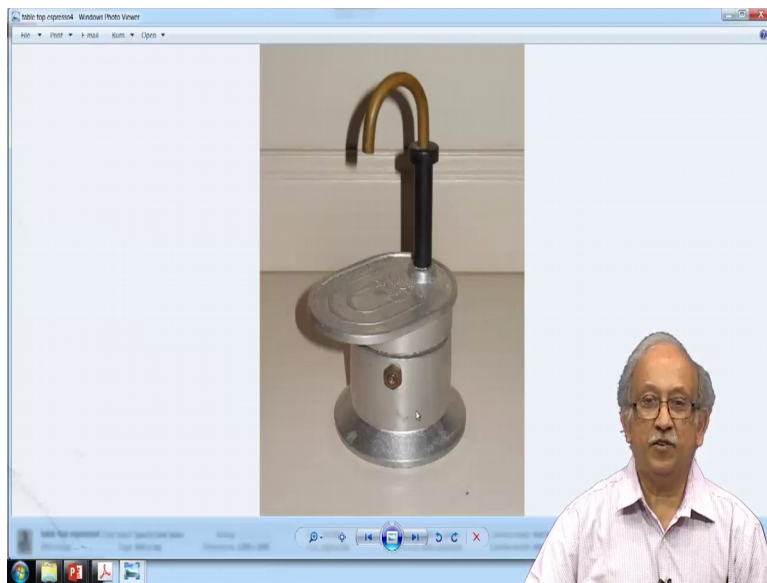


**Enclosure Design of Electronics Equipment**  
**Prof. N V Chalapathi Rao**  
**Department of Electronic Systems Engineering**  
**Indian Institute of Science, Bangalore**

**Lecture - 05**  
**Sketching in design for communication**

Let me continue with something which is a continuation of what I had spoken in the last 2 lectures.

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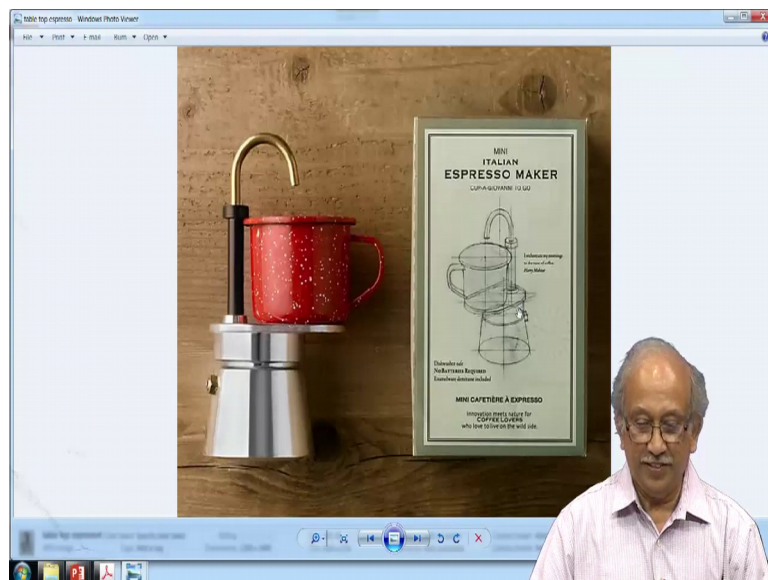
See, it started with this what you saw there actually exists; can you believe this exactly what that designer tried to draw ahead of its fabrication all the elements are carefully taken in this one of them by looking at the portion here you directly can make out that this is where if you probably are expected to put a cup and then after what you call putting on the top of a hot surface like a hot plate or probability this also induction compatible now you get coffee there and it does not stop there.

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You see here there is something here it just double sided why cannot we have A 2 and I do not know there is a clip here and what is the purpose of the clip and right from the 2 you can put 2 people.

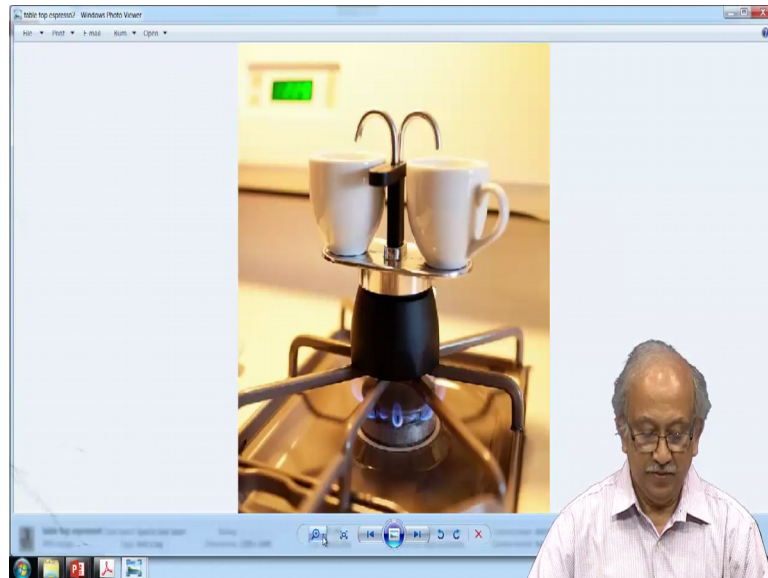
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And then you and your friend can have it; it is a not a very recent thing it is been around for a long time Italian espresso coffee maker and then you see the sketching and all this

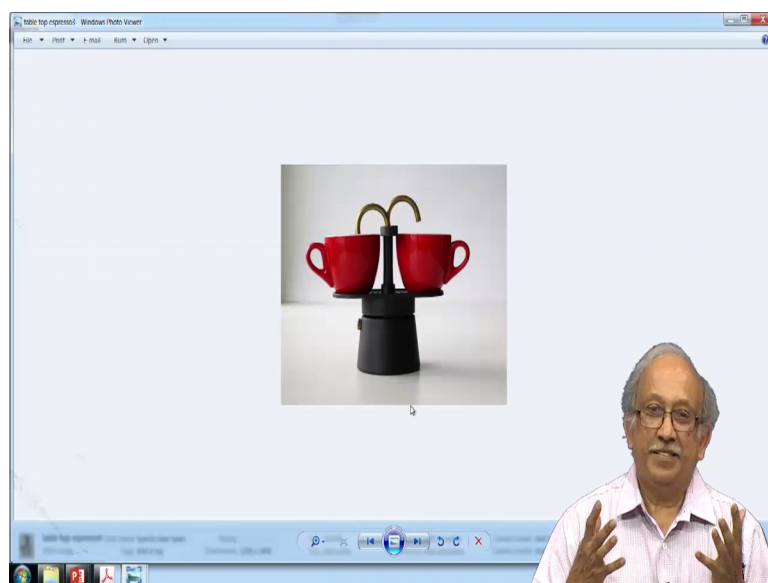
I think I have made my point now saying it is a sketching that causes all this draw to make a picture I do not know whether actually it is standing vertical or there is a wooden thing at the back.

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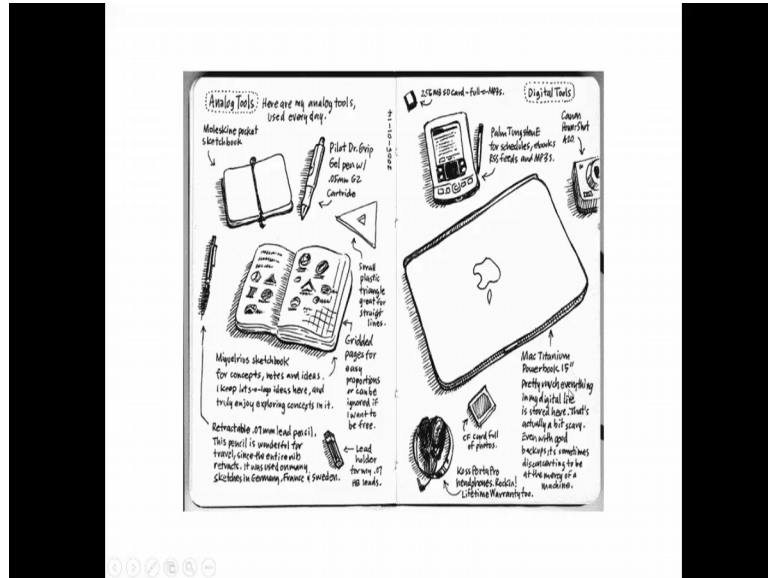
And so on this how it is used this is slightly already no modern there is elements of slightly different thing here you see here this looks a little different and then you have 2 beautiful cups and then there is a stopper at the back and then coffee comes out of it.

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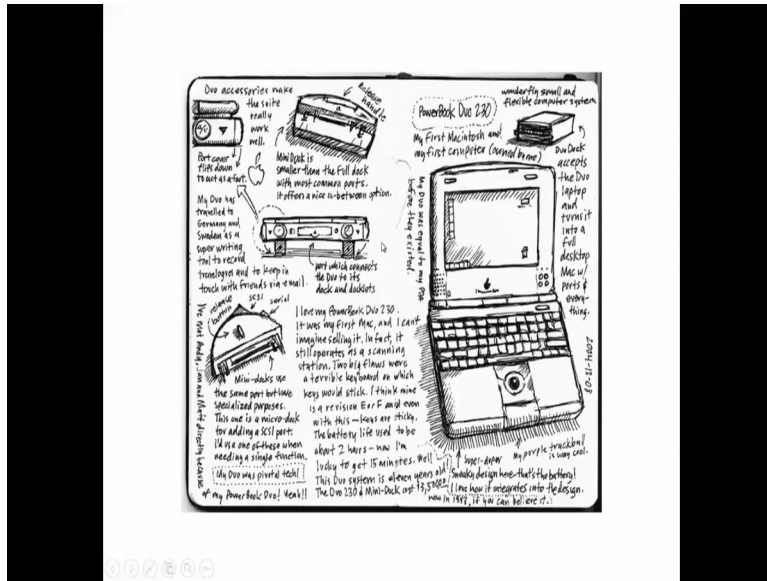
All this is come out from the designers concept stage not easy that is where this conceptualization and sketching what you want to have seems to be the core of whatever we talk well that is done for an object.

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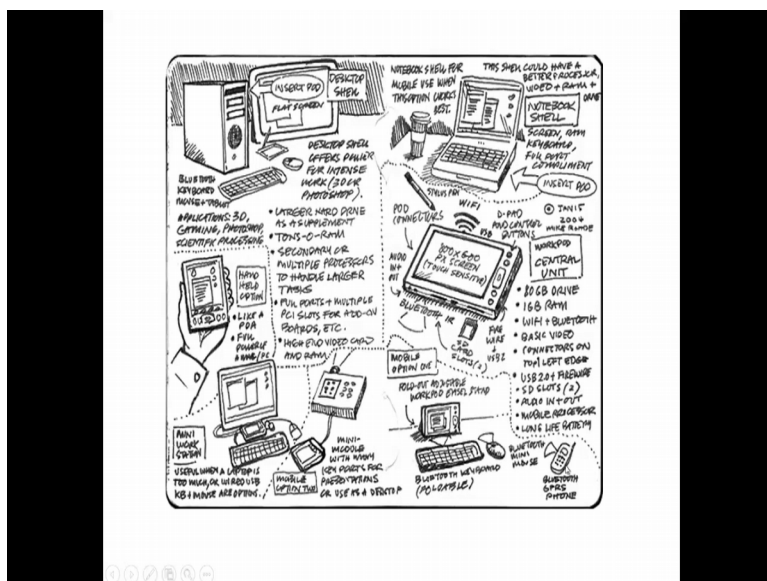
You see here we all of us are familiar with this fantastic thing MAC titanium power book 15 inch so on and so on and then you see here just to show what only has it shows here we have a palm what I call device and then there is a what I call how you put things inside this is the once upon a time analog now everything has become digital on the other side all this analog tools, it have also become digital.

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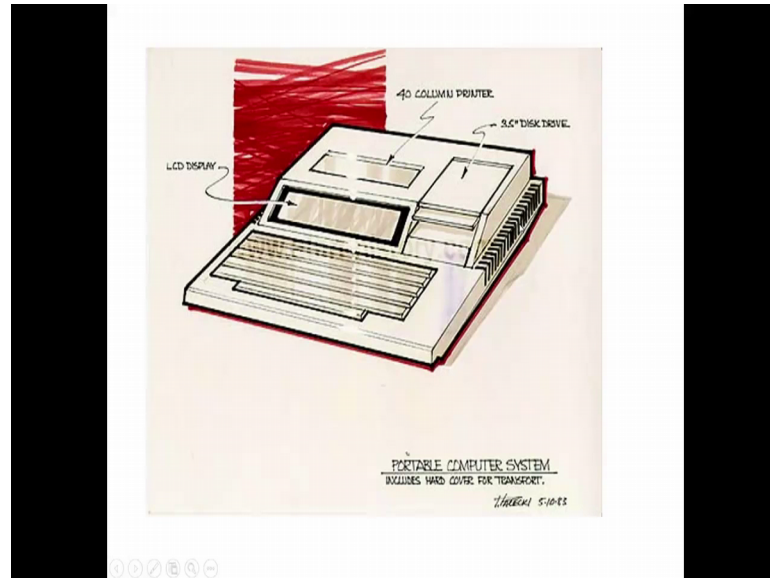
Now, luckily for us you can continue sketching take your mobile phone probably after your sketch is ready take a picture of it and then once you take a picture of it you can you can put an overlay on it you can you see we have a camera here you can put it on top and then take a picture and after that you can start sketching on top of the picture. So, you can add features which otherwise you cannot have now coming back to this slide here you will see that you see here every little detail what you want to do is all put here power book duo 230 looks nice is it not we just spontaneously that they have included this on the thing a more and more and more.

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So, right now know luckily we have the any type of a tablet you can download the apps and try to make more and more of it.

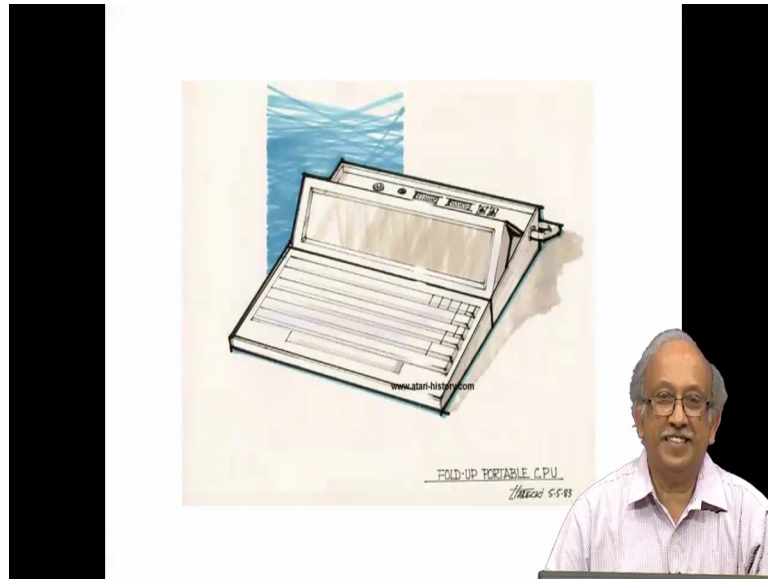
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Now I will show you one of the earliest concepts of a computer now we get into the idea saying is it they is it a real product that has been sketched which came first the chicken or the egg saying there is a sketch come first and then the product came in this case you clearly see that this is just a sketch they have added things later, but then you may be thinking about sir how can they add all these features they have something here like a heat sink and then they have a keyboard then they have a printer and so on.

Usually people gather all this information over various times then try to make things you have seen this know oh an older and older computer they were big and it has a beautiful disk drive.

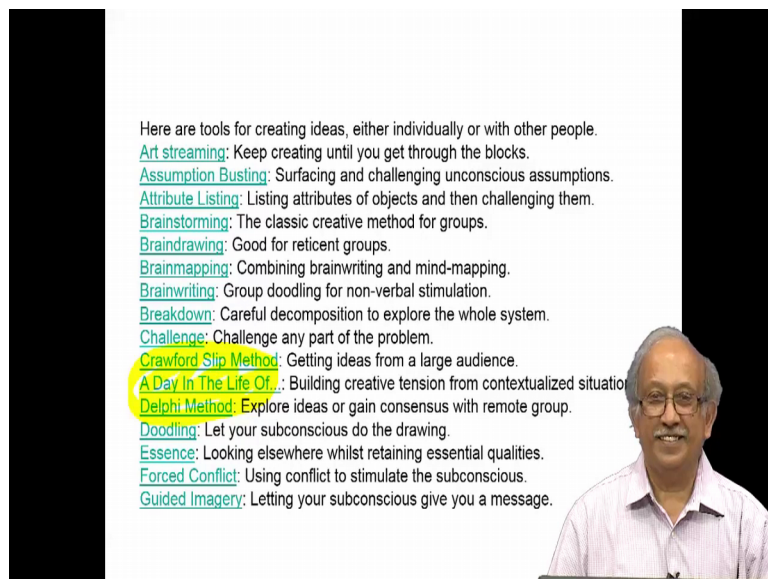
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That is you put a floppy drive on the side of it if you remember the world this computer now it looked flat there is a small elevation here the small elevation and then the things are there why not make it flat and make it a fold away display.

So, you see here we have a beautiful fold away display here you seen this here then there is a hinge and there is probably a stopper here this stopper and this hinge.

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And all that makes it flat and flat and flat for creating ideas. So, many of these are there saying art streaming and then doodling;

Student: (Refer Time: 06:10).

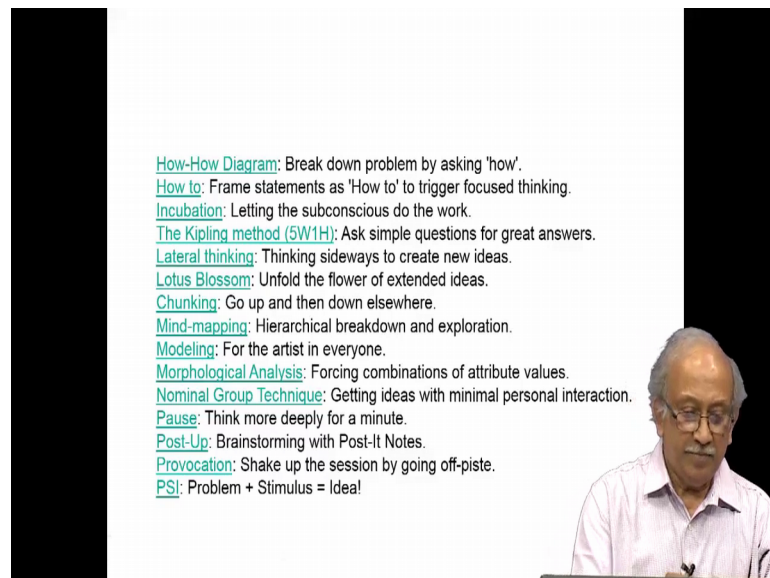
Breakdown;

Student: (Refer Time: 06:14).

I will give you with the if possible the updated links the original what I call PPT which I am using has the links they are very interesting things here you have seen this building creative things you know day in the life of very important you know this is when I tell you that there is something called design thinking that is being used everywhere unlike unlikely analytic thinking where you already have some amount of an existing product you want to optimize it by playing around with a few of the parameters design thinking starts with how will the user have used for the product which are the features.

So, that is where we have this saying see what happens in the life of a student since some most of your students or you are curious enough to follow these lectures you will notice that all the time people want to run get up and run.

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The slide contains a list of design thinking techniques, each with a brief description. The techniques listed are:

- [How-How Diagram](#): Break down problem by asking 'how'.
- [How to](#): Frame statements as 'How to' to trigger focused thinking.
- [Incubation](#): Letting the subconscious do the work.
- [The Kipling method \(5W1H\)](#): Ask simple questions for great answers.
- [Lateral thinking](#): Thinking sideways to create new ideas.
- [Lotus Blossom](#): Unfold the flower of extended ideas.
- [Chunking](#): Go up and then down elsewhere.
- [Mind-mapping](#): Hierarchical breakdown and exploration.
- [Modeling](#): For the artist in everyone.
- [Morphological Analysis](#): Forcing combinations of attribute values.
- [Nominal Group Technique](#): Getting ideas with minimal personal interaction.
- [Pause](#): Think more deeply for a minute.
- [Post-Up](#): Brainstorming with Post-It Notes.
- [Provocation](#): Shake up the session by going off-piste.
- [PSI](#): Problem + Stimulus = Idea!

In the bottom right corner of the slide, there is a small video inset showing a man with glasses and a white shirt speaking.

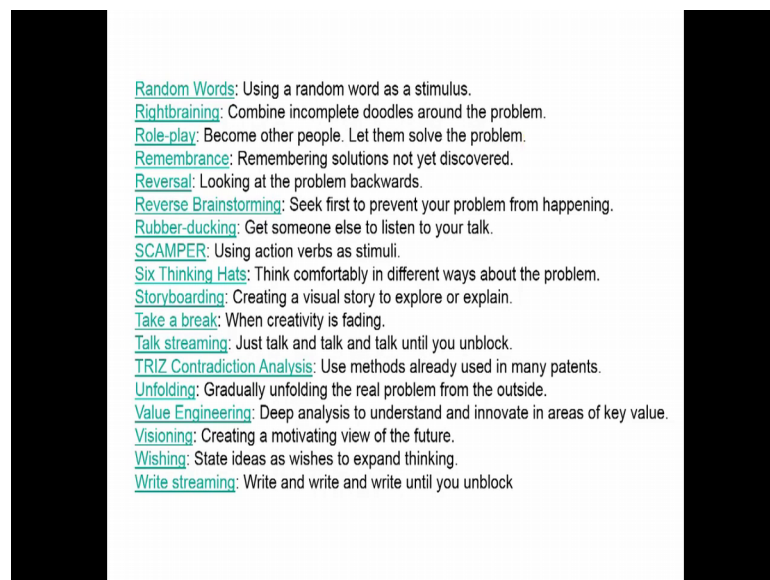
So, we have clocks then if you go to instructables you have an audio note clock which runs a selective time selective time is from the day starting from say nine to one o'clock say what you call pre lunch session it goes faster. So, by about quarter to one it already shows its 1 'o' clock. So, the teacher hopefully leaves the class and then we have a half an hour lunch here. So, that by 130 within that small time of one to one thirty the thing



speeds up and very quickly it shows a different time by the time you come back to class at say 2 'o' clock it about seems to be running between 1 and 130; it takes 45 minutes to run it about seems to be running like that has to come slowly to the evening again it speeds up.

So, I have a speeded up clock slowed down in the middle for your lunch. So, that you can get a slightly longer lunch it is not that actually eat anything to get to the spot to eat and come back next time and then on the other half second half again its speeds back total what you spend maybe here about nine hours, but you get what you are entitled for. So, at the bottom you can see here all these are various things.

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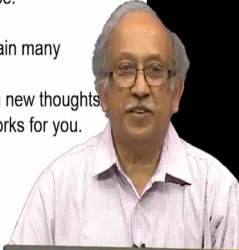


Which you can make use of it including role play become other people let them solve the problem saying if I worked to be a teacher what is my problem I cannot make out that the children are connected I meant an participant in the session are connected with me or not if they are not connected the what you call the people are little faster and they take they lose interest they quickly get bored people are slow on the uptake or would like to spend things in detail they do not they think it is too fast.

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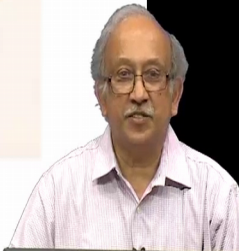

Creativity is more than tools and techniques. This page links to descriptions of critical principles about being creative.

- [Creative Problems](#): Defining creative problems and solutions.
- [Diffusion](#): Spreading ideas through social networks.
- [Divergence and convergence](#): Staying open and staying focused.
- [Exploration](#): Going where no one has gone before.
- [Forced association](#): Banging things together to create new things.
- [Ground Rules](#): Shared rules that enable safe creativity.
- [Jumping](#): Jumping to new idea domains.
- [Practice](#): Build you 'creative muscle' with regular practice.
- [Questioning](#): Asking things to get the mind going.
- [TRIZ 40 Principles](#): Principles that have been used to gain many patents.
- [Stimulation](#): Prodding your subconscious into giving you new thoughts.
- [Use What Works](#): There are many tools, so use what works for you.



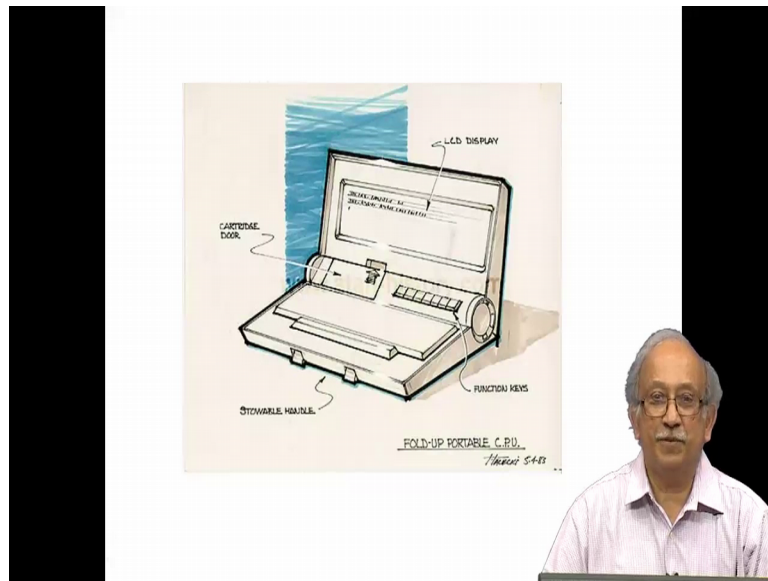
So, somewhere is that a wire media or something I repeat things. So, oh, it keeps on going we have this divergence convergence and so on.

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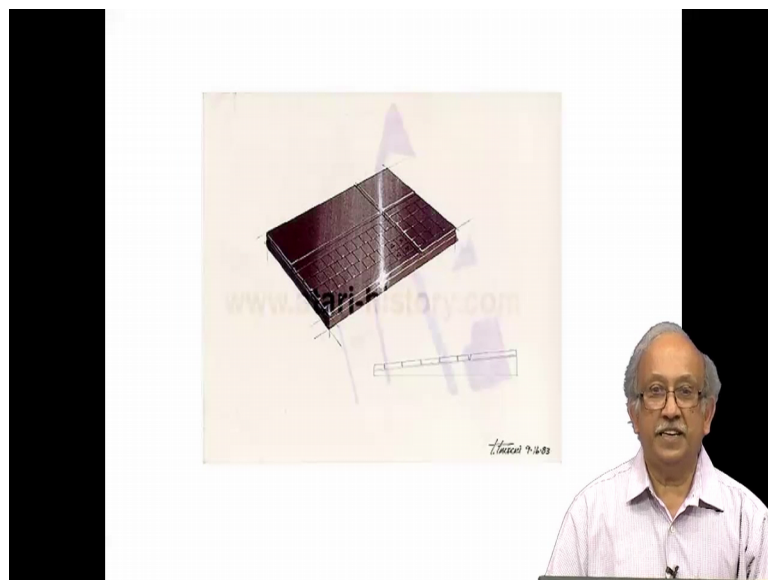
So, we come back again to be display of all these keyboards is something you have a beautiful fold up portable CPU computer.

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You remember in the first or second presentation I showed you a multi-meter which can be folded does it has to be folded yes you can probably carry it in a sling around and then you can have the display and then your keys hands are free for you have to do anything.

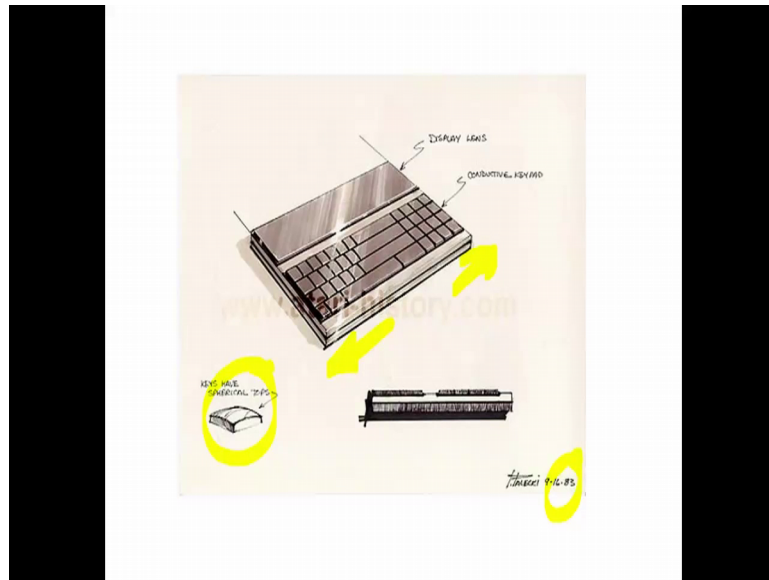
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And then if the display is properly position you can have a look at it that is where and then in the case of harsh environments when you close it you can make it such that it is off and relatively free of any other things.

Some of you may be familiar with Bang and Olufsen's stark simplicity of products. Things are just black, but then if you see a Bang and Olufsen what you call an audio system or anything you suddenly feel thrilled saying it avoids a lot of clutter. Why do we need the clutter at all.

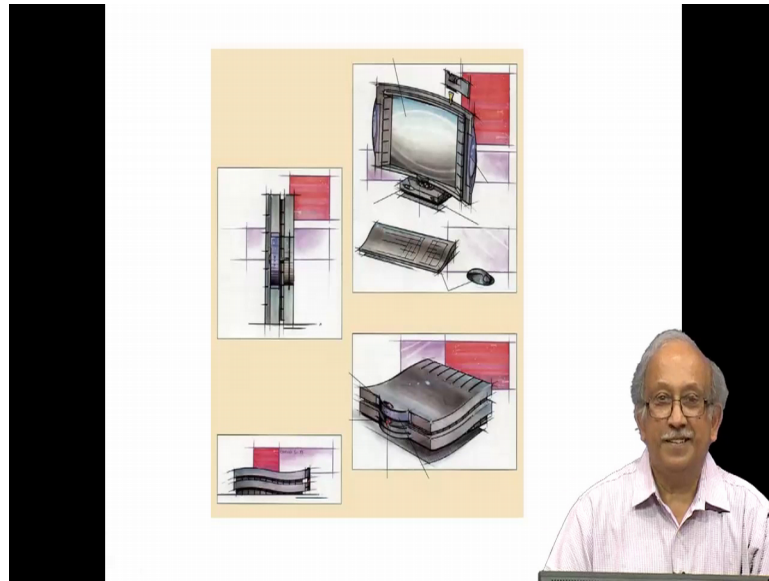
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So, we have a concept of a product here which is clean. You see here while it makes sense in that connection you see a beauty of this here. This keypad itself, you know already, this is a very old thing. Maybe this is a particular thing; oh, it is listed here 83-84 years back. This gentleman conserved this product long, long, long ago, and the important thing is you see you have a right group and the left group and they are all spaced in the middle.

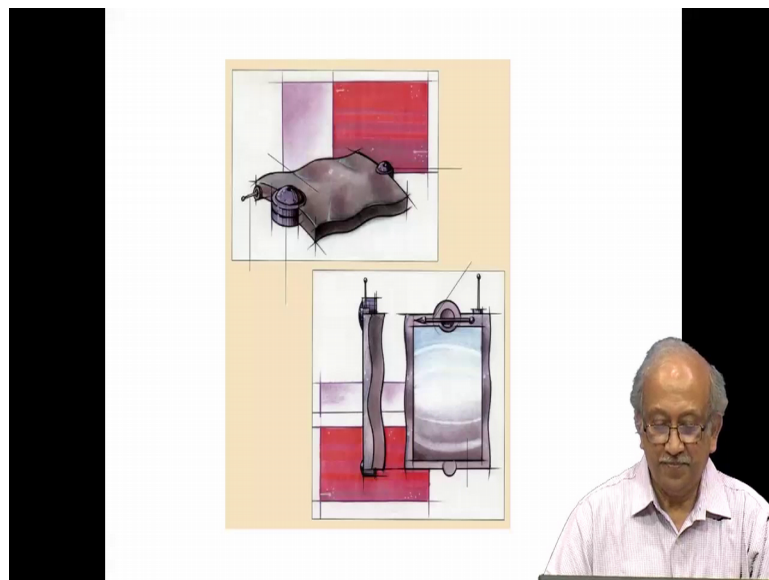
So, it already were one step ahead. Secondly, keys have spherical tops, little bit of a what you call a tactile feeling about it which is absolutely flat. You cannot see a whether they are around.

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The key are the next key, but otherwise intuitively your mind will know that your finger is slipping.

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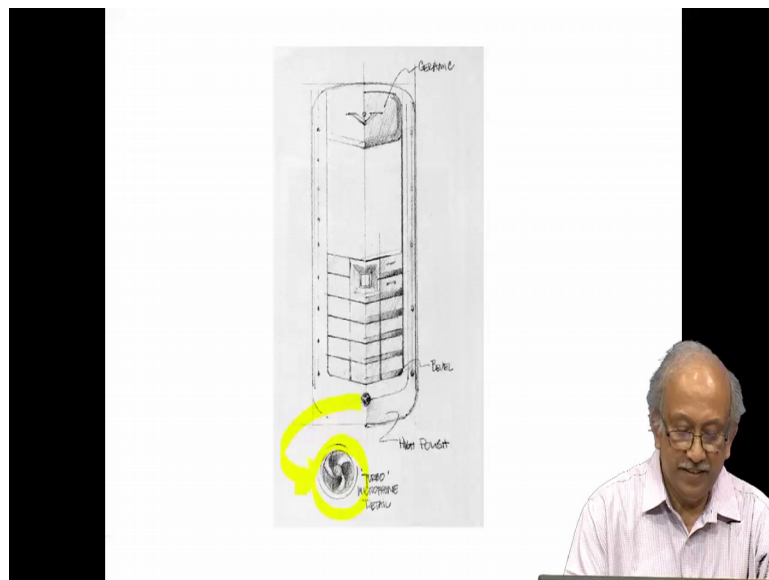
And the wrong key if it is lower than the other things say things are getting better more and more and more concepts here one of the early what you call handle devices.

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Now, we come back to really interesting, interesting and interesting products more and more and more and more and all are coming here.

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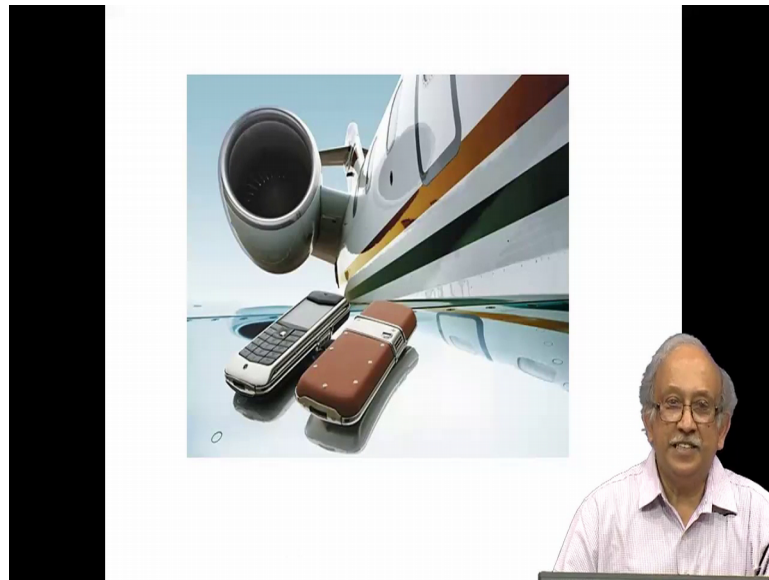
I do not know whether I have finished enough time, but this is one of those costly forms.

We know Nokia as a mass market manufacturer and some of us may also have heard of this thing called first you I do not know how they pronounce it kindly mine is a highly accented and harsh pronunciation kindly I mean my apologies for it, but I will call it a virtue; they have made it such that it conveys value.



And things look this thing if you are one of those people have caught it I think you got it now have a look at it already its meant for frequent flyers and the high flyers saying these cues if you patent them it is unlikely that people will be able to just like that copy them and make them inside.

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So, virtue continues to be for a jet set nice somehow I enjoy it like that though I cannot afford it and probably I would rather buy 10 of ordinary phone and 1 virtue hats off to the person who thinks on these lines.

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Now if you look carefully leather does not actually come in blue have you ever seen any blue leather, but we have one here leather comes in leather color and leather comes in leather texture and finally, we have phones which are probably demonstrated does it people ask does it still get a dial tone dial tone does not seem to be the main problem there see pure gold absolutely gold.

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And it is not as if people have forgotten our old phones we still have the old phone at one time it made sense to have a cover like this so that you slide the cover in this if you want

you can add a little value by changing a color and then try to make something which is much more attractive.

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These things are back absolutely just like people add a tattoo I am against piercing, but tattoo is something very safe phones are personalized you see here this personalization has not gone away much it is there forever you can buy a back you can buy a front you can buy a fitted cover you can have screen printed anything you want because personalization is real would people like to play a lot of time.

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And then sometimes concepts work out sometimes they do not work out work started as all this thing where you can you know what you call close it and try to make it look like a camera and all really never caught on this is where next stage of what is called model making helps if you just make a product and put it in the market it may or may not sell, but; however, if you make some physical models and then I try it on a target consumers I will avoid the word target audience if it tried turning consumer take their opinion because people are waiting to pass an opinion I will not say their judgmental are opinionated it is just that when you ask better listen, but in observe them what they talk.

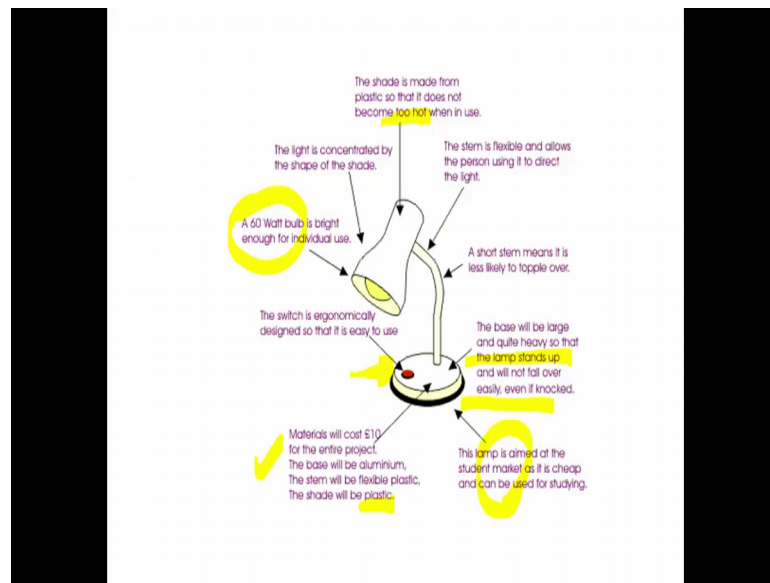
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And how they talk very easily you can make out that some features are more important they are taken better and. So, on this is same ordinary phone and suddenly you have seen what it does something have been added subtracted something has been done and things suddenly look very very good.

So, there is a generation which enjoyed the original Austin Mini and then we all know what Audi or BMW does and then we all know various other manufacturers have a feature I do not know whether I should stop this here.

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And you see here that this is typically a small what I call lamp this lamp will I forgot to bring it probably in the next class I would bring this lamp and show you the beauty is the lamp has not been made yet not at all somebody has written all the features about how it should look how much it should cost.

you have seen here know they have used a word like light is concentrated by the shape of the shade it is an abstraction you did not call it a parabolic reflector because already the word parabolic reflector has a tendency to put you off because you are using words which say feel threatening I enjoy. In fact, I can make a difference between a as I said no parboiled versus ellipsoid and something and something, but not everybody and then you see here again if you see here the stem is flexible and allows the person to use it to direct the light this will be large and heavy stands up and will not fall down.

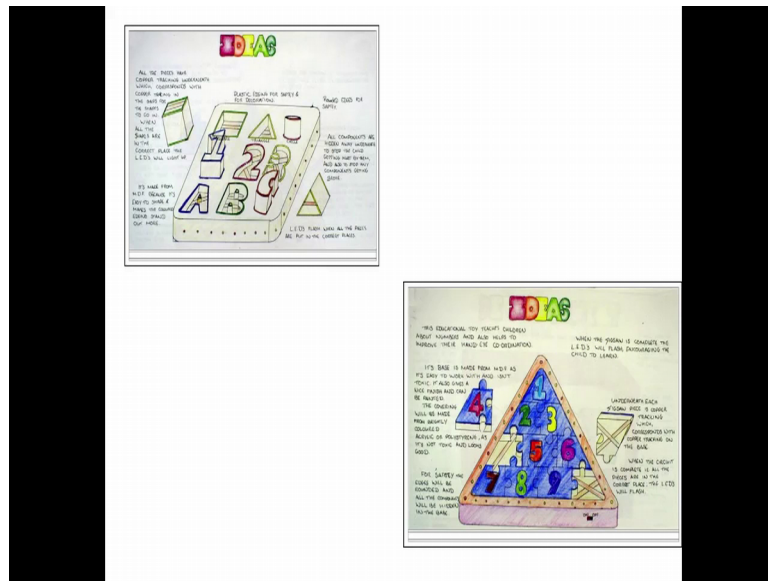
The lamp is aimed at the student market you see most important is that the lamp is aimed at the student market another class of a place like India or several other places power failure is common I am repeating power failures are very common for us. So, we get these lamps in India already with a built in backup battery. So, you just need to plug it in and your ideas thoughts are not disturbed if the power fails some ambient noise may reduce and all that and then the power takes a little time to what you call let us just probably it will take a half an hour or earlier still be maybe in a five minutes you have a backup which is there.

So, right now suddenly in our market backup is important you seen it in our situation have the power this thing backup is important now we will also see there is a beauty here there switch is ergonomically designed. So, that it is easy to use while the word is a little what you call over used we know what it means meaning it should be handy and not too much of power is required I am sorry effort is required to switch it on and accidentally you do not switch it on and you know the states when it is on and when it is off and so on this is while the amount of the effort involved in trying to operate the devices there in which direction should be top up and down or should be back and forward should be a slider should be a rotating norm and equally important is you see here something called as sixty watt bulb because it is an old thing this also is about maybe 25 years old at one time when we specified luminaries we talk about the watts typically the voltage is you know somewhat loosely proportional to the amount of light that we need around 30 to 50 lumens per watt was more than sufficient , but then the unwanted thing says a 60 watt incandescent bulb probably dissipated 59.999 watts all around as heat.

So, we end up very important to show it should not get hot accidentally if it touches nothing should happen we have brightness fortunately today we have there is. So, called light emitting diode type of bulbs which are little softer. So, in the long run everything is being I mean changed over and see they think very important things is already the designer has thought about the type of materials that need to be used, but more for its characteristics rather than for the actual when he says aluminum; aluminum comes in numerous grades .

One of them can be light, but then still it is not stiff enough some of them are very stiff and very good, but very expensive like six and I mean six thousand and seven thousand series aircraft alloys and then very loosely the word plastic is used here. So, shade is made from plastic, but then if you put what you call 60 watt like heat emitting instead of a light emitting diode we have a heat emitting incandescent bulb inside chances are it will get deformed. So, we have things.

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Which are added to this more and more I think at this point I will stop and try to continue the lecture next time along with the lamp which I tried to bring?

Thank you, I hope we continue to stay in touch.