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Artificial Intelligence, Law and Justice

Session 29

AI and Competition Law

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Artificial Intelligence, Law, and Justice Session 29: AI and Competition Law.



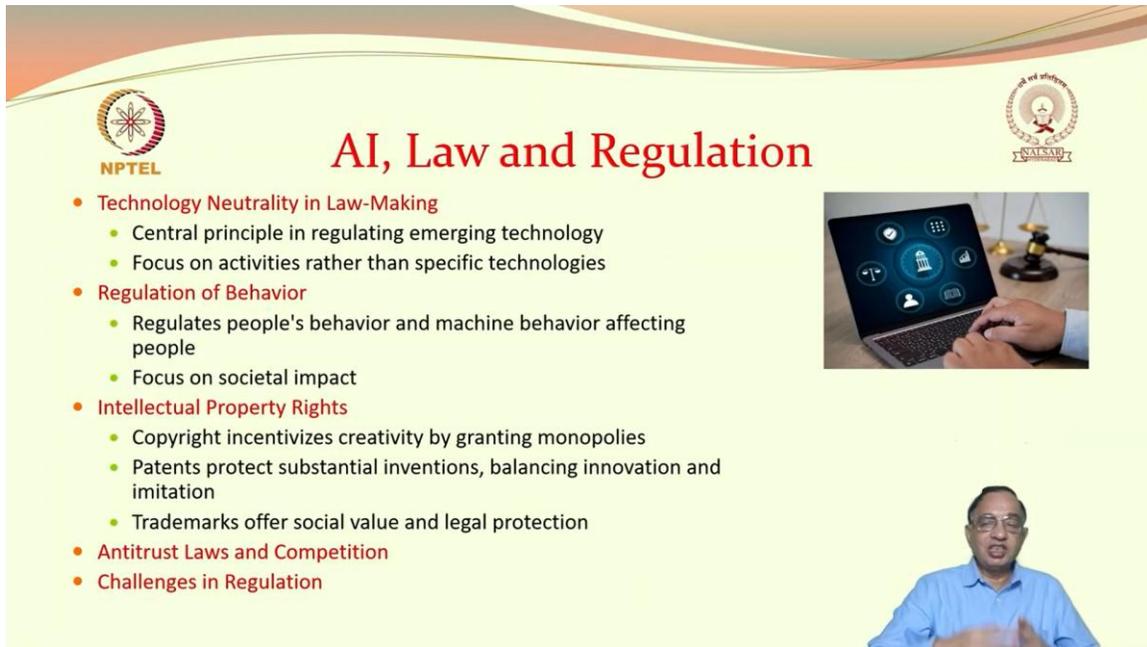
Recap

- In the previous session we discussed AI and Health Law.
- We dealt with various issues including privacy, data governance and lack of uniformity in data governance



As usual, we will do a recap of the previous session. In the previous session, we discussed AI and health law, particularly in the context of developments in AI that are enabling a lot of progress in health, particularly primary health diagnostics. So, there is a

need for health law to be updated with these developments and to meet the needs of society. On the other hand, we also discussed in detail some of the issues that are emerging, particularly on account of the digitization of health records and electronic health records in various contexts, particularly privacy, data governance, and lack of uniformity in data governance. We also highlighted why data in health law is equally important to many stakeholders because they have different perspectives on it. So finally, we also mentioned that AI and health law is an emerging and challenging area where a lot of things are not fully resolved as of now.



The slide features a title "AI, Law and Regulation" in red text. On the left is the NPTEL logo, and on the right is the NALSAR logo. A central image shows a hand typing on a laptop with icons for law, technology, and people. Below the image is a small video inset of a man in a blue shirt speaking.

- **Technology Neutrality in Law-Making**
 - Central principle in regulating emerging technology
 - Focus on activities rather than specific technologies
- **Regulation of Behavior**
 - Regulates people's behavior and machine behavior affecting people
 - Focus on societal impact
- **Intellectual Property Rights**
 - Copyright incentivizes creativity by granting monopolies
 - Patents protect substantial inventions, balancing innovation and imitation
 - Trademarks offer social value and legal protection
- **Antitrust Laws and Competition**
- **Challenges in Regulation**

Having said that, let us look into an equally interesting emerging area where many developments are happening. We discussed in detail AI and patents, as well as AI and copyrights. But competition law is something that is equally important in a society where the government wants market forces to operate freely without any monopoly or oligopoly emerging, and free market forces should also be the ones that empower consumers instead of them becoming caught up in various commercial webs or transactions, uninformed, or being led into traps by various companies.

So, what exactly are we talking about here? First of all, regarding AI in law and regulation, we should know that there is technological neutrality in lawmaking. The central principle is that any emerging technology will be regulated with technology neutrality in the sense that it will be applicable to all technologies. So, the focus here is on the activities rather than on specific technologies. Or to put it more specifically, whether it is nanotechnology, biotechnology, or cyber technology, it focuses on activities that are feasible and what is getting done, rather than the technology per se. The idea here is to regulate people's behaviour and market behaviour affecting people, rather than through government regulation trying to fix certain things or trying to direct innovation to go in a certain way. Then the focus is broadly on the societal impact, which means that the idea is to increase consumer welfare so that the innovations are for the larger social benefit. Then, the protection of intellectual property rights is equally important; that is

one of the core objectives of competition law. We have seen copyright incentives and patents in detail, and trademarks are also socially valid legal protections. So, competition law is equally concerned about protecting and safeguarding intellectual property rights. Then what we call antitrust laws and competition is something very important here.

Antitrust is a typical U.S. name, whereas competition law is the name used in other countries. So basically, antitrust refers to anti-monopoly laws; we can say that the government or society doesn't want a few corporations or a cartel of companies to decide everything, sharing everything among themselves, including price fixing and other practices. So, the challenges in regulation on account of these, when AI is a major player or when AI makes certain things happen that were not previously possible, result in lots of tensions as well as the need to look at very creative solutions.

The slide features a title "AI and Competition Law" in red. On the left is the NPTEL logo, and on the right is the NALSAR logo. A list of topics is shown in red and black text. To the right of the list is an image of a person interacting with a digital AI head. At the bottom right, there is a small video inset of a man in a blue shirt speaking.

- **Competition and Democracy**
 - Promotes material progress, quality, and innovation
 - Supports democracy and preserves choice and opportunity
 - Enforced to prevent illegitimate monopoly power
- **Digital Economy's Influence**
 - Revolutionized business patterns, products, and services
 - Priority for government policy and competitiveness
 - Alters competitive advantages globally
- **Governance and Digital Technology**
- **Consumer Protection and Data**
- **Algorithms and Automation**

To begin with, competition and democracy are equally important because competition promotes material progress, quality, and innovation. It supports democracy by enhancing the choices available to people, and it also enhances the opportunities there. More importantly, competition is something where governments allow market forces to play freely on their own, with the government trying to be the hidden hand behind. The idea here is that while the legitimacy of market forces should exist, it should not result in illegitimate monopolies, oligopolistic power, or a few cartels deciding everything. So, in the digital economy, what has happened? The digital economy is very different from the brick-and-mortar economy or the regular economy, where physical markets play a major role.

Whereas in the digital economy, many transactions happen in the blink of an eye by people sitting somewhere in the world ordering something, transacting in enormous volumes, both in terms of quantity and in terms of currencies. So, the problem is that digital markets, although they are markets, are global in nature, and the digital economy is equally global in nature. So, the governments have to really tailor some policies and

regulations to govern the digital economy. The digital economy's competitive advantage is also equally global in the sense that a digital economy, which comprises among other things e-commerce, is expanding day by day; however, there are no specific broad trade rules under the WTO to govern the digital technology. So, this is again totally linked with digital technology because digital technology is the backbone of the digital economy. And then consumer protection here is also obviously linked with data protection. And the major role that AI plays is due to the algorithms and the automation of the digital economy. So, we are talking about many things. We will go into detail one by one.

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Defining Competition and AI Developments

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- **AI as an Intangible Capital Asset**
 - Investments in AI can enhance productivity
 - Applications include autonomous vehicles and voice-recognition systems
- **Impact on Legal Technologies**
 - AI affects access to justice and legal services
 - Raises questions about regulation and equality
- **Global Digital Transformation**
 - AI developments influence various sectors
 - Public-private partnerships and private governance are key
- **AI in Competitive Advantage**
 - AI complements and substitutes human cognitive capabilities
- **Competition and Market Dynamics**



AI, as an intangible capital asset, is obviously not a very tangible asset; although AI may be operating through large data servers, large centres, and undersea cables, AI itself is an intangible capital asset like knowledge. And, more importantly, investments in AI can enhance productivity. This is obvious. And then when we talk of AI, the applications are so broad that they range from voice recognition systems like Alexa to autonomous driving vehicles to many applications that are integrated into AI systems, which can span across continents. And then what exactly is the impact of these things on legal technologies? AI, as we have seen, affects legal services and access to justice in more than one way. And more importantly, we have already seen that AI raises a lot of questions for regulation and equality.

Now, when the global digital economy is being transformed due to digitization, many things are also happening as a result of developments in AI. The problem here is that AI developments also influence various sectors on account of the novel applications, innovations, and the way AI marches ahead. And, more importantly, AI can be a good tool for gaining a competitive advantage. At the same time, AI can also be used to obstruct competitive advantage, promote monopoly, or block the market forces operating freely. So, the competition and market dynamics that could be impacted on account of AI and vice versa are the cornerstones of AI and competition law.



Market and Competitiveness



- **Market and Technological Innovation**
 - Advances technological knowledge and transforms it into valuable products
 - Combines decentralization with strong incentives for innovation
 - Profit is the key driver for technological innovation
- **Competition Law and Economic Coordination Competition Law Agency/Institution Policies**
- **Overarching legal framework**



Marketing and competitiveness: Markets and technological innovations are too obvious to understand. So, technological innovations make many things possible. They bring in a lot of developments in the market. They facilitate enormous volumes of trade in terms of both quantity and quality. And then they facilitate a faster settlement. They facilitate faster transmission of information and more. More importantly, this also facilitates decentralization to a great extent in the sense that the buyers and central sellers can be anywhere in the world, but they can be operating through various e-commerce sites or on their own. So, there is a lot of decentralization that is happening. At the same time, there are many new intermediaries that are also emerging in different sectors. Profit is the key driver of a technological revolution that is obvious.

So, we are seeing that when the digital economy spreads or grows, many things happen, including the emergence of new intermediaries; this innovation is also occurring. And then, competition law is also something that is linked with economic coordination. Competition law has to deal with problems of imbalances in power structures on account of developments in e-commerce and how AI, particularly algorithmic trading, affects that. And then there is no overarching legal framework for this, whereas digital trade itself is very new, but regular trade, or brick-and-mortar trade, is governed by different rules and different logic. More importantly, we have evolved over centuries with legal principles, legal institutions, binding contracts, and many other mechanisms. So, translating them to digital commerce is a big challenge, and fitting the competition law principles into this is another challenge.



Competition and IPRs



- **Role of Intellectual Property in the Knowledge-Based Economy**
 - Central to wealth creation in the new economic environment
 - Characterized by negligible marginal costs and high innovation rates
- **IPRs and Competition Policies**
 - IPRs linked to competition policies and FDI laws
 - Necessary to protect the market from anticompetitive practices
- **Impact of Digital Technologies**
 - AI, big data, and cloud computing transforming the global economy
 - Digital platforms facilitating new products and services
- **Antitrust Concerns**
- **Strategies for IPRs Protection**
- **IPRs in Developing Countries**



We have seen that competition and IPRs play a central role; the purpose of IPR is to create wealth through novel innovations, which then facilitate new economic development. At the same time, these innovations also contribute significantly to productivity; the society overall benefits, so IPR is socially linked to competition policies as well as to foreign direct investment flows. Why? Because foreign direct investment decisions are often determined by the level of IP protection offered in a country. More importantly, in a global market, all foreign direct investors or multinational companies are the major investors through foreign direct investment, looking for countries where IP rights are strongly protected and piracy is not promoted.

Additionally, that the government has a mechanism to ensure that IP rights are fully protected and enforced. Furthermore, that there is a dispute settlement mechanism that is reasonable and just. Equally important is that IP rights may lead to monopolistic behaviour. So, the government should bring in competition law to ensure that anti-competitive practices are curbed, if not fully constrained. And then what sort of mechanisms governments will use is a different story, which we will not get into. But when it comes to AI, things get a little complicated. For the simple reason that AI, big data, and cloud computing are transforming the global economy, they are also transforming global data flows, the data economy, the digital economy, and everything else. So digital platforms are offering new products and new services, and in fact, digital platforms today are not mere platforms; they act as multifaceted platforms. There may be one where marketing happens. They may be the same ones where content creation also happens, and some of the big data of digital platforms is also offering many other things ranging from cloud computing services to acting as intermediaries. So, there are a lot of monopolistic or antitrust concerns here. And then how to ensure that IP rights are being protected in the digital economy is equally important. And particularly in developing countries, how can we ensure that IP protection happens in the digital economy where it is now beginning to flourish?



MNCs and Innovation Performance



- **Location and Governance Decisions of MNCs**
 - Success grounded on advantageous technological assets
 - Changes in invention activities along geographic and organizational boundaries
- **IPR Protection and Innovation Performance**
 - Boosted performance with strong IPR protection
 - Higher innovation in high IPR locations
- **Digitalization and Tax Strategies**
 - Shifting profits to low-tax rate states
 - Minimum 15% global corporate tax
- **Scope of IPR Protection**
- **Effects of IPR on Competition**
- **Role of Open Trade**



So, in all these, we know that multinationals prefer safe locations where their investments are safe, IP rights are protected, and then they expect that there will be some specific set of rules to guarantee that their business is not unduly hindered. So, they look at areas where technological advantages can be deployed, and then their investment pattern and behaviour also depend on many other criteria, leading to a free flow of capital investments in technology across the world. So, IP protection is equally important.

Digitalization is also important. But what has happened on account of this digitalization and then the global digital economy is that many multinational companies have found "tax havens to benefit from the digital economy." So, in these tax havens, what they find is that some countries offer, in the name of promoting the digital economy and other incentives, tax-free options or some sort of incentives where you get reimbursements or a whole lot of other tax incentives to locate your investment in a company or to locate e-commerce in a specific country. So, this is what happens: companies through e-commerce digital platforms ship their profits to countries where the profit is taxed the least or where there is zero tax. So, there is a demand that the global corporate tax of 15% should be levied across all countries so that no country takes advantage of others promoting digital platforms, e-commerce, digital commerce, and the digital economy while also offering incentives due to lower tax rates. So, this is something where competition law has a lot of roles to play.



Competition Law, Competition, & Democracy



- **Legal Rules of Competition Law**
 - Outlaw certain practices
- **Goals of Competition Law**
 - Mission to safeguard competitive process Balance Consumer Welfare with Market driven pricing
 - Ensure that monopoly or oligopoly is restrained



And then next comes the issue of competition law and democracy, which you have seen. First, the competition law principles state that certain things can be prohibited if they do not promote competition, constrain market forces, or result in a monopoly, duopoly, or oligopoly. And then the goals of the competition law are to safeguard the competitive process, balance consumer welfare with market-driven pricing, and ensure that monopolies or oligopolies are restrained.



Dynamic Pricing Algorithms



- **Role of Algorithms in Pricing**
 - Algorithms are widely used for pricing and business functions
 - Digital companies rely on algorithms for setting prices
- **Algorithmic Pricing and Competition**
 - Algorithms can facilitate tacit collusion
 - Technological advancements enable personalized pricing strategies
 - Algorithmic pricing affects market competition
- **Benefits and Risks of Algorithmic Pricing**
 - Increases profits by adjusting prices based on supply and demand
 - May reduce prices and increase consumer surplus
 - Can lead to anticompetitive behavior and market distortions
- **Regulation and Compliance**



But algorithms, as we have seen, are part of AI. And then there are many dynamic pricing algorithms. These dynamic pricing algorithms may not be visible to us physically, but they do operate.

For example, when you book a cab or use a cab aggregator or any such service, that's a dynamic pricing algorithm that fixes the price depending on the demand, supply, and other parameters. But in e-commerce and other travel sectors, it happens in a different way in the sense that if you book a flight ticket, you are not the only one who is booking a flight ticket on the web at the same time, directly or indirectly; thousands of people may be doing it. For example, if I am booking a flight from Hyderabad to New York, I am not the only one in Hyderabad booking for that thing. Somebody sitting in Muscat might be doing the same thing. Somebody sitting in Mangalore may be trying for the same thing. So, these algorithms look at all these transactions, and then dynamic pricing occurs when all the travel agents or travel companies are able to know the supply and demand and fix the price accordingly. So, what they do is use the algorithms for it; the digital companies use algorithms for settling prices, and what the algorithms can do is facilitate tacit collusion.

Now, what is collusion? Collusion is two or three companies or two or three persons coming together, working together either to subvert a rule or to maximize the benefit on account of some of the transactions that are bound to happen or in the process of happening. So, the technological advancements enabled personalized pricing strategies, which means that companies can make personalized pricing strategies depending on the consumer's past behaviour. That is one aspect. And algorithmic pricing can affect market competition in more than one way.

For example, if the six or seven travel aggregators decide that, given the huge demand versus the availability of cars, they will fix such pricing for this hour, in this direction, or to this destination, then the algorithms will tell the cab aggregators about the demand and supply, where the direction is more favourable, where the demand is higher, or where the cabs are located. So, it is possible to use algorithmic pricing in a dynamic way to avoid market competition or to fix a minimum price, which will be again against the consumer. If I say I choose option A with one cab aggregator and find it too high, I want to go to option B, which is another cab aggregator. But if all the cab aggregators come together and have a tacit understanding or an informal understanding that all of them will apply surge pricing at this time for this route, then I, not just I, but whoever is looking for cabs at that time for that location will be the ones who will be paying the price for it. So, this sort of algorithmic pricing actually affects market competition. It is not allowing the market to determine the fare. Rather, the fare is prefixed, or it is adjusted depending on what the cab aggregators decide based on demand and supply.

In one sense, they are also manipulating demand and supply so that those who still want such pricing can go. But then, not all markets are possible in the way that unlimited options are available to people. Often people's choices are limited. So even if it's more expensive, consumers will prefer that because there are no cheaper options available. So, the benefit of algorithmic pricing is that it helps them maximize profit by adjusting prices based on supply and demand or rather gives them the option to fix prices in advance by looking at supply and demand. At the same time, in some circumstances, it could also increase consumer surplus by reducing prices. But what is important is that this prima facie results in market distortion by ensuring that the aggregators, on one hand, and the consumers, on the other hand, are involved. Aggregators try to tilt the balance in their

favour by behaving in an anti-competitive manner. So, this needs to be regulated, and then some sort of compliance has to be brought in. What I'm talking about is only cab aggregators, but then a whole lot of things happen, and travel is affected by demand and supply due to traditional e-commerce.

For example, if there is a demand and supply cap when it comes to certain medicines. The same logic will also be applicable to the consumers if they're scrambling for something, depending on the availability and other factors that the distributors and producers would know because everyone has digitized their warehouse and everything regarding how to fix the price, so that nobody sells for less than a minimum price and at the same time nobody offers any discount for that particular product. So, the dynamic pricing algorithm results in lots of collusive behaviour that is done at the cost of the consumer.

E-Platforms Power

- **Extreme Concentration of Wealth and Power**
 - Public recognition of wealth and power in few e-platforms
 - Unauthorized surveillance and data harvesting
- **Oligopolistic Platforms**
 - Social networks and search engines use free content
 - Data harvesting and surveillance to increase user time
 - Selling advertising and personal data
 - Control over individuals' opinions, spending, and political positions
- **Fair Use Doctrine and Dominant Platforms**
- **AI Technology and Content Dissemination**
- **Commercial Media Organizations**
- **Platform Strategies**

So why this happens is that e-platforms hold power. Now the extreme concentration of wealth and power happens because e-commerce in most countries, including India, is in the hands of a few or a maximum of a dozen corporations; Amazon and Flipkart, along with a few other companies, are the ones that dominate in India. Globally, you would also find that about half a dozen companies in different countries are in a dominant position. So, the power is with e-platforms that are able to play a very dominant role. And then what they do is look at who is trying to buy what, who is demanding what, what the demand and supply is, which they monitor through data surveillance, and then they do a lot of data harvesting. Data harvesting is nothing but simultaneously gathering information from different websites and screens about what the demand is, what is happening, and then monitoring consumer behaviour, such as where consumers' attention is going and what prices they are looking for. This results in oligopolistic platforms where social networks and search engines use the free content we provide because we are the ones on the web.

We search for certain things using a search engine, or we directly go to a website and search. And then data harvesting happens because they monitor behaviour. They monitor IP addresses, and then they know that this person is looking for two or three things simultaneously. He's booking a ticket. He's also trying to book a travel guide. He's also trying to buy groceries. So, they use our personal data for advertising, then for targeted consumer advertising, and also to specify specific products and goods that could be offered to us. So, these platforms, half a dozen of them, hold enormous power not just on account of their e-commerce power alone; they have the power to monitor our behaviour, the data we provide to them, and then they also shape our perceptions. They also try to shape our behaviour by offering us some discounts, or they are trying to alter our behaviour so that we move towards what they want us to buy. So, this indirect control over consumers' options, spending, and political positions is something that is not a good behaviour. This is precisely the problem with social platforms and e-commerce platforms, which are very powerful. Fair use doctrine and dominant platforms are very important issues. The dominant platforms do not tell us what exactly they are harvesting data for, how they are using it, and they do not even inform you that they are using it only for specific purposes because they collect an enormous amount of data. They have the previous purchase data, and they are able to correlate, build patterns and even guess what you would be buying within the next 24 hours or the next week. And then they use the AI technology not only to survive and to understand our behaviour but also to disseminate information to us, and more importantly, these are also in many instances tied up with commercial media organizations, so the platforms become huge and unwieldy for the government to regulate. At the same time, their excessive power becomes an issue when we talk about AI and competition law, precisely because as platforms become too powerful, competition law has to step in to ensure that they do not abuse their power.



Digitalization & Digital Entrepreneurship



- **Impact of Digitalization on Productivity**
 - Computerization, robotization, and automation drive digitalization
 - Decline in digital technology prices boosts digital capital investment
 - Digital investment enhances firm-level TFP growth sectoral heterogeneity affects productivity benefits
 - Only 30% of the most productive laggard firms benefit
- **Digitalization as a Game-Changer**
 - Alters firms' productivity growth
 - Productivity gains slow for general-purpose technology
- **Digital Entrepreneurship**
- **Complexity and Uncertainty in Digital Entrepreneurship**
- **Recent Developments in AI Technology**




Digitization is equally important; digitization should result in a broader decentralized digitization where anybody can flourish: small and medium enterprises, small dealers, handicraft producers and sellers, and someone who is operating from home, self-

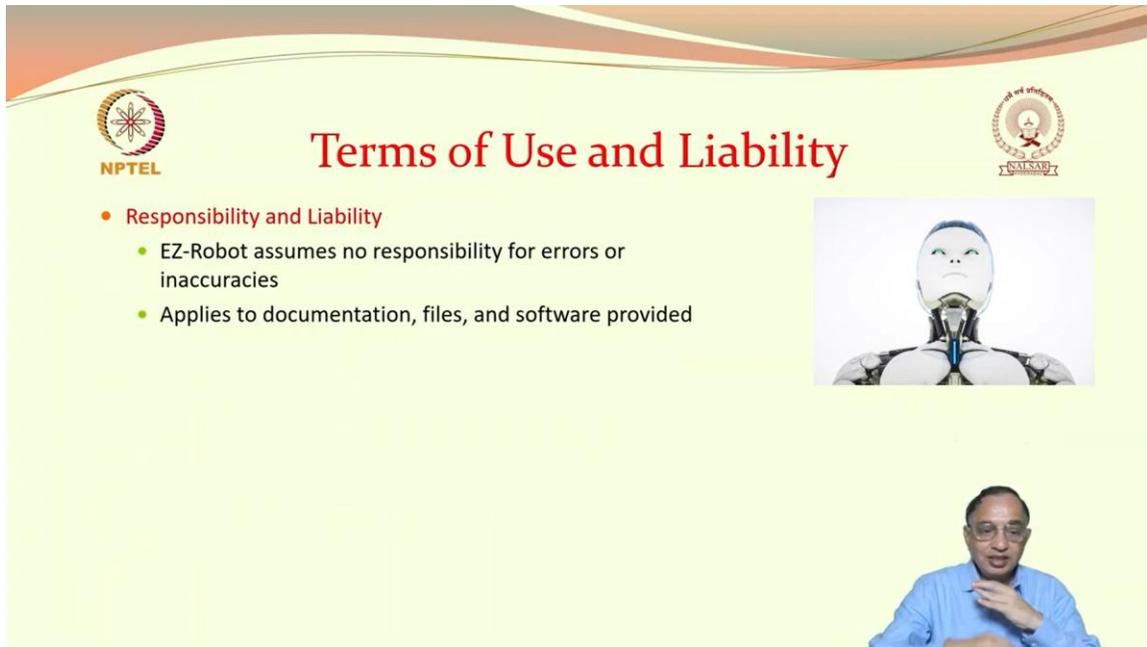
employed women, etc. But what happens when market power gets concentrated in a few platforms or in a set of companies, where everything is decided by them? Many players either get lost or co-opt on these terms. So, the digitalization and digital entrepreneurship could be totally skewed in favour of platforms and other larger entities if competition law does not step in to protect their interests. And then digitalization, as we know, is a game changer now. So, even to promote digitalization and digital entrepreneurship, or to create a level playing field for all, competition law is necessary to prevent the abuse of algorithmic power and oligopolistic power. That is why AI and competition law are equally getting more and more important now.



- **Forms of AI**
 - Algorithms mimicking human intelligence
 - Neural networks managing complex problems
- **Tort Law and AI**
 - Remedy for injuries caused by AI
 - Negligence claims: duty, breach, causation, damages
 - Assumption of risk defense
- **AI Torts**
 - Injuries from autonomous vehicles and robots
 - AI-driven algorithms hidden in daily tasks
- **Legal Challenges**
- **Workplace Injuries**

The algorithms can mimic human intelligence, which we have seen, and the neural networks can manage complex problems. So, the algorithms can mimic our behaviour. They can try to manipulate our behaviour. One way is that if I missed it due to AI-based algorithms or if my behaviour was distorted or targeted towards something I did not really want, or if the options given to me were wrong, or I was forced to choose something I did not want, or if I was laid in a trap, or I was asked to choose only from the available options although many more options were present but were not given to me, then the tort law principles can step in, where I can say that to remedy the injuries done to me, I will use tort law. So, the negligence on the part of the e-commerce platform or the e-commerce dealer could involve a failure to perform their duties, breach of confidence, unauthorized use of my data, and potential damages. Of course, it could be that they say we did nothing wrong. We only tried to help you out, and there is also a clause that the choices were ultimately yours. We didn't force you, and also you gave consent. So, automation, AI-driven algorithms, particularly the autonomous vehicles that run based on AI, and the robots, are some of the potential areas where torts can play an important role. But in the case of competition law, larger and more severe damage could occur due to AI-based algorithmic decision-making by the companies, not by us. And then the way they will collude among themselves to do some price fixing, acting as a cartel that either blocks some options available to us or throws up some options that we really know are

not the best options available to us. So how do we challenge these things and ensure that AI is used in the digital space in such a way that real competition is fostered and oligopolies and monopolies do not arise?



Terms of Use and Liability

- **Responsibility and Liability**
 - EZ-Robot assumes no responsibility for errors or inaccuracies
 - Applies to documentation, files, and software provided



Often, you know that many of these things come up regarding the terms of use and liability. For example, EZ is a robot that assumes no responsibility for errors and inaccuracies, including documentation, files, and software provided. The same thing can be seen across many e-commerce sites, digital e-commerce sites, and digital platforms.



Algorithmic Collusion & Personalized Pricing

- **Express vs. Tacit Collusion**
 - Express collusion involves explicit agreements among firms
 - Tacit collusion achieved through intelligent market adaptation
- **Legal Perspectives on Algorithmic Collusion**
 - Algorithms as Illegal Agreements
 - Potential risks from algorithm technology use by companies
 - Horizontal algorithmic pricing practices
 - Regulatory challenges in the digital era



So ultimately, they try to escape the liability by including these clauses. But the collusion we talked about need not always be very explicit in the sense that there is no need for a written agreement among the e-commerce players that they will collude among

themselves in some price fixing and then force certain options upon us. No, it never happens. It could be very tacit in the sense that it could be one that controls the behaviour. Tacit means it is an understanding given informally, not something that is written in law or a legally binding contract. So express collusion comes with express agreements, but this is not the norm. The norm is tacit informal agreements that happens on a day-to-day basis depending on the demand and supply. And then, by intelligent market adaptation, in the sense that you look at the demand and supply, you look at the number of consumers, you look at the movement of the flow of information, you look at the movement of traffic, and then intelligently, you can adapt the price, you can manipulate demand, you can manipulate supply. One way to look at this is that algorithms can be stated as illegal agreements because, by default, these agreements facilitate monopolistic power. And when companies use these algorithms in such a way, it can result in consumer loss. So algorithmic-based pricing could be such that consumers are left with no choice or have to go for the choice that is offered to them in a very unrealistic way. So, the regulatory challenge for the regulators is how to identify these things as the real issues or even how to prove that there has been collusion in the first place.



Definition Importance of Algorithms

- **Adoption of Algorithms in Online Retail**
 - One-third of best-selling products on Amazon US in 2015 sold through algorithms
 - Higher prices and sales volume observed for algorithm-sold products
- **EU Sector Study Findings**
 - Two-thirds of online retailers in the EU use algorithms
- **Understanding Algorithms**
 - Defined by OECD as a sequence of rules performed in order
 - Generates output from given input
 - Examples include solving mathematical problems, food recipes, music sheets
- **Computer Science Perspective**
- **Defining Features of Algorithms**
- **Limitations and Strengths**



So, we need to look at the importance of algorithms here. One-third of the best-selling products on Amazon in 2015 were sold through algorithms. By now, it has increased so much. Higher prices and sales volumes were observed for algorithmically sold products because they were the ones that were prominently proposed, promoted, and then projected with a lot of incentives. When the European Union conducted a sector study, they found that two-thirds of the e-commerce retailers and online platforms use algorithms. Algorithms are a sequence of rules performed in order to generate output from a given input, and then it could be solving a mathematical problem, putting together an order from different buyers, targeting certain buyers, and sellers, or creating a marketplace where buyers are locked into some sort of patterns in the sense that if you want a mobile phone with 8GB memory, 2 or 3 retailers can force you to buy a 16GB

phone by offering a false choice or by unnecessarily hiking the price of the 8GB mobile phone. Or they could come up with something like, since we want to promote this model of this capacity, we will increase the price of the 8 GB mobile phone exorbitantly so that consumers will tend to opt for the 16 GB mobile phone. So, these are some of the things that are really happening.

The slide features a yellow background with a decorative orange and white wave at the top. On the left is the NPTEL logo, and on the right is the NALSAR logo. The title "Functional Classification" is centered in red. Below the title is a bulleted list of three categories: Monitoring Algorithms, Pricing Algorithms, and Signalling Algorithms, each with sub-points. To the right of the list is a graphic showing a computer monitor with various data charts and a small robot character. At the bottom right, there is a video inset of a man in a blue shirt speaking.

Functional Classification

- **Monitoring Algorithms**
 - Monitor market, competitors, and customers through scraping
 - Help competitors monitor each other's prices
 - Permit instant retaliation against defecting cartel members
- **Pricing Algorithms**
 - Optimise pricing strategies by reacting faster to changes
 - First-generation: Follow simple pricing instructions
 - Second-generation: React to changing market conditions
 - Speed up price updates from weeks to seconds
- **Signalling Algorithms**
 - Signal pricing intentions to competitors
 - Implement instantaneous price changes stealthily

But how do we define algorithms, particularly in the context of e-commerce? Some algorithms are meant only for monitoring. They monitor the market, competitors' behaviour, and then customers through scraping. Scraping is nothing but collecting data, collating data, and then sorting it based on behaviour, in the sense that bots do it all the time, 24/7 on the web. And then they help competitors look at each other's products and prices in the sense that they know I am watching you. You are watching me, and we are watching everyone else. But in a cartel of four or five, if one member decides to offer a special price, that member will violate the rules of the cartel but will still gain a good market share; this will make the other cartel members instantly retaliate against the cartel member who is not obeying the rules. So, what they would do is try to indulge in a price war, or they will try to indulge in setting up a false competition where they will suddenly announce discounts, or they will come up with some proposals, or they will manipulate the prices so that the cartel member who actually defects or who does not obey the cartel rules will be in a disadvantageous position. Imagine in a cartel of 5 or 6 retailers, if one retailer decides that he will offer a discount of 20% against the norms set collectively just to promote his or her market share, the other e-retailers can decide on a few things to punish him, such as, "We will make our things available at a lesser price." If he is offering 15% offer, together we all will decide to offer a minimum of 20% so that there is a margin of 5%, while he had with the margin of 0%. Now we would have a margin of 5% in our favour, and all his consumers will come to us.

So, this collective instant retaliation is possible because everyone is watching everyone's behaviour in the market. Then the pricing algorithms work more like neural networks.

The way we look at matching, comparing prices, and examining where the minimum price and maximum price are, where the difference is this much, is how they fix the price by reacting to changes. The first generation simply used the simple pricing mechanism. Ok, if this is the price, offer this; if not, offer that. It's a very simple pricing mechanism, but they are not very dynamic. The second generation is very dynamic depending on the demand and supply, market forces, and availability in the sense of how much of that is available in the warehouse and how much of that is being demanded; they fixed the prices. And then the speed of price updates changed from weeks to seconds in the sense that the prices will vary from second to second. If you try now, and if there's a collusion happening and then if all of them decide to suddenly outsmart someone and offer 10%, it will be available now, but a minute earlier you would not have been able to see that.

Then there are signalling algorithms. These signalling algorithms are like sending signals to the other competitors. This is the demand. This is supply, and this is where we need to fix our price band, and this is where we need to ensure that the prices do not change exorbitantly or that the margin of the prices fluctuating is 5 to 10% of the norms we have decided. Mind you, all this is happening simultaneously at the wink of a moment and then without any human intervention because algorithms on their own can monitor and then decide.



Classification by Interpretability

- **Types of Algorithms by Interpretability**
 - White box algorithms are transparent and clear
 - Black box algorithms are impenetrable and complex
- **White Box Algorithms**
 - Designed as transparent and clear code blocks
 - Visible and understandable to humans with suitable knowledge
 - Steps leading to decisions can be retraced
- **Black Box Algorithms**
 - Work like human thought processes, not easily inferred
 - Prevent users from controlling all outcomes
 - Obstruct courts from determining user intent
- **Implications for Firms**



Some of the algorithms are transparent and clear, so it's easy to locate them. Some of them are like black boxes. So, the first one is called a white box. The second one is called black boxes. Normally, what happens is that the black box ones are the ones that are mostly used in all the e-commerce sites because they work like human thought, but then they cannot be inferred, or a third party won't be able to recognize how they work. And then the users are powerless. Users only have to give inputs. They can't decide on this. And more importantly, since they can be defined and defended as source code or trade secrets, courts won't be able to infer from them or ask them to deconstruct or make the code available to them.



Classification by Learning Method



- **Adaptive Algorithms**
 - Fixed capabilities, cannot improve autonomously
 - Follow specific instructions by the programmer
 - Present fewer concerns for algorithmic collusion
 - Mostly deployed in the Messenger scenario
- **Learning Algorithms**
 - Capable of machine learning
 - Improve over time through data, experience, and experimentation
 - Do not follow static programming instructions
 - Modify themselves to improve performance
- **Types of Machine Learning**
 - Supervised Learning: Conducted under human supervision



And then there are adaptive algorithms that have fixed capabilities. They cannot improve autonomously. So, they go by what the programmer says. They are more like step-by-step, 1-2-3-4-5. They don't do much work. But the learning algorithms that are dynamic, very agile, and can learn from their own behaviour, picking up cues from the market, are the ones mostly used in e-commerce sites. Over time, they become better, more agile, more lateral, and, more importantly, they can modify themselves to improve their performance because they have the capacity to self-learn. So after about 500 iterations or after being in the market or in use for about two to three months, they would be able to gather more information and fix the price more instantly than when they were introduced in the first place. So, this is the way the learning method of algorithms can be used to manipulate the market.



Definition & Features of Collusion



- **Definition of Collusion**
 - Competitors coordinate actions to raise profits
 - OECD: Joint profit maximisation strategy harming consumers
- **Features of Collusion**
 - Coordination among competitors
 - Raises profits to supra-competitive level
 - Harms consumers
- **Legal Perspective**
 - US: Requires evidence of conscious agreement
 - EU: Requires communication between rivals
- **Types of Collusion**
 - Tacit collusion tolerated by competition law



So, we now need to look into the features of collusion. Collusion is when, as we said, competitors or players in the market come together with some ulterior motive, either to raise their profits or to hold their market share together. One way is for competitors to coordinate actions to raise profits. The action to raise profits could be either by offering discounts or fixing a basic minimum price below which nobody will sell. So, the OECD has defined this as a joint profit maximization strategy that harms consumers. And then the coordination among competitors is equally important. We have seen that through algorithmic dynamics, it's possible. Given the gaps in demand and supply, a carefully coordinated collusion can result in super profits, particularly if it isn't something like food items, medicines, or travel, particularly during holiday seasons when consumers do not have many choices or the options available to them are narrowed down due to algorithmic behaviour. So, ultimately, consumers pay a huge price because the market is distorted. Market forces do not operate with a free hand, and more importantly, collusion ensures that profits are maximized. Consumers are duped to the fullest. So, in the US, if this has to be proved, then a conscious wanted agreement has to be proved, whereas in the EU even communication among rivals is good enough to prove that. But in some senses, tacit collusion is tolerated by competition law in some countries because it is taken as normal behaviour, although it does not often result in good consumer welfare maximization. But again, the competition law is not something that always favours tacit collusion or views it as the best option that should be permitted.



Economic & Legal Perspectives on Collusion



- **Definition of Collusion by Economists**
 - Harrington's definition emphasizes a reward-punishment scheme
 - Supracompetitive prices can occur with or without collusion
- **Importance of Reward-Punishment Scheme**
 - Critical to collusion as it ties current conduct with future conduct
 - Defines collusion through causal relationships
- **Legal Perspective on Collusion**
 - Requires evidence of direct communication
 - Focuses on agreement or mutual understanding
- **Economic Perspective on Collusion**
 - Focuses on reward-punishment schemes
- **Differences Between Law and Economics**



So how do we define collusion among economies? There are multiple views. Harrington's definition emphasizes a reward-punishment mechanism where the collaborators, market forces, or those who are colluding receive a collective reward, while they punish the ones who violate the rules. So, with or without collusion, according to him, super competitive prices can occur. But critical to collusion is the current conduct compared with the future conduct, and then you can also infer collusion through casual behaviour, although it might be very tacit. But the real problem is how we prove there is a direct communication, an indirect agreement, or a direct behaviour that could be monitored and then mapped to the behaviour? Very difficult to prove. But then, focusing on the agreement of mutual understanding, there would not be any written agreement to that effect. So, the differences between law and economics are that economists look at this from a different economic perspective based upon the microeconomic behaviour of the market players. Whereas law looks at it more from a perspective that promotes competition or hinders competition.



Structural Characteristics Conducive to Collusion



- **Structural Characteristics Conducive to Collusion**
 - Concentrated market with few competitors
 - Symmetric competitors with similar cost structures
 - Homogeneous products
 - High barriers to entry
 - Market transparency
 - Stable demand
 - Small and frequent purchases by customers
- **Impact of Concentrated Markets**
- **Role of Cost Symmetry and Product Homogeneity**
- **High Barriers to Entry**
- **Market Transparency and Stable Demand**



But collusion happens in some circumstances where structural facilitation is occurring. For example, the market is getting highly concentrated with few players. The same players have a very small or similar cost structure, and the products are very homogeneous. Other players will find it very difficult to enter the market because of higher barriers to entry due to elevated costs, or because the market is held by a few players who do not offer space for others to enter and deal with the consumers. Additionally, there is a lack of transparency in the market, and more importantly, the demand is stable and huge. Furthermore, there is frequent demand from consumers. So, under these circumstances, collusion can occur more frequently with more powerful players. So, in concentrated markets, collusion can be a very effective and powerful tool for the colluders against the consumers.



Facilitation of Collusion by Algorithms



- **Definition and Premise of Algorithmic Collusion**
 - Algorithms facilitate or consummate collusion autonomously
 - Autonomous algorithmic collusion does not require human intervention
- **Facilitation of Collusion by Algorithms**
 - Human agents agree to collude, algorithms facilitate it
 - Legality of collusion unaffected by the use of algorithms
 - Possible to pursue under US antitrust law or EU competition law
- **Controversy Surrounding Autonomous Algorithmic Collusion**
 - Technical feasibility is debated
 - Prominent commentators argue algorithms can achieve tacit collusion
 - Experimental studies show Q-learning algorithms can collude in certain settings
- **Future Considerations**



Algorithms, as we have seen, facilitate collusion in more than one way because they assume that all the sellers are able to come together and work together without having any specific agreement. Then, autonomous algorithmic collusion does not need human intervention. For example, if all the market players, four or five digital e-commerce giants, tell their algorithms that you look at the behaviour of the algorithm, you compare the prices, and on your own, you choose this as the base price or the minimum or the maximum price. Similarly, if everyone does the same thing, collusion happens without any human intervention. Or humans decide to collude, and then algorithms facilitate it. But the problem is that the legality of the collusion is unaffected by the use of algorithms, or you cannot take a stand that it was not me; it was not us, it was algorithms who decided. But it is possible to pursue this under US antitrust law or EU competition law to prove that there has been a de facto algorithmic collusion. Although there is no written agreement, the behaviour can be seen. The behaviour can be inferred from the behaviour that there has been algorithmic collusion. But is it technically feasible? It's highly doubtful. And then prominent commentators argue that algorithms can achieve tacit collusion, but that doesn't mean that every time tacit collusion happens, algorithms are the ones that should be blamed for it. So experimental studies also found that they can collude in certain settings, but not necessarily always. So, what should be the future course of the competition law to prevent frequent collusion of the algorithmic forces from resulting in a reduction of consumer welfare or consumers being taken for a ride by these e-commerce agents?



Types of Autonomous Algorithmic Collusion



- **Types of Algorithmic Collusion**
 - Express Collusion: Direct communication between algorithms
 - Tacit Collusion: Independent adaptation without direct communication
- **Legal Implications**
 - Express Collusion: Clearly illegal under US and EU laws
 - Tacit Collusion: Generally legal but debated in algorithmic context
- **Dimensions of Analysis**
 - Direct communication among firms or algorithms
 - Degree of algorithmic autonomy
 - Extent of collusive human intent
- **Challenges in Attribution**
 - High algorithmic autonomy complicates firm liability



Types of Autonomous Algorithmic Collusion: This we have seen, and we will not go into the details here.



Ezrachi and Stucke's Classification



- **Messenger Scenario**
 - Humans use algorithms to execute collusion
 - Express collusion among human agents
 - Minimal algorithmic autonomy
- **Hub and Spoke Scenario**
 - Common algorithm used by competitors
 - Higher degree of algorithmic autonomy
 - Indirect communication through the hub
- **Predictable Agent Scenario**
 - Firms adopt similar algorithms independently
 - No agreement or intent to collude
- **Digital Eye Scenario**



Ezrachi and Stucke: They classify human use algorithms to execute collusion, express collusion among human agents. So, in the messenger scenario, minimal algorithmic autonomy is present. It is not that algorithms have greater autonomy. This is one view. The other view is that common algorithms are used by the competitors. There is a higher degree of algorithmic autonomy because all of them are patterned on the same logic, the same structure, and the same decision-making thinking. So, it is to be inferred that there is indirect communication through the hub by these different algorithmic agents. And then this results in a predictable algorithmic scenario where the agents behave in a similar

way. Although there could be no tacit or explicit written agreement, the algorithmic behaviour of different competitors can itself result in the inference that there has been collusion facilitated by algorithms.

Debate on Tacit Collusion

- **Traditional Debate on Tacit Collusion**
 - Donald Turner's view: Tacit collusion is natural in oligopolistic markets
 - Richard Posner's view: Tacit collusion should be prohibited like express collusion
 - Courts generally side with Turner's perspective
- **Recent Arguments by Louis Kaplow**
 - Current approach to agreement under Sherman Act is misguided
 - Focus should be on economic consequences of collusion
 - Kaplow does not advocate outright prohibition of tacit collusion
- **Algorithmic Collusion: Predictable Agent vs. Digital Eye**
 - Predictable Agent: Firms adopt similar algorithms expecting competitors to follow
 - Intent of firms using Predictable Agent is not purely to maximize profit
 - Difference from traditional tacit collusion: Awareness of facilitating collusion



But then there is a whole lot of debate on tacit collusion: whether it is reasonable, how we prove it, and how we should go about it.

Algorithmic Tacit Collusion

- **Legality of Tacit Collusion**
 - Posner's and Kaplow's arguments support prohibiting tacit collusion
 - Express and tacit collusion cause similar consumer harm
 - Current approach focuses on lack of direct communication
- **Algorithmic Tacit Collusion**
 - Algorithms enable collusion in various market structures
 - Increased transparency and high reaction speed facilitate collusion
 - Algorithms can signal pricing intentions and enact frequent price changes
- **Critical Aspects Facilitated by Algorithms**
 - Reaching terms of coordination among firms
 - Rapid detection and retaliation
- **Accountability and Liability**



So, its legality has been questioned. There are multiple viewpoints. Posner is a famous law and economics legal expert in the USA whose thinking has been very influential globally. And according to Posner, they support prohibiting tacit collusion because tacit collusion per se results in less consumer welfare and more market concentration. They result in consumer harm. But the current approach focuses on the lack of direct

communication. But then algorithmic tacit collusion occurs in various market sectors. So, increasing transparency and then increasing reaction speed facilitates collusion. So, we should increase transparency and also see how much of that is being facilitated by high volume and high reaction speed. Algorithms can, in fact, signal price to different sellers in the market so that they, amongst themselves, get the signal and then accordingly change the rules. So, rethinking the terms of coordination among firms has to be clarified. And then they should be rapidly decided, detected, and retaliated against. But then the challenge is that competition law agencies/institutions are the ones that may not have sophisticated power to monitor, and more importantly, to prove without any doubt that there has been consumer-harming behaviour on account of algorithmic collusion.



Conclusion

- **Debate on Algorithmic Collusion**
 - Ongoing controversy in the competition law community
Whether to regulate or not?
- **Need for Proactive Competition Law**
 - Cannot ignore algorithmic collusion
 - Law should take a proactive stance
- **Programmer Incentives**
 - Clear stance against algorithmic collusion
 - Indecipherable algorithms not accepted as a defense
- **Minimizing Algorithmic Collusion**
 - Best tackled at the design stage
 - May require ex ante regulation



So, to conclude, the debate on algorithmic collusion is not fully settled, and there is an ongoing controversy. But then, proactive measures by competition law agencies are equally important. Because algorithmic collusion has become more or less a routine practice among the monopolists on e-commerce sites. And, more importantly, they should take a clear-cut stand against algorithmic collusion. How do we minimize algorithmic collusion is one way to ensure that it is prohibited or minimized by design. Ex-ante regulation is when the regulators, after looking at the behaviour of the players, particularly the dominant ones, and their impact, if they come to the conclusion that there has been algorithmic collusion behaviour, should require the sellers to either refund the balance or refund the maximum amount they have received, or they should be punitively fined, for example, a 100 million euro fine for colluding in the travel sector during the Christmas season, or for trying to mislead consumers by manipulating demand and supply, or for trying to mislead consumers in such a way that market forces are distorted, causing consumers to pay more when they should actually be paying much less. There should be a competent fine for the major players who engaged in tacit collusion to maximize their benefits. So ex-ante regulatory tools can also be used.



Literature (Selected)



- The Cambridge Handbook of Private Law and Artificial Intelligence (Eds) Ernest Lim, Phillip Morgan – Cambridge University Press— 2024
- Artificial Intelligence and Competition Law in the Transatlantic Sphere: Navigating New
- Frontiers in Regulation and Enforcement Charles Ho Wang Mak Stanford-Vienna Transatlantic Technology Law Forum 2025
- AI and Competition Georgios I. Zekos 2023 Springer
- Regulating Algorithms in India: Key Findings and Recommendations- Archana Sivasubramanian- CPR New Delhi 2021
- <https://www.moneycontrol.com/news/opinion/ai-and-competition-cci-weighs-risks-of-algorithmic-collusion-13008300.html>



And then the literature on competition law and AI is emerging like never before. I have touched them but I have barely scratched the surface. In fact, to talk about algorithmic collusion and AI itself, we would need at least two to three hours to get into the technical details as well as both the economics and the legal perspective. So, the literature provided is very selective. Now coming to the Indian context, it has recently been reported that the Competition Commission of India is also looking into the risk of algorithmic collusion happening in the Indian market and is trying to explore the possible options available to address that. In fact, the Competition Commission of India is very much aware of it. That is why it floated a draft of the digital competition bill quite some time ago. The comments have been received, and very soon India is likely to have a digital competition act, which could result in the curtailment of this algorithmic collusion behaviour. There is also an increasing body of literature in India on account of this algorithmic collusion, particularly regarding the way AI is interacting with market forces, digital platforms, and what is happening in algorithmic collusion facilitated by AI. So, I have given some literature and also shared a news item; as explained, we have just barely scratched the surface.



Next



- AI, Law and Justice in Select Jurisdictions (1 of 2)



In the next class, we will discuss AI, law, and justice in selected jurisdictions. This will be delivered in two sessions, with the first session being the following class. Thank you.