches, possibilities and solutions. This is what you would look at wearing your green hat. When you try to wear a blue hat, what do you do? When you wear a blue hat, you always look forward for set objectives, directs the discussion and summarize outcomes.

So, these are there. So, each hat you wear, you try to do a role of all these things, very interesting. It is just and in companies, what they do is they have 6 hats. So, when somebody wears, there will be a moderator, this moderator wears a white hat, then immediately people talk about facts and information. So, all of them give facts and information, he notes it down or somebody else will note it down. Then what he does? He removes it and he puts his red hat, then they talk about emotions and intuitions that feel.

Maybe today it will rain. So, how do you know? From the past data, looking at the sun, you just say yeah, it is intuition, you will get it. Intuition says, I worked very hard, my intuition says, I wrote an exam very well, I will be the first topper in the class, intuition. You say, this product may be liked by them, intuition. Then, when you try to wear a yellow hat, we always look for optimum and positivity. When you are trying to wear a black hat, you will give a critical thinking, you look at weakness, you look at limitations and other things and green hat. So, it is it green.

So, you try to talk about creativity and innovation. Then, when you try to wear a blue hat, you try to do a meta cognition and process management. So, this is very very

important. So, you try to set objectives, direct the discussion and summarize the outcome. What are the benefits of this six thinking hats? It tries to enhance creativity, here it tries to stimulate, innovate thinking.

It stimulates innovative thinking and generate new perspectives. Then, balanced decision making, here it gets different viewpoints, ensuring a comprehensive assessment. So, then when you have effective collaboration, it looks for structured approach. So, structured approach promotes focused and productive discussions.

So, this is very interesting. So, it gives lot of benefits. You look at benefits of six thinking hat, it enhanced creativity, balanced decision making and effective collaboration. All these things are the advantage of using six thinking hats.

SWOT Analysis

SWOT analysis is a strategic planning technique that evaluates:

- Internal strengths and weaknesses
- External opportunities and threats

SWOT is an acronym where:

- S- Strengths - identify internal adv + expertise
- W- Weaknesses - recognize internal limitation & areas of improvement
- O- Opportunities - explore external factors & trend that could be advantageous
- T- Threats - assess external challenges or risks that may impact performance or hinder success

Dr. Amandeep Singh
KANPUR

Image source: <https://images.app.goo.gl/625t8M25nd8Fuo7ZA>

The slide features a 2x2 matrix diagram with 'S' (Strengths) and 'W' (Weaknesses) in the top row, and 'O' (Opportunities) and 'T' (Threats) in the bottom row. Handwritten blue notes provide detailed definitions for each letter and include a signature 'Dr. Amandeep Singh' and the location 'KANPUR'.

The next one is SWOT analysis. SWOT analysis is a strategic planning technique, that evaluates internal strength and weakness, external opportunity and threat.

So, internal is strength and weakness within you, external is opportunity and threat. So, in within you, it is strength and weakness, it is you know, what is it and the external thing is going to be opportunity and threat. So, this is all from the external. SWOT is an acronym for Strength, Weakness, Opportunity and Threats. So, Strength, Weakness, Opportunity and Threats.

So, even before going to this, so let us try to see some of the strengths, weakness for any given idea. So, strength is going to be, identify internal advantage and areas of expertise. This is your strength, weakness is recognize internal limitation and areas of expertise, areas of improvement. So, you will always focus that you try to convert your weakness into opportunity or weakness into your strength. What is opportunity? Opportunity is to explore external factors and trend that could be advantageous.

When we talk about threats, it is always an assess external challenges or risks that may impact performance or hinder success. So, this is what is this acronym SWOT stands for.

The slide is titled "SWOT Analysis" and includes several logos: IIT Kanpur, IMAGINEERING LAB, and Dr. J. Ramkumar. It contains the following text and notes:

SWOT Analysis as a Creative Thinking Technique:

- Stimulates creativity:
 - Identify strengths and weaknesses for innovation. (i ntinal)
 - Explore opportunities and threats for creative solutions. (Extanal)
- Holistic and strategic thinking:
 - Analyze internal and external factors comprehensively.
 - Develop well-rounded strategies based on interplay between SWOT elements.

Benefits of SWOT Analysis for Creative Thinking:

- Strategic opportunities - identifying areas for innovation & growth.
- Risk assessment - Address potential threats proactively.
- Alignment
 - ↳ Leverage strengths and overcome weakness.

When we are trying to look at SWOT analysis as a creative thinking technique, it stimulates creativity identifying strength and weakness for innovation, then explore opportunities and threats for creative solutions. Holistic and strategic thinking is, it analyze internal and external factors.

This is internal and this is external factor. Here, comprehensively develop well-rounded strategies based on interplay between SWOT elements. The benefit of SWOT analysis for creative thinking is strategic opportunities, it identify areas for innovation and growth.

It addresses potential threats proactively, very important term, it assessments risk assessment is potential threats proactively it is. It leverages strengths and overcome weakness. So, this is alignment. So, the benefit of SWOT is Strategic Opportunities, Risk Assessment and Alignment.

Decision Matrix

The decision matrix is a valuable tool for evaluating and prioritizing ideas based on predetermined criteria.

It helps in making informed choices by systematically comparing multiple factors.

- Identify the Criteria:
 - Define specific criteria relevant to the problem or goal.
 - Examples: profitability, market demand, feasibility, sustainability.
- Assign Importance:
 - Assign weights to criteria based on their relative significance.
 - Higher weights reflect greater importance in the decision-making process.

The next technique is Decision Matrix. Decision matrix is a valuable tool for evaluating and prioritizing ideas based on predetermined the criteria. You have a decision matrix, you have all the criteria's written, you take an idea, look into that and then, start putting them putting the marks, then take the idea and see whether it fits in then, you try to go to the next idea. It helps in making informed choice by systematically comparing multiple factors.

Identifying the criteria is very important. Define specific criteria relevant to the problem or goal. This is done after empathy study clear definition of the problem does the identifying the criteria. Next example is profitability, market demand, feasibility, sustainability. So, these are the things profitability, market demand, feasibility and sustainability. So, these are some of the examples for specific criteria.

Then, assign importance, weightage to criteria's based on their relevant significance. So, here higher weight reflects greater importance in a decision matrix. Again, it can be between 0 to 5, it can be 0 to 10, it can be 0 to 100. So, depending upon the units, when you try to sum up, you can see the difference between 2 units more.

If I go with 100 as a ranking scale. You can also have 0 to 1000. So, here what happens, between one criteria and the other criteria, between one idea and the other idea, you will have a huge difference when you try to give a scale between 0 to 1000. So, it is left to you can choose anything, you can have 0 to 20 also depending upon your requirements. The larger the scale, larger will be the difference.

Decision Matrix

- Rate the Options:
 - Evaluate each idea against the established criteria.
 - Rate them using a numerical scale or descriptive terms.
- Calculate Weighted Scores:
 - Multiply the rating for each criterion by its assigned weight. $w_1 \times x_1$
 - Obtain a weighted score for each option. $w_2 \times x_2$
- Compare and Prioritize:
 - Sum up the weighted scores for each option.
 - The option with the highest total score is the most favorable choice.

Idea	C1	C2	C3	C4	C5	Total
1	3	5	6	0	0	356
2	2	4	3	0	0	248
3	7	5	2	0	0	752
4	5	1	6	0	0	516
5	3	5	7	0	0	357

So, next is rate the options, evaluate each idea against the established criteria, rate them using a numerical scale or descriptive terms.

Then calculate, the weightage scores, multiply the rating for each criterion by the assigned weights. So, what is weight? So, suppose you have an output, then for this output, you will try to have two things. So, you will have assigned weight can be weight into the value x_1 . So, it can be wave w_2 into x_2 . So, multiplying the rating for each criterion by its assigned weight then obtaining a weighted score for each option.

Then, the last one is going to be compare and prioritize. Now, first what you have done is, you have assigned importance, then you have rated them. After doing it, you have multiplied rating and assigned, then you have got some weightages, then you have got from these weightages, now you have got some values you are trying to compare and prioritize them. Sum up the weighted score for each portion, the option with the highest total score is the most favorable choice. So, this is very nice and important, it will be in a table form you can rate it.

So, for example, you can have something like this. So, you write down all the criteria's here, then you have a weightage factor 4, 2, 1, 3, 2 and then, what you do is, you have a value, which you assign. These are all the weighted factor, these are all the assigned values. Now, what you do is, you multiply it with 20, 26, 56 which comes from these are weights, these comes from rating. So, finally, what will happen, you multiply this both and you write 40, then 80, then whatever it is, then you say, this is the first idea number 1.

So, you put a total and this idea comes as 356 as a score. So, then you can say, idea 1 has a rating of 356, idea 2 has 248, then idea 3 has 752, idea 4 is 516, idea 5 is 357. So, now, your scale will be first best, second, third, fourth and fifth. So, now, the option with the

highest total score is the most favorable choice you will take this choice and you will go ahead with the answer.

Decision Matrix

Benefits of Using Decision Matrix:

- Structured Decision-Making
- Objective Evaluation
- Informed Choice

Example: Selecting a Marketing Campaign

- Criteria: ROI, target audience engagement, brand alignment, cost-effectiveness.
- Assign weights based on their importance in the marketing strategy.
- Rate each campaign against the criteria and calculate weighted scores.
- Compare the total scores to identify the most suitable marketing campaign.

Handwritten notes:
- systematic approach to assess + compare ideas.
- multiple criteria + their relative importance.
- Enables data-driven decision-making for optimal outcomes.

Watermark: Social Innovation in Industry 4.0, Dr. J. Ramkumar, IIT KANPUR

So, what are the benefits of the decision matrix? It is a structured decision matrix. So, it provides systematic approach to assess and compare what? Ideas or solutions, it is systematic.

Objective of evaluation, it is you can consider multi objective optimization, multiple criteria and their relative importance, you can do that. You can have objective evaluation. Only multi criteria and their relative importance. Informed choice is going to be enables data driven decision making for optimal outcomes.

So, these are the benefits. Structured decision making means, it gives you a systematic approach to assess and compare ideas, objective evaluation, multi-objective can be done and it enables data driven decision making. So, here it is not by hearsay, it is not by an expert say, it is not by 10 people democratizing. Democracy means, you listen to everybody and you take a call which is judicial at that point of time with the limited resources available. But here what is happened, there you can take a decision which does not work, but here when you go by decision matrix, here fact is a fact, number is a number.

So, you will assess the idea with as against a number. So, that is what it is in data driven is more and more authentic. So, examples selecting a marketing campaign. So, here the criteria will be, return on investment, target audience engagement, brand alignment, cost effectiveness. These are the criteria's. The assigned weights based on their importance in the marketing strategy will be there.

Rate each campaign against the criteria and calculate the weightages. Then, compare the total scores to identify which is the most suitable campaign. For example, door to door campaign is going to give return on investment. So, starting a newspaper is going to be a campaign. Conducting a campaign by making a road show is it going to be important.

Then trying to have banners is going to be important. Then, trying to give goodies is going to be important. So, look at all those things. Many a times, it will look like multiple different approaches play a very important role. Replace marketing by election campaign. It is a Herculean task, but decision matrix is run, creative thought process come into and innovation happens. Thank you very much for your patient hearing.