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Specials.

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Preface

Artificial Intelligence is a disruptive technology, and its special role in the status quo of the technological legal order will drift. Interestingly, the shape AI Ethics will take is a transcendence into the fields of economics, jurisprudence, diplomacy, security and other relevant disciplines. From patenting of AI products & services to algorithmic policing, vision and perspectives over the enculturation and encapsulation of technology might differ, which includes legal advocacy and scholarship.

The Indian Journal of Artificial Intelligence and Law is a biannual law journal covering technology law in a combination of theoretical and practical approaches. It also provides coverage of the relationship between law and artificial intelligence in businesses, education, research and innovation practices.

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Abhivardhan Editor-in-Chief Indian Journal of Artificial Intelligence and Law.

Acknowledgments

Mr Sanjay Notani

Partner, Economic Laws Practice and President, AI General Assembly, 1* Session, 2020

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Specials

Benoit Sauveroche's Remarks on the Release Event of the 2020 Handbook on AI & International Law

Abhivardhan, Editor-in-Chief

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Synopsis. Mr Benoit Sauveroche, First Counsellor, Delegation of the European Union to India and Bhutan, European External Action Service delivers his Opening Remarks and provides his views on the 2020 Handbook on AI and International Law.

Benoit Sauveroche's Introductory remarks on the significance of AI in terms of India-EU relations

"Actually if I'm here today, it's not about my past that was mentioned but my actual position here in India where, counselor for the digital field & I've been working three years on the links between India & EU on collaboration in the digital sector & that's why I was absolutely thrilled by your invitation, because when I received your book & you mentioned what you were doing I was overwhelmed by the size of the work & the book & then after going through I could see how relevant it is & how relevant it is for me to explain why it matters so much for EU – India relations. Artificial Intelligence is not only going to shape our societies but the world itself & we are going to define now the world that we want using this Artificial Intelligence. So, I can go further & explain you why it matters so much for the EU – India relations to work on this topic, I would just finish my introductory remarks by saying: when our President of the European Commission was elected, she received a message from PM Modi where he was explaining his expectations to collaborate with many fields with EU & he mentioned two specific fields, one of them was AI. That's just to show you that at the very high level there's a full understanding of this topic."

His opinion on the Handbook

"... This is really a nice piece you have produced; it not only shows how pervasive artificial intelligence is but it's also a very interesting book, I'm not from a legal background but when I saw the piece you've produced, I said Oh My God! How will I go through this huge piece of work, & actually I found it very interesting & I can understand you enjoyed writing it & I really enjoyed flicking through it actually, because it's not only showing where we are on different fields & aspects but it is also opens your curiosity, I mean, you learn from History but you see also all the different aspects of Artificial Intelligence in the different topics & that is quite interesting & that's why I was very happy to come & join this release of the book. I'm very happy to support it. What I would like to say regarding the EU & India within the AI aspect purview if you allow me is just to say that: Yes, I mean, you've taken AI in many of its aspects & I'm afraid to say that you will have much more work for the months & years to come, only at the EU level we are about to [present] a legislative proposal next month on AI & I think it'll be quite a landmark as well, & it will find its way into your day-today edition, but that's the point. AI is moving very fast & it's very difficult even for the lawyers to follow the pace & to frame it. I'm sure there's a race to frame it, as AI will frame our society so to say. Regarding AI, I would say that you need 3 elements in AI working – you need data, for data processing then you need the algorithm to process data & then you need the technology which is going to run the algorithm, the highperformance computing, the transfer of the data to the storage space, & we collaborate with India on the 3 elements. But, regarding what we're discussing tonight, I would focus very much on the certain elements which are linked to this legal framework which is here to deliver some hints on the values that we want to protect. One is related to data, you mentioned GDPR, and you mentioned PDPV, that's trust. It's absolutely essential for the uptake of Artificial Intelligence that there is trust & this trust Is generated by ensuring that there is privacy, transparency & also privacy. Regarding AI on the algorithm part, we have a common convergence of views India & the EU & other nations as well, that we want to defend core values & that's what we call this ethics, trustworthy artificial intelligence & that needs to be defined very early, we're even talking about ethics by design & we need to define that into more practical elements that's the people working in AI who can integrate into the concept of it. There are some elements we need absolutely according to our views & it has been published, elements such as human oversight, the aspect of transparency against fairness, nondiscriminatory explanability, & also to have safety aspects - such as liability to be sure that we are protected against effects of malicious attempts & all that would have a declination into legislation & framework. Regarding also, another aspect that you may not have seen as prevalent, in access to data, not only personal data but non-personal data. How do you ensure, how do you promote the availability of data? & that has to

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do with data ownership, data sharing. How do you ensure that there is a fair sharing that you have a fair society where ownership is not only in the hands of the government or very few powerful oligopoly but you have a system which will generate & foster innovation & completion in the market, & all these values are shared between India & EU & that is why we have momentum in collaboration in all these aspects between India & the EU; Last year, PM Modi & the President of the Commission Von der Leyen agreed that we would set up an AI expert group who is going to work on defining how these values are translated into the framework that we would like & to be adopted at an international level & there are members of international fora, you may have seen that it has been already discussed within the G7, Within the G20 from 2019, there were some outputs already & the decision to create GPAI – the Global Partnership of Artificial Intelligence to which India is a founding member along with the EU & working with the OECD as secretariat, the idea is to define what will be this ethical AI because that's the way the world will be shaped in the future, because AI is moving very very fast."

His Closing Remarks

"...One word that was said several times & I think it's an essential one is 'awareness', if people do not realize what is happening, do not put pressure on their government that will be very difficult to defend the rights of humanity, that is a big word, but it's true. We're living in an international world, we need to give the right direction & that is with the awareness of us all as active citizens, & that's why your work is absolutely pivotal in that sense. So, once again congratulations & I hope that there will be an extended diffusion on your piece of work."

Artificial Intelligence and the Future of Power: Excerpts from the Book Discussion with Shri Rajiv Malhotra

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Mridutpal Bhattacharyya, Senior Associate Editor

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Synopsis. Shri Rajiv Malhotra, Infinity Foundation was interviewed amidst the release of his upcoming book "Artificial Intelligence and the Future of Power" released in 2021. We have included some important excerpts from the interview broadcasted on YouTube containing remarks from the author.

Inspiration behind Authoring the Book

Shri Rajiv elucidates:

"So, you know, when I did artificial intelligence as a computer science student in the US, nearly 50 years ago, it was a very basic field, not so advanced.

Then I set it aside and I got into humanities. Social sciences, started a foundation, a think tank to promote ideas about our civilization and do a lot of original research myself. But about five years ago, I decided to go back and update my knowledge on AI and bring it in the context of Indian civilization, India, Indian thought issues in India, because I felt I knew lagging behind.

And of course, India is now about 10 years behind China and the US in artificial intelligence. We have a large amount of manpower trained, but these people get outsourced. They're working to create intellectual property for other people and not Indian intellectual property. And also, a lot of the work that the artificial intelligence train people in doing is very basic and low-level kind of work.

So, I felt that this needs to be addressed, and I was not satisfied. I'm still not satisfied with the policies in India. On data protection on the way in [which it is] going about, managing his artificial intelligence program, and not fully aware of the dangers and threats that a foreign artificial intelligence brings, for India's national security."

Shri Rajiv explains that the 5 focus areas of his book are 5 different battle fields like Kurukshetra. **He further explains**:

"One of the legal issues is: if an algorithm makes a choice, you know, whether to turn left or right in a crisis mode, it's driving a car. If I turn left, I killed this fellow had turned, right? I mean, just that fellow who made the choice, who decided which one, which one gets hurt, you know, so as algorithms make choices on hiring people who, how, what are the consequences of hiring X and not Y as algorithms decide that is a rare organ and organ transplant is to happen."

He further dives deep into the issue of algorithmic accountability and elucidates:

"Who's liable? (now you may say that) The Person who trained the desirable? But that's not so clear who trained it because you know, when a child is growing up, there are many influences to any of the child's bed and train them school training; friends trained him – media also trained him. So just like the child looks at so many examples and learns from them and it gets influenced and he's a product of all kinds of influence $[\ldots]$ So same way in the case of algorithmic training, training the machines up, you know, a machine gets big data and this big data gives us examples of what to do, what not to do. $[\ldots]$ It's constantly changing. It is not a fixed algorithm. The machine learning is a dynamic algorithm is learning from experiences. So, like for instance, if you have an algorithm that learning about case law, In India and you keep feeding it case law. And so, it, it processes all the case. Law understands the language could be in the English, whatever language the case is written in.

And that it's able to derive, you know, what, what actions produce, what consequences, what's the likelihood. If [you strategize] like this, then you get a favorable outcome or kind of a legal understanding, just like lawyers, human beings have. It can also, it can be augmented by algorithms. So, the question is somebody asked you, okay, show me logic in your algorithm, how you came up with this.

The person cannot because [it is] just so complex. It is so complex. And the algorithm has learned from many, many cases [and] from many, many examples, much, so much big data. You cannot say that the algorithm works exactly this way. Algorithm works this way in some cases in that way, in another situation, in that case, in another situation, and the algorithm is always learning.

If I explained it to you today, how it's working, then tomorrow, it's different because it's got new data. So, this is another challenge for the law."

Shri Rajiv elucidates that the algorithms in general used by the big tech and even in general by mainstream entities have a Westernized perspective, when it comes to studying India's demography. **He explains**:

"Another thing that I'm concerned about is that, these algorithms have been trained on [the basis of] Western [methodology & perception, i.e.,] the Western study of India. [...] The community is looked at through what I call Western universalism, which is the lens of Western, Western people, their history, their philosophy and what happened in Europe. [...] Based on all that, they've come up with a theory that this is normal for everybody in the whole world; but that's not true. It's normal for them, but may not be normal for us. So, this is kind of training based on Western universalism, even of Indian culture is quite misleading."

About Vedic AI and Biological Materialism

Shri Rajiv elucidates about biological materialism and explains how biological materialism develops in general, in the realm of AI as an industry.

"The AI can understand you very well, better than human psychology scan. And then the, I can artificially give you that also. So, you know, people will end up with artificial life with some kind of fake life, and lot of people will become total moron, Stoker zombies.

Living in this kind of world and the digital companies become worth even more. They're already so rich, the richest companies in the world. Now they become even richer because they are hacking the deepest desire side of human beings. So you see the, the world becoming FIC experience becoming FIC less and less real away from the journey of a Dante is a serious issue and gurus need to understand it."

Shri Rajiv **elucidates** about the role of Vedic and Indic literature and scriptures in the **fostering of technology & about the manipulation of the human mind**:

"It can help you in agriculture. It can help you in medical surgery. It can, you know, so many things it can do. It could also probably help in more efficient. It's more [based upon] efficient energy generation and timing, change areas – all those kinds of things. [...] But what concerns me is when it starts manipulating the human mind. When [the companies] are doing it. When it is used by human mind to solve disease and to solve problems here and there, all of that seems to be fine; that is one thing. But when you turn the surveillance into the human person himself and then the person becomes an object, or the person becomes an object controlled by whoever is controlling this AI machine, then I think there is a serious ethical problem."

Shri Rajiv explains algorithmic biology:

"So, modernization means that as machines get smarter, people are getting dumber. Machines, getting smarter people getting dumber people saying, ah, we will ask Google, how do I need to know anything, sir?

Why do I need to study law? [...] You don't even have to type; you just speak and you know, you get your answer. So, this business, the source of knowledge and authority is shifted to the digital algorithms at people. And these people who own these algorithms are feeding part of it, some other country, and they don't have any [concern] in what is happening in India.

They just do marketing and make money. So, the whole generation is being raised on these digital gurus, these digital "devtas", you know, and we are getting dumb. $[\ldots]$ They can gamify this community, whether it is farmers, whether it is [of any identity]. They can take a community, understand what their hot buttons are, how they respond, what they will respond to, who their leaders are, what their ideology is [in order] to manipulate them, how to make them think a certain way.

And then they can bring in the kind of content to motivate them in a certain direction. They can have divide and rule. They can create divide and rule like the British East India company did. [...] So this kind of insight information and the ability to manipulate while the public becoming morons becoming, you know, not leaders, not understanding this, our leaders don't understand what I'm telling you about. $\lceil ... \rceil$ People who've got this huge AI machinery going are 10, 15 years ahead of India. We are users of somebody else's technology. We may have a largest number of cell phones, but these are hardware to Chinese and the operating system is American. [...] We are proud as consumers of somebody else's product. [...] If our community somewhere in the Amazon jungle has been using a particular plant to treat a certain disease, the pharma industry, [where] people go around the world looking for such things and they take cuttings from that tree and they bring it back to their labs [which they] find out which molecule out of all the plant complicated stuff, which is a molecule, they can isolate that is active molecule. Then they get patent on it. And then they sell that medicine back to make a lot of money. [Under international IP & cultural law] the community can claim that because it was based on their plant product, even though they did not patent it, Their ownership matters since it was based on their plant product, which they were using for a certain purpose. [...] They get a certain percentage share of that intellectual property. Now the proposal that I'm making is that just like plant is raw material for discovering drugs, similarly, big data is raw material for discovering algorithms for making the algorithm stronger. So, if the foreign company comes, they do some surveillance, they got a lot of diversity of genetics. They got diversity of language and culture and economic strata and you know, all kinds of social situations. And there, the algorithm, the studying, all this, they're really studying a very complex microcosm of the whole world in one place. [...] So, they're studying this and that's very precious big data. Why are we giving it away free? Why are we even giving it at all? There is no shortage of smart people in India who could do all this. Why don't you go to 5-10 Indian universities and put up tender and say, okay, we want to give three or four contracts to you.

People come up with a proposal. Why would you outsource this to foreign people? I cannot understand why Yogi Adityanath did that [for the Kumbh Mela in 2017]. According to me, [it was] a serious blunder, especially after I had gone to him personally and briefed him what the problem is. Yet they still did it.

So that is my situation, my position on looking at biology as algorithms, as machines. $[\ldots]$ So, the human being becomes a biological machine, which is, operated by some AI system, you know, and so this way they can treat so many people in India, sort of, you know, biological objects that are working for them. And they are busy collecting data out of it. $[\ldots]$ You know, there is research on making viruses that will only attack a particular DNA type. This is not science fiction. There are viruses that will spare a particular kind of DNA, which means that it'll go for anybody, but this particular DNA, it will not attack that part of the DNA.

So, this, this is our big data. Biology has become part of AI."

Social Media Companies and Algorithmic Censorship

Shri Rajiv elucidates:

"The reason Facebook, (if you take Facebook as a competitor or let's say Twitter as a competitor) – the reason they are able to invest so much in artificial intelligence is because they make a lot of money on advertising.

So, you have to fund it. $[\ldots]$ You cannot expect some government or somebody will fund you \$50,000 a year. That's the scale I'm talking about. $[\ldots]$ And this requires several thousands of man years to develop this kind of e-commerce background because Facebook did not invent it overnight. $[\ldots]$ So, they have the experience lead of 10-15 years. $[\ldots]$ In 2022, Facebook is going to introduce augmented reality goggles and so will Apple. So, now Facebook will become a hardware-related company. So, they will combine, they will have a huge base like Apple and they will have these governments and they're testing them. I know some people who are involved in the testing of this, so this is pretty awesome stuff.

They will give you amazing experiences, which is what Facebook is about: people wanting experiences, having friends and what not. So, these augmented goggles will give you that and eventually it will be implanted.

Aesthetic & Pragmatic Influence of AI

Shri Rajiv elucidates:

"I started this philosophically. I started by asking, whether the universe is pragmatic. If all the things that moving very pragmatically, there's no aesthetic aspect. $[\ldots]$ If the universe is an algorithm, it's all very pragmatic. So, I was actually studying this for all my life from a philosophical point of view. Then if it is a pragmatic algorithm, where does aesthetics fit in? What is the role of aesthetics and what is the role of pragmatics and how do they fit with each other? This is a kind of inquiry. Then I combine this inquiry with a different inquiry because Karl Marx came up with the idea of the theory of aestheticization of power. $[\ldots]$ But AI is now getting into the emotional dimension in terms of understanding what kind of emotion this guy has, what is he like you to & how is his behavior being affected by his emotions. $[\ldots]$ So, the Indian Journal of Artificial Intelligence and Law

psychological warfare is getting better and involves the use of aesthetics. I think is a very big topic. I'm glad you mentioned it, but it deserves a lot of time."

Artificial General Intelligence

Shri Rajiv elucidates:

"So, you know, the thing is that AGI is not as far away as many people might think, or let's just say there is no disconnect between AGI and non-AGI. Yet there's much continuum.

It will be gradual. It's like, you're climbing the steps towards AGI, but you're climbing some steps – you are five steps [ahead], then you will be seven steps [ahead]. So, you will be approaching it. [...] The algorithms are learning faster than human child can learn. It takes a long time to train the child. It doesn't take that long to train an algorithm. [...] AGI is still at an academic stage, such that. It's an open book, more or less a large part of it is quite open. [...] But I'm concerned about things that are very pragmatic, which are very near-term, which are now becoming closed, which are not open source anymore."

Analytical Articles

Tacit Collusion and Artificial Intelligence

Dr Abha Yadav

Indian Institute of Corporate Affairs, India

Tarun Donadi

Chandhiok & Mahajan, Advocates and Solicitors

Abstract. Science, commerce, law, medicine, engineering, research, academia, media, communications, etc. have all been touched and revolutionized by increasing dependence on technology. Technology has developed to a micro extent where every action and behavior of persons and situations can now be monitored in real time affecting our lives, our politics and our economies. Technology advancement in areas such as networking, data archiving, data mining, cloud computing, automation, algorithms, machine learning has also transformed the way businesses interact with each other and their analysis of markets. Further, the pandemic as a result of widespread novel coronavirus – 2019 has acted as a catalyst for the use of technology and data by several businesses irrespective of their scale of operation. This dependence has led to elimination of human intervention in key areas such as strategic price management of products. Artificial Intelligence ('AI')/ Algorithms altered the way traditional businesses are conducted, both in terms of analyzing the consumer data and tracking a competitor's business activities.

In this article we will analyze the effect of algorithms on markets. In this section the author elaborates on possible collusion or anti-competitive conduct which may be facilitated by the use of AI. We will further explore the possibility of formation of cartels by the use of AI with direct or indirect human intervention. AI changed the perception of risk involved in carrying out business in the markets. Pricing algorithms have further affected the way businesses monitor and price their products in real time.

In the next section, the authors will examine the concept of Tacit Collusion. Due to lack of information flow and technology such as today at the time of framing antitrust laws, tacit collusion was considered not sustainable and harmless in the long run as cartels formed during tacit collusion are highly volatile and unstable. In this section, the paper discusses how information symmetry increases the longevity of tacit collusion. Further, the author discusses the possibility of attaining sustainable tacit collusion and increase information flow through use of AI, which can prove detrimental to market dynamics.

The next section of the article discusses the concept of signaling. Signaling simply means to indicate. A player would increase the price of his/ her commodity with the hope that the competitor, without any communication, would notice and also match his price thereby selling the products sustainably at a higher price. A problem in such mechanism is usually the lack of communication between the competitors, mistrust amongst the competitors, human urge to deviate from such a system to reap maximum profits and most importantly time taken for the entire process. Signaling and AI play a dynamic role in the longevity and feasibility of tacit collusion. The article discusses the ability of AI to decrease the costs and the time frame involved in signaling, thereby facilitating tacit collusion without direct human intervention. The authors also discuss various scenarios where such an interplay between AI and signaling shall lead to sustainable tacit collusion, which shall not only be detrimental to market conditions but also disincentivizes any deviation from cartels.

The authors finally explain the importance of know-how and why research and staffing should be increased in the area of analyzing effects of digitization on the markets and how cartel operations can be affected.

Keywords: Artificial Intelligence, Competition Law, Tacit Collusion

Introduction

A marketplace is generally a platform facilitating a dialogue between buyers and sellers in a particular area or region. This marketplace then defines the price (Competition Act, 2002, Sec.2(o)) of a commodity or performance of any service based on the supply and demand in the region. With onset of technology, traditional markets now include digital markets. These markets can be divided further based on the number of buyers/ sellers present in the market, which affect the demand and supply capabilities in the markets. Some types of market structures based on competition include:

- 1. Perfect Competition
- 2. Monopolistic Competition
- 3. Oligopoly
- 4. Oligopsony
- 5. Monopoly
- 6. Monopsony

This paper focuses on oligopolistic markets where prevalence of tacit collusion is generally higher. Tacit collusion occurs in a market when few businesses act in a speculated manner without any interaction in order to maximize benefits at the cost of affecting consumer welfare. Tacit collusion may not result in the ideal monopolistic price as the firm would achieve in case of explicit collusion (anti-competitive having appreciable adverse effect on competition) but falls short of best collusive equilibrium whilst protecting the companies from the claws of anti-trust regimes.

Under Competition Law, "agreement" refers to any arrangement or understanding or action in concert(Competition Act, 2002, Sec.2(b)) while an "anti-competitive agreement" includes any agreement which is likely to cause an appreciable adverse effect on competition (AAEC in India). It is also already established that all forms of parallel pricing are not anti-competitive but only the ones which are a direct result of agreement between competitors that are objected by the authorities (Baker, 1993). Tacit collusion may occur as conscious parallelism, where the market leader increases or sets the price and other operators in the relevant market follow suit without any agreement. These collusions also attract scrutiny by authorities since the businesses may obtain benefits at the expense of consumer welfare.

This is a recurring and unsolved issue bothering economists and anti-trust authorities due to interdependence of competing businesses in an oligopolistic market. "When a market consists of very few sellers of homogenous products, they may be able to set output below, and prices above, the competitive level with no formal agreement" (Posner 1968, p 1562). It is also accurate to state that markets witness a high risk of collusion when they are highly concentrated due to similar pricing structures, output limit, barriers to entry, or the business design in the relevant market which is highly predictable (Ittoo Petit, 2017). Many economists recognize that greater transparency and flow of information act as a component of perfect competition in the market (OECD, 2012). Digital advancement enabled increased flow of information and allowed companies to enter new markets without huge entry barriers, which, if compelled to enter through the brick and motor route, would have not been successful (Ezrachi Stucke, 2016, p. 6).

With a growing number of businesses using big data and pricing algorithms to set new pricing models or predict market trends, tacit collusion between such businesses is on the rise. Antonio Capobianco observed that "When markets are sufficiently transparent and the retaliation lag is sufficiently small, collusion can always be sustained as an equilibrium strategy, no matter the market structure. (Capabianco Gonzaga, 2017)" Such transparent pricing models when coupled with the use of pricing algorithms diminish the incentive to reduce prices as any price change is easily matched or reiterated by the competitors (Price-bots Can Collude Against Consumers, Economist 2017). Thereby making the use of 'signaling', a feasible tactic, to increase profits by price hike rather than engaging in long term price wars or pricing the products at competitive rates. This transparency compels competitors to involuntarily be a part of each other's pricing strategy, which needs to be scrutinized if such pricing is supra competitive (Ezrachi Stucke, 2017). This interdependence often acts as hindrance in competitive pricing of products.

Artificial Intelligence

Artificial Intelligence has the potential to analyze market trends to a micro level including every minute detail and does not suffer from the disadvantage of human error. It also takes away the element of human bias which stand out from the framework in which the anti-trust regime was established (Smejkal, 2017). This implies that the algorithms adapt to dynamic pricing in such a way that it maximizes the profit by changing prices without the risk of detection and at the expense of consumer welfare.

Digital markets can be assessed instantly due to increased transparency and existence of mechanism to analyze prices and trends of all competitors and related businesses on the internet. This is a perfect competition model. Applying Prisoner's dilemma to this situation would mean that two competitors would not be able to communicate and thus engage in price wars with each other, resulting in consumer gains. But with the presence of AI, we witness the opposite as they simply follow the directions to maximize the profit without any concerns. Any price alteration by one AI will result in other AIs following suit, thereby leading to higher prices which otherwise would have not been possible without them. Essentially, this would harm consumer interests. One of the best examples is the pricing of the book *"The Making of a Fly"* on Amazon for 23 million dollars per copy. Two algorithms strictly followed the codes which conflicted, and due to the absence of price ceiling, it resulted in exorbitant prices (Solon, 2019). The mistake was later rectified, and the prices were dropped manually.

Errors may not be so obvious every time, which may be at the expense of consumer welfare leading the customers to shell out more than a competitive price. Machines have the ability to do away with human error which makes it collude, in ways we may not even factor, making it a top priority across all the agencies to understand their working and ability to collude. The European Commission and various countries have started to dig deep into these new challenges (Tirole, 2019).

Algorithms may be used in many ways to collude with competitors in the markets. Ariel Ezrachi and Maurice Strucke highlight 4 types of collusions in which Algorithms can facilitate cartels (Ezrachi Stucke, 2017). They are broadly known as the Messenger Model, Hub and Spoke Model, Predictable Agent and Digital Eye or Self Learning Algorithms. However, anti-trust agencies are yet to see cases with respect to Predictable Agent and Digital Eye models.

Messenger Model is one of the straightforward models in which algorithms are merely used to enforce the decision that humans have already agreed upon. Algorithms are simply a tool of enforcement under this model. The current laws are well equipped to deal with such cases and also to penalize any form of cartels under this model. This does not fall under the category of tacit collusion as there is express communication between the parties to collude. The AI does the job for the cartel members by tracking the prices real time and any defection could be met with price wars within milliseconds, thereby disincentivizing any member to break out of the cartel. In a way, the use of AI is in the better interests of the cartel. The *poster cartel* (United States of America v. David Topkins, 2015) in the US and UK is one the typical example for such type of cartels. In the said case, both the companies used AI to implement cartel decision agreed between the parties. Respective anti-trust agencies from both countries found the parties to be guilty of their conduct and were fined accordingly. Such cartels are *per se* illegal and once detected by the authorities have little or no scope of a valid defense. This also raises questions as to whether heterogeneous marketplaces like Amazon are also easily susceptible to collusion when pricing algorithms take over (Lynch, 2017).

In Hub and Spoke model, competitors in the relevant market use third party algorithms to determine and set prices of their product. This enables companies which do not have separate advanced software teams to use third party AI to analyse the market data and adopt dynamic pricing in real time, helping them to tackle pricing problems. When these companies start to increasingly rely on third-party developers for their algorithms, then these third parties may facilitate collusion, with or without the consent/ knowledge of the competitors. The chances of these collusions increase when a greater number of competitors use the services of few common algorithm developers.

The Uber Technologies Inc. case (Gal Elkin Koren, 2017) is an example of this model. The drivers are similar to spokes with Uber as the hub. Uber uses pricing algorithm to set prices for ride by the drivers which analyses the demand and supply at a particular time and area. The algorithm decides when to charge surge pricing and normal pricing. This effectively kills the competition between the drivers in the area resulting in higher prices for the customers. The algorithm analyses the market so that customers do not shift from Uber to alternate means while extracting from them the maximum fare possible.

Another example is the *ETURAS* case (Eturas UAB v. Lietuvos Respublikos Konkurencijos Taryba 2016; Zupancic, 2016) where the travel agencies resorted to the same company to set the prices for them. Then the developer along with 30 other travel agencies colluded and set the maximum discount limit to 3 percent under the pretext of normalizing competition. This has effectively led to concerted practice as no member was able to discount more than 3% on the prices for the customers. They were later penalized by the courts when detected by the National Competition Authority of Lithuania. One major concern which arose in this case was the identification of all such travel agencies that were directly involved in the concerted practice as the mail restricting the discounts to a maximum of 3% wasn't sent to all the participants. The Court ruled that the agencies which were aware of the contents of the mail are deemed to be part of the cartel due to their inaction.

But the concept of predictable agent algorithms is set to react to price changes by the competitor without any interference from humans. Example for such a model is the case discussed above "*The making of a fly*". The pricing algorithms are set to react

to the algorithms of the competitors without any need or intervention by the humans, which leads them to conscious parallelism with higher prices and the risk/ human error factor is removed. This means that both the pricing algorithms see what's best for the company and while analyzing and understanding the competitor's algorithm they tend to price the product at supra competitive prices which would be beneficial for both the competitors. Predictable agent model poses additional problems by stabilizing tacit collusions based on data.

Tacit Collusion

Tacit Collusion in traditional markets is highly unstable, and as discussed above, it is due to the human factor involved in trusting the competitor to react in the same way as oneself. This uncertainty is the main reason why tacit collusions are considered unstable. But with algorithms in place, tacit collusions in the context of digital markets are maintain greater stability (Ezrachi Stucke, 2016), which might be a concern for anti-trust regimes around the world. Tacit collusion "refers to forms of anti-competitive coordination which can be achieved without any need for an explicit agreement, but which competitors are able to maintain by recognising their mutual interdependence. In a tacitly collusive context, the noncompetitive outcome is achieved by each participant deciding its own profit-maximising strategy independently of its competitors" (Algorithms and Collusion, OECD, 2017) Tacit Collusion is not considered anti-competitive because of absence of communication where companies set prices supra competitively with the speculation of increasing profits. Understanding joint benefits and increasing the price unilaterally is not considered anti-competitive as the firms are merely behaving with a goal of profit maximization (Brooke Grp. Ltd. v. Brown & Williamson Tobacco Corp, 1993).

But with the dawn of pricing algorithms, which have the ability to collude, there are new concerns that the anti-trust agencies are facing, as collusions are difficult to detect (Thiemam Gonzaga, 2016). Algorithms can be programmed to monitor price variations, collect market data, and automatically retaliate to any change in price or against any deviation (Kaylynn, 2019). As a result, market equilibrium could be reset to higher price or lower output entirely independent of human thought (McSweeny O'Dea, 2017). Collusion is illegal in the eyes of law and any form of agreement, interpreted in the widest sense, is used to detect and punish such collusions. But traditionally all the courts or enforcers have focused on human behavior to detect such collusions (McSweeny O'Dea, 2017).

The use of algorithms, across industries, to set and monitor prices have created an unprecedented level of transparency in the pricing of the products, which is done real time. This has also allowed the competitors to react in the quickest sense possible disincentivizing price wars among the competitors to capture additional market shares (Algorithms and Collusion, OECD 2017) and attaining the benefits of a cartel. This is recognized as problematic by many jurisdictions across the world due to lack of proper facility and jurisprudence to tackle new problems that this digital era brings to the table with the use of algorithms (Capobianco et al, 2017). Tacit collusion through algorithms is more probable and feasible in oligopolistic markets especially with homogenous products as the ability to track behavior, analyze market trends and competitors is increased and can easily detect any deviation due to similar market conditions (Guidelines on the Assessment of Horizontal Mergers under the Council Regulation on the Control of Concentrations between Undertakings, 2004).

"Conscious parallelism would be facilitated and stabilized to the extent (i) these the rivals' reactions are predictable, or (ii) through repeated interactions, the firms' pricing algorithms "could come to 'decode' each other, thus allowing each one to better anticipate the other's reaction."" (Ezrachi Stucke, 2020) Complex algorithms have higher capacity in providing companies with powerful automated mechanisms to monitor prices, implement common policies, send market signals or optimize joint profits. They may even have the ability to differentiate between intentional deviation from the conscious parallelism and initiate reactions to market circumstances, avoiding unwarranted retaliation.

What is unique to algorithms is the speed of signaling and retaliation which change the markets exponentially. Algorithms have the ability to detect any change or deviation almost immediately, which then does take into account myriad of moves and counter moves to tackle the price change by the competitor, keeping in mind the profit implication of the feasible retaliation (Priluck, 2015). With unlikelihood that a player would benefit from deviating or discounting, there is a higher probability of sustainable price parallelism/ tacit collusion (Hwang Kim 2006; Minga et al. 2003). When the speed of retaliation increases, it would imply that any price war would not be beneficial for the competitor, disincentivizing any discounts given by the firms, making tacit collusion sustainable as competitive price is no longer the norm while supra competitive prices are also matched (Shell/ DEA, 2001).

"The retaliation mechanism must be sufficiently plausible and effective to counterbalance the existing degree of probability and incentives to deviate in the market situation of the individual case ... If the parties take the view that retaliation is costly, then the cost of deviating by winning a contract in deviation from a coordinated pattern in the first place is very high, too, and reduces the likelihood of such action." (Ezrachi Stucke, 2020)

As per the OECD report, several businesses use online software and complex algorithms to analyse the web and study the prices of competitors meticulously, which a normal consumer is not able to do. They have the ability to compare and analyse hundreds of pricing strategies and of not only their market but also that of up and down stream markets as well alerting in case of any unusual deviations (Commission Staff Working Document: Preliminary Report on the E-commerce Sector Inquiry, 2016). In a survey conducted by the Portuguese Competition Authority it was found that around 40% of the companies used specialized algorithmic software to monitor the market and around 80% of these companies have altered their prices in response to the information obtained through these algorithms (Digital Ecosystems, Big Data and Algorithms, 2019).

Signaling

One of the most common form of tacit collusion is through price signaling. In this model firm A increases its price with an anticipation that firm B would also respond to this by increasing its price. Firm A undertakes the risk of losing out on profit until Firm B responds i.e. the loss it incurs during the time taken by Firm B to understand the signal and react to it. It might also be a case where Firm B does not respond to the signal at all which is the risk that Firm A undertakes (Harrington Jr.Zhao, 2012). Due to this process, tacit collusion has not been considered anti-competitive in terms of anti-trust laws. Authorities also recognize that restricting a company's profit maximization motives can have a higher adverse effect on the market. Such behavior by competing businesses is considered rational behavior of the competing firms which take up the risk with uncertainty (McSweeny O'Dea, 2017). 7th Circuit Court, Judge Richard Posner articulated such a mechanism in the High Fructose Corn Syrup decision:

"If a firm raises price in the expectation that its competitors will do likewise, and they do, the firm's behavior can be conceptualized as the offer of a unilateral contract that the offerees accept by raising their prices" (High Fructose Corn Syrup Antitrust Litigation Appeal, 2002)

Price signaling is any price set by the competitor which is higher than the lowest price of the product set by the firm and had failed to attract or has seen a diminished demand for the firm's product (Yvonne Kevin Mark Stephon Vernon, 2004) or as a price which is higher than that of the predicted competitor's price choices (Davis Kore-nok Reilly, 2010).

Tacit collusion is a bigger problem when it involves large conglomerates or where firms have multi market interactions. Niklas Horstmann analyses the situations that favour these big business houses which have contact with a competitor in not one but in multiple markets.

"According to this strategy firms are able to signal their intention for collusive play solely by sharply raising their price in a market. Clearly, in the short run such price signaling will yield opportunity costs as the signaling firm experiences a corresponding sharp decline in demand. However, if the other firm recognizes the collusive price signal and reacts to it accordingly, i.e., by raising its price as well, then tacit collusion can emerge in this vein without the need for explicit communication." (Horstmann Kraemer, 2016)

This arises when large businesses have multiple contacts in different markets with same competitors. There is an apprehension that if the firm engages in aggressive pricing in one market this might lead to initiation of a price war in all the common sectors between the companies, hence creating a disincentive for the firms to do so (Edwards, 1955). Further this allows the firms to increase price in one common market and check the response of the competitor in its behavior by subsequent price increase, which indicates the success of price signaling. This would ease the need of any necessary communication in other relevant markets as they have already tested the signaling and now have the liberty to increase prices across sectors. Price signaling in a single market is equally effective as to signaling in multiple markets without actually taking the risk of losing profits in multiple markets or products.

Considering the difficulties involved in price signaling, price signaling was not held to be anti-competitive as time taken to respond and the risk involved outweighed the possibility of a stable collusion. More over any price parallelism occurring due to such signaling was considered as market driven prices. Price announcement presents others in the market with "an economic reality to which all other competitors must react," as was held by the district court in *the Automobile Fleet Sales case* in 1974 (Automobile Fleet Case, 1974).

Professor Turner had explained why price signaling and tacit collusion shall not be violative of competition law. "One was that challenge to oligopoly pricing would be tantamount to challenging the industry structure *per* se, which is not an appropriate application of the concept of conspiracy. Two, it was impossible to draft an injunction against further violations. It is simply not feasible to demand that companies in an industry consisting of three firms behave as if they were in an industry with 100 participants" (Turner, 1962). It is only natural for competitors in oligopolistic markets to price based on the pricing strategy of the competitor and it should also be understood that the marginal costs in such markets (traditional) are often the same. Hence pricing based on competitors pricing often is the only choice as they are interdependent (Kestenbaum, 1980).

The economics of digital markets is different as the main focus for such is the scale of operations primarily rather than profit motive. Signaling works differently in digital markets, where the tech giants use algorithms to set prices and even use them to signal their competitors. This means the dependence on MNC's on pricing algorithms would mean that the cost of signaling is reduced to negligible as signaling is real time. That is when pricing algorithms are set to adjust prices based on the pricing of competitors which reduces the signaling time to mere seconds thereby making the risk of signaling by a competitor negligible.

This kind of information flow can be well explained by the "gas station" example as illustrated by Carlton, Gertner, and Rosenfield in their article (Rosenfield Carlton Gertner, 1997). In a hypothetical situation, there are only 2 gas stations in a town set across each other whilst incurring identical costs. Both the gas stations have huge billboards displaying price of the fuel and either of them can change price by merely changing it on the billboards (Rosenfield Carlton Gertner, 1997). The authors, in the

article explain why pricing below the monopolistic does not make any sense as both the competitors know that neither would be in a position to gain or steal any of the customers as any price reduction shall be matched immediately. It is economically more logical to match the price than to undercut as both the players will not gain on the consumer front. The main factors which increases the sustainability of tacit collusion include reaction period, extent of incomplete information, industry concentration, and asymmetries between the firms (Rosenfield Carlton Gertner, 1997). A relatively recent example is that of Amazon and Flipkart sales (deep discounting). One peculiar thing to note is that the dates of these discounts are identical i.e. October 17th and 16th respectively. This shows that information symmetry cancels out any benefits of price wars as both the platforms were not in a position to steal consumers from the other. This above example might not exactly be the case of causing harm to consumer welfare but portrays exactly how any deviation from supra competitive prices might be disincentivized, when price deviation is met immediately and future price signaling is made possible.

Conclusions

Algorithms and machine learning have increased transparency and the ability to monitor competitors to new unprecedented levels. They have greatly enhanced consumer experience and their interaction with business. They have improved the quality of life and the ease of doing business. But the fact that majority of these algorithms', functionality and capability of these algorithms, are not comprehensible by general public cannot be ignored. Keeping in mind the high innovative nature of the markets and networking effects that are existing in these markets, careful and diligent intervention is warranted by Competition authorities.

It is important to understand the transformation of the concept of signaling with the use of algorithms. The biggest challenge faced by the authorities is the technical know-how with respect to the algorithms used and their capability/ feasibility to engage in sustainable tacit collusion. Like solving any problem, it is imperative to first analyse the problem at hand before dwelling into the possible solutions to tackle the issue at hand. Identifying and analyzing the codes of algorithms efficiently, would enable the Competition Agencies to bring these under the purview of the existing regimes or gauge the economic harm on the competition and the requirement of a modification in the existing regime to tackle these issues. To be more precise we need to analyse the impact of these algorithms on the hypothetical "Competitive Price" of the products.

Many advanced jurisdictions have taken cognizance of the challenges posed by the algorithms and the necessity to improve the investigation capabilities to tackle these challenges. The French and the German authorities have undertaken a joint study to analyze the challenges pertaining to Algorithms and Competition Law, emphasizing on the need to increase agencies expertise on algorithms to deal with the problems (Algorithms and Competition, Autorité de la concurrence and Bundeskartellamt). European Commission are in the process to launch the new Digital Services Act, which focuses on getting information and analyzing the capabilities of the algorithms used by the big tech and their impact on markets and Competition Law (Big Tech Will Have to Open Up Their 'Black Box' Algorithms for Regulatory Scrutiny: EU Competition Head, Medianama). The United States has also introduced the bill, Algorithm Accountability Act, 2019 which is yet to be passed, with the objective to hold the big tech companies accountable for the activities of the algorithms and to understand the functioning of these algorithms.

It would be safe to state that, as one of the growing and sizable markets, India also faces significant challenges from the algorithms employed by the big tech markets which view India as a key market with almost over a billion users. It is imperative for the Competition Commission of India to improve their existing investigative setup to tackle the novel challenges or to be in a position to take cognizance of the challenges posed by these algorithms. The Competition Commission of India, though a nascent regime is however, compared to its long-established western counterparts, been in a position to tackle novel challenges faced in digital economy taking a cautious approach without overregulating and risking any disruptions in the highly innovative market. We are yet to see how the Commission and their investigative wing approach the problem of algorithmic collusion, as the need for analyzing the functions and capabilities of the AI in the sphere of Competition Law cannot be emphasized enough.

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Do Artificial Intelligence-created Inventions qualify for Patent Protection?

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Abstract. Artificial Intelligence (AI) is a modern concept that was first conceptualized in the 50s but its practical approach can only be made possible with the advancement of the present-day technology. The field of AI is growing at a rapid pace and encompassing greater areas of human life in terms that we never even thought of, from transforming the businesses to revolutionizing the way humans interact. It was truly held by Klaus Schwab that AI will bring the Fourth Industrial Revolution. The amount of data and algorithms used to teach a computer to perform a certain task is unimaginable and this is where the AI or machine learning start to behave and think like humans. AI has produced and will produce creations that will lead to greater economic growth and make a country even more technologically advanced. The COVID-19 pandemic has shown the power of having a technological edge and to keep an environment of innovation and creation we need to give this technological innovation some degree of protection. A patent right is a powerful tool which in the past has given us the solution to protect the inventions and, in the future, it is no doubt that AI will create innovations that are patentable which can be granted the patent protection. Some AI and machine learning processes generate patentable innovation and be given patent protection. Granting patent protection will create a constructive culture of innovation with the sense of security for the developer and owner of the AI. The present paper discusses various aspects that can be taken into considerations while looking at AI or computational innovations. AI will remain in our lives and its involvement will increase over time. There is a need for serious discussion by the policymakers, Patent Office and courts on the patentability aspects of some AI creations. Taking inspiration from the available literature and cases this paper argues that AI invention should be considered for patent protection under the current patent legal regime with greater degree of regulations. By acknowledging the AI inventions and its patentability criteria the law-makers would incentivize the creation of intellectual property by encouraging the development of Artificial Intelligence created innovations that will help businesses and raise the standard of living. The present paper has

delved into the different AI features that lead to the creation of patentable innovation like humans-inventors and also tried to answer the various legal questions related to the AI inventorship among AI and humans. Then the paper talks about the legal implications of AI-created inventions and who could become the owner of AI among different stakeholders such as developer, user, data suppliers, investor and owner. AI patentability can create human-like inventions but their regulation should be different from human inventors, therefore, the paper also argues about the re-considering of the patentability test while determining the AI produced patent applications. The paper will highlight all these issues and how we can fill those gaps to provide a healthy environment for AI inventions. The paper is presented with the Indian patent laws in focus but help is being taken from US laws and cases wherever needed to support the research. The author has also made some recommendations which can be looked upon while considering the AI produced patent applications.

Keywords: Artificial Intelligence, Patent Law, Ownership Rights.

Introduction

Artificial Intelligence (referred to as AI) technology can be termed as the best or the worst creation by the humankind (MacDonald, 2016). In today's troubled and uncertain future this statement by Stephen Hawking holds great relevance as AI can lead to the advancement of the human race or it can destroy the same by taking over human functions. AI will lead to tremendous economic growth by its creative output and continued & faster computer power inventions. It is not naive to say that in the foreseeable future AI and computer & machine learning will replace humans as primary source of inventors and creators. This rapid technological growth possesses new challenges to the traditional patent law and patentability. Under various circumstances AI and computer software are generating patentable subject matter which satisfies the requirements of invention under current patent laws unlike human inventors. This generation of innovative products and processes can also be termed as 'computational invention' (Abbott, 2015). But it is doubtful to consider AI as an inventor or consider the invention as patentable (Clifford, 1997, p. 1681). Around the world and in different jurisdictions there is not a single statute which talks about AI invention or any precedent directly related to the subject or any considerate policy by Patent Offices (Glucoft, 2015, p. 44). It is pretty clear to the court and Patent Offices around the world that the current legal system and regulations needs reevaluation and new solutions rather than continuing insufficient framework (Deplorer, 2014, p. 1491). Inventors have ownership rights in their patents, and failure to list an inventor can result in a patent being held invalid or unenforceable (Abbott, I Think, Therefore I Invent: Creative Computers And The Future Of Patent Law, 2016, p. 1080). This paper tries to focus on how Patent law needs to adapt to the changing scenarios which will be led by the AI

invention of products and processes. This paper will also focus on whether AI inventions should be patentable or not.

We are already living in an era of self-driving cars, autonomous weapons, drug synthesis, disease identifications, medical symptom analysis, and investment advisory tools, as well as many other automated processes (Liu, 2018, p. 2219). Some other products such as face recognition in smartphones or answering machines have already become a part of our daily life (Scherer, 2016, p. 354). It is believed that what humans could not do in the past 1000 years, the AI has the capacity to do that in a few minutes. AI has truly taken us in 3A direction of an advanced, automated and autonomous world. Soon computers will be routinely inventing, and it may only be a matter of time until computers are responsible for most of our innovation (Abbott, I Think, Therefore I Invent: Creative Computers And The Future Of Patent Law, 2016, p. 1080). This paper will try to answer many questions such as does AI generate patentable inventions, if yes then can it be dealt with the current patent regime.

The research has been carried out primarily with the help of a comprehensive literature survey of available commentaries, texts and case laws. In addition, in order to give the study a wider perspective, wherever possible the legal regime in India has been compared with the regimes in other jurisdictions, namely the US to answer the question which the title of this paper presents.

Part II of the paper tends to focus on the AI's ability to produce and create inventions on their own or with the help of human assistance. There are at least five features which assist AI in creating inventions that are also needed for any human inventor to produce patentable inventions. the author contends that these five features give an AI human like status which qualify for AI patents.

Part III of the paper talks about the need for an inventorship to AI inventions to make them eligible for patent protection as without disclosing the inventor the patent cannot be granted. It further discusses whether inventorship should be given to an AI or a human or whether there can be a case for joint inventorship.

Part IV of the paper tries to find out the legal implications of the AI patents where the author had tried to answer who will own the patent created by an AI among the different stakeholders such as developer, user, data suppliers, investor or the owner of the AI. Also, if there can be a contractual basis for determining the owner of an AI patent.

Part V of the paper delves into the re-thinking of the patentability test while determining the AI patent application as too strict or too loose regulations which harm the culture of innovation. The author contends that the test which determines the patentable invention needs to be strengthened while analyzing AI patent application.

Lastly, the author has given certain recommendations w.r.t., Indian Patent Laws which can be taken into consideration while looking at the AI patent application or AI patentability. The paper concludes with the final summary of the research where there is a need to give serious thought about the inventorship capability of the present or future AI as there will be a time where AI will create inventions.

Does AI Create Inventions?

To understand and to give patent protection to the AI innovations, we first need to understand the intelligence of AI to create products and processes which classify as patentable material, had they been created by the human inventor. AI cannot be defined or confined to a particular type of definition as there are many kinds of AI system which are based on different types of definition. Unfortunately, no widely accepted definition of AI exists, even among experts. But there is consensus among all the definitions which tend to focus on human functions such as the ability to learn, consciousness and self-awareness, all of which are difficult to classify (Scherer, 2016, p. 360). Even John McCarthy who first coined the term did not give any concrete definition or exhaustive list which can be considered as an AI, that can also include thinking like humans or rationally acting like them. An Artificial Intelligence system can be defined, based on its features, as one capable of performing tasks that normally require human intelligence, such as recognition, decision making, creativity, learning, evolving and communicating (Norvig, 2013, pp. 2-14) and an AI system is intelligent because it has creativity and knowledge as well as certain skills: problem solving, pattern recognition, classification, learning, induction, deduction, building analogies, optimization, surviving in an environment and language processing (Hutter, 2005, pp. 125-126). For patent law consideration one is required to have an intelligence by which an individual can create an invention which can be patented, therefore the most appropriate definition could be "machines that are capable of performing tasks that, if performed by a human, would be said to require intelligence" (Scherer, 2016, p. 363).

There are at least five important features of AI systems that create new challenges to intellectual property law (Liu, 2018, p. 2226) more specifically patent law. Of all the AI products and processes in the world some or all of these features are present in one way or another. The AI system which involves these five features includes robots and computer software, which not only solve compound mathematical and technological problems but also generate inventive products & processes themselves. Each of the features has its own specific characteristics and functions but sometimes they tend to overlap in the AI system. This paper contends that all of these features are the driving
force behind the 3A era of advanced, automated and autonomous AI systems (Liu, 2018, p. 2226) to create inventions through complex techniques which would be patentable if generated by human inventors.

1. Innovative – AI systems have the capacity to create and generate innovative product & processes and can also tremendously increase the capabilities of the existing ones. With the feeding of new & present data to the AI system, the reproduction capacity increases which creates new inventions on its own or with the human monitored system can create specific products & processes to cater to the existing or future needs. AI systems and computer-based AI software can invent and can draw, create designs and even produce inventions such as drugs and technical devices (Hutter, 2005, p. 231). Innovation and inventive process is one of the distinguished features of the AI system. Therefore, this feature is pivotal in the study of intellectual property considerations and most specifically to the granting of patentable invention protection to the AI system.

2. Unforeseeable Outcome – Another feature of AI systems is that sometimes the results which its produces are unimaginable by its user, owner or developer which can be seen by the patents granted to Dr. Thaler's 'Creativity Machine' which produced the results which were not foreseeable by its owner. The Creativity Machine is able to generate novel ideas through the use of a software concept referred to as artificial neural networks-essentially, collections of on/off switches that automatically connect themselves to form software without human intervention (Thaler, 2014, p. 75). The algorithms on which AI systems are based, is capable of creating random mutations that leads to an unimaginable process or way to find an optimal outcome which ultimately results in unforeseeable outcomes. The large amount of data collected and processed by the AI system, which are mostly target-oriented, can generate products or processes which are not anticipated by the user, owner or developer. The author contends that this unpredictability needs to be given patent protection in order to advance research & development (R&D) which can eventually be helpful to the needs of an industry or society or to the whole of the human race. Not affording the protection can lead to harmful results both to producers and also to the consumers at large who can be deceived if the product remains in public domain without patent protection. AI systems that work on developing new and innovative antibacterial drugs can process data from a large volume of microorganisms (i.e., bacteria), "break" the data into tiny (sometime nano) components and find similarities and patterns that the human involved has not observed and cannot identify, resulting in new and unexpected structural information for drug development (Hunter, 1995, p. 70).

3. Autonomous Creation – This is an important feature of AI generally to understand how the patent protection realm is needed for AI systems. It is difficult to define an autonomous AI system as it varies from industry to industry depending upon its applicability in a particular industry or segment but there is some general characteristic associated with the AI autonomy. AI autonomy is based on the relevance of independency and innovative capacity. We can say that a device is independent and therefore autonomous to the extent that it accomplishes a high-level task on its own, without external (human) intervention (Weber, 2016, p. 39 & 40). The key to any autonomous system is its ability to perform certain tasks on its own without the assistance of any other entity and in case of AI without the assistance of human entities. Human intervention can occur in many phases of the process-observation, orientation, deciding and acting (OODA), resulting in different levels of independence (McNeil, 2013, pp. 1143-1149). Autonomy is greatly based on the thinking ability or cognitive capacity of the AI. With increase in cognitive capacity the AI system becomes more autonomous. Increased autonomy demands greater protection for the AI system and also for the creator of AI. When acting autonomously AI can generate and create innovations in the process which when identified by the human entity (whether owner, user, developer or creator) will lead to patent protection. The role of humans is important to identify the inventive product, to have its industrial application and also to file patent protection applications. The author does not contend to afford patents to AI systems but rather than to give that protection to the human involved in the process of creation. As AI is the ultimate creation of humans and they should be rewarded for their time and money and AI does not need any incentive to innovate.

4. Intelligent Thinking – Like humans the AI system is also capable of thinking rationally and intelligently in a given state of circumstances. An "intelligent machine" means a rational system that perceives data from the outside world and decides which activities to engage in or avoid to maximize its probability of success in achieving a certain goal (Norvig, 2013, p. 27). AI systems can solve problems by using features such as learning, induction, deduction, building analogies and optimization as well as using knowledge (Hutter, 2005, p. 231). This human-like cognitive skills and intelligent behavior makes them eligible for patent protection of their invention. This intelligence makes AI systems eligible to form abstract ideas, create inventive steps and develop the product or process which seems to be an invention just like a human inventor.

5. Result Oriented – The user or creator or developer fed large amounts of data to the AI system to get a preconceived result. Innovative AI has the tendency to arrive at that result among different alternatives with minimum time to achieve best output. Thus, AI systems can be said to be result oriented when a particular task is given to it by a human entity. Specific AI systems implemented in driverless cars process data in order to choose from different alternatives and decide on routes, speed and accident avoidance (Brock, 2015, pp. 770-773). AI has the capability to achieve a particular result when it is instructed by its owner or user or developer or creator with all the available data to create a particular invention then that final product or process can be

considered as a patentable invention under patent law. Therefore, AI systems with result-oriented algorithms that create inventions which have been created by humans will be considered as patentable creation.

Various kinds of AI systems & software have all or some of the above five characteristics in a certain way. These five features can be said to create the advanced, automated and autonomous AI system and software. These features allow AI systems to create and invent products and processes which would be worthy of patent protection had they been developed by humans (Liu, 2018, p. 2230). The current patent protection regime is lacking in giving protection to this invention when we understand that AI systems have the tendency to create independent and innovative output which are worthy of protection, specifically patent protection.

AI systems have become valuable for solving specific problems and now promise to improve specific human skills—not only accuracy, velocity and capacity to process vast amounts of data but also creativity, autonomy, novelty and other features that establish patentable innovations (Liu, 2018, p. 2231). Therefore, these are important considerations for the AI and Patent Law in the modern technology driven world where the society and nations will benefit from AI created inventions.

Artificial Intelligence Inventorship Under Patent Law

The need for inventorship is mandatory for the grant of patent. Under various Patent Law legislations in different jurisdictions the grant of patent requires that the patent application discloses the inventor of that patent which should be a human entity and not a juristic person such as company or corporation¹. Inventors own their patents as a form of personal property that they may transfer by "assignment" of their rights to another entity² and in the US itself organizations own at least 93% of the granted patents rather than the human inventors. The grant of patent gives a very powerful right to the inventor who has the power or right to exclude any other person from using, selling, making, or offering for sale that invention throughout any specified geographical region set out by the respective patent legislation³. In case a patented invention has multiple owners then each of such patentee, unless a contractual agreement to the contrary is in force, has the right to use or exploit that patent without the

¹ See Indian Patent Act 1970 § 6, and 35 U.S.C. 1952 § 100(f).

² See U.S. PATENT & TRADEMARK OFFICE, MANUAL OF PATENT EXAMINING PROCEDURE, § 300 (9th ed. Revision 7, Nov. 2015).

³ See Indian Patent Act 1970 § 46 & § 48 and 35 U.S.C. 1952 § 154.

consent of other⁴. While considering the Patent Law protection for AI system inventions, all the above stated provisions and principles are necessary to be kept in mind for practical and theoretical purposes as inventors of the patent have ownership rights in the patented invention and not disclosing the true and legitimate inventor can result in failure of grant of patent protection to the inventions and render them invalid. Therefore, these issues are necessary to be addressed to effectively deal with AI inventions and innovative product & process.

In the patent law jurisprudence, the most basic concept for a person to be an inventor then he/she must contribute to the conception of the invention, in other words, the person should have come up with the abstract idea for that invention. Conception refers to, "the formation in the mind of the inventor of a definite and permanent idea of the complete and operative invention as it is thereafter to be applied in practice (Townsend v. Smith, 1929, p. 295)" as well as "the complete performance of the mental part of the inventive act" (Townsend v. Smith, 1929, p. 295). After that the subject matter of the invention should be able to be reduced into practice by the person of ordinary skill in the art. Reduction can be done by the inventor by actually making the working model of the invention or by explaining in writing by the inventor so that it can be comprehensively understood by the person of ordinary skill. This is done so because the invention created by the AI should be explainable in ordinary language and should also be capable of industrial application⁵ which is also one of the requirements for the grant of patent protection. Individuals who simply reduce an invention to practice, by describing an already conceived invention in writing or by building a working model from a description for example, do not qualify as inventors (Abbott, I Think, Therefore I Invent: Creative Computers And The Future Of Patent Law, 2016, p. 1094).

The inventor should participate in the conception of an invention is crucial to the patented invention. This aspect can block the way for the AI invention where the AI system or software creates the invention without the initial conception of the idea. This happens in systems where AI generates material without supervision by the human entity. The instances can be where AI systems may assist the human inventor to reduce an invention to practice, but the computer is not participating in the invention's conception (Abbott, I Think, Therefore I Invent: Creative Computers And The Future Of Patent Law, 2016, p. 1094). Sometimes AI system and computers takes active role in the creation of an invention like *automated fashion, retrieving stored knowledge or by recognizing patterns of information* (Abbott, I Think, Therefore I Invent: Creative Computers And The Future Of Patent Law, 2016, p. 1094). which should be recognized but fails to get any attention from the law because of AI's ineligibility of having patent

⁴ See §50, Indian Patent Act 1970.

⁵ See Indian Patent Act 1970 § 2(1) (j).

protection. AI systems can be classified in two aspects i.e., one where AI assists humans in creation of an invention and another when AI independently creates invention on its own. In both the cases the invention should be granted patent protection and the human entity (owner, user, creator or developer) should be classified as inventor.

Human assistance in AI Invention – The creation of invention by AI systems is not possible or rather incomplete without the role of any human entity. AI has the capacity to function and creates invention on its own but negating the role of humans in this process will lead to many unimagined situations where AI could ultimately supersede humans and could pose a greater threat to human societies at large. Fortunately, in today's world there is no such AI which could completely and independently function on its own without the aid and assistance of humans. For example, before the Creativity Machine composed music, Dr. Thaler exposed it to existing music and instructed it to create something new (Abbott, I Think, Therefore I Invent: Creative Computers And The Future Of Patent Law, 2016, p. 1095). So, without humans the AI cannot invent in the first place and there will be no discussion about the AI inventions. Humans are the vital key to connect AI invention with patent law protection for better regulations with adequate safeguards. AI systems and computers still do not engage in reflection, which is, a software concept that refers to a computer program that can examine itself and modify its own behavior (and even its own code) (Malenfant, 2016). Neither the AI system nor the AI invention could or would exist without the assistance or input of data from human entities, therefore, while considering the patent protection for AI invention the role and contribution of humans needs to be taken account of.

Case for Joint Inventorship – There can be a case for a joint inventorship between human and AI systems. A computer may not be a sole inventor; the inventive process can be a collaborative process between human and machine (Abbott, I Think, Therefore I Invent: Creative Computers And The Future Of Patent Law, 2016, p. 1096). The requirement for such a provision is based on the "quantum of collaboration or connection" (Kimberly-Clark Corp. v. Procter & Gamble Distribution Co., 1992) between human and AI systems. For joint inventorship, "there must be some element of joint behavior, such as collaboration or working under common direction, one inventor seeing a relevant report and building upon it or hearing another's suggestion at a meeting (Kimberly-Clark Corp. v. Procter & Gamble Distribution Co., 1992)." This can be done in cases where humans provide sufficient input in the form of data to the AI system which is needed for the creation of an invention and then the AI system using that input, built upon the final invention which is then recognized by the human. This way the Patents can be issued and both can be classified as joint inventors or co-inventors. Leaving AI aside, invention rarely occurs in a vacuum, and there are often joint inventors on patents (Manchikanti, 2013, p. 169) and also, it is not necessary that the inventive concept come to both the joint inventors at the same time (Moler & Adams v. Purdy, 1960, p. 279). This can remove another barrier to AI inventions and can be helpful in encouraging the development of AI inventions where humans also have some incentive to create better inventions.

Legal Implications of AI Patents: Who can be the Owner

The AI system can and will invent and there is a need to recognize them under the current patent protection. The question which now needs to be answered is who will own the AI invention, in technical terms, who will be the Patentee of AI system patent invention. AI and computers cannot own property, and it is safe to assume that "computer personhood" is not on the horizon (Winkler, Corporate Personhood and the Rights of Corporate Speech, 2007, p. 863). This issue possesses a great challenge for the recognition of AI invention as who will get the ultimate benefit from such a powerful monopolistic right. This scenario presents multiple aspects for ownership who can be considered as Owner such as AI's owner, AI's developer, AI's user, Data Suppliers or Investor (who funded AI projects). These are various stakeholders with different interests depending upon their contribution.

a. Developer or Programmer – for any AI system in the world the foundation of its development is laid down by the developer or programmer who writes the particular code or algorithm which results in the creation of AI. The software, based on which AI was developed, is behind the creation of invention by AI. Without the initial programming by the developer the AI could not even come into existence and hence, there also cannot be any kind of AI invention which needed patent protection. As the first developer or programmer of AI, they can be considered as the owner of AI invention but the problem arises when the AI is given to its owner for practical use which then may upon the instructions of the owner create the innovative product or process and the developer is not involved in the whole process. So, a developer or programmer can be considered as owner but the author contends that they do not seem to appropriately fit into the AI invention ecosystem.

b. User – it is the person who finally uses the AI system developed or created by the developer or programmer. AI user is important for the simple reason as user maybe the person who determines the invention created by AI or can give the inputs for the creation of AI invention as pre-determined by the user. It is simple logic to consider user the owner based on its contribution it has but this is not the case and it has some legitimate complication that render its ownership right. Consider the example of IBM's AI "Watson" which was first introduced to the world in the TV game show

Jeopardy (Best, 2013). IBM has made Watson available to numerous developers without transferring Watson's ownership (Upbin, 2013). To the extent that Watson creates patentable results as a product of its interactions with users, promoting user access should result in more innovation (Abbott, I Think, Therefore I Invent: Creative Computers And The Future Of Patent Law, 2016, p. 1116). The reason behind lending Watson to different users and developers was to provide access to modern AI technology and how AI (Watson) can engage in multiple tasks from winning game shows to cooking food with different taste and styles. The end user can perform various tasks that may result in patentable innovation but it does not seem feasible to assign them the ownership rights. If Watson invents while under the control of a non-IBM user, and the "default rule" assigns the invention to the user, IBM might be encouraged to restrict user access; in contrast, assigning the invention to IBM would be expected to motivate IBM to further promote access (Abbott, I Think, Therefore I Invent: Creative Computers And The Future Of Patent Law, 2016, pp. 1116-1117). Therefore, user might not be the best person to be considered as an owner.

c. Data Suppliers – for an AI to become truly intelligent the foremost requirement is to feed the large amount of data which the AI system can process to learn and execute that learning in making of product or processes. The next phase in the invention process is "exposing" the AI system to data that the system exploits to "learn" how to function and to achieve its goal efficiently (Liu, 2018, p. 2235). The role of data suppliers is usually undermined and not looked upon while discussing the AI system. Data Suppliers are needed to teach the AI that helps AI to learn about the existing product and process. Without the huge amount of data, the AI cannot function and perform the task of intelligence and learning. For example, in case of Facial Recognition, the supplier provides the system with millions and billions of datasets of people's pictures in various forms with different facing directions. But the problem arises while assigning ownership rights is how to identify who the true data supplier is or was. In many cases the data supplier is not one or two persons but actually the millions of persons who are using a particular app like Google's product Google Translate which uses its user as data suppliers, which can make the whole process very complicated. So, data suppliers are also not the correct choice while granting the ownership rights of the invention created by AI.

d. Investor – this aspect of AI is not even discussed while considering the ownership of AI invention. Like shareholders of a company who put their money into the company, investors are persons who provide an initial boost by investing his/her money in the AI by taking the huge risk. The investors are needed to put the idea of the creator into practical terms. Again, the author contends that investors cannot be considered as owners and risk can be rewarded in the form of monetary return. Investor does not apply his/her mind for creating an AI which subsequently may create an AI invention. The intellect of an AI creator cannot and should not be measured by investors in the form of money or monetary value.

e. Owner – after highlighting the possible persons who can be considered as owners of AI invention, the author contends that the most appropriate person to be rewarded with ownership of AI's patented invention is the owner of the AI system. Ownership rights to AI inventions should vest in an AI's owner because it would be most consistent with the way personal property (including both AI and patents) is treated in the United States & other jurisdictions and it would most incentivize computational invention (Bridy, 2012), not just in US but in many other countries including India this is the most consistent way of ownership of property. Like in IBM's case, Watson instead of affording ownership to users, it is more convenient to give that right to the owner of AI which can further access the reach of AI to different businesses and persons. If under the control and direction of the user if AI creates any patented invention then both the user and owner can be considered as joint owners of that patent. This way AI's vast reach and owner's right over the property can be ensured. AI was the means through which the user got the end result of a patented invention, therefore, the owner of AI should also be awarded the patent. Similarly, patent ownership rights should be given to the owner rather than the developer of AI. Assigning owner that right would benefit developers only by way of increased demand for AI created inventions. Having assignment default to developers would interfere with the transfer of personal property in the form of computers, and it would be logistically challenging for developers to monitor computational inventions made by machines they no longer own (Abbott, I Think, Therefore I Invent: Creative Computers And The Future Of Patent Law, 2016, p. 1117). The owner assignment should also be based on the role played by them in the creation of an AI patent and not every owner should be awarded that right. Developers can be considered as the one by licensing that AI to the person for a limited term but this way that person becomes the user and not the owner. So, like traditional physical property any profit arising out of that property is considered to be the owner's profit, so, any new product or process created by AI which subsequently gets patent protection should be awarded to the owner with patent ownership.

The above-mentioned persons create many problems while identifying the ownership claim and who should be identified as the true and legitimate owner among various entities. The most sensible and logical way of associating ownership of AI patents could be based on the contractual terms entered between different persons such as developer, user, data suppliers, investor and owners, etc. While negotiating the contract this aspect of patent ownership can be substantially be looked upon by specifically setting out the rights and liabilities of each person related to the AI patent. The ownership of AI patents also comes with the liability of any wrongdoing or breach done by the AI while performing its task. This again leads us back to our previous contention that owners of AI systems should be regarded as the Patent owner as it is practically the best way to enforce those rights and hold accountable for any breach committed by the AI in the whole process. If the contractual negotiation fails to arrive at any conclusion, then the best way in which the IP right of Patent could be awarded to, are the Owners of AI system.

Reconsideration of the Patentability Tests for AI Inventions

After looking into the AI inventions and the need for patent protection, another area of importance is to look upon the requirement of improved patent test for AI invention. The patent law requires an inventor to show substantially that the invention claimed for patent protection is useful (industrial application), novel (inventive step), non-obvious and sufficiently described in the patent application⁶. These criteria are essential for inventions to have patent protection whether they are made by humans or an AI. The most crucial aspect while studying AI invention patentability is the aspects of subject matter eligibility and non-obviousness of the invention.

Subject Matter Eligibility Doctrine – Section 2 (1)(j) of Indian Patent Act, 1970 explicitly defines the eligibility for patent protection which says any "new product or process involving an inventive step and capable of industrial application" and in US it means "process, machine, (article of) manufacture, or composition of matter". The patent invention must be used for industrial application which does not mean that it has to be commercially exploited. The US Supreme Court has made three exception to patentable subject matter that are the laws of nature, physical phenomena, and abstract ideas (Diamond v. Chakrabarty, 1980, p. 309). These exceptions are recognizable in Indian patent law jurisprudence as these are the basic tools of scientific and technological work upon whom all the innovation and scientific advances are based upon. For AI invention, the subject matter eligibility is most closely related to the machine or transformation test. This test has been held to be the threshold for the process to be used for patent eligibility and the same can be used while determining the eligibility of AI invention. AI inventions are ultimately based upon the process through which AI performs and functions. Under machine or transformation test, two requirements need to be fulfilled for patent eligibility i.e., **a).** it is tied to a particular machine or apparatus and **b**). it transforms a particular article into a different state or thing (Bilski v. Kappos,

⁶ See Indian Patent Act, 1970 § 2(1) (j), 2(1) (ja) & 2(1) (l) and 35 U.S.C., 2000 § 101, 102, 103, 112.

⁷ 35 U.S.C., 2000 § 101.

2010, p. 617). Therefore, the AI system's created inventions can be conclusively patentable based on the subject matter eligibility doctrine. This doctrine is sufficient to even deal with the AI inventions and their patentability.

Principle of Non-Obviousness or Inventive Step – This is another requirement for patentability set-out in Sec. 2(1) (ja) under Indian Patent Act, 1970. In US patent law sec. 103⁸ The Patent Act talks about the criteria of non-obviousness principle. Both the provisions state that for an invention to be patentable it should contain an inventive step which must not be obvious to the person having ordinary skill in the art (referred to as **PHOSITA**) at the time of filing of patent application. This concept has been adopted in various jurisdictions that being developed as a legal fiction that serve as a reference for determining whether an invention is nonobvious (Lemley, Is Patent Law Technology-Specific?, 2002, pp. 1188-1189). The person cannot claim patentability if PHOSITA has found the difference between new invention and prior art obvious. US Supreme Court in Graham v. John (Graham v. John Deere Co., 1966) had identified four evaluating factors that are: -

- i. the scope and content of the prior art;
- ii. the skill level of a PHOSITA;

iii. the differences between the claimed invention and the prior art's teachings; and iv. any objective indicia of non-obviousness, such as commercial success.

Practically, no person would have all the information and knowledge about the applicant's patent but this fiction is necessary and bars the inventions which are based on public knowledge. Stopping obvious variations from being patented is important because that prevents the removal of knowledge from the public domain (Sakraida v. Ag Pro, Inc., 1976, p. 281). Inventions which are obvious to PHOSITA are within the realm of public knowledge. This makes proving patent claims more difficult but that result is desirable because patents should not be granted lightly given their anticompetitive effects (Eldred v. Ashcroft, 2003, p. 246). The author contends that AI patentability claims may require the legislators to redefine 'obviousness' and 'PHOSITA' criteria. Inventions by advanced AI systems with creative and non-obvious characteristics, however, have increased processing capacities, widen access to searchable information, and increase efficiency in analyzing information-all of which would merit a patent if a human invented them (Liu, 2018, p. 1120). Considering AI technical advancements and innovation created by it, the non-obviousness & PHOSITA criteria needed to be set accordingly. The bar cannot be set at too high standard because that restricts millions of patentable inventions unworthy of patent protection which ultimately harms

^{8 35} U.S.C., 2006 § 103(a).

and disincentivizes innovations. If the hurdle is too low, a flood of junk patents may cause true inventors to face more infringement lawsuits, which also disincentives innovation (Liu, 2018, p. 1121). Therefore, courts and patent offices have to adopt a more flexible approach on a case-by-case basis which was also held stated in Graham (Graham v. John Deere Co., 1966) case while deciding non-obviousness criteria. There is a greater need now than ever to expand the scope of PHOSITA to effectively judge the content for prior art which can be done for example by employing Watson like computer AI in the patent office for particularly dealing with inventions created by AI.

However, if the PHOSITA criteria is not feasible enough then the previous requirement of subject matter eligibility can address the issue of AI patentability under current patent law. Legislators can explicitly make the list of AI subject matter eligibility but need to revise that list frequently to keep up with faster technological advancements. It is necessary because *the obligation to determine what type of discovery is sought to be patented must precede the determination of whether that discovery is, in fact, new or obvious* (Parker v. Flook, 1978, p. 593). Subject matter eligibility can be helpful in scrutinizing the junk of AI patent applications and effectively promoting the eligible & legitimate AI patentable inventions.

Recommendations

- The definition of an invention under section 2(1) (j) of Patents Act, 1970 needed to be modified to include the inventions created by an AI system.
- The Patent and Trademark Office or Intellectual Patent Appellate Board (IPAB) should list the subject matter eligible for AI patentability which should be revised after a fixed period of time.
- Non-Obviousness or PHOSITA test should be made more stringent while testing the AI patentability claim.
- The Owner of the AI system should be by default considered as the owner of AI claimed patent unless any other contractual agreement exists to determine the same.
- AI system also should be regarded as joint inventor with human entity while granting the patent protection to AI's invention.

Conclusions

The policy makers have to give serious thought to the issue of AI's creation of inventions. The Patent Office and courts have to show the path by guiding this discussion forward as far as Indian patent provisions are concerned. Legislators have to redefine the limits of patentability and also whether AI inventions can be patented or not. These questions needed to answer sooner than later for having an edge on the technological advances and AI invention protection. This will not only settle down legal conflicts but also provide businesses certainty and incentive to invest in their Research & Development capacity which can and will ultimately benefit consumers and the economy.

As Stephen Hawking once stated that "The short-term impact of AI depends on who controls it; the long-term impact depends on whether it can be controlled at all" (MacDonald, 2016). Conclusively determining this can guide us in regulating and protecting future technologies. Companies and businesses are heavily investing in AI technologies from making driverless cars to detecting new diseases. The current patent law and judicial precedents are unable to solve the riddles of AI invention patentability. The discussion needed to be started by scholars and policy makers to promote innovations and new scientific discoveries. Fourth industrial revolution will be led by AI, which may adversely affect the rights of citizens and their way of living. Consideration is necessary to protect liberty, national security and to create an environment of scientific development.

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Patenting AI and Disruptive Technologies: Can the law of Patents keep up with the perpetual advances in Technological Innovation?

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Abstract. With the vertiginous advances in the Information and Communications Technology regime, the dimension of monopolising novel technologies inevitably comes to the forefront. Apart from excluding third parties from commercialising the concerned technology, 'monopolisation' has also been identified for fostering innovation in the long run. Within the arsenal of the available IP safeguards, patents have been known to be aptly suited for serving the aforementioned purpose. An apparent retort vis-à-vis commercially capitalising on such impending technological innovations would thereby inadvertently, connote patenting these inventions. However, the framework of the Indian Patents Act, 1970 is fraught with a few impediments insofar as patenting 'hybrid-intelligent technologies' is concerned – an account of which is presented in this paper.

Centralising its focus on such 'disruptive' AI technologies, which employ tenets of Machine Learning and Natural Language Processing to replicate facets of human intelligence, this paper aims to appraise the viability of patenting them. In doing so, the Indian framework governed by the Indian Patents Act, 1970 is analogised with that prevalent in the United States and European Union. In each case, this paper elucidates the 'barriers to patentability' existent within the respective frameworks. For instance, while the European Union prescribes a 'morality' test as a prerequisite for patentability; the US has a similar barrier wherein only 'patent-eligible subject matter' within the framework of 35 USC §101 is considered for patentability.

These prescriptions, inter alia, have been precluding AI technologies from being patented across several jurisdictions. Thus, by offering a few recommendations to ameliorate the current stance of the Indian framework with respect to the patentability of intelligent systems. In an endeavour to further the 'weightier' interests associated with fostering innovation in the long run, this paper ultimately argues for an overhaul of the patent regime insofar as its proscription on patenting 'hybrid-intelligent' systems is concerned. Keywords: Artificial Intelligence, Intellectual Property Law, Disruptive Technologies

Introduction

Over the years, several jurisdictions around the world have witnessed an unprecedented rate of technological innovation in almost every sector of their market economy. While some of these advancements were aimed at ameliorating the productivity of the factors of production within the market economy, others were so drastic that they managed to 'disrupt' the entire market itself. This paper centralizes its focus on delimiting the trajectory of the latter i.e., technological innovations which have been touted as 'disruptive'. To put it simply, these are the kind of innovations which foster the engendering of new products in the market which ultimately end up replacing the old products (Tombak 2016, p. 43). By introducing newer and arguably better products in the market, these disruptive technologies not only end up shifting the focus of the consumers on to the newer products but also incentivise other consumers to enter the market.

It has been observed that the rampant digitisation of the factors of production has undoubtedly transformed several business models (Anderson 2012, p. 324). The onset of Additive Manufacturing ('AM') is probably the most profound example of such a transformation which altered radically the traditional manufacturing framework. Commonly known as 3D-Printing, the ability to complement the process of manufacturing and biochemical engineering pointed towards the interoperability of such technologies – which later disrupted a factor of production is a feature. Additionally, Blockchain and Artificial Intelligence ('AI') are two other 'disruptive' technologies, the advent of which shall be dealt with in this paper.

As a term which has been the subject of a lot of scholarships in recent years, 'AI' basically refers to a branch of Information and Communication Technology ('ICT') which deals with certain processes that aim to stimulate some aspects of human intelligence (Evans 2017). Some basic tenets of AI have been employed in the legal regime vis-à-vis reviewing, managing, and even drafting contracts; in addition to scrutinizing applications and analysing cases (Ashley 2013, p. 785). Even law firms have sought to capitalize on such AI systems by using them to standardise their contracts, in their endeavour to minimise the risk associated thereof (Ashley 2013, p. 788). In fact, AI has now been inter-connected to several other areas of technology, from 3D-Printing, Blockchain, Internet of Things (IoT) et al. Its ubiquity has further allowed it to *"permeate"* modern businesses and perhaps unsurprisingly, it is now being regarded as a tool that incentivises innovation (Cellan-Jones, 2014).

Blockchain, on the other hand, is a decentralised online ledger of transactions which is distributed in the midst of a network of nodes (McDonald, 2017). It is an

another example of an innovation which had disrupted the way transactions were effected online. Broadly, each transaction in the blockchain was implemented via an *Elliptic Curve Digital Signature* ('ECDS') – an algorithm used by the nodes to verify the transaction(s) (Wang, 2014). Although the benefits of resorting to such technologies were apparent vis-à-vis the consumers, their advent brought about an uncanny dilemma for the business managers. Apparently, while an endorsement of such technologies could alienate the latter's present consumer base; refusing to invest therein could estrange the managers from the forthcoming developments in the market (Christensen 1999, p. 10).

Would the business managers be better off if these disruptive technologies could be patented? Contrary to popular belief, commentators have stated that patents help to foster competition in the market (Lemley & Melamed 2013, p. 2128), since competing parties usually cross-licence patent portfolios in a way which allows both of them to operate in the market without the fear of having to indulge in costly infringement litigation (Chao 2013, p. 761). This paper addresses this very issue of the patentability of AI and disruptive technologies. The discussion shall be fomented by giving an account of the advent of blockchain and AI, in Part II. The succeeding sections shall deal with the concerns surrounding their 'patentability' and the discussion shall culminate with some recommendations to tackle such concerns, in Part V.

Analysing Disruptive Technologies: The Narrative of Blockchain and AI

Disrupting the way online transactions are affected: An Overview

The communal ledger system which revolutionized the way transactions were conducted online was termed as Blockchain. As a decentralized ledger, it is regulated and monitored by a community of individuals that seek to prevent any alterations in its database (Evans 2018, p. 275-76). Moreover, since the database is publicly accessible to those who wish to view a copy of their entry, blockchain has been heralded for promoting transparency in virtual transactions (Evans 2018, p. 280). Furthermore, to ensure that all transactions effected via blockchain are recorded accurately, its system accords every nodal computer/user a publicly shared copy of the ledger, which are then updated with the help of a proprietary algorithm. In addition, since these transactions are recorded on the blockchain's network without making use of any of the parties' personal information, the facet of *anonymity* is furthered by resorting to its network for virtual transactions.

Clearly, by examining the problems that have been associated with traditional online payment platforms such as that of *security, transparency*, and *anonymity*; blockchain eliminates 'middlemen' from its transactional framework. These middlemen essentially acted as the supervening authority for financial transactions in platforms such as PayPal and Venmo (Guo 2016, p. 443). By virtue of the fact that blockchain networks provide a secure and transparent chain of information, they are being applied in the realm of brand protection, IP, and customer engagement as well. However, the nationwide adoption of blockchain technology still faces a lot of impediments, from the hurdles involved in scaling these technologies, delimiting standards for their interoperability; to protecting their use via the safeguard of patents. The aspect of patentability of these technologies shall be discussed in the later sections of this paper.

AI and the Legal regime: Demystifying their relationship

A machine's endeavour to simulate human intelligence by employing tenets of machine learning ('ML') and/or natural language processing ('NLP'), among others is often termed as AI. While ML is a method of data analysis that attempts to iteratively learn from the input data and thereby, allowing programmers to benefit from its unique insights; NLP encompasses the algorithms which enable the computer to process human language. Accordingly, several attempts have been made over the years to capitalize on the ability of such AI-based software to adapt and learn from data algorithms. For instance, artificial neural networks are being put to use nowadays in the realm of clinical diagnosis because of their ability to learn from already known patterns (Ramesh, 2004). The integration of traditional diagnostic technologies with certain facets of AI has thus generated hybrid intelligent systems which incorporate the advantages of both the technologies (Tull & Miller 2018, p. 314).

To this date, IBM's 'Watson' stands as the most profound example of a cloudbased, commercially used AI product which provides Application Program Interfaces (APIs) that have truly harnessed "*the power of cognitive computing*" (Ramesh, 2004). In any case, such intelligent systems have arguably made the most significant strides in the field of medicine wherein, AI has been used to detect early cases of skin cancer in patients by making use of an algorithm originally formulated by Google, to produce around 1.3 lakh high-definition images of skin lesions. Along with this, a few genetic algorithms have also been independently formulated by scientists which have the ability to develop new inventions via a process that tends to mimic biological evolution (Abbott 2016, p. 1086).

General Electric had made use of similar algorithms to actually design jet engines which ended up performing better than the traditional ones (Schuster 2018, p. 1958). Hitachi had similarly employed AI technology to create bullet trains that were aerodynamically suited to produce less sound (Plotkin 2009, p. 60). Genetic algorithms have been used in a similar fashion to create novel communication systems, better power plants, advanced pharmaceuticals, and efficient diesel engines (Kohlhepp 2008, p. 787). Clearly, as these intelligent systems continue to engender newer and probably

even novel technologies, the aspect of safeguarding the interests of the inventors and incentivising them to further their research in developing such technologies, naturally comes at the forefront.

While patents may come out as an obvious answer, how do we divorce the invention from the AI-software that created it? How does one ascertain as to which extent an AI-system was used to actually invent a patentable invention? Do we simply accord the inventor of the AI-software with the status of being the inventor for the new product, as well? The succeeding sections of this paper aim to tackle this very quagmire surrounding the patentability of such inventions.

The Concerns associated with the Patentability of Disruptive Technologies.

The legislative barriers to patentability.

This Section aims to highlight the impediments in the way of patenting Blockchain and AI-based technologies. Since Indian jurisprudence is yet to give a detailed viewpoint on this issue, this Section shall give an account of the EU and American laws that have in fact, explicitly dealt with the subject matter. Unlike what some practitioners may believe, the regime of patent law is not merely a consolidation of a few guidelines that aim to safeguard novel inventions. The aspect of 'patentability' almost always requires a juxtaposition of the notions of merit and justice with the obvious principles of novelty and scientific usefulness (Waelde et al 2014, p. 421).

It is thus evident that the exclusive monopolisation of an invention by a single enterprise should not be encouraged if the same is bound to taint the social standards of morality (Li 2014, p. 287). Clearly, the law of patent "*does not operate in a vacuum*" (Li 2014, p. 288) but is a reflection of the very preferences upon which a deliberative democracy is established. Drawing upon these principles, Article 6(2) of the European Directive on the Legal Protection of Biotechnological Inventions ('Biotech Directive') explicitly bars AI-based technologies used for cloning and/or modifying the genetic germline of humans from being patented (Directive 98/44/EC 1998). Since the aspect of patentability may have a significant effect on the availability of such technologies, the European Patent Convention ('EPC') has an additional 'morality' test enshrined in Article 53(a) which needs to be met by an invention apart from the standard tests of novelty.

The morality test of the EPC thereby, excludes inventions which encroach upon human dignity from the gamut of 'patentable inventions' (Case C-377/98 2002). *Illustratively*, a technology capable of replicating human tissues/organs via 3D-Printing would most likely fail to meet the standard test of morality prescribed under the EPC. On similar lines, in the US, an invention is deemed to be patentable only if it contains a 'patent-eligible subject matter'. Generally, abstract ideas fail to meet the standards of 35 U.S.C. §101, because of which they are often denied patentability. The judgment of the US Supreme Court in *Alice v. CLS Bank* is the *locus classicus* on the aforementioned notion wherein, the Court invalidated the claim for patenting an escrow system implemented on a computer, regarding it 'too abstract' to be patentable.

Accordingly, in *Ariosa Diagnostics v. Sequenom Inc.* (2015), the Court did not consider a novel method of prenatal diagnosis of foetal DNA to be a patentable technology/patent-eligible subject matter. The judgment was delivered by the Court despite acknowledging the conspicuous strides this technology had made vis-à-vis revolutionizing the procedure of prenatal diagnosis (p. 1376, 1379). Just like AI-based technologies, even claims advanced for patenting Blockchain have had their share of concerns. For one, several scholars and judges have resorted to the view that since the latter is essentially a virtual currency, it is "no more patentable than the US dollar" (Guo 2016, p. 448).

Extending the argument further, attorneys W. Noonan and M.A. Berta is of the view that the novelty of the entire Blockchain system notwithstanding, each separate bitcoin cannot be envisioned to be a patentable invention (Berta & Noonan 2015). Commentators who abstain from accepting the notion of patenting Blockchain state trade secrets as the only viable option for safeguarding them with at least some IP safeguard (Clark 2019, p. 10). However, considering the fact that the private keys governing the transactions via bitcoin are subject to change with every transaction; can they be really safeguarded as trade secrets? This question warrants thorough deliberation which is beyond the scope of this paper.

Decoding AI-based scientific inventions: Who is the actual inventor?

A natural corollary to the current advancements in ML and NLP mechanisms is the fact that AI-based systems have now equipped themselves with the requisite know how to actually invent new technologies by themselves. Indeed, some AI systems have in fact, completely obviated the need of getting certain algorithms programmed by a human programmer (Hattenback & Glucoft 2015, p. 43), before the system can actually go about to generate the desired results (Bond, 2017). On the ever-increasing reliance on AI systems in the field of medicine, Ryan Abbott had argued that such hybrid intelligent systems are the ones taking the crucial inventive steps, creating novel diagnostic measures from pre-specified algorithms (Abbott 2016, p. 1097).

There is no denying the fact that Abbott's argument does hold some substance; for, based on a similar line of argumentation, even the United States Patent and Trademarks Office ('USPTO') had denied patent to an AI-based machine – DABUS (Obhan

& Atwal, 2020). The claim for a patent was filed by Stephen Thaler, an AI expert based in Missouri; however, citing that the machine was primarily responsible for coming up with the invention owing to the programming done via its extensive neural network, the USPTO invalidated Thaler's ownership claim over the invention. As per the US Patent law, the term 'inventor' only envisages natural persons and/or individuals within its ambit (Das, 2020). On similar grounds, the permission for granting an ownership of the machine was denied by both the UK as well as the European Patent Office (Gvoth & Goldush, 2020).

The main concern surrounding the grant of such patents is the corresponding difficulties that would be associated with enforcing the exclusionary rights associated with the former. It is apparent that a patent is not merely a document that fosters monopolisation of the patented invention by itself but every patentee is expected to (*inter alia*) be responsible for signing contracts, filing lawsuits for injunction(s), and granting licences. Thus, the essence behind the laws which prohibit the patents from being granted to AI-based machines is that they would fail to undertake the aforementioned responsibilities expected of a patentee. However, the Indian position on the same is not incontrovertibly settled.

Section 6 of the Indian Patents Act, 1970 ('IPA') states that a patent can only be granted to the first 'inventor' of the invention. Despite stating that the patentee needs to be a 'natural' person for being granted a right of ownership over the patent, the Act nevertheless recognizes non-governmental entities as patentees of a few inventions (Das, 2020). All of this has created a lacuna as to whether AI machines are similarly capable of being granted a patent in India. As the facet of ownership is still assessed by the metric of whether an entity has the capacity to 'sue or be sued', it might be fruitful for policymakers to deliberate upon whether there has arisen a need for employing a broader scope for the aforementioned right, in light of the innovations being undertaken in the ICT regime.

Tackling the issues around the patentability of disruptive technologies

Despite the barriers in terms of getting an intelligent software patented, as highlighted in the previous section, not all technologies end up getting excluded from the ambit of patentable inventions. For instance, the UK Intellectual Property Office ('IPO') has regarded the application of 3D-Printing technologies in the biomedical sector as a possible area of patent application, particularly when such technologies are employed in the regime of regenerative medicine (European Council Regulation, 1394/2007). In the arena of regenerative medicine, it is actually the medicines that are instrumentalized via tissue engineering, which thereby, does not violate the morality test of the EPC. Based on a similar line of argumentation, T. Boland had managed to get a US patent for a 3D Bioprinter in 2004, which was able to inject viable cell technology (US 2004/0237822 Al 2004).

On the other end of the spectrum, the narrative of Blockchain is inarguably peculiar since the implements to its patentability are not based entirely on legislative factors. Prospective patentees of Blockchain technologies often find it difficult to safe-guard such technologies since the alleged creator of Bitcoin – regarded by the pseudo-nym Satoshi Nakamoto – had already released a paper in 2008 which described his invention in detail, specifying every aspect of its functionality and the structure of its network (Guo 2016, p. 451). His publication left behind the most quintessential aspect of the technology susceptible to being exploited by the general public. Since the essence of the technology was already in the public domain, only those applications which conspicuously modified the already well-established blockchain network were considered for patentability (Economist, 2017).

Notably, even this has not curtailed applications for patenting DLTs and related technologies; since a Reuters' study revealed that around 63 Blockchain-related patents had been filed worldwide in 2016-17 (Kaye & Wagstaff, 2017). Thus, in an endeavour to work out a solution for the enigma surrounding Blockchain patents, the Chinese Ministry of Information Technology is working alongside the European Commission to frame specific Blockchain standards for governance. These standards are likely to pave the way for treating Blockchain-related patents as Standard Essential Patents which have been mandated to be licenced on 'fair, reasonable and non-discriminatory' (FRAND) terms (Burstall, 2018).

As evidenced by these instances, inventors have managed to get patents for DLTs and other technologies which employed facets of 3D-Printing in the realm of genetically engineered tissues. A case in point being Organovo's patent on 3D printed tissues that had the ability to be used in research, drug discovery and toxicology testing (WO 2011/116125; UK Patent 2478801 2012). It has been realized of late that the life science industry relies on such patents to generate substantial revenues (Black 2004, p. 410). This is probably one reason which has continued to incentivise innovators to further their research further in patentable biomedical technologies. In India, the Computer-Related Inventions (CRIs) Guidelines specifically prohibit computer programmes or hybrid intelligent systems from being patented. Thus, in their attempt to claim patents for AI-based software, inventors over the last years have been made to refrain from focussing directly on the codes/details of the AI software and rather describe the hardware systems (servers/sensors, etc.) so as to get a patent for their AI-based invention.

Accordingly, to find a way around the Indian Law, the inventor would have to portray the AI-software used in his/her technology as merely a tool for aiding the implementation of the particular idea to practice (Abbott 2016, p. 1095). The European Patent Office, likewise, requires AI inventions to be linked to a very specific use. *Al-ternatively*, it requires the inventor to explicitly state the technical effect of the use of a specific computer algorithm for it to be considered enough for patentability. High-lighting the restrictive nature of such laws when it comes to patenting AI machines, the US Supreme Court had already cautioned legal practitioners vis-à-vis employing an all-encompassing use of the exclusionary principle enshrined in §101, "*lest it swallow all of patent law*" (Alice Corp Pty Ltd. 2014, p. 2354). Despite such warnings, many believe that these laws have done just that in the regime of medicine and life sciences (Johnson 2017, p. 437-39).

Surprisingly, in spite of the aforementioned hurdles in getting a patent for an AI invention, the World Intellectual Property Organization recognized an "AI Patent Boom" in recent years, with over 3.4 lakh AI patent applications filed globally since the 1950s, about half of which were filed during the last decade (WIPO 2019, p. 39). Furthermore, as per a report ('CII Report') by the Confederation of Indian Industry (CII) and Tata Consultancy Services (TCS), about 89% of all these patent applications stated ML instead of AI, as the operative technology for the machine being considered for patentability (CII Report 2019, p. 31). The companies leading in the field of AI/ML patents include IBM (8,290 patents), Microsoft (5,930) and Toshiba (5,223) to name a few. Since these companies have anyway managed to capitalize on the lacuna in the Patent laws to get their AI technologies patented, it would now be as apposite a time as ever for policymakers to act upon the issue of ownership surrounding AI technologies.

Some scholars have argued in favour of allowing the inventors of AI-machines themselves to be regarded as the first owner(s) if the machine actually comes up with a new patentable innovation, since it would ensure that the patent is not accorded to a *'sleeping owner'* and the patentee would then be able to assign and licence all of its inventions (Fraser 2016, p. 331). This approach is also expected to tackle the limitations prescribed by $\S3(k)$ of the IPA. Additionally, in an attempt to carve out a middle ground, Migle Laukyte had argued in his paper about the possibility of granting a 'hybrid personhood' or a quasi-legal personality to patentable AI machines which would ascribe them a bundle of rights and duties similar to those granted to natural persons (Khandelwal, 2020). The CII Report had also argued for an overhaul of the current patent laws in India that have become outmoded vis-à-vis the ways in which inventions are being generated in recent years. The Report stated that,

"India needs to bring in new guidelines and policies for the enforcement of intellectual property rights, patents and intellectual property management in an AI world, where machines are often creating and inventing solutions with minimal human intervention." e-ISSN: 2582-6999 | isail.in/journal

Conclusions

This paper was aimed towards highlighting the predicament associated with patenting disruptive technologies under the ecosystem of the current laws governing the subject of 'patent-eligible' subject-matter. Drawing inferences from the examples of jurisdictions such as the US and the EU, it can be stated that the current laws do not favour the grant of patents to AI-based inventions. However, policymakers must draw their attention to the fact that the realm of patent law is not merely a regulatory tool but a mechanism which is known for incentivising innovation, subject to the overarching notion of balancing the principles of merit and justice.

The trend which has followed around the globe vis-à-vis the refusal to grant patents for most disruptive technologies owing to the 'inventor-ownership' dichotomy has unfortunately created several barriers and disincentivized several innovators from undertaking research projects because of the uncertainty associated with the patentability of such an invention. The need of the hour thereby, is to completely overhaul the current regime surrounding the patentability of intelligent systems to ensure that the innovation in the burgeoning ICT regime is not stifled in any sense.

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Interviews

Interview with Thibault Schrepel on Computational Antitrust

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Synopsis. We recently interviewed Dr Thibault Schrepel, Assistant Professor, Utrecht University, Netherlands & Faculty Affiliate at Stanford University's CodeX Center about his project entitled 'Computational Antitrust'. The interview proceeded with a Q&A mode.

The Interview

Abhivardhan: As of now because of the monopolistic behaviors of the big techs they can provide services either at free of cost or at negligible prices, so do you think that customers would want to give that when they have gotten more than just a taste of it?

Dr Schrepel: From my research the data that mainly comes from the work of Eric Barden Johnson from Stanford University, on the basis of which we now know that an average user will require over 17000 dollars a year to forgo search engine or an average user will require more than 3500 dollar to go without digital maps or another example they may actually require to pay over 1000 a year to not use video streaming services such as Netflix and YouTube; so that's something that's very valuable. It's not used by antitrust agencies, and to some degree I understand why it's not because its ok for companies to implement anti-competitive strategies and yet this is what we see in the big tech companies were saying basically look at the numbers I just gave you, which is very valuable and antitrust agencies were saying - yes this is true and yes, some antitrust computing practices should be punished. That I think must be the gap between the two which must be potentially covered up by a little more data. That's what worrying me much that some antitrust agencies seem to go in the direction of not business models neutral anymore and I think that's potentially the Amazon case in Europe; it's not very business model neutral and this is where the business models attack the core of the companies.

So, answering your question, consumers will be willing to let go of those services for the value that I gave you on the other end we must do something about what's anticompetitive.

Abhivardhan: As a follow, up to that question I would like to ask you this. What according to you is the relationship between the antitrust policies and the need to protect trade secrets? Do you think that the current big tech companies shouldn't have the rights to refuse or disclose secret interoperability information? For instance, like the EU did not think Microsoft had this right when its monopoly in 2012 was in question cause its refusal was an abuse of its dominant position and gave the company some unfair competitive advantage.so what do you think of it?

Dr Schrepel: For me there are two separate questions here, the first is the idea of making sure that companies will share some information with the agencies and for that I am actually in favor of giving more power to the competitive agencies. I think what's happening in the UK is actually quite great you may see the CMA requiring the companies and they actually done that not so long ago with google and Bing where they got access to all of their data for one week, and of course this is something where you will need some tools, they actually have to manage over 3 billion data in just a week. But that I think is something that is positive and as far as I know the European Commission may not do the same. So, I am all in favor of this type of disclosure. The other type of disclosure is where one company will have to disclose its data to one of its competitors and there, I understand the logic and I understand the Microsoft case at least in that regards, I can understand how this can potentially some bars years to enter the markets and therefore I see the reason why we may want to impose that a dominant company will actually provide its information to its competitors with some data. Unfortunately, if we do that, we tend sometimes to forget that it will actually favor the competition in the existing market and it will not create an incentive to actually create another market because of the barrier to enter the existing market and so that is referred to as the indirect entries between lots of indirect entries. $\lceil ... \rceil$ I think we should find a way to take that into consideration in antitrust policy. Potentially interoperability and the obligation to provide competitors with data, sure it could work but this is not actually the type of competition that you see within digital markets. So, I think this is not actually the holy grail when it comes to digital competition.

Abhivardhan: There has been lot of evidence that shows that how these teach monopolies have restrictive entry competition. So, what does it have with regards to the development of AI in these sectors? Do you feel it restricts innovation or does it help in ensuring everyone does not get their hands on this kind of technology? So, if that happens could that be a good thing? What's your opinion?

Dr Schrepel: My answer is that it's a feeling or it's what I think but it's really hard to get some hard data on that on that. We see is that the big tech companies they compete

heavily when it comes to AI. If you listen to the tech podcasts you will hear that everyday news story that Google, Amazon, Facebook or Apple are investing to develop in self-driving cars or home assistance or better search engines and so on. So, it seems that at least between those companies AI now is at the very center of the way they compete and we see that ever year they invest more and more money. Most of those company actually spend over 10 billion dollars a year in AI development.

I understand that for smaller companies you need to get access to some data because without the data if you are trying to train a machine learning system its near impossible. However, this is something which is dear to me. I think in the field of competition policy we should actually be looking into the technology and it seems to the best of my understanding that the more it goes the more you can develop a machine learning system without billions of data and we are getting better are actually training. The system with just a few of those of the data which was necessary just a few months or years ago, so if the trend is goes that way it means that start-ups will can compete with the tech giants if I may just give you an example you may know a website called depol.com which is a translation service online and it's a good example in my opinion because we were told a few years ago, that Google Translate will be there basically forever because the more people were using it the more the translation was becoming better and therefore it was impossible to compete and then comes another service which uses a totally different system based on deep learning and if you try it you will see that the results are much better than what Google Translate is providing us with so again the capacity to use fewer data to train system and eventually to compete in my view will be will be key when it comes to competition between big companies and smaller companies as for the competition between the big tech companies it is happening that's the least we can say.

Abhivardhan: [With regards to the] global and plural frameworks of international laws with regards to competition policy so what I would be interested to ask is [this:] Do you think there is a need for a solid framework of international anti-trust laws because what happens is that every country's approach to these monopolies is different should nations be left to their own opinions because like we can say there can be a comparative understanding between India and the US. The US's competition laws are of a completely different scenario while India's competition law earlier was inspired by Europe. Now it more mostly inspired by the US. So, I just gave an example. But what do you think what's your view?

Dr Schrepel: I think yes, we should have some sort of international framework and indeed I can see why this is good for companies to know that the same type of rules will apply all over the world and indeed most for instance in the digital market most of the companies operate all over the world and I think that without coordination between antitrust agencies, regulators and policy makers what you see (and that's very

interesting) is a winner takes all effect not regarding the tech but regarding the regulation (and there is a great book the title is the Brussels effect) and indeed GDPR is a great example we were the first in Europe to come up with some sort of big regulation regarding privacy and then in the us they have basically no choice but to implement similar regulations because otherwise it becomes a nightmare for companies and especially for small companies because of course the big tech - they can afford a bunch of lawyers but if you have a start-ups and you operate in different countries it becomes a nightmare to know which roles you should be applying. So, that's for the coordination. If we believe in competition, I also can understand why we may want competition between competition policies and competition regimes, so in that sense it might be great not to standardize everything but I guess where it will make sense. It's when it comes to using regulation to foster innovation rather than punishing anti-competitive behaviours and in the field of blockchain which is an example that comes to mind because I've been doing quite a few research in the field I think we may want to see different countries coming up with different type of safe harbours or regulatory sandboxes to try to attract companies and develop the ecosystem there and that will be positive but that's again only for granting rights to those companies rather than going after anticompetitive practices which I think should be eventually, you know, pretty much standardized all over the world. That's the dream. Of course, now we know it's not easy but luckily, we do have the OCED the ICN and a few other organizations trying to their best to coordinate between companies and I think they are doing a fantastic job so the more it goes the better.

Abhivardhan: You know – breaking of the big tech, considering the thing that already there are some cases where I would say other forms of disruptive tech companies (which we, you know, categorically in a loose fashion say, big tech) – they have already, you know, in some countries that already been trying to be banned in the case of ByteDance, we already saw in India; the US tried to do it but they failed and then I think in other countries also some incidents have happened. So, do you think it would help in reducing their monopoly and even if that were the case are they too big to break up what do you think?

Dr Schrepel: That's one effect. Another is that the economic effect will be hard to measure and we do have some empirical work. It reminds me of a great book that came out last year at the MIT press by Richard Gilbert and there is a table in the book where it shows that the relationship between the market structure and the level of innovation is very much unclear there are empirical studies going all over the place. So, we have no idea if it's best to have a monopoly, an oligopoly or a perfect competition. What we see is that if there is an oligopoly with a strong competition, it's actually good for innovation but it might be different for some for some of those markets, so we don't

know the social effects. I think we don't know. Potentially, you could argue that if you are to break up some of those companies, they will actually compete in a way which is even more aggressive and for that one good way to attract people's attention would be to publish more fake news and more of the type of content we are trying to eliminate. So, again it's a possibility I'm not saying it will happen but it's definitely a possibility what we know for sure and that is something which is a bit worrying in my opinion is that if you are to break up one of those companies, you will then have let's say five different entities, one with the service that the company can use to make lots of money but the other entities potentially will have only services or products which are being developed and those products or services potentially may be actually very costly and the company may need 10 or 15 years before making any sort of money. So, basically what you do if you impose the breakup and choose which services should go to which entity is that you will basically kill some of those services knowing that they are not tied together with all the services that the company can use to make money and that is worrying should we kill self-driving cars because now it's not ready or should we kill everything that is related to health potentially some people may want to but it seems to me that antitrust agencies are not the one to choose whether or not we should be doing that. So, overall, I'm a skeptic; although being a skeptic I think is very fashionable these days and I try to avoid the fashion. But when it comes to breaking up tech companies, I have no idea and therefore I think we should we doing it, you know, properly right and all that is something that matters. So, if you cannot prove to me how good this will be in my opinion, we should refrain from doing that.

Abhivardhan: People make arguments very interestingly that like for example when a government privatizes some aspects of something, for example, if railways is completely owned by the government, they can privatize some aspects of them, just you know for the sake of it. But the alternative argument for social media, for example, if they give or any other big tech if they wish to, they say that let's not nationalize everything or let's not just break it up - there are some segments or some aspects of some services that you're focusing on <code>[so]</code> let's nationalize them. So, this just came into my mind because I think I've been reading and hearing about it for a long time. So, what do you think of it?

Dr Schrepel: I mean that. But that's also that's the issue that comes after the one we've been discussing which is, okay, you broke up the company, you have five new entities or ten, and some of them will be nationalized. I but just for the sake of research would love to see that and to see government saying well that social media service is now nationalized and it becomes the one you know run by the government. Will people use it? I think to some degree some people would but by the end of the day it comes to which entities do you trust the most and my feeling is that we may tend to overestimate the trust people have in governments and that explain why blockchain is

booming right now because it is anti-system technology to some degree and it's still very much [in] presence there so I would love to see that will people go to Facebook. If Facebook was run by the US government, I will be very curious uh personally. I'm not sure if I trust a government more than one of those companies and so that is why I've been fascinating with blockchain because actually if you get rid of governments or at least governance in the sense that we know which is verticalized and centralized then potentially you recreate trust which is something which sounds very weird if you were looking at that from the 70s you will think well governance actually creates trust because you trust the person in charge of but potentially we have richer point in our society where the way to create trust is to get rid of governance as much as possible so it may explain why people are moving to the field of blockchain but at the same time we see that the adoption rate is very high for some industries such as fintech but not so much outside of financial services so overall very complex issues for the sake of research I would love to see that but I'm not sure if that's the good reason enough why we should actually break up the company so that I will be pleased and have a few papers to write on the subject.

Abhivardhan: That's really interesting point made about the issue of governance and how would you do because the issue of controlling things and how accountability is maintained many issues come up there and so, yes, it's really complex.

Dr Schrepel: If you discuss with some of the people in the blockchain environment, the first thing they will always tell me when I was discussing with them and some of the people, you know, running the behind the bitcoin core or some other blockchain - they were saying to me – yes – but if we do that, if we implement this type of change, we will get control and we do not want control, because control equals liability and we want to avoid that. So, I understand how a bit simplistic it might be but that's the spirit of those communities – no control – because they do not want liability; so, again it comes back to that issue of trust and the issue of who should be in charge if anyone which is not only a question of, you know, finding the right technology but also something more philosophical in a sense.

Abhivardhan: What's different here in the case of and new about Antitrust 3.0? Who are the important stakeholders what are some key new players and what is shaping the way 3.0 is developing what do you think?

Dr Schrepel: So, a bit of a background on that because some people may be asking what is Antitrust 3.0. So, it's in the research paper that I published for the project we've been launching at the Codex Centre at Stanford University entitled Computational Antitrust. I thought – well let me try to come up with a sort of a framework or just

introduction to the fields. And it seems to me (and I understand that this is very simplistic but overall) you could argue that Antitrust 1.0 is the one which was introduced with the Sherman Act so now quite a few years ago. Then we had Antitrust 2.0 which was the trend of making Antitrust more economical and always you've seen that on some; on one hand the Antitrust agencies were following that trend and also the companies where we're making sure that some of their practices will actually get to be to be explained in a way which was more economical. It seems to me that now we have reached a point where Antitrust 3.0 is not yet complete; we see companies using lots of digital services and implementing very complex and dynamic practices and yet some of the antitrust agencies are not fully ready for that because they are not yet fully transformed when it comes to being more digitalized. So, that's the rationale for the project that we've been launching. I'm very grateful for the Codex Centre for the support. We have now 50 agencies working with us, so that's the overall idea. Now to answer your question, I think the stakes are pretty much the same. I mean, at the end of the day, you do have companies: some of them are infringing anti-trust or competition law; and on the other end you do have the antitrust agencies. So, those are the same but it seems to me.

That the more it goes the more everything now is a question of politics and morale and you know putting your view to the field of Anti-trust and to some degree I understand that the way we apply the Sherman act as a political stance, I get that. But it seems to me that we could contribute to the debate by bringing some more data to the field so that we can make our moral choices in a way which is better informed because for now it is some time - two monologues of two companies and agencies or some think tank and others opposing one another without being able to prove anything except by saying that the other one is evil or bad or strawman and so on. So, that's the idea and for that it means that we need to of course have lawyers we need economists. But, that I think now is pretty much okay to work with economists in the field of antitrust but we need also to bring someone else to the dance and that person is a data scientist or computer scientist and this will be complex because I think what we're going to see is the same thing that happens with economists coming to the field of antitrust and then some lawyers couldn't understand because they have never studied econometrics and, you know, the modelling of very complex economic systems and therefore we've seen some people rejecting the economics because they thought that they were actually providing with some argument which was not explainable for them to some degree. I think we we're going to see the same when it comes to data scientists and computer scientists. They're going to bring some expertise to the field and some people probably will actually reject that and yet I think we have no choice but to actually work with data scientists and computer scientists to understand what the companies are doing better the more it goes the more you see that companies implement anticompetitive practices within the actual design and programming of their software's

and platforms and aggregators. So, we need to understand what's happening there; what's the dark pattern, what's an adversarial system and so on. So, that's the idea for the project so overall I would say the same stakeholders but informed by not only lawyers and economies but also data and computer scientists - that's the dream. It will take quite a few years but eventually we will get there.

Abhivardhan: So, there is something known as informational asymmetry which is usually more pronounced between consumers and corporations and can even be fuelled by agencies since it benefits internal bureaucracy and corrupt regular regulatory mechanisms how can basically try and solve that problem better? We can take the example of JP Morgan and the standard oil bribery case with regards to. What do you think?

Dr Schrepel: Again it seems that there are two sub questions: the one of the informational symmetry between consumers and companies can be solved technically but yet we have some empirical work showing that if you give consumers more data it's potentially not super useful since they will not actually take the time you know for reading and understanding the data so to some degree we could discuss it as great implication for what the European Commission is trying to achieve with the GSA the Digital Service Act. But, so that's one and I think overall, yes, more data is great but we have to think about the ways to by which we can actually display the data and change potentially the product and the services. The other type of informational symmetry is the one between the companies there and the agencies and this one I think can be actually solved not entirely of course but in a way which will be more rapid than the first one and there we have two symmetries – the first is the one which is raised by the fact that companies will actually send the information they want to antitrust agencies unless of course there is a down rate but I'm not discussing that here and so in a sense if you do emerge control for instance the companies will send the data they want and if you've been working in the law firm you know that it's not actually super scientific what's happening there. They have to estimate the market shares of their competitors and they have no idea. So, they will do in a way which, I guess, could be improved if we could actually automatize the way by which we transmit the data to agencies. So, that's one and the other one is the fact that once the data is sent to the agency, the agency will actually analyse the data and exploit the data, and, potentially will not actually send back the data to the companies, which means that the company then has no idea why some remedies should be taken or some commitments of course they discuss with the agency but it's hard sometimes to know what exactly is required from you is it better to just agree to let go of two businesses or a big chunk of your activity again talking in the context of merger control and there it seems to me that once again we could use some of the computational antitrust or computational tools to improve

that um and especially if we merge that with blockchain a blockchain is a database that is secured and that you could trust. So, if one company was to put some information on a blockchain and then try to get rid of some information before sending access to the agency that will be shown on the blockchain and the agency may then ask the question – why did you get rid of this type of information? I'm sure this would be valuable so that's one. We could also think that we could use smart contracts to implement remedies and commitments. So, overall, I think the tools may help to create a trusted environment and to automatize some of the information going back and forth from the company to the agency again. I'm not saying this will be perfect but especially in the field of merger control, I think it's a great example because some of the tools are ready for agencies and companies to use and potentially to improve the way antitrust agency function and we know that they complain they all pretty much all the agencies all over the world today. Merger control is taking a big chunk of their activities and they don't have the resources to go after anti-competitive practices the OECD actually came up with some numbers: 90% of all the cases come from reactive methods namely one company applying for leniency and only 10% comes from proactive methods which could be market screening and so on. So, if merger control was representing a bit less of the activities of those agencies potentially, they could actually redirect some of the resources to anti-competitive practices and that I think this will be for the better of the common good. So, that's the long answer to your great question.

Abhivardhan: So, let's get on transparency and the issue of privacy. How do you balance the privacy of data with transparency? So, we can say that of course not all the data used and generated by computational tools should be publicly available but perhaps processes and mechanisms should be. So, please shed some light on the kind of data which needs to be protected and what should be what should be available publicly and for discovery phases of cases. What do you think?

Dr Schrepel: So, let me take an example. Let us say that an entire agency will use machine learning to screen the market and to detect anti-competitive patterns and to potentially come up with a much better understanding of what is a company's strategy and therefore what might be the strategy in the coming days or weeks or months. This will be very valuable data for the agency and yet if the agency was to publish that data, this could be information about future behaviour's which is the foundation on top of which all the companies create cartels or potentially could use that information to try to disrupt the company being investigated. So, it seems to me that this type of data we do not want to be on the market available to anyone on the other end I think it is important that the company understands what are the tools being used by the competition agencies and what are the results and it's important for the company to understand the process of using the tools and reaching a certain result if that is not the case.
We could argue that due process will not be fully enforced and this will be a shame because the company must be able to explain why the antitrust agency analysis is incomplete or is factually wrong and so on. That's why I explained in that in that paper that you are referring to that the methods and the process should be explained and especially when it comes to anti-competitive investigations. However, we do not necessarily want all the information to be put out there for the sake of transparency because transparency may mean cartel in some examples, for instance. Of course, that brings us back to the issue of black boxes - can we understand the way an algorithm or a machine learning and deep learning algorithm function and I know this is a complex issue. My guess is that we'll be discussing that issue for a long time but there is one thing that I want to say is that a human brain is very much a black box, which is for now, very much difficult to enter even though we are making some progress in the field of neuropsychology and yet it's hard to understand why people make decisions when it comes to algorithm. I'm not saying this will be easy but we should remember that we oversee designing algorithm and even though they may be using unsupervised learning techniques and improve and learn from their mistake. If they do that it is because we gave them the right to do that; so, potentially we could retroactively try to go back and understand what has been the reasoning of the algorithm and provide the companies with the resonance so they could actually provide a fair defence to what is being argued by the agency.

Abhivardhan: With regards to the idea of East Coast Code and the West Coast Code Cooperation brought up in the conclusion of your article on CA, there's also deliberation as to how decentralization produces efficiency within blockchain systems which is what you argued when discussing blockchain as antitrust. Can you please discuss this further in the context of CA and how computation can facilitate efficiency in these interactions?

Dr Schrepel: So again, I'm going to try to tie everything in a way that is understandable here. First, what is the West Coast Code and the East Coast Code? So, I took that from the great and fascinating work of Lawrence Lessig from Harvard University. So he's basically explaining in his book Code 2.0 that the one from the East Coast is the one that is coming from US Congress and the one from the West Coast is the one of the Silicon Valley (the code inside our are computers and devices) and so, what you see is that the two has been opposing one another for quite some time and in fact law and technology, generally speaking, have been opposing one another. I've done some research and you can go back several thousand years ago, and see that already the law was trying to go after the technology whatever it was at the time. So, this is nothing new but to some degree I think you could argue that the confrontation between the two is becoming stronger and stronger and to understand why if one wants to escape the other. I understand why we do need some sort of confrontation to make sure that the rule of law applies or that innovation can actually thrive. That being said I think we've probably reached the end when it comes to certain type of law and certain technology and so, in our paper we argue that when it comes to antitrust and to blockchain since they have the same objective which is to decentralize economic opportunities, they should find a way to cooperate and the reason is that they can complement one another in a way, which is nice. You could argue that antitrust agencies unfortunately maybe but may not be able to apply antitrust to all the practices. [...] We have some empirical work estimating that we detect between 10 and 30 percent of all the anticompetitive practices all over the world which means that potentially up to 90 percent of illegal behaviours are not being punished. If you can use technology in a way to shape transaction and to get rid of most of those anti-competitive behaviours, that's great. And in the case of blockchain, since, you have no middleman or at least you could design it in a certain way to eliminate some of the intermediaries, potentially, you can also eliminate all the practices that goes with intermediaries. So, in that sense blockchain complements antitrust and when it comes to antitrust, it could also very much complement blockchain. We have a few cases now going on in the US and all over the world in which you see that a blockchain ecosystem sometime may see some anticompetitive behaviours which are not solvable just by tweaking the code of blockchain a little bit. So, there you need the rule of law and that's why we argued in that paper that the two should collaborate and updated the very final version of the paper this morning on SSRN, so, you may then access the final version. Overall, this is how we see a cooperation between technology and the law and this is also pretty much the philosophy for the computational antitrust project which is trying to bring the law and technology together. We've been discussing a lot in the field of antitrust how big tech companies especially use technology to infringe antitrust which is true, but the other part of the story is that antitrust agencies could use some pretty much of the same technologies to improve the way they process and therefore can fight fire with fire and in that sense, it's a collaboration between tech and the law and that's what we are trying to activate in a very active way.

Abhivardhan: Considering the antitrust hearings and the attitudes adopted by big tech companies like Amazon in 2020, how do you think CA could have benefited a policy makers and regulators during the COVID19 pandemic? What's your view?

Dr Schrepel: I think indeed Computational Antitrust would have been helpful to agencies and to some degree to companies. Of course, we do have now a few investigations and the more data you have, the more you can understand the practices and the better it is where it's especially relevant. Again, in the field of merger control, we've seen that some agencies have been saying at the very beginning of the pandemic: "forget merger

control, forget getting an approval; we're going to postpone everything". Recently, the FTC in the US said well the fast track procedures are we going to get rid of those because we need more time and to some degree you understand why right and especially in the field of merger control agencies have only a certain time a certain period by which they can study all the data and they have no choice but to come up with the decision which is a bit different in the context of anti-competitive practices since they can decide to delete go with the case and they can take a few years if they if they need to which also raises some issue but in the field of merger control this is not the case they have 90 days' work days and they have to take a decision and their computational antitrust could have helped the antitrust agencies by speeding up the process a little bit. We now know that some agencies have to actually study and analyse over two billion data to actually come up with the decision to allow a merger or not and here. I'm confident that using some computational tools, it could be blockchain, it could be machine learning, it could be natural language understanding and processing, to try to understand what's the rationality behind the merger. The agencies could actually get to take a decision in a way which is more informed and also faster. That's why I'm absolutely delighted that we have more than 50 agencies now part of the project and agreeing to discuss those issues and potentially uh to implement some of those tools a few of those agencies and on top of my mind I can think of the US, the Netherlands, France and a few others are actually implementing and of course the UK. I think we will have no choice but to implement the tools. That being said I'm not arguing that we should *\[implement]* all. *\[What]* we should do is to develop the tools even in a cooperation between competition lawyers and computer scientists and then this will be the end of the story. I understand it will have some heavy institutional implications for the agencies and we should also discuss how to implement the tools within the agencies. What do you need as an agency is to actually be able to function and to operate those tools, which means getting the information, getting the expertise to use the tools but also making sure that computer and data scientists are part of the entire investigation process. So, all of those institutional questions eventually should be dealt with but of course this will be when some of those tools will be implemented in a way which is even more active than it is today. So, overall the answer is yes those tools can help they cannot solve all the antitrust issues far from that but they can actually inform the field in a way which will be nice if we want and try and this is a bit of a call right now to try not to eliminate but to mitigate a little bit our opposition between fractions of the antitrust communities because this is not working and we can actually reach

some consensus in some places at least when it comes to the facts and so that's the idea behind the project and you could actually access all of our work if you go to computationalantitrust.com, we will be publishing papers every month.

Interview with Prateek Sibal on AI technologies in Africa

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Synopsis. We recently interviewed Mr Pratik Sibal, Sciences Po and UNESCO. The interview proceeded with a Q&A mode.

The Interview

Varun: Good evening, Prateek, and welcome. Before I get on with the meat of the discussion. I'd like to ask you about the work that you're involved in at UNESCO, as well as at Sciences Po, where you work as a lecturer. Could you briefly tell us a little bit about the work that you're involved in?

Prateek: Right, so the Sciences Po part is quick. I teach a course on digital government. Per se, it's a course on AADHAR and it's a case study-based module. I don't like to call myself a teacher, but more of a facilitator and so that's about Sciences Po, which is a university in Paris. At UNESCO, the range of activities is kind of wide: products for instance on artificial intelligence and knowledge societies from rights, openness, access and multi-stakeholder governance perspective. I've also recently co-authored another report which is on artificial intelligence needs in Africa. We did a survey over the course of 2020, and of governments in Africa, and now we have just published the findings last month. Other than that, there's also a lot of work regarding advocacy around capacity building, for instance, for law schools and the legal community. We're developing an online training on AI and the rule of law and a host of other activities, which relate to human rights. A bit of the work also revolves around standard setting on the ethics of AI. So, it's a full house and a lot of people work on different things and I play a small role there.

Varun: Thank you, Pratik, for that introduction! Moving on with the discussion, most recently your work at UNESCO has been around the subject of AI needs, i.e., the survey assessment regarding AI in Africa. Could you shed some light on what exactly are

the needs, if any, of AI in developing and underdeveloped states and what may be perceived, according to you, as the potential benefits and risks of AI technology in this context?

Prateek: Right, so let me just first dive into why we did the survey. The reason why we did the survey was that we were looking at policies emerging across different countries and we recognized that there was a gap in information which was coming out of Africa. So, as facilitators of global conversations and dialogues, we wanted to understand what was happening in Africa, whether there can be some lessons learned, what are the challenges and what kind of support can international organizations provide to governments in Africa. So, we set out on this survey, which was survey of governments in Africa, and this basically involved ministries, of ICTs, of communication, of economics and finance and so on and so forth. Some of the key issues that emerge from the survey, as one may guess, is economic growth and unemployment. Africa is a very young continent, there is a large population of young people below the age of 35 and unemployment is a big issue and a lot of governments are concerned about that. They wanted that to be the priority which they need support to address. Other than that, of course, there were issues around personal data protection around updating education systems, skills, training, research and development, around ethical implications of AI. Of course, one issue that I'd also like to highlight is around gender. There were a lot of countries which expressed concerns about issues related to gender bias and discrimination that we've seen in artificial intelligence. I think that's one major concern as well.

Varun: Thank you so much for that answer, Prateek! On a related note, in the last answer, you mentioned communication and cooperation are pivotal for the work that you're doing and with respect to UNESCO as well. It's also critical to ensure that AI develops as a force for the good of society. Do you agree that communication and cooperation are critical for this and how do you interpret the nexus between good global governance and international cooperation with regard to this context?

Prateek: Right, I think that's a very important question which hits directly at the purpose of international organizations. Let's consider that we do recognize that we live in a globalized world where everything is interconnected. If a product is developed in the United States, it is going to be used also in India and elsewhere across the world. If a technology is embedded in it, it will be accessible to others as well. So, if we have different laws or different ways of governing the same thing, and I believe there are always some differences, but if the differences are too wide, then it just impedes the process of trade or transfer of knowledge across the world, which is something which we don't want. So, per se, I think AI presents not only an opportunity but a necessity

for the world and countries across the world to cooperate and that's where the idea of AI principles comes in. UNESCO is developing artificial intelligence in the case of AI principles. There have so many other regional organizations, national governments who have developed their own principles. Once they have developed some kind of consensus at the national level or the regional level, it goes up to the international level. There is some exchange of thought on whether this works or not, negotiations, and then the international community agrees on a certain set of principles, for instance, AI to be transparent, AI to be explainable, AI to be open, and another one would be AI responsibility, etc. So, once people agree, then there can be a downstream development of products; there can be a downstream development of laws once people have some principled agreement of where they are going and that's where the international process is at the moment. Hopefully, they will agree on principles and there can be some kind of, what we call harmonization.

Varun: Thank you for that, Prateek! On a related note, however, you talked about the need for governments to find a consensus between themselves before moving on to the international stage. From your perspective, what do you think are the legal and regulatory challenges posed to governments or domestic governments rather, let's take the Biden-Harris government for example, or even the Indian Modi government? What do you think are the footholds that they need to ensure?

Prateek: I think first we need to recognize that each government in each country has its own context and the public policy process is going to respond to their policy objectives and priorities. Of course, it is dependent on what you can do potentially. You may not have the possibility to do in India what you could do in France, whether it is budgetary constraints or it is human resource constraints or it is totally different in terms of need. To point out, India is actually doing great in terms of this idea of the AI stack which they floated. In our report, we talked about the issue of access and one of the aspects of ground access is, of course, access to hardware in the sense of computing power, and also access to knowledge and algorithms. So, with this concept of the AI stack, they make this more easily available, thereby reducing the entry barriers for players who do not have access to these resources to actually also become a part of the AI economy, or leverage it for whatever productivity gains or new products they want to develop. So, I think that is one approach which they have taken to support with certain kind of, what we can call, digital public goods and, and then people will build on that infrastructure. This was also the case we saw in Aadhaar and now we have a host of services built around Aadhaar and it's all anchored within this broader concept of government as a platform. So that's just one practical way in which one country is dealing with it. Of course in terms of regulation, there are different concerns. I don't think we are at the point where there is an agreement on how we regulate. There are

certain legislations which have been passed in some countries, for instance, on bias, on privacy, on facial recognition systems, and so on and so forth, but still the field around regulation is quite open and it should be till the point we have sufficiently understood what is it that we want to regulate. It is also my view that first you need to be very clear about what you want to regulate and see if people on their own without any regulation can come around to an optimal solution. If that does not happen if there is a failure in the market, then you come and intervene and say okay, we are leading to under-delivery of public goods or it is leading to market failure because of asymmetric information, so we need to come and regulate; or it is leading to concentration of power with a few companies so we need to regulate. In that process, one must also do some forms of regulatory impact assessment. So when I say about regulation, it's not a light thing, it needs impact assessments. To give you just a small example, the GDPR in Europe has led to improvements in transparency and privacy protection but to a certain extent, it has led to some kind of anti-trust issues with the major players getting more control. For instance, they say Google with its ad platform has captured a bigger share of the market just because they had a lot better systems versus a smaller firm offering similar advertisement services. One needs to think about all these issues when dealing with regulation. This is going to be very different from Namibia to Ghana to India to France to Finland. All we can do is agree on certain principles, agree on certain common standards which allow us to interoperate between different countries, but ultimately, we need to focus on what works for our country and our markets best.

Varun: Perfect, thank you so much for that, Prateek! One of the major questions I wanted to ask in this interview, revolves around human rights. From a sociological perspective, there are still lots of hurdles for AI inclusivity in Africa. Some of these challenges may be digital divide simply due to the poor economy of Africa or due to lack of regional languages in software written for Africans. There's also been cases of misidentification of dark faces in facial recognition technologies, illiteracy, sporadic accessibility, all these sorts of issues still persist. With regard to this, how can we envisage a bright future for AI in Africa from a grassroots level?

Prateek: In moderation, which is kind of the active live debate in India right now. It's been going on since a very long time. We had this example of the Napalm Girl in Vietnam. During the war, there was a photograph of a naked girl who was escaping or who was on the street and running away, and Facebook kind of removed that image but that image has some historical value so the whole process of content moderation has at the first step algorithms which decide what is permitted or not and then in in most cases, I believe, should have human oversight and then it leads to some form of decision, whether it should be shown or not shown and this has great implications for freedom of expression. I gave you just one example but in situations of war for instance

a lot of people are documenting war crimes and uploading those on YouTube and this is actually the only source which will remain after for people to verify actually what happened. If YouTube takes down those videos, that evidence is gone. So, one must think about all these aspects when we talk about human rights. This is freedom of expression and, of course there is right to privacy which can be affected because there can be anonymization. There is a constant stream of data which is being collected about me which is being shared with third parties which can put two three four different datasets together and can figure out basically everything about me. Just as an example, if you go to the Google ad preferences page, they will have a complete detailed profile of me - this person is within the age group of 25 to 30, is a male, is living in India or is living in France, and so there's all kinds of granular information. How is that information protected because I have a right to privacy? So these are some of the implications of AI on human rights, but there are more of course, on discrimination, also on decent work, etc.

Interview with Aarthi S Anand on AI and Fintech

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Synopsis. We recently interviewed Ms Aarthi S Anand, Rhodes Scholar & a Fintech Attorney at Perkins Coie LLP. The interview proceeded with a Q&A mode.

The Interview

Mridutpal: With the rolling in of advances in the field of Fintech infrastructure in the year 2021 how will trade automation and performance will be affected?

Aarthi: It is very interesting for you to bring this up, I have been following up your podcast for a long time. With regard to the advances in 2021 where we automation and Trade Performance Analytics, I think we are coming back off a really interesting year where in 2020 in the pandemic everybody going into work from home, you saw how AI began to impact trade. The consumers are no longer calling up or relying on brokers to arrange trade for them instead they are engaging in trade by accessing relevant websites.

They are making the decisions, what to sell and what to buy which has two consequences, while on the one side you see enormous progress in Bitcoins and cryptocurrency trade coming to life in an unprecedented manner which was not the case in pre tech markets. Further, there is much more volatility in the market like the average individual responding to the Biden Administration coming in, the fluctuations in the run up to the elections as a challenge and an opportunity for consumers to come in and play a role.

Mridutpal: What exactly is Sustainable wealth and will it be data driven in 2021 and beyond?

Aarthi: I tend to do sustainable wealth in two portions, the one portion is very value driven and long-term investment decisions which match up the values of the individual. The second portion of it is the ability to invest in green energy hence making it a twofold decision which is increasingly relevant. As the average consumer determines which industries one wishes to invest in. The enormous social upheavals such as for

instance the #MeToo movement in which consumers do not wish to be associated with those companies with certain behaviour and wish to have gender non parity. Women investors are now coming in and wish to invest in those companies which uphold values.

What is different about AI and Fintech is when you ask me about whether Sustainable wealth is data driven is that it has made the average consumer at the click of a button to be able to determine for themselves what are the various factors for them to decide. It will push wealth advisers who used to give generic advice but now the consumer can say that certain companies do not align with my values, that's precisely where sustainable wealth can be a game changer in the next few years. It's about the culture itself as the consumers are forcing companies to engage in good behaviour as they now understand that if they are not taking steps to address race, gender parity, sexual harassment, climate change, the consumers won't remain with them hence it is rapidly changing how we viewed CSR which was so far an additional advertising mechanism but now consumers want to see if it is more real. I wish to see the actual output and results you are driving.

Mridutpal: Do you concur with the popular notion that customization and enhanced data tools produce the requirements for wealth advisers' skill set?

Aarthi: It is again two-fold. Data analytics was traditionally that has always existed when the broker was feeding in information and telling you which company is performing well by ten years and twenty years. The consumer is asking what more can you provide me with. The two trends which are there is a sort of pressure on wealth advisers of course which is something that Wall Street is increasingly talking about as to how advisers can utilize platforms and trade individually. The second part is that it is going to force the wealth advisers to be more intelligent about their advice as the consumers that are coming to them, come with the measured performance of the company and what value add you can provide that justifies your brokerage and me choosing the portfolio through you. It can eliminate wealth advisors and it brings me back to the historical context when the Industrial Revolution happened wondering whether machines are going to replace human beings, or is the labor force going to go away. Similarly, when AI kicked in on the autonomous vehicles that came in we wondered whether cars and drivers are going to be the thing of the past. It might not make the wealth advisers redundant but they will be forced to give us intelligent advice to consumers. If we look at the market fluctuations which took place when the COVID first hit, the truth was because the market value which went into the panic mode and performance of Wall Street Banks which did really well in that period, at a time when individuals took a hit as every time the individuals traded, the investment banks made tremendous money. The transition will shift the power balance perhaps, it will take time but it will be the way of the future.

Mridutpal: The uneasiness of the brokers will take a blow.

Aarthi: You've actually hit on the mark as it has been one of the driving forces. I have moved back into the private practice as clients come up and ask for advice, further brokers and investment bankers turn up to lawyers to provide them with a different set of skills in a legal manner. For enhanced data tools, it is about regulation. For example, a Bank which has access to one's credit card information, auto loans, mortgage and enormous data at its tips. The question is whether the banks will allow data to flow in the pipes. The concern then is from the Government Regulatory standpoint, when the government goes after the Big Tech giants worried about the consumers and individual rights. Technology will push new data tools, government regulations to safeguard consumer interests and the impetus coming in from the consumers to understand better the advice being given to them. It is technology that ensured that we did not push into another recession at a time when an average person on the street lost their jobs and livelihood.

Mridutpal: What according to you are the biggest hurdles for the adoption of Fintech and AI in the industry?

Aarthi: I wish to break down this question into two parts. When I think of fintech I think of it as two worlds. One is the banks that are bringing technology into the play and the second is the fintech companies which are the startups which are seen as bitcoin, cryptocurrency etc, making it two markets for them. You see heavy deployment of AI in bitcoin and cryptocurrency where an average consumer is seeing AI tools at the backend to give them responses that help them make investment decisions. The second part is how our banks are using Fintech in AI, where it is becoming nebulous because banks are beginning to use AI. The question is how much are the governments aware of it. The government for instance has gone after the tech companies but how will they examine the data held by these banks. I work at a law firm called Perkins Curie which has over 100 lawyers who specialize in AI. As the Biden Administration is pushing for Climate Change, carbon markets are getting very active and AI is deployed very heavily there, for example one of the reasons why EI ETS markets failed last time was because of cyber security.

Now the question is can AI be deployed in these areas and our ability to succeed the markets we failed at earlier which can change the story in the coming year. Governments are forced to pull up socks to understand what technology is before they decide to regulate it and how to go about it. Ahead of the curve as technology is, everyone is trying to catch up and every industry that has rich data sources. For instance, Carch cars have laptops in cars which connect manufacturers on the kind of search one does. This raises some real hard questions for the government and the globalization of

technology. Cities like London, New York and Singapore have created Sand Boxes where newer Fin tech companies can come in and test drive technologies in a way that the Government has some oversight and basic understanding of some sense of the implications. At the end whose data is retained and combined with it what does it tell about the consumers.

Mridutpal: What impact would it have on the Financial Markets in 2021?

Aarthi: This is like asking me to look at tea leaves. I truly think two fold again. To look at 2020, the two issues that cropped up, we had a global pandemic so initially it was thought that we are heading towards recession and the world faced a grave health care challenge. The pharma companies rose up and it is interesting to note how technology partnered with these companies in order for the development of vaccines for the distribution channels across the world.

For Fintech, folks are going to look at pharma companies to invest in and secondly the lessons we learnt from the COVID year that markets went into a low tide and resurgents of consumers with the market coming back again. In the next year, the continuation of the trend of consumers investing on their own and the emphasis on the kind of industries the consumers will be interested in like carbon trading companies, bitcoins and cryptocurrencies as these are the big trends coming up.

Mridutpal: How far the general public be accepting of the Digital Finances Coaches or advisors?

Aarthi: Now you are putting me in a really tight spot. To be candid that is a fairly and heavily regulated industry be it in New York, Bombay or New York where governments have been super protective of consumers by saying we want you to go through registered broker dealers. With regard to digital coaches and advisors, the question is what do you mean by financial coaches, are you saying the brokers will provide advice through digital mediums? Individuals who are mushrooming on their own to be a little more cautious as there is a reason why it is so regulated. Coaches are a great mechanism then the average consumer won't just have the chance to have three or four advisers who can get advice from coaches across the world. Are investments going to make extensive inroads in the financial markets of other countries by way of which an average shareholder sitting in India can be investing in the United States, by investing in bitcoins and cryptocurrency and vice versa. It leads to the opening up of markets which were close.

Mridutpal: What if the Digital Financing were mere chat bots and indeed not real people?

Aarthi: You have identified the issue that is cropping up on all our websites. The chat bots raise some interesting questions as it is not a human being. If a broker provides you advice without the safeguards, you knew whom you could go after legally. The coder who programmed it or the website who provided the service or whom? Same as the autonomous cars, exactly. A chat bot could very easily give me data on the last five year's and ten year performance. I would not however view the chat boats as a solution to Data Analysis.

Mridutpal: How in your opinion will AI affect transactions, search and visualizations.

Aarthi: That's an area where I see AI making a huge impact already. It is one of those areas with a low hanging fruit for AI, until now literally on Transactions, search and visualizations if looking back at 15 years back, I would have had a wealth adviser to dumb it down for me. I would be relying on them to tell me which companies I make investments in for my 5-year 10-year plan. AI can be super useful in these sectors by taking care of multiple factors and able to insert one or two factors maybe more by plugging in 20 to 30 data inputs where companies were letting go off employees and mortgages were impacted. So the consumer can be aware not to invest in real estate in let's say Wisconsin. That's where AI can be so useful as it takes hundreds of Data Units and put in to give a more logical story in ways that human beings would have found a lot harder at the regional, national and global level. AI can club in so many specific individual factors to come up with a portfolio that is more tailor made and appropriate for me. It is an answer for me. These areas currently have the maximum impact of AI.

Mridutpal: Do you think Client Risk profiles will be more effectively framed with the advent and implementation of AI in Fintech?

Aarthi: Absolutely. What I love about AI is that it makes us requestion about our assumptions on Data. For example, I did a study a few years ago where I started with a presumption where I pieced a critical technology industry presumption that IP is critical to the IT industry, and once we started collecting information on industrial growth like Silicon Valleys, Boston, India etc. In India have IPR laws changed and have fueled the IT industry. We realized that the data on the other hand did not support our premise, when I spoke to CEOs, I said these folks are giving away provisions at the negotiating table. The fundamental presumption on the neo classical economics that if we increase property rights it will drive technology that did not hold good in the tech industry which makes AI super interesting.

As a client I could tell my advisor that my Risk capita and what I want and what I don't want. What I might not articulate is my biases that come in believing that I am a moderate risk taker, I might be a lower or a higher risk taker regardless hence having

access to portfolio is getting better advice. When the investment advisor, in case my portfolio is in debts, it can be increased in the equity markets and a more international advice can decrease risks this is where AI provides information. It helps you make sense of the data which is accurate.

Mridutpal: How do you think the lives of brokers from Security firms will be affected with the advent and implementation of AI and Fintech?

Aarthi: We have already seen it hugely affected last year. To be candid, when I speak to my friends in different countries who are advisors and brokers in other countries, you can virtually see them and say there are folks investing in M1 and they are investing through Robinhood and through the financial markets that are available online. Earlier they average consumer would talk to the wealth adviser which is guilty of taking securities. Now the average consumer says I want great returns. AI has already changed the lives of brokers and security firms, it also keeps them on. The consumer pushes them back to open up sectors for the client. Even as a lawyer, brokers are forced to respond to the questions posed by the clients and be clear about the recommendations to the client and in a manner which does not lead to bumping up against the financial regulations. AI puts the consumer in the driver's seat making a shift in the way markets operate.

Mridutpal: What is the pathway that India shall adopt to ensure that India does not lag behind in the Fintech industry?

Aarthi: It is such a great question. If I think of one country that has benefited the most from the technology industry and revolution that is India. When I was growing up in India, technology was just beginning in India to where India is fueling the tech industry is globally. Technology 2.0 for India will be from BPO to ITO models, India is super well positioned to take advantage of the fintech industry as India cracked the technology (Infosys which backed tech giants formed in the USA). While India is a little bit slower into getting into the startup phase and the fintech space. It is a huge opportunity for both Big tech companies and Startups to flourish. The pathway as you asked, if we look at the financial experiment that demonetization was, we could see the Government encourage the Bitcoin and cryptocurrency combined with the strength of India in the field of technology in an area which India is a tad lacking but we can catch up easily as we have the fundamental building blocks to see India step up, I would love to see a Gemini fund come from India. Here's to hoping that India surpasses China in the race.

Moot Testimonials

Interview of the Winners of the 2nd Bennett National Moot Court Competition, 2020

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Synopsis. Namrita Melwin, Karthika Nair & Shwetha Surana, representing Christ (Deemed to be) University, Bangalore, as the winners of the 2nd Bennett National Moot Court Competition, 2020 were interviewed in a Q&A format.

The Testimonials

Darshna: Could you tell us a bit about your past mooting experience?

Karthika: All of us started our moot court journey, separately. Christ has an internal moot court ranking system, so all of us started our moot court journey from those rounds. And, in our 3rd year, Namitha and I got our experience of external moot. And, in our 4th year, we formed our present team for participating in this moot court competition.

Namitha: I started mooting form my first year and I really liked it. My first and second year were mostly learning experiences and from my third year, I begun with participating in external moot court competitions. We formed this team in our 4th year and presently we are preparing for our next moot.

Shwetha: Most students participate in internal rounds and my first external experience was this moot court competition.

Darshna: What are the kinds of moot court competitions that you have participated in before?

Namitha: Previously, I have participated in International law moots, Constitutional law moots and this particular moot was my first law and technology moot court competition.

Karthika: I have mostly done Constitutional and Criminal law moots.

Shwetha: I, too have a Constitution law moot court, background.

Darshna: Since all three of you come from a constitutional law background, what was the reason for picking a moot with an intersection of law and technology?

Shwetha: We were always open to exploring different kind of moot courts and never really had a particular area. But, in our fourth year we realized that we were doing too much of Constitutional law and it was getting repetitive in nature. Therefore, we decided to pick this particular moot. And, this moot turned out to be really interesting and gave us a really unique experience.

Namitha: I agree with Shwetha. This moot court problem was really complicated as it had involvement of four different areas of Law. It had Constitutional Law, Artificial Intelligence and ethics, Product Liability, Criminal Procedure Code and Motor Vehicles Act. And, when we read the problem, all of these areas were extremely tangled. And, researching on all of this through various resources also gave us a lot of new insight in this particular arena and we took this competition as a big learning experience.

Karthika: I feel we got really lucky with this moot court competition because it's the college that allocates us the competition after receiving our application for it. So, our team usually goes through the moot court problem before applying for it and we found this particular problem to be really intriguing with its mention of smart cities as compared to other moot court problems.

Darshna: What was your approach for cracking this extremely interesting moot court problem?

Namitha: I believe that every team has a different strategy for approaching a moot court problem. Some prefer sitting together and cracking the problem as a team but since we had a limited time frame, we adopted the strategy of splitting the issues with each team member picking a particular issue and researching independently. And, after completing our research, we used to sit as a team, discuss everything and help each other with whatever trouble we were having with our moot issues.

Shwetha: This moot problem involved lot of areas of law so since the beginning we knew that if we decide to do all of it together, it might mess up our research, therefore we decided to take up all the issues separately, work independently on them and then reconnect later.

Karthika: Adding to Shwetha's point, we thought giving each other time to independently understand the problem was important since it had multiple areas of law.

Darshna: Could any one of you explain the problem in brief for the benefit of our readers? Since the problem had Artificial Intelligence as its major focus area, where did you begin your research for this particular area?

Shwetha: The problem had 4 issues, first two were about jurisdiction and the other two involved AI. We knew that we were short on time so we planned our research, accordingly. Our college has one of the best libraries so we started with the library books, spoke to our teachers and they guided us to more people who worked in this area.

Namitha: AI and law is a grey area and most research papers do not have conclusive answers to these grey areas. So, what we did was to refer to a lot of available literature on these topics and then form our own understanding and opinion about it.

Darshna: That's a brilliant thought process, Namitha because for one, moots are meant to test you on your interpretation of problems that occur in the society and the approach that you take for resolving them.

Karthika: It was a coincidence that we got allotted this moot because last year itself I took a course on Law & technology, conducted by Internet Freedom Society so that was really helpful for me in understanding the nuances of AI and Product Liability which I could implement in this moot.

Darshna: How was physical experience of attending the moot?

Namitha: It was a beautiful experience. The moot was extremely well organized and punctual about conducting all the rounds. The moot court committee was really welcoming and open to listening to all our concerns.

Darshna: And, how was your experience with the judges of the moot?

Karthika: The judges were amazing beginning from the preliminary rounds. We faced grilling from our round one and for every two sentences that our speakers were speaking; they were being asked a lot of questions. But, they were keen on listening to what we had to say on those questions and that gave us the confidence to answer those questions, properly. Every judge we encountered had great points to put forward.

Shwetha: The judges were very well briefed and learned. They came down to our level for understanding our points. They were putting forward questions based on how the teams were arguing. One of the most challenging questions that I faced was in relation to product liability regulatory Act and the judges wanted me to connect it with one of the lists under the Indian Constitution. They put forward this particular question to all the teams in the competition and all the teams got it wrong. The question was tricky for me too because this Act was a fictional Act and it became a tad difficult to do so and gave us few sleepless nights before the finals.

Shwetha: One of the questions that I remember is that one of the judges asked us to not use landmark judgments for supporting our arguments and at the same time support our arguments and that threw me off a bit. And, we were on the side which had a lot of judgments that supported us so throwing them off was really difficult but that made us think of other ways to argue on the spot.

Darshna: As you progressed in the competition, do you recall getting feedback on your arguments and the way you approached the problem especially in relation to AI?

Karthika: With respect to AI particularly, no feedback was given to us in particular but we did have an interesting conservation with the drafter of this problem, Sapna Sundaram. We spoke about the upcoming smart cities and the problems that they'll face.

Namitha: The drafter had a very well-meaning intention behind drafting this problem as she wanted to make everyone aware about the risks of involving AI into state governance. Also, she thought there are few women in AI and technology in India when it comes to top level management so her other intention was also to generate an interest amongst females on the same.

Darshna: How was your experience with other teams? Did you ever feel that the argument/approach put forward by the opposite team was something that even you could have used or thought about while arguing?

Namitha: We felt like this in every round. Because, I think once you start mooting you realize that you should not stop your research till the day that moot is over for you. Specially Campus Law Delhi and GNLU, these two teams in particular were really well prepared and we took down a lot of notes from them while arguing against them, in the final and quarter finals, respectively.

Shwetha: All the teams were great and even the judges because the latter had really good understanding of the problem and the laws. The same was reflected when they were asking us questions and for teams who weren't performing well, these questions helped them to gain a better understanding of the problem, so the judges were lenient but at the same time asked right and hard questions. The other teams were good in the sense that they were friendly but we could also learn a lot of them and they helped us in preparing better for our Finals.

Darshna: Do you recall any of the brilliant arguments put forward by the other teams? **Shwetha**: I do not recall the arguments particularly but I do remember this one team which had changed the allocation of their issues so that they could save team. Usually the first speaker deals with the first two issues and second speaker deals with the other two but this team had switched it. One of main issues while mooting is that you are not able to speak all of what you have prepared in a timely fashion. Your memorial can be the best memorial but it wouldn't matter if you are not able to put forward what you have written in your memorial so this team had dealt with this smartly by answering all the questions of the judges as well as covering what they had to say, in a quick format by not asking for extra time. So, this was something that we definitely learnt from them.

Namitha: Also, we had arguments on separation of powers, corporate federalism, excessive powers etc. but this team had a comeback for all of them so we also had to work and get back on our stand on them. They were well prepared and had a retort to all our arguments.

Darshna: So, after this thoroughly learning round, how was your final round experience?

Karthika: Our final round started just after minutes of our Semis because our room took the longest. And, then there were also some problems with the compendiums which I had to fix and I was doing all of it while waiting for our finals to begin. It was

really hectic for us honestly and also that we were a bit low because we had got the petitioner side for the finals and we were much more confident and had solid arguments for the defendant side. So our beginning was a bit down but then we sailed smoothly for the remaining round.

Shwetha: So as Karthika said we barely had seconds before our finals in which we were trying to learn our side but during the round somehow, the judges understood. They were not lenient and had a lot of questions because of which we thought this round is gone for us because, the other team was also really well prepared. And, the judges kept grilling us but they had a balanced way of doing so in the sense if one judge was grilling you with a difficult question, the other judges will give you the time to think and answer that question. The organization of the event really matters when you reach the finals because everything happens quickly, so all of this helped us in calming our nerves.

Namitha: The finals were the worst because we were on petitioner side and still had a lot of research left. We knew where we were wrong and we also knew the questions that the judges were going to ask on them but we had no answers for the same. One judge was really strict in the sense that he just wanted yes or no answers without any explanation. We really got roasted in the Finals with hard question on AI technology and asking us to connect them with Constitution and where in the Constitution were aspects which we were talking about. The judges also refused to accept our landmark judgments and asked for something more substantial, giving us a real scare.

Darshna: Since you mentioned being put through lot of hard questions, do you recall any question on AI technology and law?

Namitha: Yes, the question on Constitution lists was one such question, answer to which we do not know till this date.

Shwetha: The list question was the most difficult because none of the teams knew its answer and thus all the teams kept discussing about it. We later asked the judges also about this question but we did not receive an answer. But I guess the purpose of the competition was to make us realize that AI technology is not equipped in our laws right now and if something like in the problem happens in real, how are we going to deal with it. So, therefore we need laws on it and one of the Constitution lists needs to mention it. Because even if central and state governments make laws on the same, how are they going to do if there is no backing of it mentioned in any of the lists. So, I guess that was the central idea and intention of the moot.

Namitha: And, when we said AI liability should not be limited, we were essentially arguing that limited liability does not provide for the greater good because you are losing lives over here because of technology and machines. If there is an accident, the government cannot compensate for a loss of life by machines. But, then we were asked, what we should do because we have to grow and develop technology and at the same time protect fundamental rights of people. They put us in position which made us

thinks about all of this; support AI along with protection of Fundamental Rights. So, we came up and argued that yes this is true and there has to be a balance amongst all of this but at the same time you have to prioritize human lives over technological errors that can happen due to improperly programmed algorithms.

Darshna: True. I believe the intention of the moot was to make you think about the possibilities that come up with the usage of AI and the way we are going to manage those possibilities.

Namitha: Yeah. All the gray areas, ethical issues related to AI. There are no regulatory frameworks, liabilities and there are also other laws which need to be amended etc.

Darshna: I believe the moot did a brilliant job in making you realize about all of these possibilities related to AI.

Guys, what was your biggest takeaway from this moot court competition?

Shwetha: My biggest takeaway was that this team really works for moot court competitions. But, other than that, this moot along with AI, it also had a lot of Constitutional Law and importance was given to both of these areas. And, because of it judges also couldn't entirely focus on tech law but after the valedictory ceremony, we got to sit with the moot drafter and have a discussion on Law and technology. Because, I never had a keen interest in this area but that discussion opened a lot of new interest areas for me. And, her speech was also really insightful in the sense how interference of technology is very important. Because technology is constantly advancing and we know how AI has come in law, too so that is one thing we have to be prepared for. She also spoke about an incident that happened in Uttar Pradesh and on which this and moot problem and Smart City Act is loosely based. These were few things that we learnt about and what a big role technology has to play in future.

Karthika: In terms of law, my biggest takeaway was that law and technology is a really broad subject and AI is just a small part of it. My interest in this area increased after studying Competition law because I got to know how technology and competition law are interlinked. Personally, other takeaway was that if a moot problem looks really difficult, you just have to give it time and read through it before coming to the realization that it's actually a simple problem. Also, to find a team who is on the same wave length and thought process as you is extremely important and it might take five years of your law school to find such a team but if you are lucky, you might find it in the first year itself. But team work is really important.

Namitha: My biggest takeaway from this problem was that it made me understand the relationship between AI and state governance, where we stand on it versus where we want to be in terms of urbanization, economic development etc. And, it brings to light all these grey areas in AI that needs to be resolved and incorporating them into smart cities and economic development. But, at the same time we have to maintain constitutional integrity into all the development policies of the government. So, it was a great learning experience in terms of knowing where India has to be on all of this.

Darshna: So, I believe the drafter of this moot court problem was thoroughly successful in making her point through this problem.

Namitha: Yes, absolutely. Also, she was really inspiring because she is one of the very few women who are in top management in AI and law.

Darshna: Since, you guys mentioned you are in your final year, are any of you interested in a career in law & technology, especially after this moot court competition?

Namitha: I am open to anything. There are so many areas under law and technology also and I am specifically interested in law and technology from a human rights perspective.

Shwetha: I do not see myself doing anything in law and technology as of now.

Karthika: My interest in technology with respect to law is in intellectual property and competition law, specifically.

Darshna: My last question to you is that in future if this problem occurs in real, how do you guys see yourself resolving it in leadership capacity.

Namitha: Currently, we do have a planning commission that is going for smart city mission by 2030, and what they mean by smart city is just core infrastructure development like adequate water supply, proper solid waste management, transportation and just basic necessities. So, this is where we stand at the moment, but in the problem you can see robotic cops, smart buildings, AI systems, all of this is very well advanced compared to where we are. I feel we are still very far away to achieving what the problem has and we still have to fill up not in terms of just economic and financial resources but also legislative gaps. AI has entered into every field but we hardly have the regulatory framework to deal with it and have a lot to catch up on in terms of planning all of this

Darshna: Since, you mentioned AI entering into every field, do you think AI can be used to solve our first hand basic problems like access to clean drinking water?

Namitha: Yes, we can but then that would also impact our own human resources. AI would take livelihood of lot of people and that will also be an issue. So, again economic development and human rights need to be balanced.

Shwetha: India as a country has progressed a lot and AI is something that is not going to stop as in even the government is proactively working in involving in AI. But, I feel before all of that start we really need to amend our laws because that way we will be able to put liability. If the government is not prepared with the laws and liability aspects, it wouldn't be much of a real progress.

Karthika: I have similar views as Shwetha on product liability. AI and product liability I feel go hand in hand and therefore we need someone to hold accountable for the mishaps. Though we have multiple theories on product liability, we still need to settle on one and then maybe allow for more development and investment in this field. I feel,

Science & technology and law need to move forward hand in hand but right now law is mostly trying to catch up with technology.

Darshna: True. With the ever-changing technology, it becomes imperative for the laws to keep up with it.

Guys, it was brilliant talking to you and thank you for taking out this time to speak to us.

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Interview of the Winners of the Surana & CUSAT School of Legal Studies, Dr AT Markose Memorial Technology Law Moot Court Competition, 2020

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Synopsis. Madhumita C, Vishva Shanmugam M V & Bhagavatula Naga Sai Sriram, representing the Winning team of the Surana & CUSAT School Of Legal Studies, Dr At Markose Memorial Technology Law Moot Court Competition, 2020, were interviewed in a Q&A format.

The Testimonials

About the Team's background in mooting

Madhumita: This was my third moot, and my first win. I was the runners-up in my first and second moot, held at Modern Law School, Pune and Noida International University, respectively.

Vishva: This was my second moot, my first was a Gujarat National Law University moot where I was a speaker. And CUSAT was my second moot, and first win.

Sriram: This was my second moot and my second achievement. I have also been the Best Researcher at the 2ND NATIONAL MOOT COURT COMPETITION- 2020 organised by the KALINGA UNIVERSITY, Raipur.

Reason for choosing the moot

Team: Mooting is viewed as an important aspect of law school and we accidentally ended up finding this moot. The main reason for choosing this 1st Surana and Surana & CUSAT School of Legal Studies, Dr AT Markose Memorial Technology Law Moot Court Competition, 2020 is the uniqueness of the moot proposition. The moot problem is connected with a technology which can be effective in correcting medically incurable genetic defects. Apart from the subject matter of the moot proposition, the issues involved in the case are contemporary and predominantly connected with the issue **"Whether Gene mutations will result in affecting the 'quality and dignity'** of 'human life''. The concept of Designer Babies was very interesting to us, and we were aware that it was a first-principle basis moot, and the curiosity to learn more about the concept is what motivated us to try out for this moot.

Interest and Inclination in Intersection of Tech and law

Team: It is a mandate in a lawyer's profession that one ought to constantly keep learning and never stop learning. Therefore, when times evolve, and current affairs surround new factors, a lawyer is bound to adapt to those in order to efficiently practice the profession. That is the way things have been even with the advent of technology. With the evolution of Technology, new codes have been introduced and Cyber Laws are gaining predominance, similarly, where there is a lacuna in the society's morale, the law will be enacted to ensure there is no misuse of the lack of laws, thereof. Technology is improving and technology law will also take significance. In fact, during this Pandemic we can see how the Judiciary efficiently adapted to the online Court proceedings and how "Contempt of Court" has to be broadly interpreted to include even Lawyers sitting in their houses, connecting over a video call! Technically, they aren't in court, But, that does not compromise the authority of the Judiciary!

First impression of the moot problem

Team: The Moot Problem was the primary reason my team and I were interested in taking up this moot. The Concept of Designer Babies was so interesting, because it was something that often comes up in conversation with people, people saying "I wish I could change this about me" or people describing what kind of a baby they would like, but to think that could be a reality? And the disastrous after effects? We knew we wanted to know more about it and that we would definitely have fun in the process of research. Hence it was a deciding factor in us taking up this moot.

Moot preparation strategy

Team: It was definitely a lot of work, as are most first-principle basis moot problems, and took a long time because the moot preposition was very complicated and we had to consider various legal aspects related to the moot proposition, frame proper legal issues related to the proposition, and also we had to look into various International Conventions related to the Gene Editing and Permissible Research of Genetic Mutations on humans. It took nearly three weeks to figure out the Moot proposition. **Our**

important strategy is taking mock presentations of each other. We took numerous mocks in order to make sure that the issues and laws related are cited properly during final presentation. We had to work all day and we had many sleepless nights during preparation. The debates that ensued among the teammates is what finally got us to frame a proper structure. We would constantly rebut each other's points and brainstorm by finding every possible opposing point, which gave us the ability to form fool-proof arguments.

Experience of the moot /judges/ opposite teams

Team: We were excited to experience the moot at its best by visiting Kochi, however, the onset of the pandemic took that from us, and just when we thought our research just might go down the drain, they declared it to be held online, being in different cities, and not having remote access to our college's resources, preparing was wholly done through calls and e-mails and the moot itself was a new experience because we hadn't had on online moot before, and the etiquette and the usual connectivity issues were a threat to us. However, the organising committee were very helpful and the judges of the rounds very accommodating. In fact, the finals were judged by three sitting judges of the Kerala High Court, and the level of understanding and patience and they showed us was one of the main reasons we emerged winners!

Challenging moments during the moot

Team: We had to work nearly 8 hours every day for preparing the moot memorial and the arguments on behalf of the Petitioner and Respondent. Adding to these we had to balance the regular semester classes, assignments given by the faculty. By balancing all these and working continuously was challenging to us.

Takeaways from the Moot and Moot Problem

Team: The main takeaway was the wealth of information relating to how the legal aspects would play a vital role if a scientific advancement were to occur in society, and especially in the Indian context where the constitutional mandate is to protect the interests of religious sections and its communities, the ideas of customs and values ought to be given consideration and weightage maybe even more so than a scientific development. I think its safe to say, if there was a designer baby tomorrow, we could point out just exactly how the media would represent it immediately on different front because we considered all the variables!

General Idea about a career in Tech and Law/ Area in which team members may be interested.

Team: We were only in our second year when the moot took place, so we didn't really have much of an idea about whether we wanted to pursue a career in Technology Law, we are currently exploring our options and learning more about all the fields to take a conclusive decision by the end of our third year or the start of the fourth! As of now, our researcher is particularly inclined towards criminal law, and the speakers have our focus set on Alternative Dispute Resolution!

Darshna: Do you think India is prepared in dealing with the problem and scenario mentioned in the moot? Or if this problem happens in real life, the approach and preparedness that will be required to deal with it?

Team: In our honest opinion, the Indian Judiciary is well equipped to handle such a case because of the spectacular Constitution that our nation has, and the important questions of law would surround the cornerstone of Right to Life, Equality and Freedom as opposed to Right to Religion, since the major opposition to such advancement would occur from religious groups who would feel threatened of their values and customs. And seeing as the Indian Judiciary makes phenomenal pronouncements with regards to the new sections of the society, taking into account the people of its country, as evidenced in Navtej Singh Johar and NALSAR Judgement, it is safe to say if a designer baby were to exist, Indian Courts will know what to do about it. Are the people ready to accept it? Well, now that's debatable, seeing the multitude of opinions that the public have.