

# Artificial Intelligence and Corporate Decisions: Fantasy, Reality or Destiny

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*Fueled by the ever-growing significance of big data and advances in AI, tasks in relation to decision-making in contemporary societies have been increasingly delegated to AI at different levels. While there is massive investment all over the world related to one side of AI, namely engineering, it is also important to create rules and competence related to humanistic AI and its effects on people and societies. This article aims to examine AI's role in the boardroom and associated legal challenges, by exploring the interplay between AI and corporate law and governance. We observe that the delegation of board tasks to AI may tackle situations where urgent decisions need to be made on the basis of a large quantity of data. AI will also ease the tension between plausible hypotheses for the formal analysis of business judgments and a lack of capability to understand and subsequently choose among the options available to directors. As a powerful tool to radicalize and change decision makers' habits and rationales, AI can assist or advise directors in using big data more effectively and efficiently for more informed and higher-quality decisions, which will result in higher perceived legitimacy. Therefore, we propose the imposition of a duty to use AI to suggest options and disclose the responses of the board to these suggestions, in order to satisfy the standard of care for rational decision making by prudent and diligent directors, and to promote the fair, accountable, and transparent application of AI in the boardroom.*

**Keywords:** Artificial Intelligence, Algorithmic Entities, Corporate Governance, Liability, Corporate Purpose, Sustainable Corporate Decisions, Directors' Duties, Informed Decisions.

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## 1. Introduction

Artificial intelligence (AI) is changing everything. Global leaders from various industries have predicted that AI will have a more significant impact than the internet.<sup>2</sup> It was estimated by PwC that by 2030 AI will contribute \$15.7 trillion of global economic growth;<sup>3</sup> meanwhile, according to the McKinsey Global Institute's notes AI could potentially deliver additional economic output of around \$13 trillion by 2030, boosting global GDP by about 1.2 percent a year.<sup>4</sup> AI is also gaining meaningful traction within companies; NewVantage Partners' annual executive survey 2020, based on 70 leading firms, reports that AI-enabled systems in organizations are expanding rapidly as 98.8 percent of firms are investing more than \$50M in big data and AI initiatives.

As with practitioners in fields as varied as finance, medicine, human resources, legal services, marketing, sports, and many others, it is suggested that recent advancements in AI will affect all levels of management.<sup>5</sup> Therefore, the potential use of AI to manage corporations should come as no surprise to us. In line with the rapid technological development, AI is predicted to enter corporate boardrooms in the very near future,<sup>6</sup> and to become the foundation of essential competitive advantage when it is used for strategic management and operational decision-making.<sup>7</sup> Furthermore, it is predicted that the day may soon come when AI will play a part in "augmenting human governance boards in driving decisions and executing digital strategies".<sup>8</sup>

The article aims to explore the interplay between AI and corporate law and governance by focusing on the potential benefits that AI could bring to the boardroom—an increasingly pressing question with the popularity of discussions on topics such as accountable algorithms,<sup>9</sup> ethical AI,<sup>10</sup> or morally responsible AI.<sup>11</sup>

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<sup>2</sup> PwC, *22nd Annual Global CEO Survey – CEO's Curbed Confidence Spells Caution* (2019).

<sup>3</sup> PwC, *Artificial Intelligence Everywhere*, <https://www.pwc.com/gx/en/issues/data-and-analytics/artificial-intelligence.html>

<sup>4</sup> McKinsey Global Institute, *Notes from the AI Frontier: Modelling the Impact of AI on the World Economy, Discussion Paper* (13 September 2018).

<sup>5</sup> VEGARD KOLBJØRNSRUD ET AL., *THE PROMISE OF ARTIFICIAL INTELLIGENCE: REDEFINING MANAGEMENT IN THE WORKFORCE OF THE FUTURE* 6 (2016), <https://www.accenture.com/us-en/insight-promise-artificial-intelligence>.

<sup>6</sup> Florian Möslin, *Robots in the Boardroom: Artificial Intelligence and Corporate Law*, in *RESEARCH HANDBOOK ON THE LAW OF ARTIFICIAL INTELLIGENCE* 649, 649 (Woodrow Barfield & Ugo Pagallo Eds 2018).

<sup>7</sup> Barry Libert, Megan Beck, and Mark Bonchek, *AI in the Boardroom – The Next Realm of Corporate Governance*, MIT Sloan Management Review Blog (2017), <https://sloanreview.mit.edu/article/ai-in-the-boardroom-the-next-realm-of-corporategovernance>

<sup>8</sup> Michael Hilb, *Toward an Integrated Framework for Governance of Digitalization*, in *GOVERNANCE OF DIGITALIZATION* 11, 20 (Michael Hilb ed. 2017).

<sup>9</sup> Joshua A. Kroll, Joanna Huey, Solon Barocas, Edward W. Felten, Joel R. Reidenberg, David G. Robinson & Harlan Yu, *Accountable Algorithms*, 165 U. PA. L. REV. 633 (2017).

<sup>10</sup> Michael Stocke *Be Wary of 'Ethical' Artificial Intelligence*, 540 NATURE 525.

<sup>11</sup> WENDELL WALLACH & COLLIN ALLEN, *MORAL MACHINE: TEACHING ROBOTS RIGHT FROM WRONG* (2009)

Considering that directors are viewed as “mediating hierarchs” and enjoy ultimate control over their company’s assets and profits, they are charged with the task of balancing the conflicting claims and interests of many different groups,<sup>12</sup> and it is legitimate for us to question whether directors, and even boards, are sufficiently competent to perform their duties and achieve these tasks. The relevance of this query is even more urgent and relevant in the context of recent corporate scandals that throw doubt on corporations and their directors.<sup>13</sup> Moreover, the accuracy and truthfulness of human decisions can be questioned, as people are prone to deliver one-sided retrospective explanations of their decisions and hold biases that are inaccessible to others.<sup>14</sup>

In the context of the challenges faced by corporations when it comes to decision making, such as uncertainty, complexity, and equivocality, the ability of AI to settle complicated questions in relation to business judgments, such as “for whom corporations should be run,”<sup>15</sup> seems critical. Instead of proposing an automation of leadership and governance, we argue in favor of using AI to enhance board intelligence, fairness, and efficacy. The following interrelated questions will be discussed. First, considering that the legal strategies currently adopted by corporate law are tailored to human directors, to what extent does the current law need to be adapted, updated, and complemented to accommodate the complexity of AI and its associated social, medical, and ethical implications? Second, we will consider the most suitable role for AI in making more informed and effective business judgments, either together with human directions if AI plays an assisting or advisory role, or independently if AI plays an autonomous role with varying degrees of autonomy and proactivity.<sup>16</sup> Third, considering the fact that cognitive technologies are becoming increasingly reliable and accessible,<sup>17</sup> should certain businesses use AI mandatorily to

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<sup>12</sup> Margaret M. Blair & Lynn A. Stout, *Director Accountability and The Mediating Role of The Corporate Board*, 79 WASH. U.L.Q. 403, 418 (2001).

<sup>13</sup> Such as Enron, WorldCom, Tyco, Parmalat, BHS, Royal Bank of Scotland, and Carillion. It is forecast that half of the S&P 500 companies will be replaced over the next ten years.

<sup>14</sup> Wilhelm Hofmann, Bertram Gawronski, Tobias Gschwendner, Huy Le, & Manfred Schmitt, *A Meta-Analysis on the Correlation between the Implicit Association Test and Explicit Self-Report Measures*, 31 PERSONALITY & SOC. PSYCHOLOGY BULLETIN, 1369, 1380-1381(2005).

<sup>15</sup> Xenophon Koufteros, Mark Vonderembse & Jayanth Jayaram, *Internal and External Integration for Product Development: The Contingency Effects of Uncertainty, Equivocality, and Platform Strategy*, 36 DECISION SCI. (2005); Ronald K. Mitchell, Gary R. Weaver, Bradley R. Agle, Adam D. Bailey & James Carlson, *Stakeholder Agency and Social Welfare: Pluralism and Decision Making in the Multi-Objective Corporation*, 41 ACAD. MGT REV. 252; Chun Wei Choo, *Towards an Information Model of Organizations*, CANADIAN J. INFOR. SCI. 16, 32 (1991).

<sup>16</sup> See VEGARD KOLBJØRNSRUD *et al.*, THE PROMISE OF ARTIFICIAL INTELLIGENCE: REDEFINING MANAGEMENT IN THE WORKFORCE OF THE FUTURE 6 (2016), <https://www.accenture.com/us-en/insight-promise-artificial-intelligence>

<sup>17</sup> Jonathan Nelson, *Netherlands: AI in The Boardroom – Fantasy Or Reality?* (26 March 2019), <http://www.mondaq.com/x/792746/new+technology/AI+In+The+Boardroom+Fantasy+Or+Reality>; AI could make decisions using complex algorithms and based on vast amounts of information.

support the business judgments of the directors? Consulting and overseeing AI in companies may create new responsibilities and possibly impose new duties for directors. Some related question may arise on the legal status of AI, and whether AI applications can be held liable for misconduct. Also, in terms of promoting more ethical decisions, the advantages of AI-amplified or augmented decisions will be discussed.

Clearly, it is not possible for us to address all these questions in detail in this article. However, we intend to start a conversation rather than to give the final word on AI and decision making in the boardroom. The paper aims to lay out a template suggesting how existing corporate law might provide a potential regulatory framework for AI, and to explore some legal consequences of this possibility. We believe there is a gap to fill in exploring and contextualizing AI's role to enhance the effectiveness, transparency, and sustainability of decision-making processes, particularly in terms of the directors' duties. This article aims fill this gap and provide critical analysis to advance the discussion of the feasibility and problems of using AI in the boardroom, together with an examination of some legal challenges and a rationale for a number of potential paths to effective AI regulation in corporate law. We focus on two major challenges: first, can directors authorize AI to carry out delegated tasks? Second, should the directors of a company be obliged to use AI to provide decision-making consultation, in order to promote more informed and effective decision and discharge their duty fully and competently?

The article is an original attempt as its focus exceeds most of the existing literature on the implementation of AI at the operational level.<sup>18</sup> Instead, we observe that the rapid advances in AI's role in companies have provoked expressions of alarm from the legal domain, along with calls for a regulatory framework that restricts AI in terms of its operation while encouraging its functions.<sup>19</sup>

The article is divided into six parts, of which the introduction and conclusion form the first and sixth. Part II sets the scene with regard to AI, outlining some key definitions, classifications, and characteristics. Part III investigates the different functions that AI can play in decision making, while Part IV speculates about AI's legal personality and explores the possibility of imposing liability on AI. Part V considers a justification of

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Certain algorithms with the ability to learn cognitive technologies – such as machine learning and deep learning – are becoming more reliable and accessible every day.

<sup>18</sup> Daron Acemoglu & Pascual Restrepo, *Artificial Intelligence, Automation, and Work*, in *THE ECONOMICS OF ARTIFICIAL INTELLIGENCE: AN AGENDA* (Daron Acemoglu, Pascual Restrepo eds. 2019) 197; Eleonora Bottani, Piera Centobelli, Mosé Gallo, Mohamad Amin Kaviani, Vipul Jain & Teresa Murino, *Modelling Wholesale Distribution Operations: An Artificial Intelligence Framework* 119 *INDUS. MGMT & DATA SYS.* 698 (2019).

<sup>19</sup> Matthew U. Scherer, *Regulating Artificial Intelligence Systems: Risks, Challenges, Competencies, and Strategies*, 29 *HARV. J. L. & TECH.* 353 (2016)

legalizing AI's role in corporate law through directors' duties and enforcement of the duty to promote more informed decisions and board accountability.

## **2. Setting the Scene: The Definition, Classification and Characteristics of AI and Its Application in the Business Environment**

Like any other controversial terms, scholars and organizations in different fields have given different definitions or interpretations of AI. There are many variations to define AI. AI has been applied in many different domains and defined in various ways with different focus. This section aims to give an overview and try to describe AI and contextualize a few characteristics of AI, rather than providing a widely applicable definition, for the convenience of our discussions on AI's role in the boardroom.

### **2.1 Definition of AI and Intelligence**

The difficulty in defining AI lies not in the concept of artificiality but rather in the conceptual vagueness of intelligence, since human beings are seen as the only entities that possess intelligence and AI's definitions tend to be tied to human nature and characteristics.<sup>20</sup> The term "artificial intelligence" was first introduced by the American computer scientist John McCarthy, an AI pioneer, during a workshop at Dartmouth College in 1956 that set out to explore how machines could intelligently think. He defined AI as "the science and engineering of making intelligent machines, especially intelligent computer programs".<sup>21</sup> Following the approach of McCarthy in using intelligence as a test for the effectiveness of AI, some later definitions still use the term "intelligence" to explain AI. Linking the notion of intelligence with machines or systems, Jarrahi broadly defined the notion as "intelligent systems with the ability to think and learn".<sup>22</sup> Meanwhile, Nilsson claims that "AI is concerned with intelligent behavior that will make machines intelligent so they can appropriately act in environments with perception".<sup>23</sup> A typical behavioral definition, with a focus on the task-oriented evaluation of AI, describes AI as "the science of making machines capable of performing tasks that would require intelligence if done by [humans]".

In relying on the term "intelligent [agent]", Russell and Norvig focus on the process of creating functional AI and define AI as the designing and building of intelligent agents that receive precepts from the environment and take actions that affect that environment.<sup>24</sup> This definition of AI links various subfields of computer studies, such

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<sup>20</sup> Matthew U. Scherer, *Regulating Artificial Intelligence Systems: Risks, Challenges, Competencies, and Strategies*, 29 HARV. J. L. & TECH. 353, 359 (2016).

<sup>21</sup> John McCarthy. *What is artificial intelligence*. Technical report, Stanford University 1 (2007), <http://www-formal.stanford.edu/jmc/whatisai.html>

<sup>22</sup> Mohammad Hossein Jarrahi, *Artificial Intelligence and the Future of Work: Human-AI Symbiosis in Organizational Decision Making*, 61 BUS. HORIZONS 577, 578 (2018).

<sup>23</sup> NILS J. NILSSON, *ARTIFICIAL INTELLIGENCE: A NEW SYNTHESIS* 1-2 (1998).

<sup>24</sup> STUART RUSSELL & PETER NORVIG, *ARTIFICIAL INTELLIGENCE: A MODERN APPROACH* 1-3 (3rd ed., 2006).

as “speech processing, natural language understanding, reasoning, knowledge representation and learning”, in order to achieve the goal to be performed and executed by the AI.<sup>25</sup> The consensus here is to use AI in a functional fashion, with the associated goal that an AI-driven mechanism will function as well as, or better, than a human.

Moving away from the notion of “intelligence”, others define AI by focusing on different approaches or the different stages of AI application in practice. Nilsson divided AI into four approaches: “thinking humanly approach, acting humanly approach, thinking rationally approach, acting rationally approach.”<sup>26</sup> This is also applicable in the domain of law. In order to link the definition of AI with the legitimacy of regulating AI, Turner defines AI as “the ability of a non-natural entity to make choices by an evaluative process.”<sup>27</sup> One of the most often-quoted human-centric definitions of AI was offered by Nevada for the purpose of legislation to regulate self-driving cars: “the use of computers and related equipment to enable a machine to duplicate or mimic the behavior of human beings.”<sup>28</sup> On the other hand, focusing on thinking or acting rationally and being goal-driven, AI may be defined as “the quality that enables an entity to function appropriately and with foresight in its environment”. The entity in this case would be machine or AI itself, even though the legal status of AI itself is questionable.<sup>29</sup>

AI is rapidly developing, but it seems from the above that there is no consensus about a precise and universally accepted definition. However, this is sometimes seen as beneficial, since it may be argued that the definitional vagueness has “helped the field to grow, blossom, and advance at an ever-accelerating pace.”<sup>30</sup> The AI that we are discussing in this article, with a focus on its potential function in the boardroom to make business judgments, will be closely related to both the human-centric and rationalist definitions of the notion; the duty and liability of AI will be explored later in this article.

In applying AI in the boardroom, AI will be defined as the use of computers to assist, support, collaborate, or even duplicate the directors’ behaviors so that the company can function competently, successfully, and with foresight in its business environment

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<sup>25</sup> Anand Rao, *AI: Everywhere and Nowhere (Part 1)* (June 2, 2016), <http://insurancethoughtleadership.com/ai-everywhere-and-nowhere-part-1/>

<sup>26</sup> NILS J. NILSSON, *ARTIFICIAL INTELLIGENCE: A NEW SYNTHESIS* 1-2 (1998).

<sup>27</sup> JACOB TURNER, *ROBOT RULES: REGULATING ARTIFICIAL INTELLIGENCE* 16 (2018).

<sup>28</sup> NV Rev Stat § 482A.020 (2011), <https://law.justia.com/codes/nevada/2011/chapter-482a/statute-482a.020>.

<sup>29</sup> See for example, SAMIR CHOPRA & LAURENCE WHITE, *A LEGAL THEORY FOR AUTONOMOUS ARTIFICIAL AGENTS* (2011).

<sup>30</sup> Peter Stone et al., *Artificial Intelligence and Life in 2030 One Hundred Year Study on Artificial Intelligence, Report of the 2015–2016 Study Panel* 12 (2016), [https://ai100.stanford.edu/sites/g/files/sbiybj9861/f/ai\\_100\\_report\\_0831fml.pdf](https://ai100.stanford.edu/sites/g/files/sbiybj9861/f/ai_100_report_0831fml.pdf)

in the long-term. In a “blissfully circular fashion”, the definition refers to machines that are capable of performing board members’ tasks whereas these board members all should have their individual intelligence, satisfying both a subjective and an objective tests.<sup>31</sup>

## 2.2 Classifications and Characteristics of AI

AI has been distinguished into two classifications, namely narrow and general AI. Narrow AI focuses on the ability of a system to achieve a certain stipulated goal or set of goals using techniques which qualify as intelligent, while general AI is the ability to achieve an unlimited range of goals, and even to set new goals independently, including in situations of uncertainty or vagueness.<sup>32</sup> This stronger version of AI is concerned with building its capability towards the level of human ability, although its possibility has been questioned.<sup>33</sup> The AI that we would aim to employ in the boardroom as a board member or as a replacement of board members would be given tasks at both ends of the spectrum.

By looking at AI through the lens of business capabilities, AI functions may be classified into three categories, including “automating business processes, gaining insight through data analysis, and engaging with customers and employees.”<sup>34</sup> First, process automation refers to schemes where AI is applied to automate digital and physical tasks. Second, cognitive insight refers to opinions offered by AI to make predictions through the analysis of big data. AI applications may be used to detect patterns in data, and may subsequently offer interpretations of the meaning of patterns through machine learning. Third, cognitive engagement refers to systems that use AI to interact with humans directly using natural language processing chatbots. In the business setting, AI can interact with customers or employees of a company directly. AI applications can also vote in the boardroom, and can communicate with other directors and inform other directors about the rationale of their decisions.

All three of these functions will be important elements for applying AI in the boardroom, although the second function in relation to cognitive engagement technologies will enable AI to interact with other directors based on analysis of big data. The cognitive engagement function will be also promising in interacting with

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<sup>31</sup> See Section 174 of UK Companies Act 2006; Matthew U. Scherer, *Regulating Artificial Intelligence Systems: Risks, Challenges, Competencies, and Strategies*, 29 HARV. J. L. & TECH. 353, 362 (2016).

<sup>32</sup> David Weinbaum & Viktoras Veitas, *Open Ended Intelligence: The Individuation of Intelligent Agents*, 29 J. EXPERIMENTAL & THEORETICAL ARTIFICIAL INTELLIGENCE 371 (2017).

<sup>33</sup> For example, see MARGARET BODEN, *AI: ITS NATURE AND FUTURE* (2016).

<sup>34</sup> Thomas H Davenport & Rajeev Ronanki, *Artificial Intelligence for the Real World*, January-February HARV. BUS. REV. (2018), <https://hbr.org/2018/01/artificial-intelligence-for-the-real-world>

stakeholders directly, to establish a trust-based relationship on behalf of the company. AI may also directly communicate with other board members to give feedback on their decisions, provide rationales, and challenge their decisions by comparing other alternatives through big data analysis.

A few characteristics of AI have been recognized in comparison with other technologies. The most noticeable feature of AI in this regard is its ability to act autonomously to complete challenging and multifaceted tasks without active control or supervision from human beings.<sup>35</sup> The second is its reliance on big data; an AI program, by studying past correct and incorrect decisions, can search through big data rapidly, thus permitting it to analyze potential solutions without human involvement. This may complement humans' strengths in "decision-making processes typically characterized by uncertainty, complexity, and equivocality."<sup>36</sup> Echoing the decision-making processes in the second characteristic, the third characteristic of AI is its nature of being creative in the face of [un]foreseeability, despite being rather limited in scope. AI is able to generate solutions that are seen as "unexpected" from a human point of view. The performance of AI depends partially on post-design experience, and even the most careful designers and programmers find it literally impossible to predict the experience of AI system after it leaves their care,<sup>37</sup> unless they are exercising strict control over their software and performing routine patches and updates.<sup>38</sup>

### 3. AI's Function in Decision Making and Corporate Governance

The section primarily aims to respond to challenges for decision making and corporate governance at both the practical and conceptual levels, because of the increasingly significant role of AI in the economy and society. We will explore the possibilities of using AI for decision making, ranging from AI's role in performing certain specific tasks delegated by the director or board of directors, just like being delegated to sub-committees or councils, to making the consultation of AI (effectively having AI as a member of the board) mandatory, so that directors can make informed decisions.

Amour *et al.* described three prevalent agency problems that are relevant to corporate lawyers, including: agency between the shareholders and directors; agency between shareholders, primarily between controlling and minority shareholders; and agency

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<sup>35</sup> European Group on Ethics in Science and New Technologies, *Artificial Intelligence, Robotics and 'Autonomous' Systems* (9 March 2018).

<sup>36</sup> Mohammad Hossein Jarrahi, *Artificial Intelligence and the Future of Work: Human-AI Symbiosis in Organizational Decision Making* 61 BUS. HORIZONS 577, 577 (2018).

<sup>37</sup> Pei Wang, *The Risk and Safety of AI* (2016), <https://perma.cc/5LY3-CTLD>

<sup>38</sup> Weston Kowert, *The Foreseeability of Human - Artificial Intelligence Interactions*, 96 TEX. L. REV. 181, 203 (2017).

between the company and other parties such as creditors, employees, and customers.<sup>39</sup> To mitigate these agency issues, a number of legal mechanisms have been designed in corporate law and corporate governance codes, providing for restraints or incentives or giving voting or decision rights to various constituencies within the company. If there is AI involvement in decision making by the board, depending on its role, AI will certainly contribute to mitigating these agency conflicts, especially those between directors and shareholders and those involving other constituencies when the decisions of directors are assisted by, informed by, or delegated to AI. Meanwhile, if an AI application becomes a director and plays an autonomous role, the traditional agency problem may disappear or transform to become a problem with the involvement of the programmer or the designer of the AI, since it should be impossible for AI to independently commit fraud, benefit itself or cause damage to the public interest. The corporate governance structure and company law rules based on agency problems may also need to be reconstructed. This section will explore the possibilities of making AI's contribution more legitimate and structured, in order to enhance its effectiveness.

In 2016 the Finnish IT company Tieto became the first Nordic company to appoint an AI application, Alicia T, as a board member to lead the new data-driven businesses unit.<sup>40</sup> From the description on the official website, Alicia T “will help the management team to become truly data-driven and will assist the team in seeking innovative ways to pursue the significant opportunities of the data-driven world”. In 2018 an AI machine by the name of Einstein began to be invited to weekly staff meetings by the California-based software provider Salesforce in order to comment on proposals under discussion. These are examples in which AI has become involved in corporate governance and management to perform assistant, advisory, and delegated tasks.<sup>41</sup> Just as AI is helping doctors to make better diagnoses and deliver better care, AI also brings valuable insights to corporate leaders.

### **3.1 Different Roles of AI in the Board Room**

AI is regarded as a driver in the decision-making transformation towards an intellectual and information-centered process.<sup>42</sup> In the business world, AI can

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<sup>39</sup> John Armour, Henry Hansmann & Reinier Kraakman, *Agency Problems and Legal Strategies*, in *THE ANATOMY OF CORPORATE LAW: A COMPARATIVE AND FUNCTIONAL APPROACH* 29 (Reinier Kraakman et al. eds, 3<sup>rd</sup> ed. 2017).

<sup>40</sup> ‘Tieto the First Nordic Company to Appoint Artificial Intelligence to the Leadership Team of the New Data-driven Businesses Unit’ (17 October 2016), <https://www.tieto.com/en/newsroom/all-news-and-releases/corporate-news/2016/10/tieto-the-first-nordic-company-to-appoint-artificial-intelligence-to-the-leadership-team-of-the-new-data-driven-business/>

<sup>41</sup> Martin Petrin, *Corporate Management in the Age of AI*, *COLUM. BUS. L. REV.* 965, 966-969 (2019).

<sup>42</sup> Mohammad Hossein Jarrahi, *Artificial Intelligence and the Future of Work: Human-AI Symbiosis in Organizational Decision Making*, 61 *BUS. HORIZONS* 577, 578 (2018).

generally support three important business needs: automating business processes, gaining insight through data analysis, and engaging with customers and employees. Therefore, the major advantages of using AI to make decisions lie in its fast speed and the fact that some decisions have to be made by analyzing big data. Applying computational analytic techniques to big data will help board members to reveal hidden insights and valuable knowledge, and provide useful analytical results. These data can be used by the board to improve the efficacy and quality of their decision-making processes.<sup>43</sup>

Before investigating a more detailed role for AI in helping with business judgments such as prioritizing conflicting interests between various constituencies, it is useful to clarify the general classification of AI. Differing based on the allocation of decision rights between human beings and AI, there are three types of role that may be played by AI, regardless of the area they are applied within: assisted AI, advisory or augmented AI, and autonomous AI.<sup>44</sup> This classification is based on the level of autonomy enjoyed the AI. We will look at each of these three levels of AI briefly in the context of the boardroom.

At the lowest level, AI may be treated as an assistant in the board. With no or low autonomy, AI's role will not exceed administrative tasks, and all decision rights still exclusively belong to human beings. At the next level, advisory AI will support humans on more complex issues and in "decision-making situations by asking and answering questions as well as building scenarios and simulations."<sup>45</sup> At this level, decisions may be made by the human directors or co-determined by the human directors and the AI. Advisory AI will be able to support directors in consolidating human skills such as responsiveness, helping them to become more creative, and most importantly controlling their emotional intelligence, so that the directors are able to work with AI in order to improve their decision-making through data-driven evidence, reducing uncertainty and ultimately maximizing the long-term interests of the company.

If this role is applied to the boardroom in the corporate environment, AI could build partnerships with human directors by providing predictions and options to the board. Directors can generate ideas using probability and data-driven statistical inference approaches, identify relationships among stakeholders to promote the efficiency of

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<sup>43</sup> Nada Elgendya & Ahmed Elragalab, *Big Data Analytics in Support of the Decision Making Process* 100 *PROCEDIA COMPUT. SCI.* 1071, 1071, 1083-1084 (2016).

<sup>44</sup> Anand Rao, *AI: Everywhere and Nowhere (Part 3)* (May 20, 2016), <http://insurancethoughtleadership.com/ai-everywhere-and-nowhere-part-3/>

<sup>45</sup> VEGARD KOLBJØRNSRUD ET AL., *THE PROMISE OF ARTIFICIAL INTELLIGENCE: REDEFINING MANAGEMENT IN THE WORKFORCE OF THE FUTURE* 6 (2016) p.17, <https://www.accenture.com/us-en/insight-promise-artificial-intelligence>

their decision-making processes, and act upon sets of big data.<sup>46</sup> AI may also help directors to detect irregularities and provide warnings about potential risks that may require timely corrective actions.<sup>47</sup>

Autonomous AI, the highest level of autonomy, will “proactively and autonomously evaluate options”.<sup>48</sup> At this level, AI will be able to make business judgments independently by analyzing input from the actual business environment and perceiving patterns and trajectories in that data. AI could receive signals and indications from the business world and take responsive actions with some degree of autonomy.<sup>49</sup> At this level, AI owns decision rights due to human trust and delegation. Alternatively, AI may replace humans in situations where AI is more likely to make an informed decision, since decisions have to be made quickly or the process is complicated and requires a large amount of data that humans are simply unable to process.

In order to match various types of decisions with different functions of AI, Gorry and Scott-Morton established a framework categorizing different types of business decisions based on criteria according to their level of “structure” or “routine”.<sup>50</sup> The framework places business decisions on a spectrum, from those at the routine level (e.g., budget analysis) to structured or strategic decisions (e.g. business expansions or new product planning), with other types of decision falling in between.<sup>51</sup> When AI takes its place in the boardroom, the human role in making decisions at the routine level may be easily and even completely achieved by AI. However, the role of AI in making decisions at the structured level deserves further investigation. This is particularly relevant considering the machine-learning technology offered by AI, which is becoming increasingly thoughtful and insightful. Capabilities to assist directors to make decisions, or to make decisions independently by going through

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<sup>46</sup> Mohammad Hossein Jarrahi, *Artificial Intelligence and the Future of Work: Human-AI Symbiosis in Organizational Decision Making*, 61 BUS. HORIZONS 577, 580 (2018).

<sup>47</sup> Mohammad Hossein Jarrahi, *Artificial Intelligence and the Future of Work: Human-AI Symbiosis in Organizational Decision Making*, 61 BUS. HORIZONS 577, 580 (2018); see also Farman Afzal, Shao Yunfei, Mubasher Nazir & Saad Mahmood Bhatti, *A Review of Artificial Intelligence Based Risk Assessment Methods for Capturing Complexity-risk Interdependencies: Cost Overrun in Construction Projects*, INT’L J. MANAGING PROJ. IN BUS. Vol. ahead-of-print No. ahead-of-print. <https://doi.org/10.1108/IJMPB-02-2019-0047>

<sup>48</sup> VEGARD KOLBJØRNSRUD ET AL., THE PROMISE OF ARTIFICIAL INTELLIGENCE: REDEFINING MANAGEMENT IN THE WORKFORCE OF THE FUTURE 6 (2016) p.17, <https://www.accenture.com/us-en/insight-promise-artificial-intelligence>

<sup>49</sup> Loubna Bouarfa, *Europe pushes for Ethical Artificial Intelligence* (2019), <https://www.csreurope.org/europe-pushes-ethical-artificial-intelligence#.XdKb71egLIU>

<sup>50</sup> George Anthony Gorry & Michael S. Scott-Morton, *A Framework for Management Information Systems*, 13 SLOAN MGMT. REV. 49 (1971).

<sup>51</sup> George Anthony Gorry & Michael S. Scott-Morton, *A Framework for Management Information Systems*, 13 SLOAN MGMT. REV. 49, 56-57 (1971).

millions of pieces of data, may be able to predict the best solution for the company and/or the risks that the company faces.

### **3.2 Delegation of Directors' Task to AI and Avoidance of Choice Overload**

The directors do retain a residual duty of supervision if AI is given an assistant or advisory role.<sup>52</sup> In these scenarios, where AI is playing a non-autonomous role, directors may need to delegate tasks to the AI. In cases where the AI is granted a legal personality, however, the AI may act as an agent of the director or the board. Nevertheless, this delegation of duties should not be confused with abdication. When the AI plays an autonomous role and a director abrogates his duty entirely to the AI, the duty and subsequently liability of AI would then be a different issue; the AI or its programmers, users, or creator may then become liable for the AI's decisions. The AI may be rationally seen as the agent of the companies; indeed, these presumptions are based on the precondition that the AI is granted an artificial legal personality.

Powered by ever-growing big data and developments in AI, decision-making is increasingly being delegated to automated processes. In terms of the consistency and mismatching between AI and current law, and following on from the discussion in the last section, it is worth briefly exploring the current company law on the directors' authority to delegate and the duty of the agent. It is unreasonable to expect directors to perform every task independently without delegating on a wide scale. The advantages brought by delegation by boards is the ability to tackle problems such as "choice overload"<sup>53</sup> and "analysis paralysis".<sup>54</sup> In terms of the complications of "choice overload", directors may become overwhelmed by the large numbers of potential outcomes and the inherent risks, which can lead to unreasonable decisions that do not promote the success of the company. This problem is particularly noticeable if the directors face a large number of seemingly equivalent alternatives when making judgments, such as business judgements within a complicated stakeholder network with limited resources and no obvious prioritized interests from particular stakeholder groups. "Analysis paralysis" causes similar issues, where directors may find themselves in a situation where decisions are deemed too complex and swift responses are not possible because of the excess of available information.

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<sup>52</sup> *Re Baring plc (No 5), Secretary of State for Trade and Industry v Banker (No 5)*, 433 BCLC [1999] 1.

<sup>53</sup> The "choice overload" hypothesis notes that "although the provision of extensive choices may sometimes still be seen as initially desirable, it may also prove unexpectedly demotivating in the end"; see Sheena S. Iyengar & Mark R. Lepper, *When Choice Is Demotivating: Can One Desire Too Much of a Good Thing?* 79 J. PERSONALITY & SOC. PSYCHOLOGY 995, 996 (2000); Alexander Chernev, Ulf Böckenholt, & Joseph Goodman, *Choice Overload: A Conceptual Review and Meta-analysis* 25 J. CONSUMER PSYCHOLOGY 333.

<sup>54</sup> "Analysis paralysis", according to the Lexico dictionary, "is the inability to respond effectively to a situation due to an over-analytical approach or to an excess of available information" [https://www.lexico.com/en/definition/analysis\\_paralysis](https://www.lexico.com/en/definition/analysis_paralysis).

Overanalyzing large alternative sets in a corporate context can increase the possibility that decision making becomes paralyzed, which may lead to cognitive dissonance in business judgments.<sup>55</sup>

Delegation to AI may tackle such problems where decisions need to be reached based on a large quantity of data and the directors are not capable of providing a swift response. Such delegation will ease the tension between plausible hypotheses and the formal analysis of business judgments, allow the systematic study of issues in order to help companies make better decisions, and mitigate the human lack of capability to understand complex data and subsequently choose between the options available. In addition to assistance with processing large quantities of data, efficient algorithms have empowered AI to make decisions at a near-instantaneous speed.<sup>56</sup> This decision-making speed is having and will continue to have a great impact on decision making in high-velocity business contexts, avoiding a speed-accuracy trade-off.<sup>57</sup> Delegation enables AI to categorize solutions based on different criteria and priorities, assess the merits of each solution, and subsequently recommend a set of selected options for the board so it can evaluate these solutions more efficiently and in a focused and informed manner. The evaluation process can be made more effective as the algorithm “can be configured to calculate and inform the confidence level”<sup>58</sup> of all selected option and qualify the merits and advantages of each option.

Another issue in relation to delegation to AI is the directors’ duty to employ the most competent and appropriate AI to offer the best delegation service, as part of their duty of skill, care and due diligence. We have contextualized this duty into the following three aspects. First, in terms of selection, the directors should be responsible for having and understanding relevant information at a reasonable level. This may include knowledge of the operating principle, the corporate purpose, basic algorithm logic, and the operation of equipment when selecting AI to play a role in the boardroom. Directors should have reasonable relevant knowledge based on subjective and objective tests.<sup>59</sup> Second, after the appropriate AI has been selected, directors should have a duty of due diligence to ensure the accuracy and trustworthiness of the data provided to the AI, with appropriate *ex post* audit strategies and reporting. Third, directors should also take steps to mitigate the risks brought by AI by applying the AI safely and smoothly through appropriate channels, and by regularly allowing

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<sup>55</sup> See Ann Langley, *Between ‘Paralysis by Analysis’ and ‘Extinction by Instinct’*, 36 MIT SLOAN MGMT REV. 63 (1995).

<sup>56</sup> Jeff Dean, David Patterson & Cliff Young, *A New Golden Age in Computer Architecture: Empowering the Machine-Learning Revolution*, 38 IEEE MICRO, /2, 21-29 (2018).

<sup>57</sup> Yash Raj Shrestha, Shiko M. Ben-Menahem & Georg von Krogh, *Organizational Decision-Making Structures in the Age of Artificial Intelligence*, 61 CAL. MGMT. REV. 66, 66-67 (2019).

<sup>58</sup> Yash Raj Shrestha, Shiko M. Ben-Menahem & Georg von Krogh, *Organizational Decision-Making Structures in the Age of Artificial Intelligence*, 61 CAL. MGMT. REV. 66, 74 (2019).

<sup>59</sup> For example, see the UK Companies Act, Section 174.

professionals to perform routine maintenance to ensure the effectiveness and efficacy of the application.

### 3.2 AI, Big Data, and Decision Making

Although defining AI is a difficult task, Duan *et al.* claimed that it is “necessary and beneficial to re-define the concept of AI and related terms to reflect the changing nature of AI development and applications in the era of Big Data.”<sup>60</sup> The key differentiator between AI and other IT applications is that the machine learns from examples and experience, rather than being explicitly programmed for a particular result or outcome. This indicates that the performance of AI in decision making primarily relies on sufficient and useful data. By using automated search processes AI algorithms identify patterns in data which will allow them to develop an optimal prediction model.<sup>61</sup> The level of the data required is always proportional and relational to how complex the decision is.<sup>62</sup> Given the appropriate data, AI will be able to achieve a number of tasks including “coordinating data delivery, analyzing data trends, providing forecasts, developing data consistency, quantifying uncertainty, anticipating the user’s data needs, providing information to the user in the most appropriate forms, and suggesting courses of action.”<sup>63</sup> These rapidly changing data, with high “volume, velocity, variety, veracity, and value”, are considered the raw material of the 21st century, and they can be provided to decision makers so that they can gain valuable insights.<sup>64</sup> Encompassing a broad range of applications and algorithms, AI will be able to extract and exploit value information to promote informed decisions as a byproduct. In a business society with increasing emphasis on information, AI, which uses big data to run algorithms, can provide boards with opportunities to enhance their adaptive capabilities and shape their ability to address environmental changes rapidly.<sup>65</sup> A tidal wave of new AI tools, such as document

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<sup>60</sup> Yanqing Duana, John S. Edwards & Yogesh K Dwivedi, *Artificial Intelligence for Decision Making in the Era of Big Data – Evolution, Challenges and Research Agenda*, 48 INT’L J. INFOR. MGMT. 63 (2019).

<sup>61</sup> Yash Raj Shrestha, Shiko M. Ben-Menahem & Georg von Krogh, *Organizational, ‘Decision-Making Structures in the Age of Artificial Intelligence*, 61 CAL. MGMT. REV. 66, 66-67 (2019).

<sup>62</sup> Florian Möslin, *Robots in the Boardroom: Artificial Intelligence and Corporate Law*, in RESEARCH HANDBOOK ON THE LAW OF ARTIFICIAL INTELLIGENCE 649, 655-656 (Woodrow Barfield & Ugo Pagallo eds 2018).

<sup>63</sup> Gloria Phillips-Wren & Lakhmi Jain, *Artificial Intelligence for Decision Making*, in KNOWLEDGE-BASED INTELLIGENT INFORMATION AND ENGINEERING SYSTEMS 531, 531 (Bogdan Gabrys, Robert J. Howlett, & Lakhmi C. Jain eds 2006).

<sup>64</sup> Nada Elgendya & Ahmed Elragalab, *Big Data Analytics in Support of the Decision Making Process*, 100 PROCEDIA COMPUT. SCI. 1071, 1071 (2016).

<sup>65</sup> Alessandro Merendino, Sally Dibb, Maureen Meadows, Lee Quinn, David Wilson, Lyndon Simkin & Ana Canhoto, *Big Data, Big Decisions: The Impact of Big Data on Board Level Decision-making*, 93 J. BUS. RESEARCH 67, 71 (2018).

processing or responding to shareholder or stakeholders' queries, will enhance the efficiency of decision making processes.<sup>66</sup>

Brynjolfsson, Hitt and Kim found that "firms that adopt DDD [data driven decision] making have output and productivity that is 5–6% higher than what would be expected given their other investments and information technology usage", and that DDD controls for a wide range of possible confounding factors.<sup>67</sup> AI's function in decision making is seen as the result of the merging of AI and big data, which facilitates talent and learning simultaneously and enables AI's role in decision making. The most significant impact of AI will be to support or even replace humans in making decisions, particularly under conditions of uncertainty.<sup>68</sup> By using machine learning concepts, AI's roles can include assisting roles such as helping directors to select useful information from big data for complex issues, mitigating the complications brought by overloaded information, and enabling information updates, as well as advisory roles such as providing a dynamic and even a critical response from intelligent agents and facilitating communication to build collaborative decisions.<sup>69</sup>

These function of AI in decision making should also be applicable in the corporate world. A recent (2018) survey of 250 executives who were familiar with their companies' use of cognitive technology showed that three-quarters of them "believe that AI will substantially transform their companies within three years."<sup>70</sup> In the next sub-section, we will discuss the role and capacity of AI, together with predictions related to the potential challenges of using AI for decision making in the corporate environment within the domain of company law.

#### **4. AI's Legal Personality and the Possibility of the Imposition of Liability on AI**

AI has long since left the "geek" corner, and is seen as a transformative force by helping directors to excel. On a very optimistic note, Dmitry Kaminskiy, a managing partner of Deep Knowledge Ventures, predicted that most of the duties in typical corporations will be automated within five to ten years, and the arrival of

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<sup>66</sup> Ajay Agrawal, Joshua Gans & Avi Goldfarb, *Artificial Intelligence in The Boardroom*, March/April CORP. BOARD 16, 16 (2018).

<sup>67</sup> Erik Brynjolfsson, Lorin M. Hitt & Heekyung Hellen Kim, *Strength in Numbers: How does Data-driven Decision-making Affect Firm Performance?* (2011) [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1819486&download=yes](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1819486&download=yes) .

<sup>68</sup> Florian Möslein, *Robots in the Boardroom: Artificial Intelligence and Corporate Law*, in RESEARCH HANDBOOK ON THE LAW OF ARTIFICIAL INTELLIGENCE 649, 656 (Woodrow Barfield & Ugo Pagallo eds 2018).

<sup>69</sup> Gloria Phillips-Wren & Lakhmi Jain, *Artificial Intelligence for Decision Making*, in KNOWLEDGE-BASED INTELLIGENT INFORMATION AND ENGINEERING SYSTEMS 531, 531 (Bogdan Gabrys, Robert J. Howlett, & Lakhmi C. Jain eds 2006).

<sup>70</sup> Thomas H. Davenport & Rajeev Ronanki, *Artificial Intelligence for the Real World*, 96 HARV. BUS. REV. 108, 110 (2018).

decentralized autonomous companies which are operated without the involvement of human beings is not far away.<sup>71</sup> Despite the advances in technology, however, the current literature suggests that the legal system will struggle to manage the rise of AI and ensure that aggrieved parties receive the appropriate compensation when an AI system causes harm.<sup>72</sup> Given the persistently different analytical structure between AI and human intelligence, traditional corporate law rules will undoubtedly be unfit for the business needs and realities that will arise with AI directors present in the boardroom. The acceleration and accumulation of AI, although they offer fascinating possibilities and herald great transformative effects, will also pose unforeseen challenges to our current laws, including company law.<sup>73</sup> In order to deal with the fact that current company laws lag behind technology, this Section examines the potential impacts of AI on existing principles, rules and concepts in the domain of corporate law.

#### **4.1 AI Becomes a Member of the Board**

The first question is a straightforward one. Is it legal to for an AI entity to become a board member? In 2014 Deep Knowledge Ventures, a venture capital firm from Hong Kong, appointed VITAL (Validating Investment Tool for Advancing Life Science), a machine learning program capable of making investment recommendations in the life science sector, to its board in the capacity of a member of the board with observer status.<sup>74</sup> VITAL was appointed because of its ability to “automate due diligence and use historical data-sets to uncover trends that are not immediately obvious to humans surveying top-line data.”<sup>75</sup> Despite the fact that this appointment catapulted us into a new era of corporate management, legally speaking, VITAL does not satisfy the legal requirements of corporate directors in Hong Kong, considering the requirement to have at least one director who is a natural person.<sup>76</sup> It is simply treated “as a member of [the] board with observer status” by its fellow (human) directors.

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<sup>71</sup> See Nicky Burridge, *Artificial Intelligence Gets a Seat in the Boardroom*, NIKKEI ASIAN REV. (May 10, 2017), <https://asia.nikkei.com/Business/Artificial-intelligence-gets-a-seat-in-the-boardroom>

<sup>72</sup> See for example Martin Ebers, *Regulating AI and Robotics: Ethical and Legal Challenges*, in ALGORITHMS AND LAW 33 (Martin Ebers & Susana Navas Navarro eds., 2020); Mohammad Bashayreh, Fadi N. Sibai & Amer Tabbara, *Artificial Intelligence And Legal Liability: Towards an International Approach of Proportional Liability Based on Risk Sharing*, 30 INFO. & COMMUN. TECH. L. 169-192 (2021)

<sup>73</sup> Teresa Rodriguez de las Heras Ballell, *Legal Challenges of Artificial Intelligence: Modelling the Disruptive Features of Emerging Technologies and Assessing Their Possible Legal Impact*, 24 UNIF. L. REV. 302, 302 (2019).

<sup>74</sup> See Nicky Burridge, *Artificial Intelligence Gets a Seat in the Boardroom*, NIKKEI ASIAN REV. (May 10, 2017), <https://asia.nikkei.com/Business/Artificial-intelligence-gets-a-seat-in-the-boardroom>

<sup>75</sup> Ellie Zolfagharifard, *Would You Take Orders From a Robot? An Artificial Intelligence Becomes the World's First Company Director*, DAILY MAIL (May 19, 2014).

<sup>76</sup> See Section 457 of Cap. 622 Companies Ordinance 2014 see also Section 453 -454 of Cap. 622 Companies Ordinance 2014: Public company and company limited by guarantee required to have at least 2 directors, whereas private company required to have at least one director; it is required that

This particular obstacle to introducing AI to the board, e.g. the requirement in corporation law that directors be natural persons, also exists in other jurisdictions. Taking UK company law as an example, Section 155(1) of the UK Companies Act 2006 provides that “[a] company must have at least one director who is a natural person”. In the US, Delaware Corporation Law stipulates that a director “shall be a natural person.”<sup>77</sup> A process with two stages is embedded in the Model Business Corporation Act by, first, providing that a board of directors “shall consist of one or more individuals,”<sup>78</sup> and second, further defining an individual as “a natural person.”<sup>79</sup> It was summarized by Bainbridge that “the same is true in most other major capitalist economies.”<sup>80</sup> These legislations obviously impede AI applications from serving as board members. However, Bainbridge and Henderson list some reasons to justify opportunities for hiring “board service providers”, considering not only the failure of the board but also promoting board accountability,<sup>81</sup> and we are convinced that there is space for us to argue in favor of granting AI with legal entity status. If the participation of an AI entity would promote the effectiveness and accountability of the board and enable more informed, balanced and sustainable decisions, limiting the scope of directorship to natural persons is somehow inconsistent with “the significant potential upside and the limited downside of doing away with the natural person requirement.”<sup>82</sup>

#### 4.2 Legal Entity and Liability of AI

One of the biggest problems with AI in the boardroom is the risks entailed in its autonomy, which is not a problem that is exclusive to the area of corporate law and governance. Therefore, questions arise regarding, first, how to maintain control over AI that is programmed to act with considerable autonomy, and second, whether corporate mechanisms could be applied to reduce the legal and public risks that AI potentially generates without altering its innovative nature. Discussions around the duties and liability of AI are closely related to its legal entity, which decides the capacity to be the subject of rights and obligations and to determine one’s own legal situation. Granting AI with personhood has been seen as a “missing link” when discussions try to link AI with legal liabilities. In practice, there are cases where AI

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director is also defined in the legislation to include any person occupying the position of director (by whatever name called).

<sup>77</sup> Section 141(b) of the Delaware General Corporation Law.

<sup>78</sup> Section 8.03(a) Model Business Corporation Act.

<sup>79</sup> Section 1.40 Model Business Corporation Act.

<sup>80</sup> Stephen M. Bainbridge, *Corporate Directors in the United Kingdom*, 59 WM. & MARY L. REV. 65, 67 (2017).

<sup>81</sup> Stephen M. Bainbridge & M. Todd Henderson, *Boards-R-Us: Reconceptualizing Corporate Boards*, 66 STAN. L. REV. 1051, 1051, 1064-1067 (2014).

<sup>82</sup> Stephen M. Bainbridge & M. Todd Henderson, *Boards-R-Us: Reconceptualizing Corporate Boards*, 66 STAN. L. REV. 1051, 1068 (2014).

applications have been granted legal personhood. “Successful” cases include the granting of “citizenship” to a humanoid robot named Sophia in Saudi Arabia in October 2017.<sup>83</sup> Sophia became the first robot ever to have a nationality, and personifies our dreams for the future of AI. This is an encouraging start, although legal recognition still needs to be achieved in a more explicit and formal manner.

The recognition of AI’s legal personality is a problem for its role in the boardroom. The use of AI can change how liability plays out in traditional business models, regardless of the legitimacy of granting AI legal personhood. If AI is widely and effectively utilized in the company and in the boardroom, it may be worth promoting an independent legal status for AI as a way of legalizing and limiting the financial and legal obligations of AI creators, programmers, and users, similar to granting corporations the status of a legal entity.<sup>84</sup>

This proposed legal status for AI may be analogous to companies’ legal personhood, which allows companies to act as dependents and respondents in legal cases. The legitimacy of companies as separate legal entities inspires us to investigate a similar status for AI. A company is a legal entity separate from its shareholders, directors, and creditors, and as such it is conferred with rights and is subject to duties.<sup>85</sup> Companies have artificial legal personality, they own assets, pay taxes, and they can sue and be sued. A company has rights and obligations, and it may be held liable. A company gains its legal entity through registration, but it may also go bankrupt, or “die”, if it performs poorly. Companies are seen as the results of teamwork, with the involvement of directors, shareholders, and stakeholders behind them.<sup>86</sup> Companies may be assimilated to the position of “mediating hierarchs” as proposed by team protection theory.<sup>87</sup> This theory also suggests that the most important tasks for board members in public companies are a “balancing act in which they pay attention and respond to the competing claims of a variety of important corporate constituencies.”<sup>88</sup>

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<sup>83</sup> Sophia, Website of Hanson Robotics, <http://www.hansonrobotics.com/robot/sophia/>

<sup>84</sup> WENDELL WALLACH & COLIN ALLEN, *MORAL MACHINES: TEACHING ROBOTS RIGHT FROM WRONG* 197 (2009). See also Murray A. Pickering, *The Company as a Separate Legal Entity*, 31 MOD. L. REV. 17.

<sup>85</sup> See *Santa Clara County v. Southern Pacific Railroad Company*, 118 U.S. 394 (1886).

<sup>86</sup> Margaret M. Blair & Lynn A. Stout, *A Team Production Theory of Corporate Law*, 85 VA. L. REV. 247 (1995).

<sup>87</sup> Stephanie Ben-Ishai, *A Team Production Theory of Canadian Corporate Law*, 44 ALTA. L. REV. 299, 303 (2005).

<sup>88</sup> Margaret M. Blair & Lynn A. Stout, *Director Accountability and The Mediating Role of The Corporate Board*, 79 WASH. U.L.Q. 403, 445 (2001).

Similarly, AI may be registered in a particular jurisdiction in order to obtain a separate legal personality.<sup>89</sup> Just as a company has its stakeholder network,<sup>90</sup> the “stakeholders” of an AI application, such as creators, programmers, and users, may be conferred with rights and be subject to obligation and duties, in addition to those constituencies who contract with the AI. Like companies, AI entities could be seen “artificial” persons or “legal persons” who are designed, created, and controlled by humans. They could also deregister as the result of misconduct.

Another issue that is worth exploring is consistency between current law and the proposal to grant AI with the status of a separate legal entity.<sup>91</sup> Using US law as an example, Bayern argued that existing laws already permit the recognition of AI personhood for all purposes.<sup>92</sup> The New York Law of Limited Liability Companies could be used to grant legal personhood on any type of autonomous system by creating a limited liability company under the control of an AI mechanism authorized by operating agreement.<sup>93</sup> Although this is plausible based on the plain language of the legislation when reading it in isolation, Scherer disagreed with the assumption to the effect that the relevant statutes would not be construed by the courts. The concept of a memberless LLC controlled by AI fails to account for the fact that operating agreements cannot be used to override provisions in a charter of organization or in the LLC act itself under New York law.<sup>94</sup> Giving AI the power to control a company would not be consistent with the spirit and purpose of the legislation, or with the text, context, and legislative history of the statute.<sup>95</sup> Therefore, attempts to grant AI legal personhood should still be justified by the necessity and rationale of enabling AI to perform its role more legitimately, effectively, and fairly. Such decisions will assist policy makers, legal practitioners, and company controllers to determine whether and

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<sup>89</sup> For example, the idea of registration is supported by the European Commission, and it is suggested that “a comprehensive Union system of registration of advanced robots” should be introduced and the Commission should “investigate whether it would be desirable for the registration system and the register to be managed by a designated EU Agency for Robotics and Artificial Intelligence”; see General Principles Concerning the Development of Robotics and Artificial Intelligence for Civil Use 2, European Parliament Resolution of 16 February 2017, Civil Law Rules on Robotics (2015/2103 (INL)).

<sup>90</sup> See R. EDWARD FREEMAN ET AL., *STAKEHOLDER THEORY: THE STATE OF THE ART* (2010).

<sup>91</sup> See Simon Chesterman, *Artificial Intelligence and The Limits Of Legal Personality*, 69 INT’L & COMP. L. Q. 819-844 (2020)

<sup>92</sup> Shawn Bayern, *The Implications of Modern Business-Entity Law for the Regulation of Autonomous System*, 2 EUR. J. RISK REG. 297 (2016); Shawn Bayern, *The Implications of Modern Business-Entity Law for the Regulation of Autonomous Systems*, 19 STAN. TECH. L. REV. 93, 101 (2015).

<sup>93</sup> New York’s Limited Liability Company Law § 701(a)(4). permits an LLC to continue to exist even after all of its members withdraw.

<sup>94</sup> Shawn Bayern, *The Implications of Modern Business-Entity Law for the Regulation of Autonomous System*, 2 EUR. J. RISK REG. 297 (2016); Shawn Bayern, *The Implications of Modern Business-Entity Law for the Regulation of Autonomous Systems*, 19 STAN. TECH. L. REV. 93, 101 (2015).

<sup>95</sup> Matthew Scherer, *Is AI Personhood Already Possible Under U.S. LLC Laws? (Part One: New York)* (14 May 2017), <http://www.lawandai.com/2017/05/14/is-ai-personhood-already-possible-under-current-u-s-laws-dont-count-on-it-part-one/>

to what extent these machines can be held accountable.

Looking at the trajectory for development, there have already been legal attempts to address the issue. Taking Europe as an example, the European parliament has expressed the necessity to create a robust European legal framework to oversee the formation and practice of AI, including a form of “electronic personhood to ensure rights and responsibilities” for AI.<sup>96</sup> It is suggested that granting “a specific legal status” for AI in order to establish a legal mechanism to ascertain the status of AI with rights and obligations is key to clarifying the legal situation where AI makes autonomous decisions and interacts independently with third parties.<sup>97</sup>

From the liability angle, the legal personhood of AI, like that granted to companies, would be a good solution to minimize the impact of illegal and immoral acts committed with AI’s involvement.<sup>98</sup> AI’s liability largely rests on the role played by the AI. If AI plays a role in the boardroom that is towards the autonomous end, duties and rule for compliance regarding its conduct may be effectively embedded into the “brain” of its algorithms, in line with the requirements enshrined in corporate law and the corporate governance code. Due to the generality of the algorithmic code, case-by-case control in terms of specific conduct will then be mostly replaced by the nonconcrete control of algorithms. Thus, different enforcement mechanisms may be imposed against creators, designers, distributors, manufacturers, sellers, or other providers of agency-certified AI programs, who will become the primary potential defendants.<sup>99</sup> This may indicate the possibilities of imposing duties and liability upon AI, in response to calls for new rules to provide clarity on how to impose liability upon various constituencies concerning responsibility for the acts and omissions of AI if the cause cannot be traced back to a specific human being.

## 5. Justification of Legalizing AI’s Involvement in Corporate Law

If AI is able to enhance the accuracy and effectiveness of decision making and promote board accountability, it is worth considering enshrining the involvement of AI through directors’ duties in corporate law, in order to promote fairness and the effectiveness of corporate governance. This may be achieved through the imposition of a general legal duty to obtain options from the AI application and disclose the

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<sup>96</sup> See Alex Hern, *Give Robots ‘Personhood’ Status, EU Committee Argues*, THE GUARDIAN (12 Jan 2017), <https://www.theguardian.com/technology/2017/jan/12/give-robots-personhood-status-eu-committee-argues>

<sup>97</sup> European Parliament, Section 31 (F), Draft Report with Recommendations to the Commission on Civil Law Rules on Robotics (2015/2103(INL)).

<sup>98</sup> Roman Dremluga, Pavel Kuznetsov, & Alexey Mamychev, *Criteria for Recognition of AI as a Legal Person*, 2 J. POL. & L. 105, 112 (2019)

<sup>99</sup> For example, see General Principle F, European Parliament Resolution of 16 February 2017, Civil Law Rules on Robotics (2015/2103 (INL)).

responses of the board to the suggestions, in order to satisfy the standard of care for a prudent and diligent director making rational decisions. It can be viewed as a screening process for the directors to optimize their discretion through an analysis of big data. Rational decision making is the process of selecting the alternative that is expected to result in the most preferred outcome,<sup>100</sup> and it involves several stages including “identifying the alternatives, estimating their consequences, and comparing the accuracy and efficiency of each of these consequences.”<sup>101</sup> AI will be particularly useful in all these stages, providing “fast, accurate, repeatable, and low-cost decisions, with quality approaching human-like intelligence.”<sup>102</sup>

AI will be particularly helpful when the decisions involve many risks and uncertainties. The materialization of risks brought by uncertainties often lead to deviations from the intended approaches in order to counterbalance discrepancies, such as taking out insurance policies or obtaining advice from independent third parties. These approaches in essence transfer the corporate risks to a third party with the goal of minimizing any future losses. AI would also be a good party for mitigating risks, either as an independent third party or as a board member, depending on the size of the company, the development stage of the technology, and the feasibility of imposing such a requirement in the jurisdiction where the company is registered.

If this is embedded in law, directors will be able to investigate and judge the advice and data trends provided by AI and use them to make more effective decisions to promote the success of the company and provide forecasts related to possible risks and options. AI may quantify uncertainty and predict companies’ data needs, and may consequently provide directors with information and options for different action plans. If it is legitimate or, taking one step forward, legally required for directors of certain eligible companies (perhaps based on their type, such as public companies or companies dealing with natural resources due to the risks associated with environmental damage) to delegate some of the tasks for reaching the most sustainable decisions to AI, it is reasonable to question the extent to which directors should be required to do so, and whether a duty should be imposed.

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<sup>100</sup> Herbert A. Simon, *A Behavioral Model of Rational Choice*, 69 Q. J. ECON. 99, 108 (1955).

<sup>101</sup> Yash Raj Shrestha, Shiko M. Ben-Menahem & Georg von Krogh, *Organizational, ‘Decision-Making Structures in the Age of Artificial Intelligence*, 61 CAL. MGMT. REV. 66, 66-67 (2019).

<sup>102</sup> Yash Raj Shrestha, Shiko M. Ben-Menahem & Georg von Krogh, *Organizational, ‘Decision-Making Structures in the Age of Artificial Intelligence*, 61 CAL. MGMT. REV. 66, 67 (2019).

## 5.1 Duty to Reach AI-augmented Human Decisions

The current emphasis in the digitalization of boardrooms through various technologies is on the production and distribution of information for board members, in order to assist them in their supervisory and strategic roles.<sup>103</sup> Therefore, it is worth considering the role of company law in promoting informed decisions more effectively with the assistance of AI, as it seems to be accepted that AI should at least play a role in assisting the board of directors.

First, the business judgment rule<sup>104</sup> will only apply if directors are legally required to make informed decisions.<sup>105</sup> In the US case *Smith v. van Gorkom*, the finding was that directors' duties had been breached because of insufficient preparation for the respective board decision, not because of its substance. It was held that this decision "was not the product of an informed business judgment."<sup>106</sup> Informed decisions is one of the four conditions that have to be satisfied for the board to be protected from judicial review by the business judgment rule; specifically, the board must engage in a process to become adequately informed about all the material information that is reasonably available in order to make its decision.<sup>107</sup> To establish that directors have made an informed business judgment, the court must determine "whether the directors have informed themselves prior to making a business decision, of all material information reasonably available to them."<sup>108</sup>

In another Delaware case, *Aronson v. Lewis*, it was held that "directors have a duty to inform themselves, prior to making a business decision, of all material information reasonably available to them. Having become so informed, they must then act with

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<sup>103</sup> Natania Locke & Helen Bird, *Perspectives on The Current and Imagined Role of Artificial Intelligence And Technology In Corporate Governance Practice And Regulation*, 35 AUSTRALIAN J. CORP. L. 4, 5 (2020)

<sup>104</sup> The only formal definition of business judgment is in the Australian Corporations Act 2001. Section 180(3) of the Corporations Act states that business judgment means 'any decision to take or not take action in respect of a matter relevant to the business operations of the corporation'. This clearly comes within the decision meaning of the word 'judgment'. The Business Judgment Rule affirms the director's or officer's belief that the judgment is in the best interests of the corporation and is rational. The rule protects directors from liability and allows them to make efforts to act in an "informed fashion", as long as they are free of personal conflicts of interest.

<sup>105</sup> For the US law see *Sinclair Oil Corp. v. Levien*, 280 A.2d 717, 720 (Del. 1971); *Grobow v. Perot*, 539 A.2d 180 (Del. 1988); *Smith v. Van Gorkom*, 488 A.2d 858 (Del. 1985); see also the UK law cases *Brehm v Eisner* 746 A 2d 244 (2000); *Secretary of State for Trade and Industry v Baker* [1999] 1 BCLC 433.

<sup>106</sup> *Smith v. Van Gorkom*, 488 A.2d 858 (Del. 1985).

<sup>107</sup> Melvin Aron Eisenberg, *The Divergence of Standards of Conduct and Standards of Review in Corporate Law*, 62 FORDHAM L. REV. 437, 441 (1993).

<sup>108</sup> *Smith v. Van Gorkom*, 488 A.2d 858 (Del. 1985) at 872; see also *Cede & Co. v. Technicolor, Inc.*, 634 A.2d 345, 367 (Del. 1993); Bernard S. Sharfman, *Being Informed Does Matter: Fine Tuning Gross Negligence Twenty Plus Years After Van Gorkom*, 62 BUS. LAW. 135 (2006); Jonathan R. Macey, *Smith v. Van Gorkom: Insights About C.E.O.s, Corporate Law Rules, and the Jurisdictional Competition for Corporate Charters*, 96 NW U. L. REV 607, (2002).

requisite care in the discharge of their duties.”<sup>109</sup> The presumption that lies at the center of the business judgment rule is that “in making a business decision the directors of a corporation acted on an informed basis, in good faith, and in the honest belief that the action lay in the best interest of the company.”<sup>110</sup> In the same case, the business judgment rule was interpreted as “a presumption that in making a business decision the directors of a corporation acted on an informed basis, in good faith and in the honest belief that the action taken was in the best interests of the company.”<sup>111</sup> In the UK, in *Revenue and Customs Commissioners v Holland* a director failed to obtain advice from a specialist, and the judge concluded that the director lacked the necessary information to make an informed business judgment.<sup>112</sup> Similarly, in *Re Sunrise Radio Ltd*, Purle indicated that the advice of an independent evaluation should be sought before making a business judgment.<sup>113</sup> In *Re Westmid Packing Services Ltd*,<sup>114</sup> it was emphasised that “each individual director owes duties to the company to inform himself about its affairs”. Langely J approved comments of Morritt LJ in *Re Barings Plc (No 5)*,<sup>115</sup> directors have “a continuing duty to acquire and maintain a sufficient knowledge and understanding of the company’s business to enable them properly to discharge their duties as directors”.

For countries with codified business judgment rules in their company law legislations, conditions for informed decisions are explicitly embedded in the legislation. For example, under Section 76 Standards of Directors’ Conduct in the South African Companies Act 2008, subsection (4)(a)(i) of makes it clear that before making a decision, a director must ensure that he or she “has taken reasonably diligent steps to become informed about the matter.”<sup>116</sup> Civil law jurisdictions also impose a requirement of informed decisions in their legislations. For example, in the Portuguese Commercial Company Act in the section related to “Responsibility of Board Members towards the Company”, the liability of directors or managers can be “waived if any of the persons to which the previous paragraph refers is able to prove that he or she acted in an informed manner, free of any personal interest and using the criteria of corporate rationality.”<sup>117</sup> Similarly, the German Stock Corporation Act (AktG) stipulates that “no dereliction of duties shall be given in those instances in which the member of the management board, in taking an entrepreneurial decision, was within his rights to

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<sup>109</sup> *Aronson v. Lewis*, 473 A.2d 805, 812 (Del. 1984).

<sup>110</sup> *In re Walt Disney Co. Derivative Litig.*, 906 A.2d 27, 52 (Del. 2006).

<sup>111</sup> *Aronson v. Lewis*, 473 A.2d 805, 812 (Del. 1984).

<sup>112</sup> *Revenue and Customs Commissioners v Holland* [2009] BCC 37 at [268].

<sup>113</sup> *Re Sunrise Radio Ltd, Kohli v Lit* [2010] 1 BCLC 367 at [96].

<sup>114</sup> *Re Westmid Packing Services Ltd (No. 3)* [1998] B.C.C. 836 at 842.

<sup>115</sup> *Re Barings plc (No 5)* [2000] 1 BCLC 523, 535

<sup>116</sup> See also Brighton M. Mupangavanhu, *Standard of Conduct or Standard of Review? Examination of an African Business Judgment Rule under South Africa’s Companies Act 71 of 2008*, 64 J. AFR. L. 127 (2019).

<sup>117</sup> Article 72 of Commercial Company Act 2007 of Portugal.

reasonably assume that he was acting on the basis of adequate information and in the best interests of the company.”<sup>118</sup>

Therefore, if relying on AI could lead to more informed decisions, utilizing its capabilities to process information and make predictions using large data sets, it is then reasonable to expect directors to consult AI when making strategic decisions, and this expectation may become soft law – or even hard law, if compliance with soft law changes corporate behaviors. Directors are already bound to undertake due diligence before making decisions to ensure they have adequate information; otherwise they may violate their duty of care. AI could help to “collect, collate, format, distribute and regularly update” data to support board members or their sub-committees in drafting periodic comprehensive reports, which can then be used to ensure that directors are informed about the state of the business at regular intervals and help them to make decisions in a more informed basis.<sup>119</sup>

As the operational level, a machine learning algorithm (MLA), as a framework to facilitate the learning process to allow the AI system to learn by itself, may be used to achieve the system’s goals. The role of this framework is simply to define the data input and allow the algorithm to be trained, which enables the machine to understand and adapt based on information collected from the real world. The MLA uses past data and attempts to extrapolate to make a prediction. In a similar format to AI’s decision-making role in the board, MLA is already in use in the administration of law by government officials, where predictions are made about the defendant before the judge makes his or her ruling.<sup>120</sup> Although judges are not bound by the assessment scores produced by the MLA, they are influential when judges make their decisions.<sup>121</sup>

At the procedure level, AI could function at two stages in a hybrid decision-making structure with involvement from both AI and human directors.<sup>122</sup> In the first stage, AI could be used as a filter to discard inappropriate and ineffective alternatives, so that a group of appropriate alternatives can be presented to the board of directors.<sup>123</sup> This stage will avoid information overload, and will allow the board of directors to

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<sup>118</sup> Section 93 (1) of AktG 2017.

<sup>119</sup> Natania Locke & Helen Bird, *Perspectives on The Current and Imagined Role of Artificial Intelligence And Technology In Corporate Governance Practice And Regulation*, 35 AUSTRALIAN J. CORP. L. 4, 8 (2020).

<sup>120</sup> DANIELLE KEHL ET AL., ALGORITHMS IN THE CRIMINAL JUSTICE SYSTEM: ASSESSING THE USE OF RISK ASSESSMENTS IN SENTENCING, Responsive Communities Initiative, Berkman Klein Centre for Internet & Society, Harvard Law School (2017).

<sup>121</sup> DANIELLE KEHL ET AL., ALGORITHMS IN THE CRIMINAL JUSTICE SYSTEM: ASSESSING THE USE OF RISK ASSESSMENTS IN SENTENCING, Responsive Communities Initiative, Berkman Klein Centre for Internet & Society, Harvard Law School 13 (2017).

<sup>122</sup> Yash Raj Shrestha, Shiko M. Ben-Menahem & Georg von Krogh, *Organizational, ‘Decision-Making Structures in the Age of Artificial Intelligence*, 61 CAL. MGMT. REV. 66, 74 (2019).

<sup>123</sup> Yash Raj Shrestha, Shiko M. Ben-Menahem & Georg von Krogh, *Organizational, ‘Decision-Making Structures in the Age of Artificial Intelligence*, 61 CAL. MGMT. REV. 66, 74 (2019).

consider a number of alternatives more effectively and realistically. In the second stage, the board of directors, with or without support and assistance from AI, selects from the alternatives presented.<sup>124</sup> This procedure is consistent with the business judgment rule as the AI will offer suggestions for a set of alternatives, and the board will select the most suitable alternative to make the final decision. The board members will use their discretion to decide to what extent they wish to rely on advice given by AI, based on their professional business judgment.

In order to satisfy the *reasonableness test*<sup>125</sup> for an informed business judgment, the involvement of AI seems inevitable. The imposition of the duty to act on an informed basis may evolve into a “derivative duty” to obtain guidance and forecasts made by AI. The focus of AI would go beyond applications of AI in the industry, throwing light on how AI interconnects with society and heralding developments in technology to facilitate better and more accountable decisions made by boards.<sup>126</sup> Like the appointment of VITAL, this duty will enable companies to take advantages of AI’s ability to “automate due diligence and use historical data sets to uncover trends that are not immediately obvious to human surveys top-line data.”<sup>127</sup> Automated due diligence may be achieved through decentralized autonomous organizations which are run according to rules encoded as computer programs and transactions recorded in the blockchain.<sup>128</sup> Performing this duty through an automated due diligence system using AI will therefore reduce regulatory and reputational risks as well as due diligence expenditure, and the board will be able to gain more comprehensive control of their compliance in order to explain their decisions to their accountees.

For example, automated due diligence could help the board to mitigate risks in relation to business decisions. This has been regarded as a role on “the center stage”<sup>129</sup> since the financial crisis 2008. AI will be able to assist CROs (Chief Risk Officers), who take “positional priority” to avoid uncontrolled damage that will harm companies’ performance and reputations, with higher legal costs, fines and costs of explanation.

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<sup>124</sup> Yash Raj Shrestha, Shiko M. Ben-Menahem & Georg von Krogh, *Organizational, ‘Decision-Making Structures in the Age of Artificial Intelligence*, 61 CAL. MGMT. REV. 66, 74 (2019).

<sup>125</sup> See *Unocol Corp. v Mesa Petroleum Co.* (Del. 1985) 493 A.2d 946, 954. The test is satisfied by a demonstration that the board of directors had reasonable grounds to believe that a danger to corporate policy and effectiveness existed.

<sup>126</sup> Swathi Young, *10 Trends of Artificial Intelligence (AI) in 2019* (Jan 2, 2019), <https://becominghuman.ai/10-trends-of-artificial-intelligence-ai-in-2019-65d8a373b6e6>

<sup>127</sup> Ellie Zolfagharifard, *Would you Take Orders from a Robot? An Artificial Intelligence becomes the World's First Company Director*, DAILY MAIL (May 10, 2014), <https://www.dailymail.co.uk/sciencetech/article-2632920/Would-orders-ROBOT-Artificial-intelligence-world-s-company-director-Japan.html>

<sup>128</sup> Also known as “smart contracts”; see Roger Brownsword, *Smart Contracts: Coding the Transaction, Decoding the Legal Debates*, in REGULATING BLOCKCHAIN: TECHNO-SOCIAL AND LEGAL CHALLENGES 311 (Philipp Hacker eds. 2019).

<sup>129</sup> Brooke Masters, *Positional Priorities: Crisis Moves Chief Risk Officers from Supporting Role to Centre Stage*, FINANCIAL TIMES (April 29, 2013), <https://www.ft.com/content/b4fc0c08-a678-11e2-bc0b-00144feabdc0>

AI may play a key role in the filtering process to avoid occasions where a business decision puts the whole enterprise at risk, including environmental, social, and human rights risks and the likelihood of their materialization. Moreover, it is likely that consultation of AI will become a trend to satisfy due diligence tests of the directors duties in relation to skill and care, including the objective test, namely the general knowledge, skills and experience that may reasonably be expected of a person carrying out the functions of the director in relation to the company, and the subjective test, namely the general knowledge, skills and experience that the director has.<sup>130</sup> With the development of AI, it may be reasonable to expect directors to have knowledge and experience of dealing with AI, and possibly of consulting with AI to make more effective and informed decisions and make the process of consultation transparent as part of the board's accountability mechanism. Finally, if AI participates in the boards' decisions, the relevant risks of decision-making can be effectively pre-set through the design of codes and algorithms, and therefore can be controlled in advance. This may address problems caused by the "idiosyncratic vision" of human directors.<sup>131</sup> There will be fewer concerns about excessively aggressive or excessively conservative corporate behavior that may affect the company's performance.

However, we also understand that there will be barriers to enforcing this proposal. For example, if the use of AI to obtain relevant and adequate information and options becomes a prerequisite for decision-making, the process of data acquisition and maintenance may incur a high information cost. At the same time, there are also serious concerns related to over-reliance on AI, which may lead to a diminution in the skills and competence required for human governance. Over-dependency on AI may lead to a temptation to defer to decisions to AI as a default rule, but the credibility and effectiveness of such systems still need to be tested over a long period of time.

## 5.2 AI and Ethical Decisions

Clearly board judgments involve balancing the interests of shareholders and stakeholders, which causes challenges to directors' judgments and decisions. It therefore may bring challenges related to how to use AI in a more ethical and socially responsible manner. Of course, wider society has yet to reach a consensus on the ethical use of AI, and the application of AI in the boardroom will only add a new dimension to this existing complexity. For example, questions may arise on whether AI should be involved in promoting more ethical decisions. Will the machine learn

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<sup>130</sup> See for example Section 174 UK Companies Act 2006; Section 180 Australian Companies Act 2001; see also Vanessa Finch, *Company Directors: Who Cares about Skill and Care?*, 55 MOD. L. REV. 179 (1992).

<sup>131</sup> Zohar Goshen & Assaf Hamdani, *Corporate Control and Idiosyncratic Vision*, 125 YALE L. J. 560 (2015). The entrepreneur's or director's idiosyncratic vision is described as "subjective value an entrepreneur attaches to her vision".

inappropriate behavior from previous irresponsible decisions, and how can AI be programmed towards a more sustainable trajectory?

The nature of AI is seen as optimistically kind. It is difficult to envisage the deliberate creation of socially irresponsible AI, and it is practically impossible to imagine an AI that would develop an immoral habit.<sup>132</sup> There have been rising concerns about the general lack of understanding and increasingly penetrating bias in AI decisions, arguing in favor of the need to promote their transparency and accountability.<sup>133</sup> It is suggested by the European Commission that AI engineers should be accountable for social, environmental, and human health impacts imposed by AI decisions.<sup>134</sup> In this section, we will tackle the question of how to make AI decisions work in a manner that is ethical, in order to promote the long-term interests and sustainability of the company. This involves the need to establish a machine-learning system that reflects a commitment to ethical AI. Apart from the traditional ethical attempts at the consideration of individual stakeholder groups, such as employee satisfaction, customer satisfaction, creditor protection, environmental protection, and most recently reputation and supply chains, AI is also able to promote transparency and accountability more rigorously by collecting, processing, sharing, and using data in a comprehensive and ethical manner.

This is achievable since basic algorithms can be programmed to drive AI towards more ethical corporate actions. A group of 200 CEOs from the world's leading companies have argued that we should treat AI's involvement as a tremendous opportunity to increase the number of ethical companies, and they suggest that CSR committees and colleagues in companies should collect "social impact program data" on their target stakeholders, in order to empower machine learning and AI to tackle the biases that may be programmed into AI systems;<sup>135</sup> this may lead to an increase in perceived legitimacy. Supported by big data and complemented by other directors until they are able to play an autonomous role, AI will be able to contribute to data-driven decisions in directors' business judgment and strategic management policies, in order to help promote sustainability.

We would like to make a few suggestions to enhance the collaborative work between AI and other board members to promote more sustainable companies. First, AI will be able to promote transparency in order to enhance sustainability. "Publicity is justly

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<sup>132</sup> Kristijan Krka, *Corporate Social Irresponsibility: Humans Vs Artificial Intelligence*, 15 SOC. RESP. J. 766, 792 (2019).

<sup>133</sup> Jayshree Pandya, *What Is The Future Of Enterprise AI?*, Forbes (Nov 17, 2019) <https://www.forbes.com/sites/cognitiveworld/2019/11/17/what-is-the-future-of-enterprise-ai/#e6ec5517a791>

<sup>134</sup> European Commission, Liability AB, European Parliament resolution of 16 February 2017, Civil Law Rules on Robotics (2015/2103 (INL)).

<sup>135</sup> Cheryl Porro & Katharine Bierce, *AI For Good: What CSR Professionals Should Know* (June 29, 2018) <https://cecp.co/what-csr-professionals-should-know-about-artificial-intelligence/>

commended as a remedy for social and industrial diseases. Sunlight is said to be the best of disinfectants.”<sup>136</sup> Disclosure plays an important role, with effects ranging from more traditional roles such as reducing information asymmetries and instilling confidence in the market<sup>137</sup> to other aspects that are becoming increasingly important to promote corporate accountability.<sup>138</sup> AI can also measure disclosure against standards which may be legally required either nationally and internationally, in order to ensure compliance with regulations<sup>139</sup> or voluntary standards.<sup>140</sup> There is a trend towards viewing disclosure as a precondition of stakeholder accountability,<sup>141</sup> and discussions should therefore be encouraged on the ethics of AI, to ensure that all relevant parties are able to contribute to open, clear, interactive, and honest decision-making using big data to achieve social disclosure, which is regarded as the basis for corporate accountability with ethical ends.

Second, AI will be able to recommend sustainable policies and make sustainable decisions. Complementing human directors, AI can understand the companies’ ability to generate positive outcomes for multiple stakeholders by organizing ethical goals using a smart system. AI will be able to identify patterns in data that may not have been recognizable by human actors before. Thus, AI may be able to recommend a multi-dimensional strategy and policy. For example, AI will be able to use the big data presented by companies during their preparations for budget planning, and investigate peer group trends so as to identify differences and alignments and suggest opportunities for new corporate community investment programs or policies.

AI can decrease uncertainty enough to determine the right balance in strategic dilemmas.<sup>142</sup> Policies of this kind have already been embedded in some company law legislations. For example, the Indian Companies Act 2013 indicates that the CSR committee should carry out tasks such as formulating and recommending a CSR policy indicating the CSR activities to be undertaken by the company, recommending the amount of expenditure to be incurred, and monitoring the enforcement of the CSR policy.<sup>143</sup> As a member of the committee, AI would be able to make a substantial

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<sup>136</sup> LOUIS D. BRANDES, *OTHER PEOPLE’S MONEY AND HOW THE BANKERS USE IT* 65 (2009).

<sup>137</sup> Gaëtane Schaecken Willemaers, 11 *The EU Issuer-Disclosure Regime: Objectives and Proposals for Reform* 21 (Kluwer Law International 2011).

<sup>138</sup> Barnali Choudhury, *Social Disclosure*, 13 *BERKELEY BUS. L.J.* 183, 185 (2016).

<sup>139</sup> For example see “Strategic Report”, Section 414C (1) UK Companies Act 2006; “directors’ report” Section 2 (3) Companies (Corporate Social Responsibility) General Order Pakistan, 2009; “board’s report” Section 135 (4) Indian Companies Act 2013; “annual report” Article 225 of the “Grenelle II” France.

<sup>140</sup> For example, ISO26000, SA8000; see Michael Grüning, *Artificial Intelligence Measurement of Disclosure (AIMD)*, 20 *EUR. ACCOUNTING REV.* 485 (2011).

<sup>141</sup> Andreas Rasche & Daniel E. Esser, *From Stakeholder Management to Stakeholder Accountability*, 65 *J. BUS. ETHICS* 251, 252 (2006).

<sup>142</sup> Ajay Agrawal, Joshua Gans & Avi Goldfarb, *Artificial Intelligence in The Boardroom*, March/April *CORP. BOARD* 16, 18 (2018).

<sup>143</sup> Section 135 (3) Indian Companies Act 2013.

contribution to shaping and optimizing a program to enhance sustainability, monitor and track emerging trends and global variations, and provide performance measures against global standards.<sup>144</sup>

Third, AI can also be used to play a preventive function by providing a barrier to corporate damage to society and the environment. Preventative measures could be achieved through smart technology that identifies discrimination,<sup>145</sup> fraud, or conflicts of interest. AI and other directors will be able to tackle these issues by improving internal controls, and penetrative measures may also change corporate culture and attitudes towards a more active involvement with ethical initiatives before irreversible damage is done to stakeholders. Supported by benchmark big data programs over past years and by peers with similar volume and in similar industry sectors, AI will be able to set benchmarks customized for companies beyond the minimum requirements in legislations that mandate “formal equality”<sup>146</sup> or self-assessment mechanisms.

Moreover, AI can be programmed to act in a way that is in line with the organization’s core values. This may be implemented in the primary phase of the AI decision-making process, namely the goal-setting phase when the controllers of companies, including promoters before the registration of the company, decide on the goals of the AI and how to balance the different interests in the company, as well as the features and data that are available to draw inferences from.<sup>147</sup> For example, for Benefit Corporations (or B Corps), in which the interest of a specific public benefit (stakeholder group) is identified at the moment of registering the company, the AI will be programmed in such a way that the company’s directors and officers will consider specified stakeholders’ interests apart from maximizing shareholder wealth.<sup>148</sup> This can facilitate the promotion of “general public benefit” or the

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<sup>144</sup> Hency Thacker, *How AI can transform CSR*, THE CSR J. (January 22, 2019), <https://thecsrjournal.in/how-ai-can-transform-csr/>

<sup>145</sup> Of course, there are also arguments that AI creates bias; for example, Amazon reportedly abandoned an AI recruiting tool because it was biased against women, see Mutale Nkonde, *Is AI Bias a Corporate Social Responsibility Issue?*, HARV. BUS. REV. (November 04, 2019), <https://hbr.org/2019/11/is-ai-bias-a-corporate-social-responsibility-issue>; Jeffrey Dastin, *Amazon Scraps ‘Sexist AI’ Recruiting Tool that Showed Bias against Women*, TECH. NEWS (10 October 2018), <https://www.reuters.com/article/us-amazon-com-jobs-automation-insight/amazon-scraps-secret-ai-recruiting-tool-that-showed-bias-against-women-idUSKCN1MK08G>

<sup>146</sup> This “formal equality” approach to interpreting the role of government has been criticized for failing to achieve substantive equality; see Nina A. Kohn, *Vulnerability Theory and the Role of Government*, 26 YALE J.L. & FEMINISM 1 (2014).

<sup>147</sup> See Karl de Fine Licht & Jenny de Fine Licht, *Artificial Intelligence, Transparency, and Public Decision-making Why Explanations Are Key When Trying to Produce Perceived Legitimacy*, 35 AI & SOC’Y 911, 921.

<sup>148</sup> Susan H. MacCormac, Jonathan Glass & Julie Cooke, *The Emergence of New Corporate Forms: The Need for Alternative Corporate Designs Integrating Financial and Social Missions*, 9 SUMMIT ON THE FUTURE OF THE CORPORATION, PAPER SERIES ON CORPORATE DESIGN 88, 96 (2007). These new hybrid organizational forms that straddle the for-profit and non-profit sectors were developed in the US as a novel alternative

identification of a “specific public benefit” as a purpose, a list of which is provided by the Benefit Corporation Information Centre.<sup>149</sup> Unlike the unanswered issues around the accountability and liability of an AI system when it violates laws or rules, an ethical approach would be available for the designer of the algorithm, the company that uses the AI, the directors who work with AI, and the final user to contribute to collectively.

Finally, since the best fitting model is identified using automated search by AI-based algorithms, AI can be applied to “evaluate the same set of objective functions uniformly and consistently over millions of alternatives”, while “human decision making is limited by cognitive constraints” and the consistent processing of large numbers of alternatives is seen as mission impossible.<sup>150</sup> Applied to the boardroom, once the “best” option for a sustainable and ethically responsible company is defined, the same criteria can be autonomously and efficiently applied over a number of different cases to arrive at business judgments. We are aware that business judgments have unique characteristics and need to perform in different business settings, and it may be difficult to identify the “best” option that is most likely to promote the sustainability of the company. However, big data can also facilitate possible channels to offer guidance for the company on the trajectory that is most likely to promote its long-term interests, capturing the “historic expertise” of strategic decisions through rule elicitation or case-based reasoning.

Although it seems plausible and desirable for AI to make more ethical decisions for the company, some concerns have been raised. Since AI is a product of designers and programmers who are human beings, AI may be programmed to shape the world to their own private ends, which presents concerns about the extent to which the AI serves public interest.<sup>151</sup> According to industry logic, in the context of self-driving cars the AI will favor the driver and passengers where there is a choice between saving them or a pedestrian, since they paid for the vehicle.<sup>152</sup> Applying this logic to

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legal form to standard commercial corporations. This form is now available in thirty-two states in the US. The B Corps have evolved from their original definition as a Certificated B Corporation. This is a pioneering corporate certification product organised by B Lab, a non-profit organization that serves a global movement of people using business as a force for good; see <https://www.bcorporation.net/what-are-b-corps/about-b-lab>

<sup>149</sup> William H. Clark, JR et al., *The need and rationale for the benefit corporation: Why it is the legal form that best addresses the needs of social entrepreneurs, investors, and, ultimately, the public*, BENEFITCORP.NET 7, at 16 (January 18, 2013), <http://benefitcorp.net/policymakers/benefit-corporation-white-paper>; this is quite similar to Schedule VII of the Indian Companies Act 2013. The list and certificate can also be regarded as a way of rewarding socially responsible companies.

<sup>150</sup> Yash Raj Shrestha, Shiko M. Ben-Menahem & Georg von Krogh, *Organizational, ‘Decision-Making Structures in the Age of Artificial Intelligence*, 61 CAL. MGMT. REV. 66, 69 (2019).

<sup>151</sup> Alan Dignam, *Artificial Intelligence, Tech Corporate Governance and The Public Interest Regulatory Response*, 13 CAMBRIDGE J. REGIONS, ECON. & SOC’Y 37, 52 (2020)

<sup>152</sup> Alan Dignam, *Artificial Intelligence, Tech Corporate Governance and The Public Interest Regulatory Response*, 13 CAMBRIDGE J. REGIONS, ECON. & SOC’Y 37, 52 (2020)

corporate governance, it implies that the parties who pay for AI in corporate settings, namely the shareholders, will be the parties that ultimately benefit from decisions made by the AI, or at least they will be at the front of the queue where there is a conflict; this *de facto* duplicates the norm of shareholder wealth maximization,<sup>153</sup> which clashes with the sustainable development of corporate governance in a more ethical direction.<sup>154</sup>

Therefore, the regulation of AI and its design and programming by including and recognizing public interests seem significant, as the outcomes of AI's decisions are still largely dependent on the function of its human design. The effectiveness of the regulation will largely depend on the enforcement of the duties proposed in this section; realistically this is likely to be through public enforcement with the involvement of a public enforcer, which could be the Secretary of State, a securities commission, a central bank, or some other supervisory body representing the public interest. Keay suggested a series of benefits of public enforcement, including: protection for shareholders who cannot fund a derivative action and stakeholders who cannot bring derivative actions based on current corporate law, for example UK company law;<sup>155</sup> the enhancement of public interests; sending messages to directors about the importance of their duties and deterrence; and possibly enhancing the efficacy of private enforcement.<sup>156</sup> The issues surrounding enforcement will be discussed in detail in the next Section.

### 5.3 Enforcement

If consulting AI becomes a statutory duty when making business judgments, the enforcement of the duty may involve litigation in the courts and judgment by public authorities. We agree that, at least in principle, the quality and quantity of information required for "informed decisions" should be decided by the board instead of being scrutinized by the courts,<sup>157</sup> since "the amount of information that is prudent to have before a decision is made is itself a business judgment of the very type that courts are institutionally poorly equipped to make."<sup>158</sup> However, the potential contribution from

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<sup>153</sup> Mark J. Roe, *The Shareholder Wealth Maximization Norm and Industrial Organization*, 149 U. PA. L. REV. 2063 (2001).

<sup>154</sup> Beate Sjøfjell & Mark B. Taylor, *Clash of Norms: Shareholder Primacy vs. Sustainable Corporate Purpose*, 13 INT'L & COMP. CORP. L. J. 40 (2019).

<sup>155</sup> See Section 260-263 UK CA 2006; a broader range of claimants approach is adopted in Canada and Singapore.

<sup>156</sup> Andrew Keay, *The Public Enforcement of Directors' Duties: A Normative Inquiry*, 43 COMMON L. WORLD REV. 89, 118-119 (2014).

<sup>157</sup> Florian Möslin, *Robots in the Boardroom: Artificial Intelligence and Corporate Law*, in RESEARCH HANDBOOK ON THE LAW OF ARTIFICIAL INTELLIGENCE 649, 661 (Woodrow Barfield & Ugo Pagallo eds., 2018).

<sup>158</sup> *In Re RJR Nabisco, Inc. Shareholders Litigation*, [1989] WL 7036, para. 19 (per Chancellor Allen).

company law legislation will be to impose minimum requirements for the information sought and used by the directors under their duties of skill, care, and diligence.<sup>159</sup> It would be possible to further interpret the minimum requirement by including mandatory consultation of AI related to business decisions based on the companies' nature or significance; for example, the requirement may only be applicable to listed companies, or only to decisions that relate to particular matters such as natural resources. Even if litigations against directors for such cases are rarely prosecuted to fruition, the litigation risk of negligence or not acting on an informed basis would encourage compliance from directors. The enforcement of the duty would be the same as the enforcement of other directors' duties, based on company law in each jurisdiction, since it still falls within the domain of enforcing the duties of (human) directors.

If AI plays an autonomous role and the legal entity of AI is recognized in law, it is reasonable to expect that AI could be sued and held liable for misconduct. At this early stage of AI's autonomous involvement it may be overly optimistic to anticipate private enforcement from shareholders, creditors, supervisors, or supervisory board, or to expect these parties to have the technical knowledge to challenge the nonconcrete control of AI or bring litigation against AI providers based on their tort liabilities.<sup>160</sup> Therefore, there should be a focus on the *ex ante* control of algorithms, supported by *ex post* control of directorial conduct. The *ex post* control may come from public enforcement, e.g., a government agency with relevant expertise and experience of the control of algorithms in order to make such systems accountable and governable. It was proposed by Kroll *et al.* that this may be achieved by technical experts on behalf of the court or government-run algorithms.<sup>161</sup> However, such a public enforcement proposal may be difficult to enact in jurisdictions with weak public enforcement mechanisms.

Calling on the state to intervene and formulate a road map for the development of AI at the national and international strategic level is indispensable, and intervention from public authorities to regulate AI codes and algorithms has already begun. Taking the EU legislative initiatives as examples, civil liability for damage caused by AI is seen as a crucial issue in order "to ensure the same degree of efficiency, transparency and consistency in the implementation of legal certainty."<sup>162</sup> The European Commission

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<sup>159</sup> See for example Section 174 Companies Act 2006.

<sup>160</sup> The system grants access to financial resources which will provide claimants with the ability to afford issues such as investigation, attorneys, and experts. An inspiring example is the US AIDA, which would create a liability system under which the designers, manufacturers, and sellers of agency-certified AI programs would be subject to limited tort liability.

<sup>161</sup> Joshua A. Kroll, Joanna Huey, Solon Barocas, Edward W. Felten, Joel R. Reidenberg, David G. Robinson & Harlan Yu, *Accountable Algorithms*, 165 U. PA. L. REV. 633, 703-705 (2017).

<sup>162</sup> For example, see Liability 49, European Parliament resolution of 16 February 2017, Civil Law Rules on Robotics (2015/2103 (INL)).

adopted a proposal to develop legislative instruments to provide civil law rules for the liability of AI, establish a designated EU Agency for AI, and consider creating a specific legal status so that AI may own an electronic personality and be held responsible any damage it may cause.<sup>163</sup> Furthermore, the European Commission has also established a Robotics and Artificial Intelligence Unit, which fellows “ethical and legal issues related to robots and autonomous systems such as liability and safety.”<sup>164</sup>

Another practical idea, which would be suitable for an interim approach before confirming AI’s legal personality, would be to apply Article 12 of the United Nations Convention on the Use of Communications in International Contracts, which stipulates that a person, including a natural person or a legal entity, on whose behalf a computer was programmed should be responsible for any message generated by the machine,<sup>165</sup> complying with the general rule that the principal of a tool should be the party who is responsible for the results obtained from applying the tool, which has no independent volition of its own.<sup>166</sup>

Finally, it is worth mentioning the convenience and benefits brought by AI for the enforcement of company law if AI plays an autonomous role on the board. First, there would rarely be a need to impose the duty to avoid conflicts of interest. The AI will be able to perform according to rules encoded in computer algorithms through smart contracts. These rules, together with their transaction record maintained on a blockchain, would enable the AI to operate smoothly and effectively without human involvement. Of course, there may still be cases where the personal interests of the AI’s programmers and designer could be actually or potentially in conflict with the company’s interests. However, if the AI is seen as a separate person with no biological family members or self-interest, it is hard to imagine that conflicts of interest would be a direct issue. Second, there would be no need to offer the AI incentives or remuneration for its service. As a matter of international debate in the arena of corporate governance in the era of globalization and post financial crisis 2008, AI’s involvement would mitigate corporate governance issues by partially settling the

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<sup>163</sup> European Parliament, *European Parliament Resolution of 16 February 2017 with Recommendations to the Commission on Civil Law Rules on Robotics (2015/2103(INL))* (2017), <http://www.europarl.europa.eu/sides/getDoc.do?type=TA&reference=P8-TA-2017-0051&language=EN&ring=A8-2017-0005>

<sup>164</sup> European Commission, *Robotics and Artificial Intelligence (Unit A.1)*, <https://ec.europa.eu/digital-single-market/en/content/robotics-and-artificial-intelligence-unit-a1>; see also Expert Group on Liability and New Technologies, *Liability for Artificial Intelligence Report and Other Emerging Technologies* (European Union, 2019); David C. Vladeck, Essay, *Machines Without Principals: Liability Rules and Artificial Intelligence*, 89 WASH. L. REV. 117 (2014).

<sup>165</sup> Paulius Cerka, Jurgita Grigien & Gintare Sirbikyte, *Liability for Damages Caused by Artificial Intelligence*, 31 COMPUTER L. & SEC.REV. 376 (2015).

<sup>166</sup> UGO PAGALLO, *THE LAWS OF ROBOTS: CRIMES, CONTRACTS, AND TORTS* (2013) 77.

agency problem generated by directors' remuneration, as well as derived problems such as short-termism and board accountability.

## 6. Conclusion

The rapid progression of AI technology is facilitating opportunities for algorithmic decision makers' participation as key members of the board. Corporations globally are taking promising steps towards a digital transformation of the board structure and task allocation therein. There is no doubt that AI will expand its capacity "in order to provide cognitive insights and cognitive engagement in corporate board rooms."<sup>167</sup> AI creates many opportunities for using technology in the decision-making process in companies. The basic definition of advancement tells us to use AI if it could be helpful,<sup>168</sup> since a powerful tool can radicalize and change decision makers' habits and rationales. At the same time, AI's ethical and legal implications and effects have been explicitly realized worldwide,<sup>169</sup> and they may cause various legal problems and mean that national company law legislations have to be adjusted to accommodate AI's application in business. AI's involvement in the boardroom is a complex but legitimate issue, since AI is creative and may be unpredictable because it learns from examples and experience, rather than being explicitly programmed for a particular task.

The trajectory of AI development, computational progress, and digitalization mean that it is inevitable that corporate directors will be supported by AI,<sup>170</sup> even possibly with the full delegation of decision making to AI without human intervention.<sup>171</sup> We believe that AI will come to be an essential competitive advantage for both strategic decision-making at judgment level and operating decision-making at the management level.<sup>172</sup> Our focus is on the AI and its advantages and challenges in situations where AI assists, complements, or even acts as a substitute for humans in the workforce. It has been forecast that AI will become the basis of essential competitive advantage if it

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<sup>167</sup> Natania Locke & Helen Louise Bird, *Perspectives on the Current and Imagined Role of Artificial Intelligence and Technology in Corporate Governance Practice and Regulation*, 35 AUSTRALIAN J CORP. L. 4 (2020).

<sup>168</sup> Ismael Peralta-Valdivieso, AI and Corporate Law: Can an AI replace a director of a Company?, THE TECHNOLAWGIST (March 25, 2020), <https://www.thetechnolawgist.com/2020/03/25/ai-and-corporate-law-can-an-ai-replace-a-director-of-a-company/>

<sup>169</sup> For example, see Introduction B, European Parliament resolution of 16 February 2017, Civil Law Rules on Robotics (2015/2103 (INL)).

<sup>170</sup> Florian Möslin, *Robots in the Boardroom: Artificial Intelligence and Corporate Law*, in RESEARCH HANDBOOK ON THE LAW OF ARTIFICIAL INTELLIGENCE 649, 650 (Woodrow Barfield & Ugo Pagallo eds., 2018).

<sup>171</sup> Yash Raj Shrestha, Shiko M. Ben-Menahem & Georg von Krogh, *Organizational, 'Decision-Making Structures in the Age of Artificial Intelligence*, 61 CAL. MGMT. REV. 66, 72-73 (2019).

<sup>172</sup> Barry Libert, Megan Beck & Mark Bonchek, *AI in the Boardroom: The Next Realm of Corporate Governance* (October 19, 2017), <https://sloanreview.mit.edu/article/ai-in-the-boardroom-the-next-realm-of-corporate-governance/>

is used for decision-making in the boardroom.<sup>173</sup> With its diverse applications, AI programs could collect, filter, and provide information and options to help directors to make informed, ethical, and effective decisions, which may promote board accountability and corporate sustainability.

Compared with most of the AI literature on decision-making, we have investigated the issue from a new angle by focusing on one subset of corporate law that to date has attracted a considerable amount of attention in the corporate law literature, namely directors' duties and their enforcement. We believe that AI has a role to play in generating preventive and deterrent interaction, such as the possibility of imposing a directors' duty to consult AI in order to satisfy the subjective and objective tests of directors' duties of care<sup>174</sup> and promote more ethically accountable companies. By avoiding "choice overload", "analysis paralysis", a speed-accuracy trade-off, or an efficiency-fairness trade-off, AI may be delegated by directors to make decisions that involve the analysis of big data, multiple options, and urgency.

In order to enforce directors' duties more effectively, we discussed the possibility of granting AI with artificial personhood through a registration process, in order to regulate AI and promote its effectiveness in an ethical and accountable manner, taking account of the conception, development, implementation, and functioning of AI in the full spectrum from big data collection to acting as autonomous directors in a "fused board". If the personhood of AI is possible or even desirable in the future, it will facilitate a more detailed accountability mechanism for AI with the possibility of appropriate punishments for misconduct or ignorance by AI board members in the domain of corporate law.

The application of AI in the business setting has not yet reached maturity, and a variety of benefits will continue to emerge in line with technological progression. Just like the decisions made by AI, the involvement of AI on the board is also unpredictable. However, the legal and ethical hazards will only get more challenging and multi-dimensional. Before AI can play an autonomous role, a framework must be established to facilitate a combined mode of management with the involvement of both human and AI directors, in order to optimally promote the quality of decision making in companies and benefit from the strengths and wisdoms of both humans and AI, while also compensating for their respective weaknesses. The improved technology may be employed to obtain better, more accurate, and more reliable

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<sup>173</sup> See Marco Iansiti & Karim R. Lakhani, *Competing in the Age of AI*, HARV. BUS. REV. (January - February 2020), <https://hbr.org/2020/01/competing-in-the-age-of-ai>

<sup>174</sup> See Section 213 & 214 of the Malaysian Companies Act 2016; Section 174 of the UK Companies Act 2006.

information about the sustainable performance of businesses and facilitate improved information and transparency.