ADDRESSING ALGORITHMIC PRICING COLLUSION IN MALAYSIAN COMPETITION LAW: CONSIDERATIONS FOR ARTIFICIAL INTELLIGENCE ETHICAL GOVERNANCE

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Abstract

Artificial Intelligence ('AI') tools in the digital economy empower electronic agents to facilitate e-commerce transactions for digital enterprises in Malaysia. The growing number of Malaysian digital enterprises utilising digital platforms that employ AI algorithms - to customise services, predict market trends, and improve their pricing models - may result in various anti-competitive practices and tacit collusion amongst these enterprises. The absence of a formal agreement or human interaction evidencing an intent to co-ordinate poses regulatory challenges to monitor and control algorithms that trigger anti-competitive behaviour. The paper focuses on anti-competitive tacit collusion in algorithmic price setting. In the absence of formal agreement or human interaction, the possibility of colluding has caused various regulatory challenges to monitor or control such use of algorithms that may result in anti-competitive practices. This may render the Competition Act 2010 and the role of the Malaysian Competition Commission as nugatory. The paper, firstly, sets out the technological background of algorithmic pricing and collusion and its impact on consumer welfare; secondly, it examines Malaysian competition governance and the inadequacy of the regulatory tools to address the challenges presented by anti-competitive practices arising from tacit algorithmic collusion; and finally, the paper proposes the use of an AI ethical governance mechanism by the developer or deployer of the AI to ensure algorithms function ethically when used by digitised enterprises in Malaysia. This paper serves as a prescient proposal to the consequential issues of algorithmic pricing and collusion.

Keywords: Artificial Intelligence, anti-competitive, pricing algorithm, algorithmic collusion, AI ethical governance

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I INTRODUCTION

Digital enterprises operate within a digital ecosystem embraced mainly by new and innovative digital transformation. These digital enterprises have harnessed technological advancements to create a cutting-edge competitive advantage. Digital enterprises experience digital transformation by taking a multi-prong approach in strategising and changing their operational activities using technologies to identify the best customer experiences and manage a unique business model in a digital ecosystem. Such strategising requires continuous improvement in integrating physical and digital businesses and creating a culture that encourages iterative innovation while taking advantage of modern technologies' full potential, including factors such as analytics, cognition, and mobility.[1] The technological model of these enterprises is based on global trends that espouse the priority use of specific technical and technological tools in an enterprise's digital transformation.

A digital enterprise adopts not only profound digitalisation of all internal value chains of an enterprise design, production, logistics, technical support and product support. Equally important is its capacity to build close partnerships between the business and its counterparties that create common integrated information and communication space.[2] In addition, significantly, many of their business interactions with participants in the business chain participants are translated into digital services provided by third-party organisations that include analytics, references, applications, offers, contests, and call centres.[3]

As described by Uhl and Gollenia, digital enterprises are companies with excellent transformational ability, having 'the right instruments to monitor technological and socio-political trends and make the right strategic adjustments' and capable of surviving in future business ecosystems as their digital transformation imbues them with the capability to remain competitive in a rapidly-changing market.[4] Furthermore, digital enterprises are also keen on transforming and being proactive to new technologies that make them excel in innovation and exploit technologies to derive a real financial benefit.[5] Therefore it is only natural to expect these digital enterprises to be utilising Artificial Intelligence ('AI') tools as part of their transformation to obtain a market advantage and gain a financial advantage.

The deployment of AI tools that utilise algorithms generates efficiency in the digital market when large data is used to predict the consumer's preferences through profiling and making recommendations on the products or services to be purchased, forming a coalition of buyers to secure optimal terms and conditions.[6] AI tools enable the business to strategise on prices based on algorithms that consider competitor pricing, supply and

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[1] Anna Obukhova, Ekaterina Merzlyakova, Irina Ershova and Kristina Karakulina, 'Introduction of digital technologies in the enterprise' (2020) 159 *E3S Web Conference* 1-10 <https://doi.org/10.1051/e3sconf/202015904004>.

[2] Ibid 3.

[3] Ibid.

[4] Axel Uhl and Lars Alexander Gollenia, *Digital Enterprise Transformation* (Taylor and Francis, 2020).

[5] Ibid.

[6] Michal S Gal and KN Elkin-Koren, 'Algorithmic Consumers' (2016) 30(2) *Harvard Journal of Law and Technology* 309-353.

demand, and other external factors in the market. Such pricing technology also leads to gain unfair benefits when used to autonomously coordinate prices resulting in the phenomenon of anti-competitive price collusion and price surge[7] within the realm of competition law.[8]

Competition law prohibits market players from engaging in cartels or agreements restraining competition without compromising benefits to the consumer. This prohibition is based on the notion that competitors can make independent decisions only if the competition's consequences increase consumer welfare. However, the imposition of a too-strict or limited legal liability to curb AI tools and algorithms carries a risk of impeding the efficiency of the use of innovative technology, which may inhibit progress on technological innovation that benefits society.[9] Nevertheless, since algorithms should not be immune from the competition laws and the use of algorithms is not illegal *per se*, appropriately, specific uses of the algorithms should be considered illegal and therefore, both the programmers and the users be made aware of its potential legal consequences.

AI tools have the ability to interact with other algorithms to enable coordinated actions and to collude on price-setting without the human-in-the-loop, but it is difficult to prove an illegal cartel under competition law since such a collusive agreement must be evidenced and requires proof of communication between human actors to show an intent to act in a coordinated manner to proof concurrence of wills between the parties.[10] This phenomenon enables digital enterprises to escape responsibility for anti-competitive collusion by hiding behind the algorithms. Therefore, not all algorithmic price setting involves human actors, but it does provide the ability for competing digital enterprises to employ algorithmic price collusion. Since algorithmic price collusion may be explicit or tacit. This paper focuses on tacit algorithmic price setting as explicit collusion will fall within the ambit of the law discussed in the succeeding headings. This phenomenon poses a considerable challenge to the application and adequacy of the Malaysian Competition Act 2010 ('CA 2010') and Malaysia Competition Commission ('MyCC')[11] to identify and determine a case of infringement. Thus, the question arises of when does the use of the pricing algorithms amount to anti-competitive and how or on whom the legal liability could be imposed - whether on the developer or deployer of the algorithm facilitating the tacit collusion.

The phenomenon of placing pricing decisions in the "hands" of algorithms has gained concern among scholars and competition authorities since algorithms are capable of sustaining collusive outcomes more effectively than human decision-makers. However, to find the right balanced approach, a modern approach is recommended to recognise

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7   Surge pricing involves the use of algorithms to automate price increases on products and services in periods of high demand and limited supply and to lower prices when demand is weak. Such as used by *Uber*, *Grab* and *Open table*.

8   Michal S Gal, 'Illegal Pricing Algorithms' (2019) 62(1) *Law and Technology* 18-20 <https://ssrn.com/abstract=3326381>.

9   Thomas A Hemphill, 'Human Compatible: Artificial Intelligence and the Problem of Control by Stuart Russell' (2020) 40(2) *Cato Journal* 561-566.

10 Gal (n 8) 19.

11 The Malaysian Competition Commission, or the 'MyCC', is an independent body established under the Malaysian Competition Commission Act 2010 to enforce the Competition Act 2010.

its potential positive uses for AI in society, such as advancements in scientific research and possible anti-competitive consequences.[12] In balancing the posit to regulate the phenomenon whilst realising the benefits flowing from the use of AI tools, this paper proposes a co-regulatory model between businesses and regulators wherein the authors emphasise the need for some framework of values to be employed by developers in designing the algorithm as well as on the related AI tools audited against this framework. It is proposed that adopting an AI ethical governance framework in using AI tools imbued with the overarching principles of competition law is deployed. This will overcome the inadequacy of the CA 2010, particularly in situations where anti-competitive regulations are not viable to impose legal constraints on tacit algorithmic pricing models. Hence, a triumvirate approach is proposed to be adapted to find a solution in regulating anti-competitive practices resulting from algorithmic pricing by addressing technological factors, normative legal rules, and ethical considerations[13] in addressing anti-competitive AI tools usage in illegal pricing algorithms in Malaysia.

This paper firstly sets out the technological background of algorithmic pricing and collusion and its impact on consumer welfare; secondly, the examination of the inadequacy of the CA 2010 and MyCC's efficacy in addressing the phenomenon of unprecedented anti-competitive collusion using AI tools to execute joint algorithmic price-setting without human interaction in Malaysia; and finally, the paper proposes the adoption of an AI ethical governance through the operationalisation of an ethical governance framework to complement competition law principles in the development and deployment of AI. This paper serves as a prescient proposal to the consequential issues of algorithmic pricing and collusion in the digital marketplace.

II   TECHNOLOGICAL BACKGROUND: ALGORITHM, ALGORITHMIC PRICING AND COLLUSION

Emerging technologies such as AI systems are increasingly ubiquitous and pervasive in businesses - developing at a pace that has left an ever-widening governance or regulatory gap. Naturally, there is a growing consensus that digital technologies break new "pacing" grounds[14] and presents a dilemma when AI technology raises novel challenges to the governing frameworks in place, such as traditional competition law. Therefore, it is crucial to contextualise this discussion by explaining the technology.

The word "algorithm" originated as a system of Arabic numerals developed in the nineteenth century by a Persian mathematician, *Abu-Ja'far Mohammed ibn-Mūsa al-Khuwārizmi,*[15] representing a set of mathematical instructions or rules. In the context of

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[12]   Hemphill (n 9) 563.

[13]   Joshua A Gerlick and Stephan M Liozu, 'Ethical and legal considerations of artificial intelligence and algorithmic decision-making in personalized pricing' (2020) 19 *Journal of Revenue and Pricing Management* 85-98 <https://doi.org/10.1057/s41272-019-00225-2>.

[14]   Organisation for Economic Co-operation and Development (OECD), *Regulatory effectiveness in the era of digitalization* (June 2019) <https://www. oecd.org/gov/regulatory-policy/Regulatory-effectiveness-in-the-era-of-digitalisation.pdf>.

[15]   Merriam-Webster Dictionary < https://www.merriam-webster.com/dictionary/algorithm>.

a computer, it helps to calculate an answer to a problem.[16] The learning by AI in machine learning pivots on the amount of data fed into the algorithm. AI's enormous ability to make efficient, accurate and intricate predictions increases with more data. The widespread use of AI is advanced by collecting and processing large data sets, commonly referred to as Big Data, that 'train' the algorithm.[17] AI is often referred to as an intelligent agent owing to its ability to learn from vast amounts of data and experience and make decisions through perception and cognition.[18] The former means the ability of AI to perceive the world and recognise patterns through experience, and the latter refers to the ability to learn and reason.[19] Russell and Norvig refer to the "intelligent agent" as a unifying theme in the study of AI, explaining AI as 'the study of agents that receive percept's from the environment and perform actions'.[20] They place the field of AI to surpass the ability of human intelligence to understand how we think as AI goes beyond merely understanding but extends to building intelligent entities.[21] This manner of intelligence is often spoken of as intelligibility, and a computer with intelligibility can perform in the same way as human intelligence. Definitions of AI can be organised along dimensions of thinking and acting. The thinking dimension covers thought processes and reasoning,[22] and the acting dimension deals with performance, either humanly or ideally.[23] It is well worth expanding on the acting dimension, which includes an AI that acts humanly, as it will include AI for "automated reasoning" and "machine learning". Automated reasoning uses 'stored information to answer questions and to draw new conclusions' whereas machine learning adapts 'to new circumstances and to detect and extrapolate patterns.[24] In other words, the algorithm in machine learning allows the AI to make predictions from the data that it has been provided.

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[16]   Cambridge Dictionary <https://dictionary.cambridge.org/dictionary/english/algorithm>.

[17]   Brad Smith and Carol Ann Browne, *Tools and Weapons: The Promise and the Peril of the Digital Age* (Hodder and Stoughton, 2019) 195.

[18]   Ibid 194, 196.

[19]   Ibid.

[20]   Smith and Browne (n 17) viii.

[21]   Smith and Browne (n 17) 1.

[22]   Smith and Browne (n 17) 1-2. Thinking humanly refers to '[The automation of] … activities that we associate with human thinking, activities such as decision-making, problem solving, learning …'. See Richard Ernest Bellman, *An Introduction to Artificial Intelligence: Can Computers Think?* (Boyd & Fraser, 1978). Another definition regards AI as 'The exciting new effort to make computers think … machines with minds, in the full and literal sense.' See John Haugeland, *Artificial Intelligence: The Very Idea* (MIT Press, 1985). AI with respect to thinking rationally refers to 'The study of the computations that make it possible to perceive, reason, and act'. See Patrick Henry Winston, *Artificial Intelligence* (Addison-Wesley 1992). Another definition is 'The study of mental faculties through the use of computational models.' See Eugene Charniak and Drew McDermott, *Introduction to Artificial Intelligence* (Addison-Wesley, 1985).

[23]   Smith and Browne (n 17) 1-2. AI in terms of acting rationally 'is concerned with intelligent behaviour in artefacts'. See Nils John Nilsson, *Artificial Intelligence: A New Synthesis* (Morgan Kaufmann Publishers Inc,1998). Another definition is 'Computational Intelligence is the study of the design of intelligent agents'. See David Poole, Alan Mackworth and Randy Goebel, *Computational Intelligence: A Logical Approach* (Oxford University Press, 1998). Acting humanly refers to 'The art of creating machines that perform functions that require intelligence when performed by people'. See Ray Kurzweil, *The Age of Intelligent Machines* (MIT Press, 1990). Another definition is 'The study of how to make computers do things at which, at the moment, people are better'. See Elaine Rich and Kevin Knight, *Artificial Intelligence* (McGraw-Hill Inc, 1991).

[24]   Smith and Browne (n 17) 2.

The extent of the use of AI tools in Malaysia has been measured in terms of several factors. The AI Readiness Index 2022[25] ranks Malaysia in 29th place globally in terms of how ready a given government is to implement AI in delivering public services to its citizens. Albeit focused on public services, the report commented on the aspects imbibed in the local climate required for a country to be an AI leader. For instance, the report concludes that in terms of the human capital dimension, Malaysia appears to have the highest proportion of STEM graduates in East Asia[26] and a growing technology sector with an increase in companies defined as unicorns which are companies valued over US$1 billion.[27] Malaysia published its National Artificial Intelligence Roadmap ('Malaysian Roadmap') in 2021. It was launched in 2022,[28] setting the overarching policy and direction in positioning the nation to benefit from the AI revolution by assisting understanding and confidence in AI systems. Within this roadmap is a policy position on AI governance and ethics in developing and deploying AI tools by recommending the values of Responsible AI within the Malaysian Roadmap. These are further enumerated in Heading V. Additionally, the Malaysia AI Blueprint Annual Report 2021 indicates that the Big Data Analytics Maturity and the overall AI Maturity of Malaysian companies across twelve industry verticals, including the government sector, evidenced an improvement from 2020, albeit very slightly. However, the use of AI tools is rife in delivering services in industries such as telecommunication and finance and, generally, any sector that can provide consumer services on platforms in the digital marketplace. The Malaysian Roadmap's findings indicate there are hurdles to AI adoption amongst businesses, particularly AI governance. Still, the overall trajectory is one of continued growth, particularly in the private sector.[29]

This weak link to a lack of AI governance is concerning when an increased level of AI adoption is undertaken. The authors anticipate that the phenomenon of algorithmic price-setting collusion will be incremental in line with increased AI adoption. The OECD report on algorithm collusion highlighted that pricing algorithms might 'expand the grey area between unlawful explicit collusion and lawful tacit collusion, allowing firms to sustain profits above the competitive level' more effortlessly without the necessity of having to agree or even enabling digital enterprises to replace explicit collusion with tacit coordination.[30] While algorithms serve as tools to implement cartel agreements and facilitate coordinated interaction or discriminatory pricing, there are innumerable reasons for algorithmic collusion to occur without the element of an explicit arrangement,

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[25]   Oxford Insights, Government AI Readiness Index 2022 (Annual Report, 12 December 2022) <https://www.oxfordinsights.com/government-ai-readiness-index-2022>.

[26]   Ibid 12.

[27]   Oxford Insights (n 25) 42.

28   Rex Tan, 'Mosti launches five technology roadmaps to develop Malaysia's robotics, advanced materials, and AI industries' *Malay Mail* (Kuala Lumpur, 9 August 2022) <https://www.malaymail.com/news/money/2022/08/09/mosti-launches-five-technology-roadmaps-to-develop-malaysias-robotics-advanced-materials-and-ai-industries/21970>.

[29]   Malaysian Ministry of Science & Technology, Malaysia National Artificial Intelligence Roadmap 2021-2025 (2021) 29 <https://airmap.my/> 17.

[30]   Organisation for Economic Co-operation and Development (OECD), *Algorithms and Collusion: Competition Policy in the Digital Age* (2017) <www.oecd.org/competition/algorithms-collusion-competition-policy-in-the-digital-age.htm>.

coordination, or communication between parties. [31] Tacit collusion occurs when digital enterprises utilise the same dataset or an identical pricing software; or where it is an unintended consequence of the use of the pricing algorithm where the same dataset or source of data has been used to train the algorithm that allows the humans to program their pricing algorithms to monitor and respond to rivals' pricing and other keys terms of sale. Digital enterprises are aware that the likely outcome will be conscious parallelism and higher prices which are taking place without the need for the rivals to communicate with each other or otherwise enter into an illegal cartel agreement.[32]

In addition, unintended algorithmic collusion occurs when businesses develop and use algorithms to monitor competitors' by collecting, mining, and analysing data and information related to the competitors' decision-making or business practices which are then used to make pricing decisions for their businesses. This type of data, also known as "monitoring algorithms", is increasingly available on price comparison websites,[33] making it a common practice among businesses to deploy identical pricing software from the same developer to develop pricing strategies. This practice creates a type of digital cartel - the "hub and spoke" cartel - when competitors use the same "hub" for coordinating with each other, whether willingly or otherwise, by way of what is described as a "parallel algorithm". [34] This cartel is an algorithmically aided[35] collusion[36] or a pricing algorithm that facilitates anti-competitive activity.[37] The increasing AI-based sophisticated data-mining techniques, without human intervention, allow algorithm operations to operate like "robot-sellers" while making pricing decisions autonomously.[38] Meanwhile, the algorithms facilitate information exchange and enable rival firms' to fix prices and allocate markets or bids. Their agreement is enforced and monitored through the algorithm. The algorithms operate as mere "intermediaries". They are used as the central "hub" from which the leading players/or individual market players coordinate competitors' prices and all the other players' activities, i.e., the "spokes" collectively or individually. [39] Algorithmic pricing allows players to react instantly to market dynamics

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[31]   Terrell McSweeny, Commissioner, US Federal Trade Commission, '*Algorithms and Coordinated Effects*' in *Online Markets and Offline Welfare Effects: The Internet, Competition, Society and Democracy* (The Centre for Competition Law and Policy, University of Oxford, 2017) <https://www.law.ox.ac.uk/sites/files/oxlaw/online_markets_and_offline_welfare_effects.pdf > 58.

[32]   Ariel Ezrachi and Maurice E Stucke, 'Sustainable and unchallenged algorithmic tacit collusion' (2020) 17(2) *Northwestern Journal of Technology and Intellectual Property* 217-260 <https://scholarlycommons.law.northwestern.edu/njtip/vol17/iss2/2>.

[33]   See generally OECD (n 30).

[34]   Ariel Ezrachi, 'The Competitive Effects of Parity Clauses on Online Commerce' (Research Paper No 55/2015, Oxford Legal Studies, 2015) < https://ssrn.com/abstract=2672541>.

[35]   See example in *Meyer v. Kalanick*, 477 F. Supp. 3d 52, 54 n.1 (SDNY, 2020). The Plaintiff filed a class action alleging *Uber*'s pricing algorithm model amounted to horizontal price-fixing, restricting competition among drivers to the detriment of *Uber* users and in violation of the antitrust law under the Sherman Act (USA).

[36]   See also *United States v. Airline Tarif Publishing Co.*, 836 F. Supp. 9 (DDC, 1993); *United States v. Topkins*, 15 Cr. 201 (ND Cal, 2015).

[37]   Nidhi Singh, 'Virtual Competition: Challenges for Competition Policy in an algorithm driven market', *Kluwer Competition Law Blog* (11 September 2018) <http://competitionlawblog.kluwercompetitionlaw.com/2018/09/11/virtual-competition-challenges-competition-policy-algorithm-driven-market/>.

[38]   Joseph Harrington Jr, 'Developing Competition Law for Collusion by Autonomous Price Setting Agents' (22 August 2017) <http://dx.doi.org/10.2139/ssrn.3037818>.

[39]   See generally Singh (n 37).

by setting prices without direct interaction with each other by simply using the upstream suppliers' pricing algorithm. The competitors operating on the same platform usually use a single algorithm and the prices automatically align.[40] This algorithm-fuelled hub-and-spoke model facilitates collusion among the competitors.

These algorithms convey a predetermined decisional tree that assigns weights to decision parameters to suggest the optimal decision given to a particular data set and circumstances[41] to optimise price settings from consumer data. AI tools employ machine learning wherein the algorithm can refine and redefine its decision parameters, freeing the algorithm from the predefined preferences of the consumer to decide features to be used to make their determinations.[42] Such algorithms replicate human neurons' activity by creating an artificial neural network with discrete layers, connections, and directions of data propagation[43] - replacing the "invisible hand" referred to by Adam Smith with the "digital hand", which results in behavioural pricing and collusion amongst digital enterprises as the new norm in the digital economy.[44]

The algorithm enhances conscious parallelism or tacit collusion when the pricing algorithms used by individual enterprises respond to market dynamics and become synced and predictable without the involvement of any express agreement between the competitors. Hence, competitors can unilaterally operate their pricing algorithms to reach a similar understanding without negotiation. Despite the awareness among the competitors of the use of pricing algorithms to facilitate tacit collusion or conscious parallelism, it is legally difficult to get direct evidence to prosecute for having the intent to commit the anti-competitive act given the complex nature of the algorithms used and the difficulty in identifying the human perpetrator. Furthermore, self-learning capabilities from the data with AI tools[45] enable predictions without the human-in-the-loop, further complicating the finding of an infringement under competition law without the existence of any illegal collusion. This will be discussed further in Headings III and IV.

III PRICING ALGORITHMS: THE COMPETITION LAW IMPLICATION

Businesses' reliance on algorithm-predictive analytics for optimisation of business processes with the assistance of AI, big data collection, storage, and analytics-fuelled algorithms has become ubiquitous.[46] The increased use of technological tools like algorithms has automated pricing systems – referred to as "pricing algorithms" - that serve

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[40]   Ibid.

[41]   Thomas H Cormen, Charles E Leiserson, Ronald L Rivest and Clifford Stein, *Introduction to Algorithms* (MIT Press Cambridge, 2009) 192-93, 843-49.

[42]   Organisation for Economic Co-operation and Development (OECD), *Data-Driven Innovation for Growth and Well-being: Interim Synthesis Report* (2015); Ariel Ezrachi and Maurice E Stucke, *The Promise and Perils of the Algorithm-Driven Economy* (Harvard University Press, 2016).

[43]   Kenji Lee, Algorithmic Collusion & Its Implications for Competition Law and Policy (12 April 2018) <http://dx.doi.org/10.2139/ssrn.3213296>.

[44]   See generally Gal and Elkin-Koren (n 6).

[45]   See generally OECD (n 30).

[46]   Christopher Steiner, *Automate This: How Algorithms Came to Rule our World* (Penguin, 2012) 248.

as "digital butlers" in making critical business decisions on pricing. This exponential growth and usage of large amounts of data, combined with the rising use of pricing algorithms, has resulted in extraordinary levels of market transparency. This enables digital enterprises to react almost instantaneously to price movements by competitors. The pricing algorithm can set the price of an item for sale and can be written to rely on competitors' prices and demographic or other information about the customer.[47] Since the pricing algorithm generates the actual prices for transactions and evaluates complex data with speed and sophistication beyond human capability, pricing algorithms perceive price-setting as entirely machine-driven. [48]

Further, predictive analytics allows algorithms to measure the likelihood of future outcomes by analysing historical data to estimate demand, forecast price changes, and predict customer behaviour and preferences. This ability includes forecasting endogenous or exogenous shocks that might affect the market environment, such as the entry of new firms, variations in exchange rates or even natural disasters. This is valuable input for improved decision-making, business planning strategies, innovation and customised services. Still, predictive analytics go further to optimise the businesses' ability to gain a competitive advantage by reducing production and transaction costs, segmenting consumers, or setting optimal prices that effectively respond to market circumstances.[49]

The benefit of having the human-out-of-the-loop allows the pricing algorithm to optimise processes within their automated feature by processing large datasets at a speedier mode and lower cost when compared to the time and cost of undertaking the same tasks if humans performed these.[50] The very absence of the human element presents a significant conundrum in competition law in terms of establishing infringement, imposition of liability and the competence of enforcement agencies.[51] Therefore the use of pricing algorithms and dynamic pricing algorithms has been subjected to intense debate and investigation for causing excessive, unfair and discriminatory pricing in the airline industry,[52] taxi apps,[53] hotel booking apps[54] and other digital enterprises in violation of

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[47] Organisation for Economic Co-operation and Development (OECD), *Algorithms and Collusion - Note by the United States* (26 May 2017) <https://one.oecd.org/document/DAF/COMP/WD(2017)41/en/pdf>.

[48] Ibid 5.

[49] See example *United States v. Airline Tarif Publishing Co.*, 836 F. Supp. 9 (DDC, 1993); *United States v. Topkins, 15 Cr. 201* (ND Cal, 2015). Topkins and his co-conspirators alleged to have written the computer code to coordinate prices for wall posters they sold through the *Amazon Marketplace* that instructed algorithm-based software to avoid price competition. They were guilty of violating Section 1 of the Sherman Act (USA). This case exposed the act of collusion using software tools in the digital market highlighting the related challenges and risk of harm using digital technology.

[50] See OECD (n 47) 5.

[51] Maureen K Ohlhausen, 'Should We Fear The Things That Go Beep In the Night? Some Initial Thoughts on the Intersection of Antitrust Law and Algorithmic Pricing' (Remarks from the Concurrences Antitrust in the Financial Sector Conference, 23 May 2017) <https://www.ftc.gov/system/files/documents/public_statements/1220893/ohlhausen_-_concurrences_5-23-17.pdf>.

[52] See generally *United States v. Airline Tariff Publishing Co*, 836 F Supp 9 (1993) <http://www.usdoj.gov/atr/cases/dir23.htm>.

[53] See *Meyer v. Kalanick*, 174 F Supp 3d 817 (SD NY, 2016). An example when taxi operators set consumer ride-fares in the *Webtaxi* app via the algorithmic pricing tool.

[54] See *Eturas and al v Lietuvos Respublikos konkurencijos taryba* CJEU - C 74/14, EU (Fifth Chamber, 2016). An example of *E-TURAS*, a Lithuanian online travel booking system, that used an algorithm alleged to collude

competitional law in Europe and the United States. Nevertheless, since the investigation relied on the proof of evidence of the human act or intent that is traditionally applied in the "brick and mortar" business model, the enforcement agencies failed to prove an anti-competitive infringement. This debate also reflects the risk to consumer welfare that is expected to exacerbate further since AI-assisted pricing algorithm is a standard business tool in all sectors, irrespective of their size.[55]

Therefore, challenges presented by pricing algorithms to the current competition law ecosystem are multifarious. Firstly, as long as the static nature of the enforcement principle for anti-competitive collusion remains unchanged in the context of pricing algorithms, the action and consequences of independent pricing algorithms that interact with competitors in the absence of evidence to support an agreement to fix prices or set prices, will not tantamount to an infringement under traditional competition law principles.[56] The pricing algorithm is unlikely to amount to an agreement "by object"[57] or "by effect"[58] that leads to price discrimination without incorporating competitor data and elements of human communication.[59]

Secondly, the undetectable and autonomous working of the pricing algorithm makes it difficult for antitrust officials to identify the cheater or those who conspire to cheat because the algorithms can bypass by way of automating the conspirators' responses to changing market developments or speeding them up - avoiding the need for ongoing coordination between the participants.[60]

Thirdly, pricing algorithms coordinate interaction through tacit collusion or parallel accommodating conduct[61] allowing multiple competitors to use the same company software. This technology allows the algorithms to collectively gravitate towards higher prices on their own.

Fourthly, pricing algorithms enable price discrimination strategies for certain groups of customers. Since the core function of the pricing algorithm is to respond to market characteristics which unavoidably includes competitors' market behaviour and matching

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and coordinate discount rates when booking online via an email to several travel agencies participating in the system to vote on the appropriateness of reducing the online discount rate from 4 percent to a range from 1 to 3 percent, contrary to an anti-competitive rule under Article 101 of the Treaty on the Functioning of the European Union (TFEU).

[55] Kaela Murie, 'Pricing Algorithms: Should Competition Authorities be Worried?' *European Law Blog* (21 December 2020) <https://europeanlawblog.eu/2020/12/21/pricing-algorithms-should-competition-authorities-be-worried/>.

[56] See generally OECD (n 30).

[57] The violation by "object" refers to agreements that, by their very nature, are anti-competitive. Examples of such agreements include price fixing arrangements, agreements that limit imports and exports, and agreements that divide the market.

[58] The violation by "effect" refers to an agreement or concerted practice that is found to harm competition by assessing surrounding circumstances by way of an economic analysis of the market once the action occurred.

[59] Organisation for Economic Co-operation and Development (OECD), Roundtable on Price Discrimination - Note by the United States (29-30 November 2016) <https://one.oecd.org/document/DAF/COMP/WD(2016)69/en/pdf>.

[60] See generally McSweeny (n 31).

[61] See generally Ezrachi and Stucke (n 42).

competitors' discounts, and presenting consumers with lower prices, it is theoretically considered pro-competitive and not anti-competitive.[62]

Finally, the price setting conceals the cross-subsidisation between different groups of consumers, which may not be considered fair. Price discrimination is driven not only by the cost to serve customers but also by customers' willingness to pay or to switch providers. Algorithmic approaches to this pricing structure may identify and exploit these differences between consumers more efficiently than prices set by humans.

Therefore, the aim of regulating price setting and collusion with the use of pricing algorithms may be beyond the scope and ambit of the present Malaysian competition law legal framework and the MyCC's ability to tackle issues of detection, investigation and evidence-collection that are incumbent in the process of proving such collusion.[63] The operability of pricing algorithms presents hurdles in building the evidential trail to claim infringement or establish an anti-competitive agreement or the required "meeting of minds" or "conscious commitment to a common scheme" of conduct or behaviour.[64]

This leads the authors to posit the reliance on an ethical dimension as a resolution to the legal conundrum. As a starting point in integrating an ethical construct in algorithmic pricing, Seele *et al* proffer a definition of algorithmic pricing that includes an ethical dimension:

> Algorithmic pricing is a pricing mechanism, based on data analytics, which allows firms to automatically generate dynamic and customer-specific prices in real-time. Algorithmic pricing can go along with different forms of price discrimination (in both a technical and moral sense) between individuals and/or groups. As such, it may be perceived as unethical by consumers and the public, which in turn can adversely affect the firm.[65]

There are different forms of algorithmic pricing. According to Seele *et al.*, two of these are dynamic and personalised pricing:

> Dynamic pricing (sometimes also known as surge, yield, or real-time pricing) generally refers to the practice of dynamically adjusting prices to achieve revenue gains, while responding to a given market situation with uncertain demand… Personalized pricing is referred to as first-degree price discrimination, customized, or targeted pricing, and represents a pricing strategy whereby firms charge different prices to different consumers based on their willingness to pay.[66]

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[62] See generally Murie (n 55).

[63] Nikita Koradia, Kiran Manokaran and Zara Saeed, 'Algorithmic Collusion and Indian Competition Act: Suggestions to Tackle Inadequacies and Naivety' in Steven Van Uytsel (ed) *The Digital Economy and Competition Law in Asia: Perspectives in Law, Business and Innovation.* (Springer, 2021) 127-191.

[64] See generally Harrington Jr (n 38).

[65] Peter Seele, Claus Dierksmeier, Reto Hofstetter and Mario D Schultz, 'Mapping the Ethicality of Algorithmic Pricing: A Review of Dynamic and Personalized Pricing' (2021) 170(4) *Journal of Business Ethics* 697-719, 698-699 <https://doi.org/10.1007/s10551-019-04371-w>.

[66] Ibid 699.

In this article, the authors' focus is on dynamic pricing as defined by Steele *et al* above, as it has a relatable cause of algorithmic collusion, discussed earlier.

IV INADEQUACY OF MALAYSIAN COMPETITION LAW IN ADDRESSING THE ANTI-COMPETITIVE CONSEQUENCES OF PRICING ALGORITHMS

Competition law, or antitrust law, consists of rules intended to protect the competition process and maximise consumer welfare.[67] The general aim of the law is to control and prohibit anti-competitive agreements that have as their object or effect the restriction of competition in a market or industry except if they have some redeeming virtue, such as the enhancement of economic efficiency.[68] The Malaysian CA 2010 and the Competition Commission Act of 2010 are primarily intended to regulate and control anti-competitive conduct by businesses and protect consumers and businesses against monopolies and dominant market players.

The scope of the law extends to an "enterprise" that includes "any entity carrying on commercial activities relating to goods or services".[69] The term "consumer" includes "any direct or indirect user of goods or services supplied by an enterprise in the course of business", and it encompasses " another enterprise that uses the goods or services thus supplied as an input to its own business as well as a wholesaler, a retailer and a final consumer".[70] The term "commercial activity" within Section 3(1) and (2) CA 2010 applies to both within and outside Malaysia subject to subsection (2) applies, "to any commercial activity transacted outside Malaysia which affects competition in any market in Malaysia". "Commercial activity", as defined in section 3(4) CA 2010, refers to all activity of commercial nature which is capable of extending to e-commerce activity carried out by digital enterprises except[71] for those excluded for a specific sector or related activities.[72]

The CA 2010 chiefly regulates two domains of competition law - the anti-competitive agreement under Section 4(1) and the abuse of dominance under Section

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[67] Richard Whish and David Bailey, *Competition Law* (Oxford University Press, 2015).

[68] Ibid 3.

[69] See *Competition Act 2010* (Malaysia) s 2.

[70] Ibid.

[71] "Commercial activity" is defined under Section 3(4) CA 2010 to include 'any activity of a commercial nature but does not include (a) any activity, directly or indirectly in the exercise of governmental authority; (b) any activity conducted based on the principle of solidarity; and (c) any purchase of goods or services not for the purposes of offering goods and services as part of an economic activity.' See *Competition Act 2010* (Malaysia) s 3(4).

[72] See *Competition Act 2010* (Malaysia) s 3, First Schedule; s 13, Second Schedule.

10(1).[73] Section 4(1)[74] prohibits vertical[75] and horizontal[76] anti-competitive agreements[77] between enterprises or involves a decision by a trade association,[78] with the object or effect[79] of significantly[80] preventing, restricting, or distorting competition in any market for goods or services.[81] Such agreements include any price-fixing, price-setting or standard-setting[82] agreements or cartel that restricts the competition in that market that prominently showcases the use of pricing algorithm. In such situations, where an anti-competitive "object" is not found, the agreement may still breach the law on the basis that it has an anti-competitive "effect".[83] Furthermore, the "agreement" could be either on price or non-price whereby the seller imposes a fixed price or a minimum price at which the product must be resold or also known as the "Resale Price Maintenance" ('RPM'). Hence, any form of RPM that serves as the agreement's focal point is deemed anti-competitive within Section 4 CA 2010.[84]

Exchanges of commercially sensitive information between competitors can be deemed competition concerns if the information exchanged relates to pricing and is likely to infringe the CA 2010.[85] Pricing information, when exchanged, will violate the law, which includes future intended prices, costs, discounts, rebates, or allowances.

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[73]   Competition law generally regulates three main domains - the anti-competitive agreement, abuse of dominance and control of merger and acquisition. The Malaysian Competition Act 2010 does not provide for any merger and acquisition control provision.

[74]   *Competition Act 2010* (Malaysia) s 4.

[75]   The term "vertical" refers to an agreement between businesses that are at different levels in the business chain, such as between a wholesaler and a retailer. Such agreements are only considered anti-competitive if the effect restricts the competition in the market. See *Competition Act 2010* (Malaysia) s 2.

[76]   The term "horizontal" refers to agreements between two businesses that operate on the same level in the business chain between manufacturers, wholesalers, or retailers. The Act enlists that several horizontal agreements are deemed to be illegal or, *per se,* illegal among others when specifically, for fixing, directly or indirectly, a purchase or selling price or any other trading conditions or control technical or technological development. See *Competition Act 2010* (Malaysia) s 2.

[77]   The term "agreement" in Section 4(1) includes "any form of contract, arrangement or understanding, whether or not legally enforceable, between enterprises, and includes a decision by an association and concerted practices" which means the term covers both verbal and written agreements. See *Competition Act 2010* (Malaysia) s 4.

[78]   See Malaysian Competition Commission (MyCC), *Guidelines on Chapter 1 Prohibition* [2.3].

[79]   A further dimension to anti-competitive agreement is found in *Competition Act* (Malaysia) 2010 s 4(1), where it states that horizontal or vertical agreement has the object or effect of significantly preventing, restricting or distorting competition in any market for goods or services in Malaysia or in any part of Malaysia.

[80]   Accordingly, such anti-competitive agreements are only prohibited if found to significantly 'prevent, restrict, or distort competition', and an agreement is not significant if the combined market share of the competitors in that market does not exceed 20% of the relevant market, or for non-competitors, all the parties individually have less than 25% market share in the relevant market. See Malaysian Competition Commission (MyCC) *Guidelines on Chapter 1 Prohibition* [3.4].

[81]   See *Competition Act 2010*, Malaysia s 4.

[82]   Price setting is regarded as the most serious of anti-competitive offences. It involves an agreement between competing persons or businesses, for some illegal purpose, such as raising prices, reducing or restraining output, dividing markets, or even allocating customers.

[83]   Malaysian Competition Commission (MyCC), *Guidelines on Chapter 2 Prohibition* [2.5].

[84]   Malaysian Competition Commission (MyCC), *Guidelines on Chapter 2 Prohibition* [2.4]- [2.5].

[85]   It requires the proof to have 'significantly preventing, restricting or distorting competition in the market', *Competition Act* 2010 (Malaysia) (Act 172) s 4(2).

The sharing of price information[86] and exchanging current price information[87] falls within the conduct deemed to have the "object" within Section 4(2) CA 2010 as it may facilitate price fixing and is thus considered significantly anti-competitive. On the matter of whether non-price information-sharing substantially reduces competition, it is assessed on a case-by-case basis.[88] The non-pricing information includes sales data, capacity information, demand data, market shares and investment plans. Meanwhile, the frequent exchange of confidential information among competitors in a market with few competitors is more likely to affect competition significantly.[89] In addition, the exchange of information between competitors that are not provided to consumers is also expected to have a significant adverse effect on competition.[90]

However, if the information is available to all competitors and customers, it is unlikely to cause concern. Meanwhile, information exchange at the horizontal level, such as research and development agreements, production agreements, commercialisation agreements or joint ventures, are considered on a case-by-case basis to determine their effect on competition.[91] Nevertheless, the MyCC guidelines rule out any genuine parallel behaviours which may or may not involve direct or indirect contact or communication between the parties concerned, either showing to have entered an agreement or arrangement or otherwise, in case of concerted practice, the conduct of direct or indirect contact or communication not within the CA 2010.[92] The task of proving this criterion is problematic in pricing algorithms.

Section 10(1) of the Act prohibits enterprises from engaging, independently or collectively, in any conduct that amounts to the abuse of a dominant position in any market for goods or services[93] if they have significant power[94] in a market to adjust prices, outputs, or trading terms, without any effective "push-back" from competitors or potential competitors. An abuse of a dominant position includes imposing unfair purchasing conditions, selling prices or unfair trading conditions on the supplier or consumer. The abuse of significant market power from the economic perspective is categorised as either

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86   Malaysian Competition Commission (MyCC), *Guidelines on Chapter 2 Prohibition* [3.6].
87   Malaysian Competition Commission (MyCC), *Guidelines on Chapter 2 Prohibition* [3.8].
88   Malaysian Competition Commission (MyCC), *Guidelines on Chapter 2 Prohibition* [3.7].
89   See MyCC Guidelines (n 83).
90   See MyCC Guidelines (n 84).
91   See MyCC Guidelines (n 82).
92   Malaysian Competition Commission (MyCC), *Guidelines on Chapter 2 Prohibition* p10 Para [3.5]; Sec *Competition Act 2010* (Malaysia) s 4(2).
93   See Competition Act 2010, Malaysia s 10.
94   According to the MyCC guidelines. an enterprise is considered dominant if its market share is above 60%. However, market share is not a conclusive criterion as other factors, such as whether there is an easy entry into the market, are also taken into account. For instance, where there is an enterprise with a new product and with new features that are protected by patents is considered dominant, even if it has a 20 to 30% share of a rapidly growing market where there is a rapid increase in consumers switching to the new technology. See Malaysian Competition Commission (MyCC), *Guidelines on Chapter 2 Prohibition* [2.14[-[2.15].

an "exploitative conduct"[95] or an "exclusionary conduct".[96] Further, abuse of dominance includes applying different conditions to similar transactions with other trading parties to the extent that it can discourage new entrants, or expansion or investment by existing competitors, and force existing equal competitors from the market or seriously harm them.

The primary concern is whether the present CA 2010's structure on anti-competitive prohibition can extend its control measure effectively to price-setting algorithms or will it require a different regulatory consideration. The limitations in the legislative framework in Malaysia mirror the common phenomena worldwide in addressing the regulation of algorithmic-related anti-competitive activity. Thus, in this context, the Malaysian regulators and the MyCC need to address three key questions. Firstly, do the provisions of the CA 2010 and the powers of the MyCC, which were designed to address anti-competitive behaviour in the "brick and mortar" business environment, have sufficient legal tools and adequate expertise to intervene, manage and counter price-setting algorithms and tacit collusion leading to anti-competitive practices? Secondly, who should the competition authorities hold liable for such practices involving the problematic issue of attributing responsibility and accountability of the AI's behaviour to a human?

The *per se* rule of liability under Section 4(2) of the CA 2010 for price fixing or cartel infringement implies liability or illegality strictly without any of the following factors - any extrinsic proof of any surrounding circumstances, without any further inquiry into their effects on the market, the existence of any objective competitive justification or pro-competitive claims, or lack of sciennter knowledge of its illegality.[97] Nevertheless, the formation of a cartel itself requires direct or indirect participation[98] among competitors, and that implies proof of the necessary human intent, engagement and facilitation behaviour to establish the act of infringement under Section 4 of the CA 2010. This requirement is complex to satisfy when dealing with proving tacit collusion arising from the use of pricing algorithms, as it does not involve direct human interaction in the act of collusion in price fixing. Furthermore, the issue of liability becomes more complicated when the competitors use a joint algorithmic price setter[99] which is designed to maximise the profits of the users.

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[95] An "exploitative conduct" refers to the 'ability of an enterprise to maintain price above the competitive level for some time without worrying about whether consumers will switch to other products or worrying that new competitors will enter the market'. See Malaysian Competition Commission (MyCC), *Guidelines on Chapter 2 Prohibition* [2.4].

[96] An "exclusionary conduct" refers to the 'ability of an enterprise to dictate the level of competition in a market by preventing efficient new competitors from entering or significantly harming existing equally efficient competitors either by driving them out of the market or preventing them from effectively competing'. See Malaysian Competition Commission (MyCC), *Guidelines on Chapter 2 Prohibition* [2.4].

[97] Such as Small Medium Enterprise (SME) involving a small market share, claiming either to have not consented or be present at Trade Associations decisions meeting, or, unaware that one's actions are wrong or contrary to law. See *Cameron Highlands Floriculturist Associations Case* (2012) MyCC/0003/201*; Malaysia Indian Hairdressing Saloon Owner* (2021) < http://www.mycc.gov.my>.

[98] See *Competition Act 2010* (Malaysia) s 2(a) and (b); Malaysian Competition Commission (MyCC), *Guidelines on Chapter 2 Prohibition* [2.4].

[99] When competitors designed and shared dynamic pricing algorithms that were programmed to act in conformity with their agreement to set coordinated prices. See *United States v. Topkins*, 15 Cr 201 (ND Cal, 2015).

Section 4(2) CA 2010 provision on anti-competitive agreement covers even a "concerted practice"[100] Concerted practice refers to "any form of coordination between enterprises which knowingly substitutes practical co-operation between them for the risks of competition, and includes any practice which involves direct or indirect contact or communication between enterprises, the object or effect of which is either, to influence the conduct of one or more enterprises in a market; or that to disclose the course of conduct which an enterprise has decided to adopt or is contemplating to adopt in a market, in circumstances where such disclosure would not have been made under normal conditions of the competition".[101] Hence, the concerted practice covers an informal arrangement where one competitor sets the price, and other competitors follow without any reasonable justification or even an understanding between the competing parties that have not fully matured into an agreement through some contact between the parties directly or through another party.[102]

A concerted practice reflects a digital price-setting scenario among digital enterprises when entering into a tacit collusion or conscious parallelism[103] using the "hub and spoke" pricing algorithm discussed above. As the self-learning algorithm responds by enhancing the market dynamics for setting the price, under the right market conditions, the self-learning algorithms may independently arrive at tacit collusion, without the knowledge or intent of their human programmers or unsustainable allegation of anti-competitive activity in the absence of supporting communications between the humans.[104] Despite the awareness among the competitors of their concerted approach to pricing, such practices are difficult to evidence as concerted practices under the present competition law provisions. Therefore, establishing liability under traditional competition law principles for collusion from algorithmic price setting faces a hurdle since it is a tacit collusion without the human in the variable. The use of price-setting algorithms by third parties further complicates the matter. Hence, conventionally based legal tools of assessment under the *per se* rule of anti-competitive infringement under Section 4(2) of the CA 2010 lack the appropriate measures to pin down the liability on digital enterprises without the satisfaction of the requirement of the human action to establish collusion under the present legal structure. The resulting non-human factor in pricing algorithms that have replaced human activity requires a novel regulatory approach, such as an alternative ethical measure to counter the anti-competitive practices of digital enterprises.

Additionally, regulators are in a dilemma to control the algorithmic-facilitated commercial transactions in Malaysia because of its indispensable nature and efficient feature in facilitating the digital economy. As a developing nation, Malaysia has undeniably and vastly benefited from the opportunities of the digital economy and may

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[100]   See Malaysian Competition Commission (MyCC), *Guidelines on Chapter 2 Prohibition* [2.5].

[101]   Ibid.

[102]   See Malaysian Competition Commission (MyCC), *Guidelines on Chapter 2 Prohibition* [2.6].

[103]   Tacit collusion, also known as, "conscious parallelism", occurs as a result of no illegal agreement or even any contact or communication among the competitors. Instead, each competitor acts unilaterally, in response to the behaviour of its rivals, to raise prices above competitive levels. See Ariel Ezrachi and Maurice E. Stucke, 'Sustainable and unchallengeable algorithmic tacit collusion' (2020) 17(2) *Northwestern Journal of Technology and Intellectual Property* 217-260, 218.

[104]   See generally Ezrachi and Stucke (n 103).

wish to take a pro-innovation approach. This approach will not rely on putting in place regulating mechanisms to inhibit the transformation into a robust digital economy. A softer approach is proposed by applying an ethical monitoring approach to enhance the competition law management on AI applications will be a viable way to monitor all these algorithmic abuses in the absence of adequate laws and simultaneously fill in the gap in the regulatory structure.

AI-based algorithmic price-fixing or price-setting is widespread among digital enterprises or platform-based industries such as *Lazada*, *Shopee* and *Grab* in Malaysia. The case involving *Grab's*[105] e-hailing service in Malaysia reflected the impact of the lack of the regulator's capacity to regulate the use of pricing algorithms. The inability to produce evidence of *Grab*'s automated theorem, based on the Evidence Algorithm ('EA') to detect their pricing algorithm, and the System for Automated Deduction ('SAD') for illegal pricing under CA 2010, reflected the difficulty of proving modus operandi of digital enterprises owing to the lack of expertise. Thus, MyCC's *parens patriae* role as the watchdog was undermined and, in the fault-finding stage, faced a multitude of problems in gathering intangible digitised-based evidence and automated theorem since the EA information and SAD systems access requires a degree of expertise that was absent amongst the members of the investigation team.[106]

The role of competition law and that of the regulators is tested in trying to take control of platform apps for fixing sellers' prices[107] (unlike price-fixing) on their platforms and the related abuse of dominance and consumer preferences. The *Grab* case[108] in Malaysia revealed that MyCC needs to take control of the digital economy in managing the practices arising from anti-competitive agreements or illegal mergers leading to abusive behaviour[109] in setting the pricing terms flowing from the use of pricing algorithm to exclusionary agreements, price discrimination, or unfair price hike[110] and price surges.[111] Digital enterprise mergers and algorithmic settings in the post-merger phase may become crucial business agreements that require diligent monitoring to reduce the damage to

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[105]   Malaysian Competition Commission, 'MyCC Proposes to Fine GRAB RM86 million for abusive practices' (News Release, 3 October 2019) <https://www.mycc.gov.my/sites/default/files/pdf/decision/Proposed%20 Decision%20against%20GRAB%20%28Eng%29.pdf >.

[106]   Angayar K Ramaiah, Anupam Sanghi and Ningrum Sirait, 'Digital Market Governance and Challenges on Competition Law in Asia: Malaysia, India, and Indonesia' (Conference Paper, 5th International Multi-Conference on Artificial Intelligence Technology, 4-5 August 2021) 132-139 <https://www.ftsm.ukm.my/mcait2021/eproceeding/mobile/index.html#p=11>.

[107]   Julian Nowag, 'When Sharing Platforms Fix Sellers' Prices' (2018) 6(3) *Journal of Antitrust Enforcement* 382-408.

[108]   See generally, Malaysian Competition Commission (n 105).

[109]   Ahmad N Idris and Nazuin Z Kamarulzaman, 'MyCC proposes RM86.77m fine on Grab for abusive transit media practices' *The Edge (*Malaysia, 3 October 2019*)* <https://www.theedgemarkets.com/article/mycc-proposes-rm8677m-fine-grab-abusive-transit-media-practices>.

[110]   Bernama, 'E-hailing service providers to explain alleged fare hikes', *Free Malaysia Today* (Malaysia, 22 May 2022) <https://www.freemalaysiatoday.com/category/nation/2022/05/22/govt-to-monitor-e-hailing-amid-complaints-over-massive-price-surge/>.

[111]   Angayar K Ramaiah, 'Merger Phenomenon in Digital Economy: Uber-Grab Competition Tell-Tale in Malaysia' (2020) 56 *European Proceedings* 638-650 <www.europeanproceedings.com>.

consumer welfare, as evidenced by the *Grab-Uber* merger in Malaysia.[112] Meanwhile, the unsupervised mergers of digital enterprises also may create barriers for newcomers, which may lead to market concentration and consequently impact consumer choice. When digital enterprise mergers become a common phenomenon among digital enterprises to gain a monopoly, the task of regulators controlling anti-competitive pre-and post-merger practices must be robust within a governance framework with continued monitoring striking the right balance between enforcement and embracing innovative technologies for growth and general consumer and economic well-being.

V USE OF ETHICAL FRAMEWORK IN FILLING THE LEGAL GAP

Monitoring pricing algorithms requires novel approaches to competition investigations and possibly even rethinking the legal definition of competition infringements. Algorithms that reach tacitly coordinated outcomes will, by their nature, be challenging to identify and interpret. Competition authorities must consider the tools used to identify issues and what constitutes an illegal act when algorithms interact. Likewise, companies using algorithms will need to review and test their pricing practices from a legal and economic perspective to avoid infringing competition law.

The alternative to exploring the inadequacy of the normative legal framework to address the dilemma of algorithmic collusion in Malaysia, but equally committed to aligning with the underpinnings of competition law, is ensuring that the algorithm used by the AI in pricing strategies aligns with ethical values that avoid the risks and harms to individuals, businesses, and society. In other words, adopting several strategies to manage the consequences of algorithm collusion when using AI tools to determine price can be combatted by adopting an ethical framework that will affect the algorithmic design and use.

Hence, the second part of the authors' proposition of regulating pricing algorithms is developing and using an ethical framework that will complement the reliance on the normative function of the competition law principles. The authors proffer that this approach can be part of a co-regulatory model between businesses and regulators whereby a framework of values must be employed by developers when designing the AI and for deployers to ensure that the AI tools they are using are audited against this framework to minimise anti-competitive practices. This ex-ante approach of an intervention at the stage of the algorithm's design has been forwarded as a feasible constraint in managing algorithmic pricing and collusion.[113]

Reliance on normative models of regulation such as laws, and in the case of pricing algorithms, the principles espoused within the legal constructs of competition law may not provide an effective model of minimising risks arising from the use of pricing algorithms.

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[112]   Emir Zainul, 'MyCC to continue monitoring Grab post-merger' *The Edge* (Malaysia, 10 April 2018) <https://apps.theedgemarkets.com/article/mycc-continue-monitoring-grab-postmerger >; LW Khuen, 'MYCC assessing impact of Uber-Grab merger', *The Sun* (Malaysia, 10 April 2018) <http://www.thesundaily.my/news/2018/04/10/mycc-assessing-impact-uber-grab-merger >.

[113] See generally Gerlick and Liozu (n 13). See also, Ezrachi and Stucke (n 42).

Normative key principles found in legislation may not be fit-for-purpose and practical as the regulatory landscape may not be as dynamic as the technology and unable to keep pace with the development of AI technologies. This development can be in terms of both their potential altruistic and utilitarian uses and the potential harms and risks that may arise. With new technologies, we proceed through a series of milestones in terms of their lifecycle. There is a trajectory of firstly, invention, approval and adoption, followed by exploitation, and finally, regulation. Black and Murray identify the stages or lifecycle of the development of disruptive technologies touching on points where regulation becomes part of these stages - either before, at the point of, or after - commercial exploitation.[114] Regulation is justified as the proliferation of the use of technological innovation may present instances of documented risks that require managing. Black and Murray's allusion to ethical debates on the development and deployment of technologies contextualises the debates on the regulation of AI. Ethical debates often predate regulatory initiatives, and the lifecycle of AI is no exception. If the risks and challenges arising from the design and use of the AI require managing, governance frameworks or processes can be introduced in place of or before legal regulation. The accelerated use of AI, whilst yielding benefits, must be compatible with value-based principles within these governance frameworks. In a sense, the authors are proposing an ethical framework as a governance framework to be adopted by developers of AI tools.

The case for adopting an ethical framework to substitute traditional regulatory approaches that can manage competition law issues arising from pricing algorithms is an approach that can be taken before establishing a legal framework. Scheuerer speaks of a 'certain consensus regarding overarching and recurring paradigms' and 'overall relations of 'ethics', fairness, transparency, accountability, autonomy and the promotion of innovation.'[115] Therefore, employing a value-based ethical framework in the algorithmic design and development and subsequently deploying and using the pricing algorithm, such as algorithmic transparency in the design process, could lead to increased accountability.[116] Numerous organisations have made the prescient call to establish a set of guiding principles for algorithmic transparency and accountability, which are intended to minimise harm while simultaneously realising the benefits of algorithmic decision-making.[117] Adopting ethical constraints in algorithmic pricing is at its nascent stage, with a fervent pursuit by researchers to fill the gap.[118] Having said that, regulators have undertaken initiatives to introduce ethical considerations into pricing algorithms. Take,

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[114]   Julia Black and Andrew Murray, 'Regulating AI and Machine Learning: Setting the Regulatory Agenda'., (2019)10(3) European Journal of Law and Technology 20 <https://ejlt.org/index.php/ejlt/article/view/722/980>.

[115]   Stefan Scheuerer, 'Artificial Intelligence and Unfair Competition – Unveiling an Underestimated Building Block of the AI Regulation Landscape' (2021) 70(9) *GRUR International* 834–845, 835 <https://doi.org/10.1093/grurint/ikab021>.

[116]   See generally Seele *et al* (n 65).

[117]   See for example, Association for Computing Machinery, US Public Policy Council (USACM), *Statement on Algorithmic Transparency and Accountability* (12 January 2017) <www.acm.org/binaries/content/assets/public-policy/2017_usacm_statement_algorithms.pdf>.
       See also, UK Competition and Markets Authority, *Algorithms: How they can reduce competition and harm consumers* (19 January 2021) <https://www.gov.uk/government/publications/algorithms-how-they-can-reduce-competition-and-harm-consumers/algorithms-how-they-can-reduce-competition-and-harm-consumers>.

[118]   See generally Seele *et al* (n 65).

for instance, the US Federal Trade Commission ('FTC'), which makes it mandatory for an algorithm to be, inter alia, transparent and accountable when used by businesses to avoid unfair or deceptive practices.[119]

The call is for these guiding principles to form a set of good practices found in an AI ethical framework.[120] The ethical framework provides values that must exist during the AI's lifecycle and, more importantly, serve as ex-ante monitoring of the algorithm's design. Ex-ante monitoring is validated as an effective manner of ensuring improvement in the development and design of the algorithm.[121] The developer of the AI tool can employ governance mechanisms to ensure that the algorithm functions in an ethical manner. And the deployer of the AI tool will have to ensure that ethical considerations were made in the process of development of the AI tool. In defining a "developer" and "deployer" of an AI system, the authors adapted these from the Second Edition of the Singapore Model AI Governance Framework 2020.[122] The definitions are as follows:

> "developer" is an entity that develops 'AI solutions or application systems that make use of AI technology.
> "deployer" refers to 'companies or other entities that adopt or deploy AI solutions in their operations as part of a useable service.
> "developer and deployer" are organisations that 'develop their own AI solutions and can be their solution providers.'

In drawing up a framework of relevant ethical principles to overcome the dilemmas of collusion and anti-competitive outcomes resulting from pricing algorithms, reference is made to the Malaysian Roadmap's first iteration of Principles for Responsible AI containing seven principles of fairness; reliability, safety, and control; privacy and security; inclusiveness; pursuit of human benefits and happiness; accountability; and

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[119] U.S. Federal Trade Commission, Using Artificial Intelligence and Algorithms (2020) <https://www.ftc.gov/business-guidance/blog/2020/04/using-artificial-intelligence-and-algorithms>. See also, U.S. Federal Trade Commission, Aiming for truth, fairness, and equity in your company's use of AI (2021) <https://www.ftc.gov/business-guidance/blog/2021/04/aiming-truth-fairness-equity-your-companys-use-ai>.

[120] See for example, European Commission, *Ethical guidelines for trustworthy AI* (2020) <https://ec.europa.eu/digital-single-market/en/news/ethics-guidelines-trustworthy-ai>;
The IEEE Global Initiative for Ethical Considerations in Artificial Intelligence and Autonomous Systems, Institute of Electronics and Electrical Engineers (IEEE), *Ethically aligned design: A vision for prioritizing human wellbeing with artificial intelligence and autonomous systems. (Vers. 1)* (2016) <https://standards.ieee.org/content/dam/ieee-standards/standards/web/documents/other/ead_v1.pdf?>;
The IEEE Global Initiative for Ethical Considerations in Artificial Intelligence and Autonomous Systems, Institute of Electronics and Electrical Engineers (IEEE), *Ethically aligned design: A vision for prioritizing human well-being with autonomous and intelligent systems. (Vers. 2)* (2017) <https://standards.ieee.org/content/dam/ieee-standards/standards/web/documents/other/ead_v2.pdf>;
The Organisation for Economic Co-operation and Development (OECD), *OECD AI Principles* (2019) <https://oecd.ai/en/ai-principles>;
Future of Life Institute. *Asilomar AI principles* (2017) <https://futureoflife.org/2017/08/11/ai-principles/>.

[121] Ariel Ezrachi and Maurice E Stucke, *Virtual competition: The promise and perils of the algorithm-driven economy* (Harvard University Press, 2016).

[122] Info-communications Media Development Authority (IMDA) and Personal Data Protection Commission Singapore (PDPC), *Model AI Governance Framework* (2020) <https://www.pdpc.gov.sg/-/media/files/pdpc/pdf-files/resource-for-organisation/ai/sgmodelaigovframework2.ashx>.

transparency.[123] There is a rudimentary explanation of these salient principles in the Roadmap.[124] However, this explanation is incapable of forming a distillate tool to guide developers and deployers as a risk assessment tool. The authors of the Final Report made a notation that the Principles for Responsible AI must be read in line with the provisions of the Federal Constitution and the Rukun Negara, and the Malaysian Roadmap is to be read as a "living document" which suggests that the Roadmap is expected to evolve with updated iterations.[125] Pending this further iteration, the authors propose that the starting point is scoping the corpus of documents that comprise existing AI ethical frameworks. Jobin *et al* distilled eleven overarching ethical values and principles from the content analysis of ethical frameworks adopted worldwide.[126] These ethical principles and their corresponding codes derived from the content analysis are found in the Table. These values are transparency, justice and fairness, non-maleficence, responsibility, privacy, beneficence, freedom and autonomy, trust, dignity, sustainability, and solidarity.

Table 1.   Ethical principles identified in existing AI guidelines.

Ethical Principle	Included Codes
Transparency	Transparency, explainability, explicability, understandability, interpretability, communication, disclosure, showing
Justice & fairness	Justice, fairness, consistency, inclusion, equality, equity, (non-)bias, (non-) discrimination, diversity, plurality, accessibility, reversibility, remedy, redress, challenge, access and distribution
Non-maleficence	Non-maleficence, security, safety, harm, protection, precaution, prevention, integrity (bodily or mental), non-subversion
Responsibility	Responsibility, accountability, liability, acting with integrity
Privacy	Privacy, personal or private information
Beneficence	Benefits, beneficence, well-being, peace, social good, common good
Freedom & autonomy	Freedom, autonomy, consent, choice, self-determination, liberty, empowerment
Trust	Trust
Sustainability	Sustainability, environment (nature), energy, resources (energy)
Dignity	Dignity
Solidarity	Solidarity, social security, cohesion

To determine the specific values to be adopted in the regulation and oversight of the pricing algorithm, the harm, and risks that these values seek to suppress, minimise

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[123] Malaysian Ministry of Science & Technology, *Malaysia National Artificial Intelligence Roadmap 2021-2025* (2021) 29 <https://airmap.my/>.

[124] Ibid 30.

[125] Ibid 88.

[126] Anna Jobin, Marcello Ienca and Effy Vayena (2019) 1 'Artificial Intelligence: The Global Landscape of Ethics Guidelines' *Nature Machine Intelligence* 389–399, 396 <http://ecocritique.free.fr/jobin2019.pdf>.

or eradicate have to be identified. These values will serve as the conceptual foundation of the ethical framework. By addressing the dilemma, the conceptual foundation of an ethical framework must be embedded in values that help overcome the dilemma. The dilemma of collusion through algorithmic pricing, namely dynamic pricing, is, first, the opacity and non-suitability of the algorithm. This may result in deception and a lack of clarification and transparency in the system. Secondly, the collusion may result in price discrimination among consumers, raising questions about fairness.

A   *Transparency*

The need for "explainable" AI requires that any manner of pricing mannerisms or structure using algorithms must be explainable, such as the need for market transparency in competition law that prohibits misleading practices. The coding of the ethical principle of "transparency" in the Table is capable of encapsulating the principles of competition law. For market transparency to exist, consumers and regulators need to know the extent consumer data has been used to make decisions about the pricing, how the businesses arrived at the pricing, and, more critically, if there has been any manner of price discrimination. Taking the definition of price discrimination as being '…charging different customers or different classes of customers different prices for goods or services whose costs are the same or, conversely, charging a single price to customers for whom supply costs differ…',[127] the discussion around transparency leads to the phenomenon of "algorithmic consumer price discrimination".[128]

This phenomenon converges with the principle of "justice and fairness", where price discrimination may lead to discrimination, inequality, and inequity.

B   *Fairness*

The element of fairness is essential in building trust amongst consumers. Using dynamic pricing that results in different pricing systems leads to a loss of trust in businesses.[129] Examples include the loss of trust in companies such as *Amazon*[130] when discriminatory schemes were applied, resulting in price fluctuations for items in demand. Price fairness has been defined as the extent to which sacrifice and benefit are commensurate for each party involved.[131] The element of fairness, specifically, price fairness, must benefit

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[127]   *Post Danmark A.S v Konkurrencerådet* [2012] ECR I-172 (Case C-209/10) [30].

[128]   Christopher Townley, Eric Morrison and Karen Yeung, 'Big Data and Personalised Price Discrimination in EU Competition law' (Research Paper No 2017-38, Dickson Poon School of Law, King's College London, 6 October 2017) <http://dx.doi.org/10.2139/ssrn.3048688>.

[129]   Ellen Garbarino and Olivia F Lee, 'Dynamic Pricing in Internet Retail: Effects on Consumer Trust' (2003) 20(6) *Psychology & Marketing* 495-513.

[130]   Wei Ke, 'Power pricing in the age of AI and analytics', *Forbes* (New Jersey, 2 November 2018) <https://www.forbes.com/sites/forbesfinancecouncil/2018/11/02/power-pricing-in-the-age-of-ai-and-analytics/?sh=193a509b784a>.

[131]   Lisa E Bolton, Luk Warlop and Joseph W Alba, 'Consumer Perceptions of Price (Un)Fairness' (2003) 29(4) *Journal of Consumer Research* 474–491.

consumers and businesses. Consumers' perception of the price as unfair and unfavourable will lead them to other businesses.

The coding of the ethical principle in the table requires further review for it to be a cogent ethical principle to be considered in the exercise of a value or measurement to assess the pricing algorithm. Scheuerer, clarified that the understanding of the term "fairness" in the AI context differs from that in unfair competition law, where the latter is attuned to safeguarding competition and competition-related interests.[132] The European Commission's High-Level Expert Group alluded to the fact that there are many interpretations of the term "fairness".[133]

To ensure that the term "fairness" is coded to align with the dilemma arising from algorithmic pricing, guidance can be sought through legal constructs that regulate unfair competition standards. Under Section 5 of the United States Federal Trade Commission Act,[134] the FTC has the power to prohibit unfair methods of competition. The section is viewed as a "principle" based provision instead of a "rule" based. Applying this principle can provide the scaffolding to the ethical principle of fairness in developing and deploying AI systems that lead to collusion resulting from algorithmic pricing.

The legal standard to be established for assessing the algorithm to be unfair must be based on - firstly, the cause or likely causes of substantial injury to consumers; secondly, if consumers cannot reasonably avoid it; and, finally, the use of the algorithm 'is not outweighed by countervailing benefits to consumers or competition.'[135]

VI RECOMMENDATIONS

Following the discussion around the need for transparency and fairness, and upon review of whether these principles exist in the lifecycle of the AI, the question of accountability arises where these values are absent. Consequently, unlike human accountability, the algorithm as a digitalised system is subsumed under the principle of "responsibility" in the ethical principles identified by Jobin *et al*. Finality in the determination of which entity is held responsible and accountable is essential, as consumers must have avenues of redress.

The authors consider the manner in which "responsibility" can be operationalised to ensure, firstly, that developers and deployers of AI systems develop a framework as part of an internal governance tool to ensure collusion arising from algorithmic pricing that results in a lack of transparency and fairness is addressed; and secondly, to consider the best regulatory approach to be adopted in particular which authority or regulatory agency will hold the responsibility of reviewing and supervising developers and deployers of AI who partake in collusion arising from algorithmic pricing.

The authors, whilst aware of the debate for new regulatory interventions to manage AI regulation through algorithmic pricing, prefer to explore options involving soft

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[132]   See generally Scheuerer (n 115).
[133]   High-Level Expert Group on Artificial Intelligence, European Commission, *Ethics guidelines for trustworthy AI* (2019) 12 <https://ec.europa.eu/digital-singlemarket/en/news/ethics-guidelines-trustworthy-ai>.
[134]   *Federal Trade Commission Act*, 15 USC §45 (1914).
[135]   OECD (n 30) 38.

governance through self-regulation by businesses with adequate scaffolding provided by some regulatory oversight by regulatory institutions and agencies.

The authors recommend a regulatory moratorium and take the position of the OECD in exploring 'alternative courses of action'.[136] Taking a lighter touch in the form of voluntary measures, such as internal risk assessments to mitigate risks within a regulatory sandbox, is a method favoured by regulators.[137]

A *Internal Governance Measures*

Internal governance would require developers and deployers of AI tools to create and operationalise mechanisms employed as self-governance tools to ensure that algorithm design does not lead to anti-competitive practices.

These tools must include the essential role of "human-in-the-loop" overseeing the AI lifecycle. The responsibility is vested in an "audit" committee leading the integration of self-governance measures in the regulatory sandbox. This committee must undertake a rigorous impact assessment process using the values identified in an ethical framework. The impact assessment must contain an index of anti-competitive practices capable of identifying the potential harms and risks. It will serve the purpose of providing a rationale for using the algorithm. This will also facilitate any oversight body to evaluate the quality of the assessment providing redress for any grievance deemed to result in price collusion.

Therefore, the recognition and adoption of substantive AI principles that are the standards of responsible and trustworthy AI are essential. Jobin *et al*'s research on prevalent values of the different ethical tenets found in ethical frameworks can be integrated into the impact assessment index.

B *Regulatory Oversight*

With the publication of the Malaysian Roadmap, the authors foresee a continued iteration of the Governance and Ethics strategic initiative within the roadmap and the adoption of an AI Ethics National Framework. With the framework in the pipeline, one of the flagship initiatives of the said framework will include AI Governance, where a national AI Ethical Framework will be a crucial component. Owing to the policy vacuum resulting from Malaysia not having an AI National Framework, organisations have no detailed and readily implementable guidance to address critical ethical and governance issues when developing and deploying AI system solutions. With most national AI frameworks, it is an essential policy document that aims to promote public understanding and trust in AI systems.

Such national AI frameworks will provide an overarching policy and direction in positioning a nation to benefit from the AI revolution by assisting understanding and confidence in AI systems. Within these frameworks is a policy position on AI governance.

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[136]   OECD (n 30) 46-51.
[137]   See Ryan Morrison, 'Government backs UK AI regulatory sandbox', *TechMonitor* (Hull, 16 March 2023) <https://techmonitor.ai/technology/ai-and-automation/government-backs-ai-regulatory-sandbox>. For definition of "regulatory sandbox", see <https://www.lexology.com/library/detail.aspx?g=419b7b84-bde0-4c29-bb63-41df2aa3d0b1>.

Therefore, the absence of such a framework impedes forging standards in AI governance premised on a value-based ethical framework. There is immense potential for the development of a national policy that adopts a sector-specific framework as a tool of AI governance to set out overarching aspirational values that must be demonstrable in the life cycle of AI systems supported by a set of principles that can be used by developers and deployers of AI tools that carry out algorithmic pricing activities.

This sector-specific framework is a feasible starting point in ensuring a digital marketplace that promotes trustworthy and responsible AI in its use of innovative tools in a complex regulatory landscape with multiple regulatory and oversight bodies involved at the national level. Regulating the digital economy requires the coordination of different laws and oversight regulators that intersect in the various facets of the activities of such an economy. The algorithmic pricing and the anti-competitive risks arising from the use of the algorithm in the digital economy require a harmonious and integrated initiative of different agencies and regulators in Malaysia who are responsible for competition law as well as telecommunication law, data protection law, consumer law, to name a few amongst others.

Further, the phenomenon of tacit collusion from algorithmic pricing is at its nascent stage in Malaysia. Policymaking requires a sufficient volume of antecedent cases and investigations of the negative impact of the phenomenon to develop solutions. The use of algorithmic pricing is merely at the preliminary stages of this modern technology's growth trajectory. Therefore, these solutions must not impede or inhibit the growth of digital innovation in the digital economy. Nevertheless, regulators and agencies must not be pusillanimous in the dilemma presented by the type of algorithmic regulation of pricing but must embark on a graduated response.

To support internal governance measures adopted by businesses, an advisory body comprising the various agencies and regulatory stakeholders should be established - assigned with the responsibility at the first stage of its gestation to observe and collate evidence of the anti-competitive cases where tacit collusion from algorithmic pricing has resulted and the impact on consumers; and; at the second stage, to review and supervise businesses in operationalising self-governance tools to minimise harm to the consumers and overcome anti-competitive practices; and at the final stage, to coordinate and reconcile policies and laws to produce guidelines to minimise risks to consumers. Ideally, a regulatory sandbox could be developed. Article 53 of the European Commission AI Law proposal defines a regulatory sandbox as a controlled environment that facilitates developing, testing and validating innovative AI systems for a limited time before they are placed on the market or put into service under a specific plan'.[138] It will allow regulators and businesses to use this sandbox as an incubator to develop AI tools to craft best practices and ensure compliance with standards such as impact assessment tools and the sector-specific AI ethics framework.

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[138]   European Commission, *Proposal for a Regulation of the European Parliament and of the Council Laying Down Harmonised Rules on Artificial Intelligence (Artificial Intelligence Act) And Amending Certain Union Legislative Acts* (2021) <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021PC0206>.

VII CONCLUSION

The regulatory structure in dealing with AI tools must view such transformative technologies as useful innovations to digital enterprises. The regulatory structure must shift to a pro-innovation approach to prevent over-regulation while being equally effective in minimising the risks and harms of such innovations. Reiterating the position of a moratorium in addressing the challenge of pricing algorithms and collusion through a legal framework, this paper aligns with the recommendation of the OECD in resorting to alternative courses of action. In exploring these alternative governance mechanisms to address the risks of algorithmic collusion, a risk assessment tool employing an AI ethical framework within a regulatory sandbox scaffolded by a regulatory oversight body could be vital in taking the path of a pro-innovation approach. This approach will support the underlying ethos of competition law to ensure that a fair market price architecture is indeed competitive and pricing algorithms are reliable, instilling confidence amongst consumers that price-setting is taking place both ethically and legally. The assessment based on competition law doctrine must expand beyond economic principled market study, progressing toward an ethics-based risk assessment strategy that could evolve into legal norms of Malaysian competition law. The gaps within the normative framework of the Malaysian CA 2010 on algorithmic pricing and collusion are capable of being filled by the proposed regulatory sandbox to craft best practices ensuring compliance with standards for risk assessment and the creation of a sector-specific AI ethics framework.