

IP Management and Technology Transfer
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Lecture - 24
Case Study IV

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A very warm welcome in the 4th module of week 5 of the course Intellectual Property Management and Technology Transfer titled Case Study 4. So, in the last session we have seen the case study of CRISPR and now we will focus on case study of a 3D printing and that 3D printing is in biological we can say the organ development ok.

So, and the week which is we are now is like dealing with use of IP analytics for IP management. And we have understood in the first session about the various applications of

patent analytics. In the second session we have focused on that how IP management and this that patent analytics they are like if we use it effectively giving the competitive advantage. Then we have seen the CRISPR in detail and lot many we can say the analytical points actually are discussed in that case study.

And again, we have requested you to take any of the figure from that particular session and interpret and put the comments in the comment box below the video in the YouTube actually right. So, probably you have done that thing and now what we will do we will focus on the 3D printing.

Again, this is something a very new kind of approach 3D printing is a very common we have use probably everybody now knows about 3D printing and so many we can say the different we can say the developments are like circulated through social media also like preparation of a home by using 3D printing and all probably you have seen that.

Now, this is something application of 3D printing in biological sciences. Now, it is little bit we can say a very different because when we are talking about a biological sciences, we have to be very careful considering. In a sense that regulations actually like whenever because this is something whatever you will create probably is related to them maybe the in vivo application may be there and if in vivo application is there then there should there are lot many regulations are there ok.

So, we will go into details of that particular in this session and you will get idea how that 3D printing is used and what is a landscape and then we will discuss in the last that how it will be applied for the effective IP management. Now, this case will be very useful again to the biological sciences and again sorry for that because CRISPR was also the biological sciences this was the also the biological sciences.

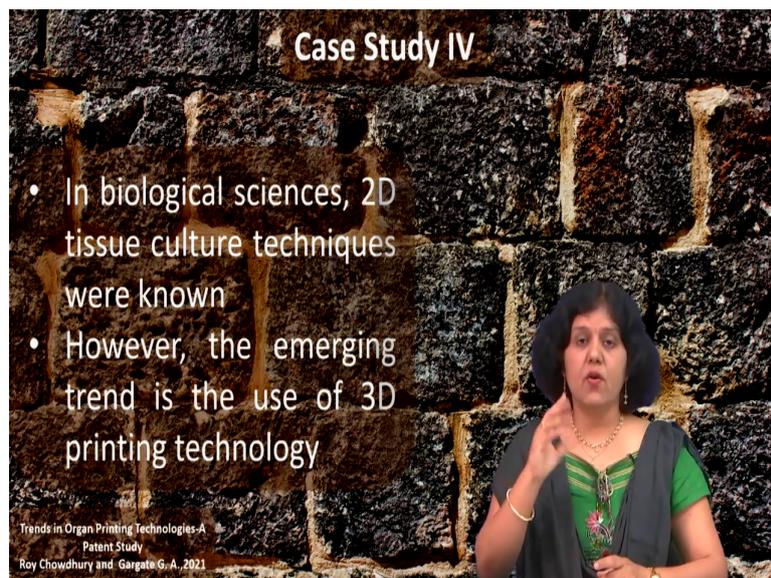
The next case study we will focus on related to the energy sector and the block chain. Probably if you are engineer and if you are some other background than the biology definitely

you will enjoy that. And I hope that CRISPR like everybody is like it is like an buzzword like a block chain and artificial intelligence CRISPR is a buzzword.

I can say in the biological sciences because lot many miraculous we can say the applications we can say it is the descriptive we can say the innovation invention I will say and lot many applications are there. Similarly, now this is a combination that 3D printing something engineering we can say that machinery and then it is application in biology, very we can say a interdisciplinary we can say the approach and its applications ok.

So, you can just check here that 3D printing technology is encompassing several domains from varied engineering streams to a biological science.

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Case Study IV

- In biological sciences, 2D tissue culture techniques were known
- However, the emerging trend is the use of 3D printing technology

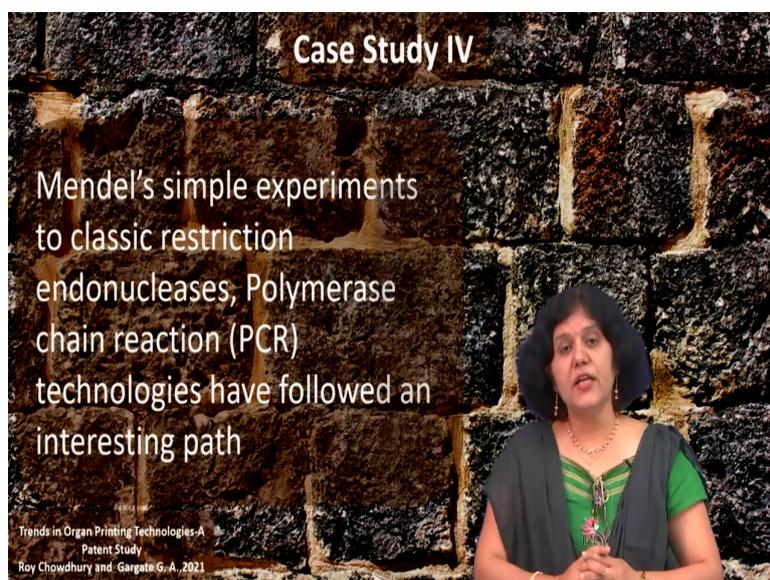
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And in the biological sciences we are very well aware about 2D tissue culture techniques; that in the petri plate we are growing that or in the cell lines are there we are growing that it is a very common actually.

Because many we can say the in vivo if kind of replica or we have to create that kind of a environment for the study of in vivo effect of some we can say the living like viruses or bacteria or some other we can say molecules and all that cell lines are very common we are using it. However, the emerging trend is the use of 3D printing technology in the biological sciences.

Now, we are very well aware you know the if you see the history of biology Mendel's experiments are very classic, we can say the experiments you know that how he has used that plants like and using that in the monastery he has grown the plants and then he has given the rules regarding the genetics actually ok.

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It is a very we can say the very classic experiment of a Mendel it work, just now as Mendel name came I just share the story that he has done that experiments then after; that means, nobody was knowing about that he has done that he has published in local journal actually Gregor Johann Mendel.

And after 25 years 3 scientists at 3 different places, they have done the same experiment and then they have qualified or they have been like that work was like appreciated so much and all 3 like a received Nobel Prize in sharing. And one of them have clearly said that we are not the first already Mendel has done this experiment, you can see the we should appreciate this approach of that particular scientist and then people come to know about the Mendel experiments.

That was a history actually that was a story and without any we can say the instrument and all that Mendel has done that experiment. We can say that it is very interesting that just observing the external appearance of that pea plant he has like given the details about the genetic combinations and all that we can say the details.

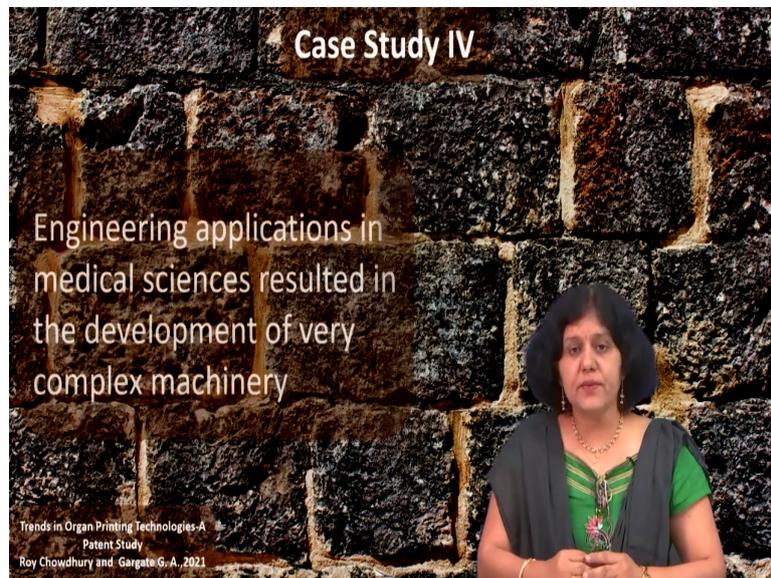
So, another is like a restriction endonuclease again the classic we can say the case study considering the disruptive innovation also and considering the patent case study. Because it was a classic example of a how a technology officer of a particular university it was a Stanford university actually that how he has taken the efforts to file the patent of that restriction endonuclease after publication of this invention in the paper.

And that fellow also come to know about this invention that somebody from his university have developed such a kind of a new technology. Obviously, it is a biological technique and that through paper he come to know because that was a conference that professor he has published or he has given that details in the conference and that was reported by the new media actually.

And then he come to know and then he has taken that effort and within 1 year that was a timeline he has filed that patent and lot many hindrances come. Because it was a biological research and that passing through that guidelines and all amazing case study actually we have recorded it in one of the courses either roadmap or entrepreneurship one of the case it is in the week 1 only and it is a very classic case study of patent filing in time biotechnology officer lot of efforts he has taken.

And then the polymerase chain technology against anger like this is another very we can say the classic and in the COVID time we have seen the effect or use of that PCR. Everybody now knows about PCR because of COVID and that is the that these are the classic we can say the events in the history of a biology. And now this is a 3D printing because if we get that success in that 3D printing probably it will be like a revolutionary it will revolutionize the biological sciences.

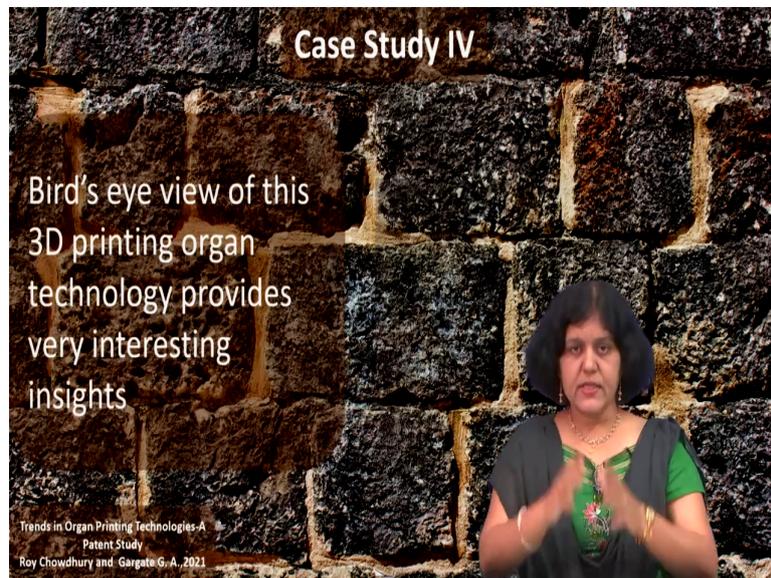
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Now, this engineering applications in medical sciences they are very commonly known that very complex machinery, if simple example of angiography when we are doing the machine which is used or MRI machines case scanning machines and all. So, all these machines like this is like a amazing that engineering applications are there to detect the falls or working of the biological system and these are very complicated machineries.

And we know that how effective they are to analyze the internal body condition of that particular individual or the we can say wherever it is required it is assisting the for the diagnosis.

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Now, if we see the now 3D printing organ technology whatever this case study is like focused on, we are just giving you the bird's eye view of this 3D printing technology and probably it will be very interesting like just like a CRISPR. That if you see the CRISPR application these are very interesting applications are there.

Similarly, 3D printing itself is so interesting that if you have watched that actual working of 3D printing, that how that device or any article is prepared in a small time in that short time and how it is fastly like a that that particular we can say the object is created its very interesting. And here it is like a for a organ we can say that creation of the organ this particular technology is used.

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Case Study IV

- Biological sciences very promising technologies
- Restriction endonuclease, monoclonal antibodies, nude mice, dolly sheep,

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Now, if you see in biological sciences this, I have already mention about restriction endonuclease, monoclonal antibodies again it is a very classic I can say considering patent because Stanford University has filed that patent and this is one of the very promising, we can say the invention. Google was also there like from Stanford only monoclonal is also from Stanford, but observation is that monoclonal has given a more license fee this patent has given a more license fee to Stanford actually.

Nude mice again very important considering the patent, I will say it is also known as Oncomouse. It is a Harvard Oncomouse and it is a very we can say the important invention we can say when because the meaning of nude mice is like a immunologically it is like giving no reaction that immune system is 0 we can say in this particular mice if I want to explain it in a very layman language.

And this particular situation is very useful for studying we can say the biological any molecule and all any new molecule its action and all it is very easy to study on that particular Oncomouse. Dolly sheep we are very well aware about that dolly sheep actually right and yes these are not patentable in India according to section 3 ok.

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Case Study IV

- Artificial pacemakers, the use of bolts and plates in ortho surgery, prosthetic limbs, damages.
- Body organ transplant from donor to a receiver, with various challenges including graft rejection and so on

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Now, when we are talking about this artificial pacemakers then bolts and plates in the Ortho surgery it is very common you are a very very aware about that, prosthetic limbs that is very helpful and it has solve the major problem of we can say the disability we can say that prosthetic limbs.

Then body organ transplant from donor to receiver is again the very important we can say you probably hear that news in the paper or TV that yes heart is transplanted and all that grafting.

It is like a grafting actually, but graft rejection is a problem because of the it is considered as a foreign body and our immune system like a it gives it may reject that particular.

So, these issues are there definitely and as these issues are there probably 3D printing will be very useful, because that may avoid that may reduce this graft rejection issues actually.

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Case Study IV

- Considering the current population and demand for organs, tissue; probably some new solutions are required to handle current challenges.
- 3D printing for developing artificial organs.

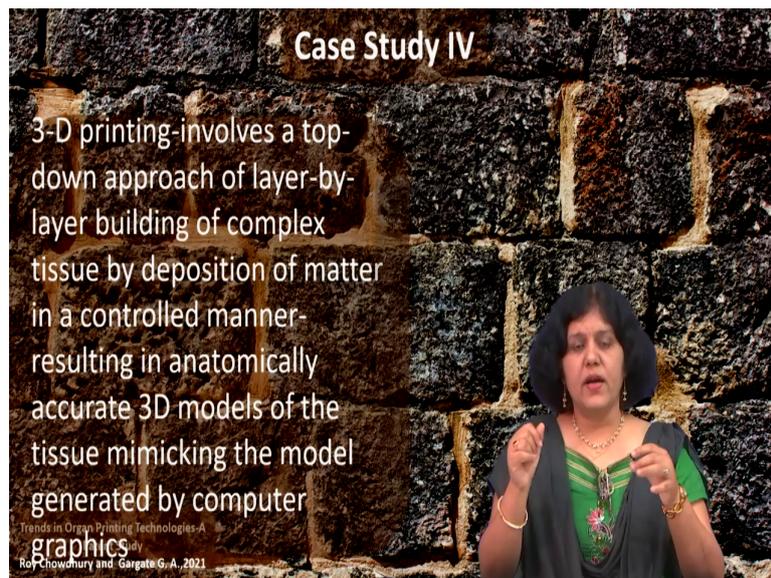
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Now further if you see this considering the current population and the demand of demand for organs, I just remember considering the demand for organs and tissues and all. When I was doing the practice, I have filed one patent which is related to the organ transplantation box actually, because we know that within the stipulated time after brain death actually and again that characteristic is means that it should be a brain death.

And then at that time the organ is like from one place to another place it should be kind of transferred in a very small time that time is very important and the condition in which it is like from one place to another place it should like transferred that conditions are again important actually.

So, one of the invention that is related to that particular box which will carry that organ without affecting the any of the we can say the parameters of that particular organ or a tissue ok. So, this considering the population and demand we can say that organs tissue probably some new solutions are required and I guess this 3D printing will be if successfully if it gives us the artificial organs probably that will solve the issue ok.

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Now, this 3D printing involves or top-down approach like you have seen that layer by layer building of the complex tissue by depositing the matter in a controlled manner and it should

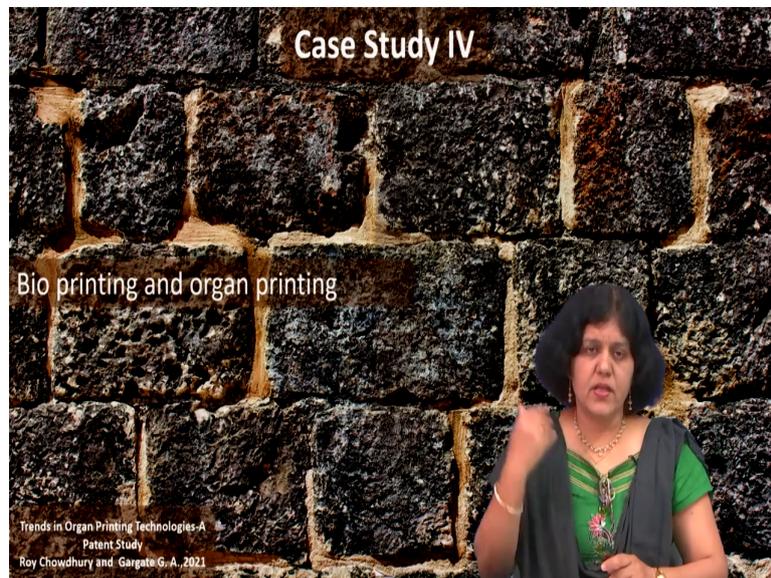
be again it is a it looks very easy to write here that. But anatomically accurate 3D model is required that anatomy is very important we know that cell structure itself we see it is so complex.

And now it is a 3D printing actually the non-living artificial that pacemaker and all that thing it is ok fine. But you are creating a organ which is supposed to work in that in vivo system and that it should replica it should be the replica of the original we can say or it should do the task of the original organ, that is expected as if it is a original organ it should work.

And it is a very challenging it looks ok, but it is like a we can say it is a starting point because anatomically it should be very accurate and this 3D models like tissue mimicking like a model like computer graphics are there and then it has to kind of develop that particular organ based on that computer graphics.

So, we have to means so many parameters will come in that computer graphics actually means before developing that particular organ, because one single cell is like a we can say lot of lot of information is there and here we are talking about organ. So, like there may be lot of developments in the future, but this is we can say the starting point actually.

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And if you move further in this particularly bio printing and the organ printing we can say that we are still in the starting phase because developing such particular organ and then its mass production and all its really challenging, but let us see how it will grow. But here what we have done we have we have seen the patents which are filed after that first January 2017 that 5 years data we have considered.

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Case Study IV

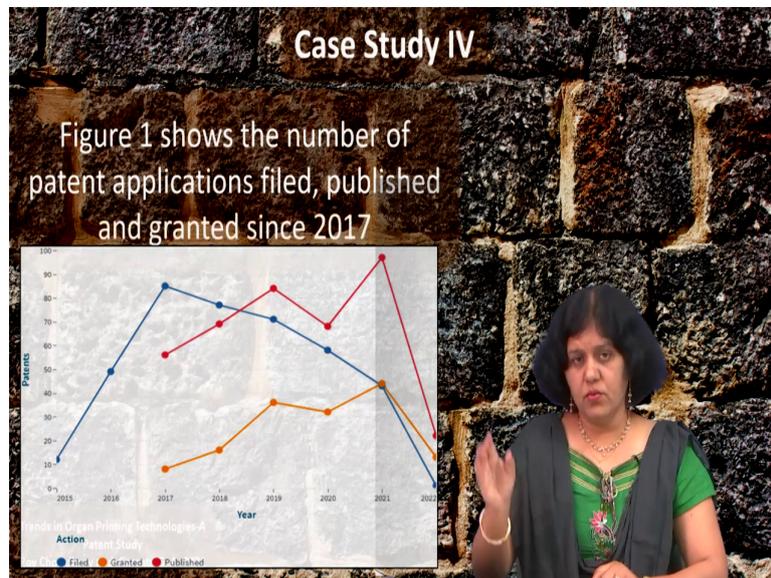
Method

- January 1st, 2017 to the present date.
- Patent data retrieval
- Non-patent data retrieval

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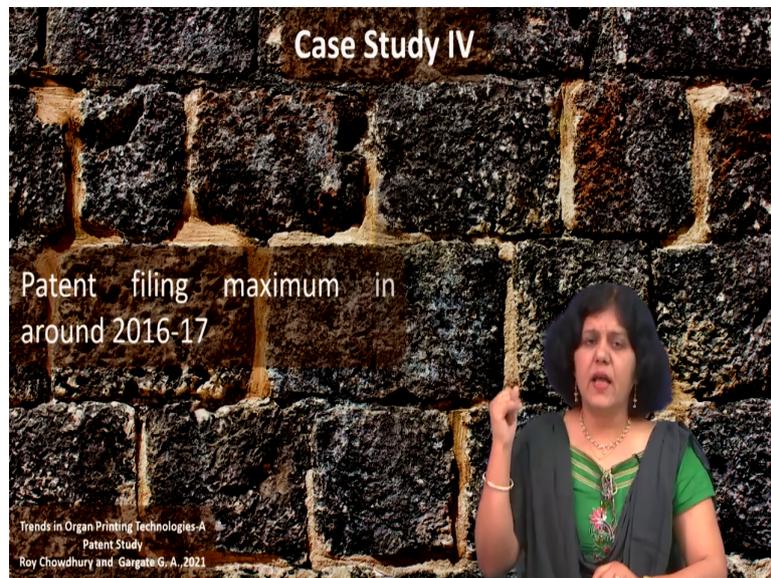
And you can see the paper is like the you can if you want to go into more details of this particular you can go through the paper actually, we have given the citation of that paper ok. So, let us see what exactly the patent data shows of that organ printing.

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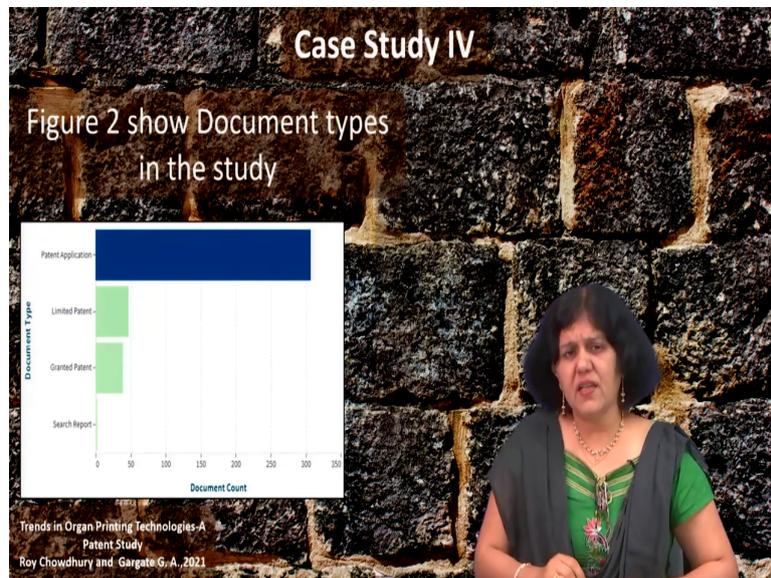
That is this is particularly the figure which is showing the number of patent applications filed and published and granted also, you can see in this graph that three we can say application granted and the filed. And if you see carefully you can just check that in the year 2016-17 there is a maximum, we can say the patent filing is there.

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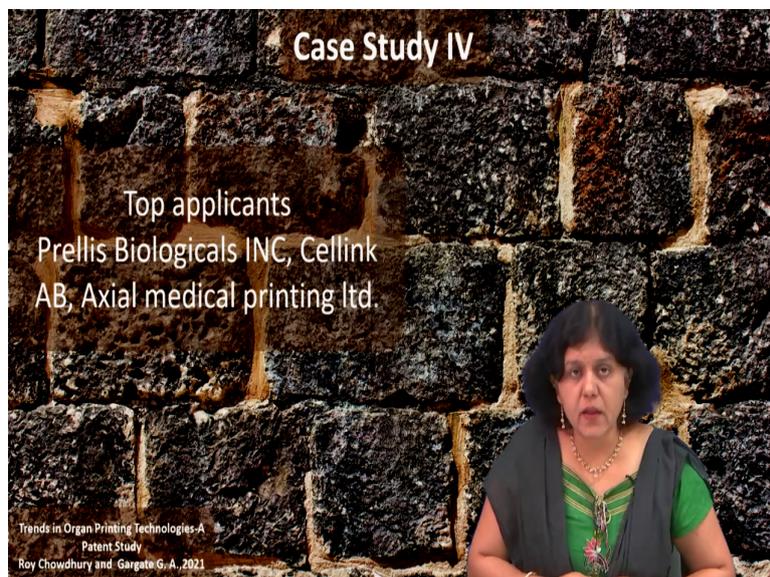
Granting and application I cannot I mean it is like a process because sometimes like a strategy might be used and all that thing. So, we never know what is that strategy and all that. But so, we cannot I will not comment because we have to study it further in details to comment on that, but just it will give the [FL] idea that ok these are the patents which are filed in a this particular field.

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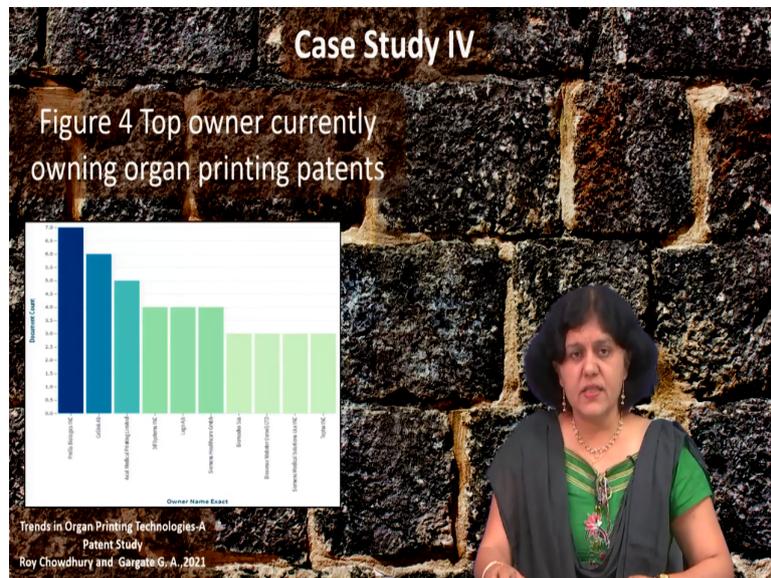
Now, this is a another graph you can just check here that the document types that there are patents are there, non-patent literature is also there, books are there and this data is shown here. Now, if you see further this figure three actually it shows the top applicants in the organ printing and if you see that top, we can say the applicant these are Prellis biological.

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Actually, then cell link and then the axial medical printing and there are few more, but these are the top we can say the applicants in the organ printing.

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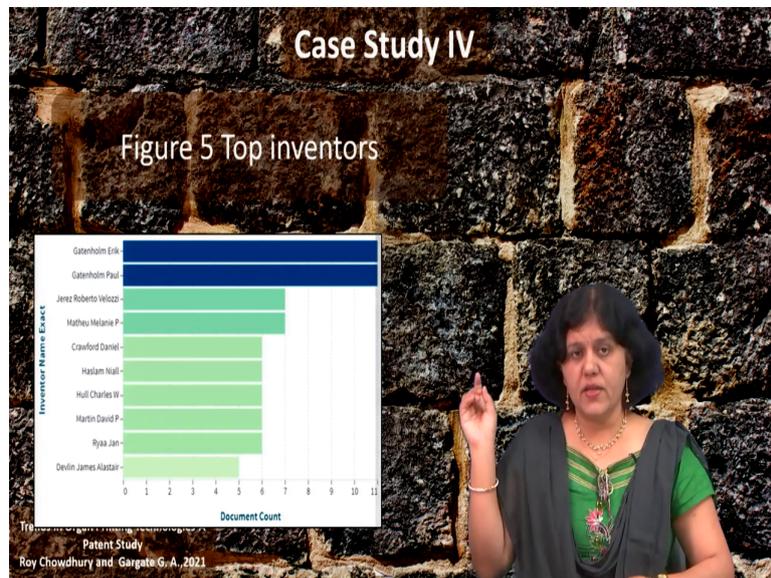
Now, moving further if you see that who are the top owner, again we can say generally the applicant who are doing this particular activity will be the top owner generally.

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And if you see this graph actually you can see that again that Prellis biologicals are selling and axial medical printing these are the owners of that particular top owners in the organ printing.

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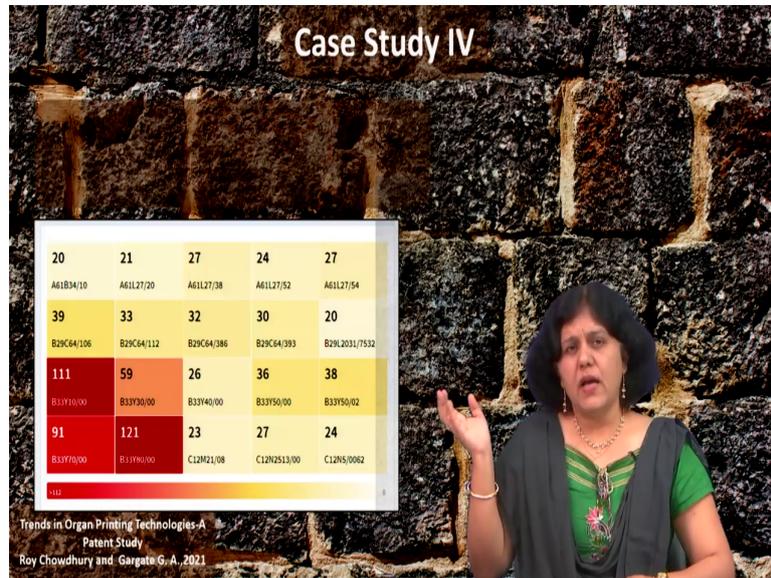
Now, moving further if you see the who are the top inventors here in this particular area and if you go into details of that you can just see that Gatenholm Eric and Gatenholm Paul.

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We means, these are the we can say two and then the Jerez Robert Roberto is there Velozzi and then there are a few more we can say the inventors are there who are like working in this particular area.

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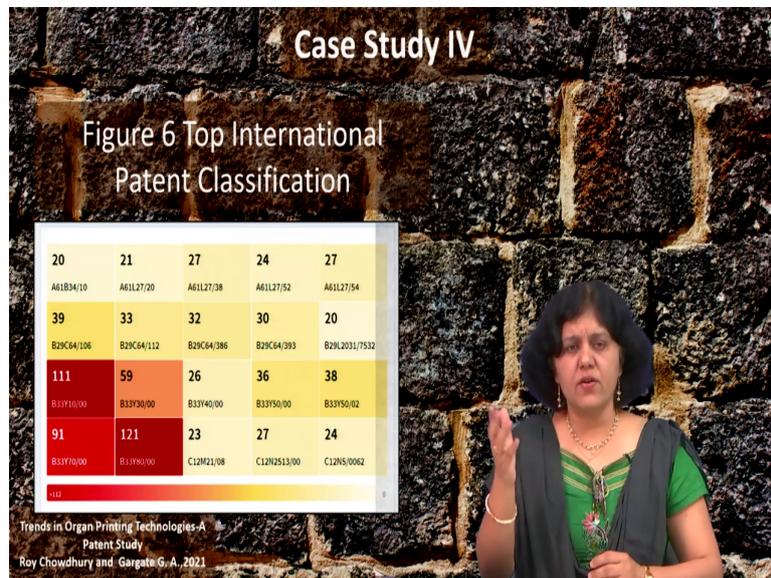
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Top inventors
Gatenholm Erik, Gatenholm
Paul, Jerez Roberto Velozzi

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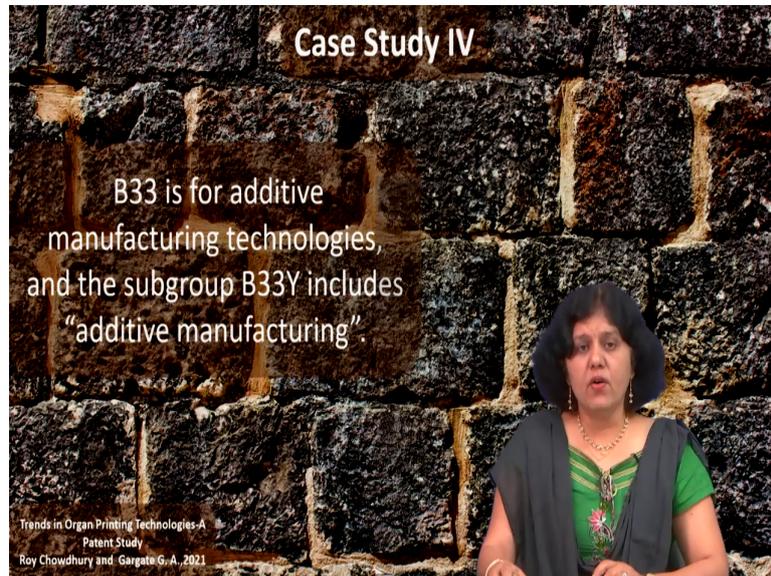
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Just now you have seen the graph which was like presenting the top international patent classifications. In the last session I have given you idea again that about the IPC, there is a there are different kind of classifications are there like IPC, CPC Z terms are there ok. So, IPC international patent classification WIPO and 8th edition is currently we are following and you can just see here that ok.

Which are the class that IPC which is focused on the this particular organ printing and if you see it is like a B33 Y that is the major class actually.

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So, what is this B33 Y represents? So, this B33 Y if you see it is a additive manufacturing technologies and the subgroup B33 Y includes a additive we can say the manufacturing. So, when we are talking about this additive manufacturing what exactly means of that additive manufacture?

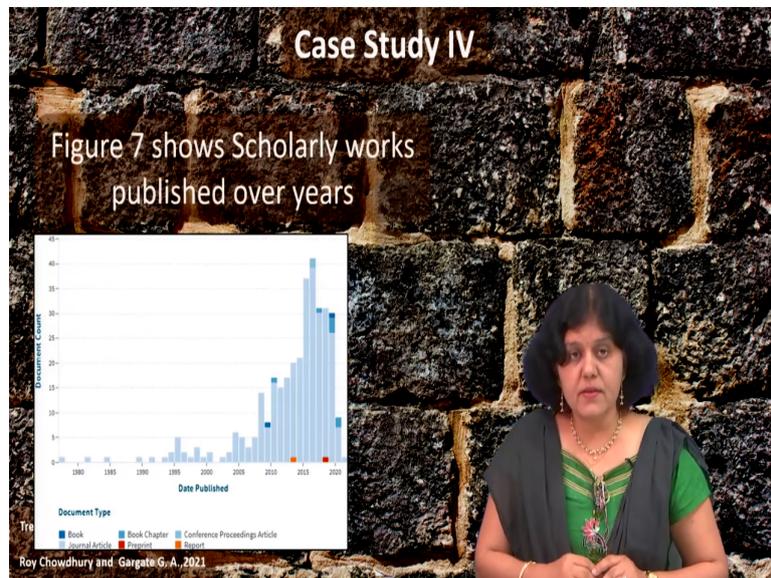
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It is a manufacturing of a 3D objects by additive deposition or we can say the additive agglomeration or additive layering is there. So, for example, 3D printing or stereo lithography or selective laser sintering if you see this is the additive manufacturing is there ok. If you are engineer probably or chemist actually especially chemist, I will say you will appreciate it more that what is that agglomeration or what is that additive layering or what is that sintering actually.

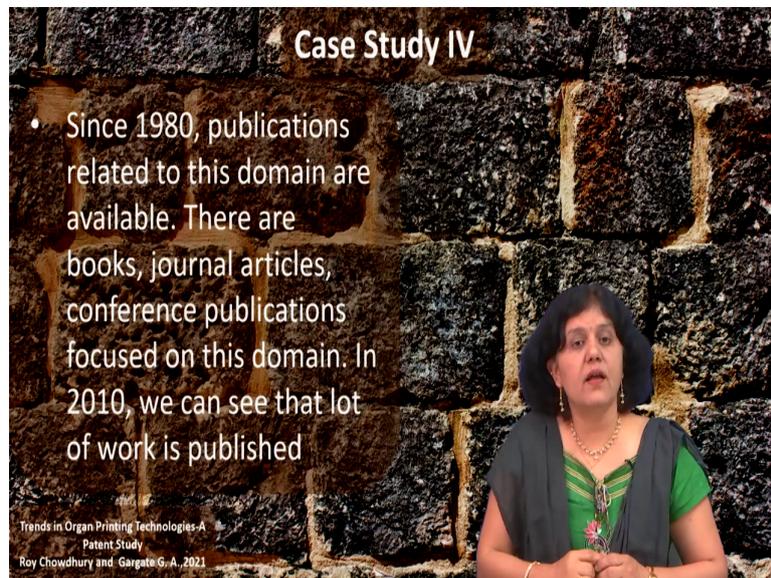
So, polymerization process is going on when we are doing some activity and at that time, we are doing allowing some chemical reaction and all and that sintering process and all that thing we are allowing; so that some new molecule will be created and all that. You know this is as a layman language I am sharing this, but you know that if you are chemical, we can say in that particular domain you will appreciate it more ok.

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Now, if you move further, you can just see here these are the scholarly works published over the years related to organ printing and this scholarly work it is in since 1980 you can see the publications.

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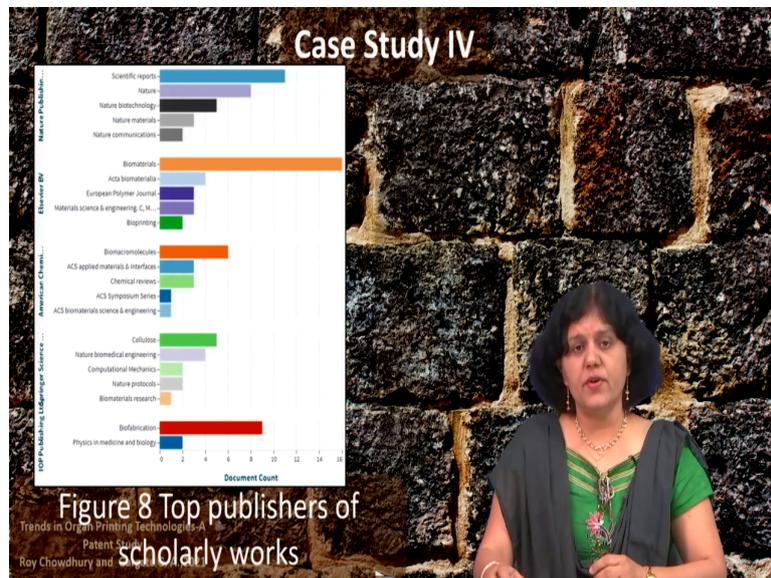
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- Since 1980, publications related to this domain are available. There are books, journal articles, conference publications focused on this domain. In 2010, we can see that lot of work is published

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So, we are now in 2023 and this publications are started somewhere in 1980 and this publications are related to the domain are available there are books, there are journals, there are articles, conference publications which are focused in this domain and you can see that a lot of work is around 2010 the it is published ok.

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Now, moving further if you see the next graph or next presentation it is are the top publishers of that scholarly work. And if you observe this graph carefully you can see here that elsewhere turn out to be again that most popular publisher among the researchers in this area.

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Case Study IV

- Elsevier turned out to be the most popular publisher among the researchers in this area.
- The journal Biomaterials have published most of the articles submitted under the Elsevier umbrella.

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In CRISPR also we have seen elsewhere is like that was the popular publisher and the journal biomaterials have published most of the articles submitted under the elsewhere umbrella. So, that is observation actually. So, if somebody want to enter or know more about that probably this is the reference and you can go into more details about the 3D printing.

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Now, moving further if you see the most promising work if you can see means if I want to summarize actually whatever we have seen. Most of the work promising work it is going on in USA and next is like a China, again in a CRISPR also we have seen USA is in top.

Then if you see the top owners or applicants here the Cellink Ab or Prellis biologicals or Lego 3D system and all these are like the topmost applicants and owners in this particular domain. And the inventors we have seen that yes Jerez Roberto, Velozzi are the like another means he is a inventor and he is a applicant also so that is the scenario ok.

And I guess this is this is a we can say the scenario about the 3D printing, it is very we can say the CRISPR we can say the case study and pretty well we got we can say. So, we have

said suburb eye view of that particular organ printing actually ok. So, now you are applying it to the IP management. So, how you will going to do that particularly?

So, when we are seeing the IP management in the model again, I will remind you that there are three 5 major processes 15 detail processes are there. Now, in that the first phase whatever we are talking IP generation I will say that patent analytics have major role in that patent generation and patent mining.

So, when we are doing the patent generation if you know the state of the art of that particular domain and the white spaces especially probably that gives you the idea that where exactly this technology is growing right. So, technology trained analysis actually or white space mapping or that the complete state of the art prior art of that particular domain which probably we are entering into the research.

That is the first major process that is the IP generation process and there we have seen the policy and then the contracts and then we have seen also there is like a ideation, idea drivers and all ok. So, idea generation drivers we have seen. So, when something like when we are talking about idea generation drivers and the conducive environment, we are expecting that if any in the organization if you have something like a newsletter related to the research area where the companies focuses.

If we continuously publish that this kind of landscapes and all information if it is shared, especially with the concern we can say the researchers or a personnel in that particular organization. Probably your research will be at we can say the as state of the art is known it will be like from that point and therefore and then if white space mapping is there done properly. We know that where is the possibility of we can say growth that is very important ok.

So, landscape is like the or patent informatics or this patent analytics is like a wonderful tool to decide your we can say the path actually and you can predict also the market by doing that analytics ok. And I guess I have shared few examples before also that how exactly this

technology trend is helping you to do the prediction about the future considering the technology ok.

And obviously, as technology changes the social, we can say the conditions, culture and its affect is effect is immediately actually right. So, I guess definitely means if you if we do the IP analytics very properly that IP generation, that is a first step of IP management is directly related with this particular IP analytics ok. So, with this we are coming to the end of the session and now the quiz time.

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So, what I will suggest you that again like last CRISPR case study you take any graph whatever you like and you just go into the details of that and just check whenever you are writing in the comment box just refer the figure number in this video. And just whatever your interpretation is there about that particular figure.

And again, reiterate that just a discussion forum or this the comment box the quiz related questions. It is for your we can say the thinking like even say to increase your or to we can say the within the group we are expecting you to network reply there.

And let us see that how what kind of. So, we will observe you when you are writing the answers in the that comment box and we will see that how the different kind of interpretation is coming and how you are among yourself is among yourself you are interacting actually.

So, that the application or the learning whatever is done in this particular course you are applying immediately and if you are writing it. So, we are watching it definitely and if there is any correction is required, we are writing it actually. So, probably you have you are observing that particular thing that we are correcting or if it is required intervention is necessary, we are doing that particular thing.

Discussion forum definitely if you are you have any queries questions, please write down whichever questions it is possible to write give answers there quickly we are giving it. If you are not able to do that particularly in that forum because of maybe answer is long or some explanation is required we are taking it into the caption evaluation ok. So, with this we are coming to the end of this session see you in the next session next case study.

Thank you.