Smart Business and the Social Value of AI

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Abstract

Organizations across industries are increasingly using Artificial Intelligence (AI) systems to support their innovation processes, supply chains, marketing and sales and other business functions. Implementing AI, firms report efficiency gains from automation and enhanced decision-making thanks to more relevant, accurate and timely predictions. By exposing the benefits of digitizing everything, Covid-19 has only accelerated these processes. Recognizing the growing importance of AI and its pervasive impact, this chapter defines the ***social value of AI*** as the combined value derived from AI adoption by multiple stakeholders of an organization. To this end, we discuss the benefits and costs of AI for a business-to-business (B2B) firm and its internal, external and societal stakeholders. Being mindful of legal and ethical concerns, we expect the social value of AI to increase over time as the barriers for adoption go down, technology costs decrease, and more stakeholders capture the value from AI. We identify the contributions to the social value of AI, by highlighting the benefits of AI for different actors in the organization, business consumers, supply chain partners and society at large. This chapter also offers future research opportunities, as well as practical implications of the AI adoption by a variety of stakeholders.

Keywords: Artificial Intelligence, social value of AI, benefits of AI, AI risks, business-to-business

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Artificial Intelligence and the Post Covid-19 Recovery

Digital technologies are rapidly changing the way businesses operate. There is an increased demand for partially or fully digital products and services; firms interact with customers and supply chain partners via digital channels; internal processes and operations such as production or office management also rely on digital technologies. The Covid-19 pandemic has accelerated these processes and underscored the benefits of "digitizing everything". The biggest organizational changes implemented during the crisis, for example, remote work and reduction in the on-site workforce, will prevail in the post-pandemic recovery, which makes investments in new technologies of strategic importance for businesses.

This chapter is focused on Artificial Intelligence (AI), which was named as the number one technology to help businesses recover and improve after the Covid-19 crisis (McKinsey 2020b). Looking at the big picture, AI is argued to contribute to economic and societal welfare as well. For example, AI image analysis software CAD4COVID, developed by Delft Imaging[1], is analysing thousands of chest X-rays from Covid-19 patients and used for diagnostics in 120 hospitals worldwide. Furthermore, it is estimated that AI can add 1.4% of annual GDP growth for the European economy until 2030 (McKinsey 2020a). This is reflected in the EU's billion euro investments with the ambition "… to lead globally in the development and uptake of human-centric, trustworthy, secure and sustainable AI technologies" (European Commission 2021, p. 3).

Defining the Social Value of AI

The purpose of this chapter is to discuss the impact of AI adoption on various stakeholders of a business-to-business (B2B) organization. To this end, we adopt a cost-

[1] www.delft.care/cad4covid/

benefit approach and define ***the social value of AI*** *as the combined value derived from AI adoption by a (B2B) organization by multiple stakeholders*. More specifically, the social value of AI can be understood as the trade-off between 1) the *benefits and improvements* this technology brings for stakeholders and 2) the *costs and concerns* that arise from it. Specifically, we look at the impact of AI on 1) the internal stakeholders in the firm, i.e. the executives and employees, 2) business customers, supply chain partners and competitors, and 3) society at large.

Our definition of the social value of AI is rooted in the theory of value creation, which recognizes that "value created by organizations […] may not be wholly captured by them but, instead, may spill over into society as a whole" (Lepak, Smith and Taylor 2007). Social value of AI as a central concept in this chapter, emphasizes the overall anticipated impact of AI on many stakeholders of an organization. While the focus of this chapter is the AI adoption by a B2B firm, our definition allows that the social value of AI be created by any type of organization and captured by its stakeholders.

AI in Business-to-Business Relationships

The B2B literature has noted the pervasive impact of digital technologies on relationships in business networks (see e.g. Pagani and Pardo 2017; Hofacker et al. 2020). Focusing on AI technology specifically, it has been shown to contribute to improved decision making and overall firm performance (Bag et al. 2021) thanks to the ability to generate insights and knowledge from a variety of digital data sources such as for example social media information. Multiple studies have also discussed how AI can support buyer-seller exchanges in the sales process (Paschen, Wilson and Ferreira 2020; Luo et al. 2019), contract negotiations (Schulze-Horn et al. 2020), or throughout the purchasing process (Schiele and Torn 2020). Gligor, Pillai and Golgeci (2021) have recently discussed the potential dark side effects of AI on B2B relationships, such as exacerbated power asymmetries or reinforced

organizational inertia. We extend this literature by considering how AI impacts the internal stakeholders and society at large, not only customers and supply chain partners.

Ethical Considerations Arising from Digital Technologies

This research builds on the developments in business ethics and sustainability literature, which have recently considered the digital domain. Lobschat et al. (2020) defined a new concept of Corporate Digital Responsibility (CDR), arguing that companies need to assess the impact of digital technologies on business partners in the value chain, individual users of data and technology (customers, managers, employees technology developers), public institutions and non-governmental organizations. Elsewhere, López Jiménez, Dittmar and Vargas Portillo (2021) theorized that on top of the (minimal) legal requirements, firms will voluntarily subscribe and commit to a more strict, industry-specific code-of-conduct about the digital activities. Finally, Kumar and Ramachandran (2020) discuss the stakeholder wellbeing as an outcome of digital transformation, arguing that firms can pursue stakeholder focus together with the adoption of technology and analytics.

The contribution of this chapter lies in the discussion of the social value of AI, which extends the above studies in several ways. First, unlike previous studies, we focus on the impact of one specific technology, the AI, and the implication of automation and algorithmic decision making. Second, Lobschat et al. (2020) and López Jiménez, Dittmar and Vargas Portillo (2021) have emphasized the importance of the internal processes and corporate self-regulation about digital technologies, and we complement those studies with a more detailed discussion about the pervasive impact of AI on internal and external stakeholders of a B2B company. While Kumar and Ramachandran (2020) discuss multiple stakeholders and focus on the growth strategies that are realized by the focal firm, we contribute with an interdisciplinary review of the impact of AI on the organization, its environment and society.

The chapter is organized in the following way. We first discuss AI and related technologies, and discuss its main advantages and disadvantages. Second, we identify different groups of stakeholders that a B2B company should consider when developing AI. Next, we discuss the value contributions to the Social Value of AI, by showing how different stakeholders can benefit from this technology. We close this chapter with a short discussion and implications for managers.

Artificial Intelligence and Its Advantages and Disadvantages

Overview of AI and Related Technologies

We use the definition of AI proposed by Kaplan and Haenlein (2019), formulated as "a system's ability to interpret external data correctly, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation". A system is understood here as interconnected computers, interfaces, robots, sensors, or any smart devices, governed algorithmically to execute specific actions. AI understood in this narrow sense uses machine learning (ML) algorithms – predetermined rules to achieve prescribed goals based on input data. For example, in predictive analytics ML analyses vast amounts of historical data to predict the probability of future unknown events. AI is different from other analytics technologies because it evolves and becomes more effective and efficient, thanks to the ability to autonomously learn from past data, from new data sources, as well as from the system's responses via the feedback loop. For a non-technical review of AI technology see e.g. Agrawal, Gans and Goldfarb (2018).

The development of AI is closely related to the developments of digital technologies, such as IoT, block-chain, machine-to-machine communications (sensors), robotics, cloud computing, big data, ML and deep learning. For example, used in the smart industry, IoT and sensors generate volumes and a variety of data, which are continuously tracked and monitored

to optimize production lines with AI. Cloud computing and big data facilitate automation and real-time implementation of algorithmic decision making. ML is prevalent in everyday life, for example, computer vision is used for face recognition, and natural language processing with voice recognition are used by chatbots and voice assistants. In recent years there has been a discussion about the ability of AI to mimic and surpass human intelligence and creativity (see e.g. Huang and Rust 2018, Ng 2016), however so-called *strong AI* does not exist yet. We focus here on a narrow definition of AI, and the associated implications of automation and algorithmic decision making.

Benefits of AI

Social value of AI as a new concept takes into account the benefits and improvements this technology brings for a variety of stakeholders, as well as the costs and concerns associated with this technology. Looking at the benefits, we focus on two aspects of AI: 1) AI can perform tasks faster and with fewer errors than humans, which leads to efficiency gains; 2) AI's ability to analyse vast amounts of data, which leads to better, more timely predictions and enhanced decision making (i.e., higher effectiveness). Therefore, AI enables automation and predictive analytics making, which have powerful implications for stakeholders of a B2B company.

AI Risks and How to Mitigate Them?

The concept of the social value of AI also takes into account the costs and risks associated with this technology. First, the technology is costly to implement and requires significant financial investments for firms, including public subsidies (McKinsey 2020a, European Commission 2021). Second, the diffusion of AI within organizations is curbed by necessary organizational changes, adjustment costs, data vulnerability (cybersecurity), and the lack of skilled staff (Brynjolfsson, Rock, and Syverson 2017).

There are also concerns about the fairness of the algorithms underlying AI, therefore developers and organizations should monitor the quality of training and input data, create algorithms that are fair and appropriate, and evaluate the outcomes for potential bias. Furthermore, AI algorithms need to be explainable: transparent and understandable for decision makers to allow for inspection. Although algorithmic decision-making in principle implies that AI systems can be autonomous, in order to perform efficiently and ethically correctly, there must be a human in the loop. For a discussion of algorithms from an ethical perspective, see for example Martin (2019).

Using lessons learned from GDPR and California privacy law, companies also anticipate the costs of compliance with stricter AI regulations. For example, the Artificial Intelligence Act in the European Union[2] or the Canadian Algorithmic Impact Assessment[3] are the legislative initiatives regulating the use of AI. While this legislation represents the minimal legal requirements, firms additionally self-regulate to mitigate undesirable AI risks and voluntarily commit to a stricter code of conduct (López Jiménez, Dittmar, and Vargas Portillo 2021). Signalling the higher standards can lead to an improved brand image, but the noncompliance could imply a damaged credibility and consumer pushback.

Finally, there is an important discussion about the development of AI and its negative implications for individuals, such as customer privacy concerns, algorithmic bias, the psychological and emotional drivers of AI resistance, or human-machine interactions. While important in the B2C context, they are less relevant for a B2B company and therefore outside the scope of this research. For a recent discussion on privacy in consumer marketing, we refer the interested reader to the research of Krafft et al. (2021), who developed a framework to

[2] https://digital-strategy.ec.europa.eu/en/library/proposal-regulation-laying-down-harmonised-rules-artificial-intelligence-artificial-intelligence

[3] https://www.canada.ca/en/government/system/digital-government/digital-government-innovations/responsible-use-ai/algorithmic-impact-assessment.html

understand how both individuals and firms derive value from the data exchange. Algorithmic bias has been covered recently by Lambrecht and Tucker (2020). The work of Puntoni et al. (2020) explains how individuals experience AI, and algorithm resistance is covered for example by Leung et al. (2018), and Huang and Rust (2018) provide an analytical model of AI job replacement.

Social Value of AI is Expected to Increase

Being mindful of the above concerns about AI, we believe that the social value of AI will increase over time. First of all, while capital investment remains a major barrier for the AI diffusion, the information technology costs are declining and we observe the overall growth in computing power. Secondly, the anticipated tightening of laws and regulations about the use of AI can, on the one hand, increase the financial cost for firms, but on the other hand, will decrease the AI risk and concerns for the users and society at large. Overall, we expect the latter effect to dominate because the majority of companies are already actively self-regulating to mitigate AI risks, and there are brand reputation benefits for the voluntary code-of-conduct about the use of AI (López Jiménez, Dittmar and Vargas Portillo 2021; McKinsey 2020a). Thirdly, over time the AI algorithms become better and more efficient thanks to their learning capacity, which increases the AI value. Furthermore, we expect that the AI skills gap, a major obstacle for AI diffusion at the moment, will slowly close, given the emergence of dedicated programs at academic institutions. Finally, as AI becomes more pervasive in industries and societies, more and more stakeholders will reap their benefits, thus increasing the social value of AI.

Key Stakeholders in B2B

Building on stakeholder theory, we aim to understand the pervasive impact of AI on various actors in the value chain of a B2B company. Stakeholder theory proposes that

successful companies need to take into account all the “publics" that have an influence on the firm. Therefore, the focal firm must consider its position in a business ecosystem, maintain relationships with stakeholder groups, understand their role in value co-creation as well as their interests (see e.g. Hult et al. 2011; Hillebrand, Driessen and Koll 2015). This is relevant because B2B relationships are an increasingly complex network of co-existing and codependent relationships between organizations: suppliers, business customers, distribution partners in the global value chain and competitors (Hofacker et al. 2020; Pagani and Pardo 2017). Stakeholder theory is also relevant for AI diffusion, currently driven by joint investments in public-private partnership (ppp) initiatives. For example, the EU’s Coordinated Plan on Artificial Intelligence (European Commission 2021) emphasizes the joint role of businesses, SMEs, start-ups as well as policy makers, academic institutions, and NGOs in the responsible development of AI.

We analyse three levels of stakeholders that the focal firm needs to consider so that the development of AI takes place with regard to the well-being of individuals, customers, and society. As such, the focal firm can contribute to the social value of AI across three levels: 1) the internal environment level, represented by the organization itself, with top management and employees (including salespeople) as the key stakeholders, 2) the immediate environment, represented by the immediate actors in the value chain, with whom the focal firm has direct interactions: customers, supply chain partners and competitors, 3) the remote environment (macroenvironment) where the focal organization has only an indirect influence. Nevertheless, the focal firm needs to take into account the influence of external stakeholders on its strategy and operations. These stakeholder groups are the government, public and academic institutions, NGOs, industry associations, and technology ecosystems.

Key Stakeholders within the Organization

Executives Seek Efficiency Gains Associated with AI

According to the aforementioned McKinsey report (2020a), the development and implementation of AI technology have become now a strategic priority among the companies leading in digital transformation. Executives recognize that adopting AI can generate business value, through increased revenues and cost reductions.

Employees Might Resist Work Automation

The proliferation of AI means that well-structured, routine and repetitive tasks are automated and managed by algorithms (for a recent review of developments in digital technologies in the workplace see e.g. Bondarouk, Parr, and Furtmueller 2017). In Amazon warehouses, the algorithms can determine the tasks and how they should be executed by the workers, and they also continuously track performance (van Rijmenam 2020). However, job automation and algorithmization of tasks may lead to frustration, feeling of scrutiny, reduced interactions between employees, as well as lower employee engagement because "following the script" reduces creativity and independence (Kellogg et al. 2020). Furthermore, employees might resist AI fear of being replaced by a technology that can perform their job tasks faster and with fewer errors. On the other hand, automation of routine tasks frees employee capacity to solve more creative, complex tasks, increasing employee engagement and overall firm performance (Kumar and Pansari 2016).

How is AI Used in Sales Organizations?

We consider salespeople as one specific group of employees affected by the adoption of AI in a B2B organization. AI is already assisting humans in marketing and sales tasks at all stages of the B2B funnel (for a detailed review see e.g. Paschen, Wilson and Ferreira 2020; Agnihotri 2020). For example, in the prospecting phase AI algorithms analyse large volume of data to build better prospect profiles and to qualify leads (Meire, Ballings, and Van den Poel 2017). In the (pre-)approach phase machine learning can improve the targeting and

retargeting of digital advertising (Järvinen and Taiminen 2016), and natural language processing is used by conversational sales chatbots to interact with prospects (Luo, Tong, Fang and Qu 2019); machine learning algorithms are used in automatic dynamic pricing systems to help close the deals (Leung et al. 2019); as well as automating the workflows, services, customer relationship management post-sales (Libai et al. 2020; Chatterjee et al. 2021). Finally, AI has the potential to play an important role in the on-the-job training of salespeople. In this context, Luo, Qin, Fang and Qu (2021) have demonstrated through a series of experiments that using an AI coach (vs. a human coach) leads to improved salesperson sales rates.

External Stakeholders: Business Customers and Supply Chain Partners

Consider an example of a bicycle manufacturing industry, which since the beginning of Covid-19 pandemic has seen an exploding consumer demand. While other industries begin to recover, the majority of bicycle manufacturers have been affected by a lockdown of a production site from a key supplier, Shimano, which holds 65% of the market for high-end breaks and gears.[4] This single event contributed to the continued global bike shortage as the manufacturers report now average lead times of about 400 days – a number comparable to producing a luxury car.

As seen from this example, business relationships are nowadays very dynamic and complex. Digital technologies and AI facilitate the connectedness of this global marketplace (Hofacker et al. 2020, Pagani and Pardo 2017), by connecting partners directly, and effectively blurring the boundaries between buyers and suppliers. Adopting AI within a firm will impact the stakeholder groups that lie immediately within the firm's value chain: the business customers and the downstream and upstream supply chain. Furthermore, those

[4] https://www.ft.com/content/ddd98460-5461-4014-9856-f2c62908ae57

external stakeholders may encourage the firm's decision to adopt AI. To realize efficiency from process automation, AI systems require a good alignment of buyers and suppliers in the network, integration of data and real-time data sharing with business partners to generate valuable insights. Through collaboration the focal firm and its business partners can extract more value from AI.

Business Customers

For a focal B2B company, important buyers constitute end-users or manufacturers whom a focal firm supplies with materials and subcomponents required in the production process. A company adopting AI can leverage big data about consumers and markets to better manage business relationships, and cost-effectively personalize products and services. Predictive customer lifetime value (CLV) models and value-based segmentation will be more accurate and better, taking into account not only the transaction but also social media information. This results in better customer development but also more effective loyalty programs and incentives (Libai et al. 2020), and a higher engagement between B2B firms (Chatterjee et al. 2021).

Suppliers and Supply Chain Partners

A focal B2B firm also needs strong relationships with upstream and downstream supply chain partners such as their own suppliers, distribution partners and retailers, and companies that provide products and services to support their operations. Recall the example of the bicycle manufacturing industry: when a key supplier experiences production shortages, manufacturers can benefit from being a preferred customer and prioritized deliveries. In this context, AI systems are used in B2B companies to automate procurement processes and gain better insights about suppliers and sourcing opportunities. New and publically available data sources such as social media information, industry reports, or global news events can be used

to provide additional information about supplier opportunities. Schiele and Torn (2020) consider how AI systems can be incorporated in procurement at all the stages of the purchasing process. For example, AI-based virtual interactive chatbots can facilitate suppliers in creating proposals, which then are being analysed and preselected using text mining. AI algorithms can facilitate the execution of complex negotiations, which in B2B involve many parties, multiple decision criteria (e.g. delivery times, guarantees, prices, quantities) as well as quality and budget constraints. This is typically a hard optimization problem and AI systems can explore unobvious solutions to reach an acceptable outcome for all parties involved (Schulze-Horn et al. 2020).

Looking at the downstream operations B2B firms cooperate with distribution partners and retailers to deliver their goods to end-users. In logistics, AI and machine learning use the RFID and blockchain to track materials, components, products throughout the value chain to optimize and automate the schedule of deliveries (Tsolakis et al. 2021). Operations in large logistics hubs, such as for example Port of Rotterdam, rely on autonomous navigation and Automated Guided Vehicles, and use AI analytics for optimization and container management[5]. Covid-19 pandemic has exposed the vulnerabilities of the global supply chains, disrupting for example the bike manufacturing industry. Dubey et al. (2021) show that in unpredictable events like Covid-19, companies within a strong alliance are able to take advantage of AI analytics and improve operational and financial performance.

Competitors

There is an active discussion on how AI will affect the competition and the markets, because algorithms can induce mechanisms promoting the competition and hindering it. Looking at algorithmic pricing, research has found that, on the one hand, AI can lead to lower

[5] https://www.portofrotterdam.com/en/news-and-press-releases/port-rotterdam-authority-tests-autonomous-navigation-floating-lab

prices thanks to better forecasting, but on the other hand, algorithms can also learn to play collusive strategies (Miklós-Thal and Tucker 2019). Varian (2019) considers how first mover advantages are created thanks to returns to scale (economies of scale, indirect network effects and learning-by-doing effect) in the industries using AI. While imitation from late movers is possible thanks to public data sources, open source AI algorithms and cheap cloud computing infrastructure, Varian (2019) identifies the lack of expertise as the major obstacle for AI diffusion.

Furthermore, as a result of digitization "firms are compelled to compete with their partners and collaborate with their competitors" (Hofacker et al. 2021, p.1163). Therefore, coopetition and value co-creation emerge as two phenomena that are integral to the analysis of business-to-business relationships. Focusing on AI adoption, it has been linked with improved competitive advantage and increase in relative power of a focal firm (see e.g. Chatterjee 2021), but it can also hinder interorganizational trust (Gligor et al. 2021).

Macro perspective: Societal Stakeholders and Other Interest Groups

Apart from internal stakeholders and supply chain partners, there are actors in the distant environment of the firm who will be affected by the firm's AI adoption. Those actors will also influence the firm's decision about AI development.

Governmental bodies, public administration institutions, and NGOs shape the legal environment about the use of AI to protect individual and consumer rights. Furthermore, governmental actors and policy-makers have an interest in AI development, foreseeing potential for economic growth and societal improvements. They offer public funding opportunities to stimulate AI development, balancing economic gains and responsible AI use. For example, the European Commission has set forth an aligned AI policy priority and investments for AI R&D with the aim of "… seizing the benefits and promoting the

development of human-centric, sustainable, secure, inclusive and trustworthy artificial intelligence (AI)" (European Commission 2021, p. 2).

Industry associations and accreditation bodies give representation for small and medium-sized businesses to influence AI policies. Furthermore, industry associations are an ecosystem through which businesses learn, share knowledge and experience about AI solutions, improving the diffusion of AI. Industry associations may promote their own standards about AI, writing a code of conduct which complements the legislation. For example, recently a Data Pro Code was proposed by the association of the Dutch ICT sector, NL Digital. Companies who voluntarily subscribe to these strict regulations signal a commitment to responsible AI, which can enhance brand image. Violating the code could lead to the damaged credibility and consumer pushback (López Jiménez, Dittmar, and Vargas Portillo 2021).

AI incubator ecosystems arise from the geographical convergence of high technology start-ups, academic institutions, enterprises, and governmental actors. Thanks to the access to human resources, capital, and infrastructure, there are collaboration opportunities and synergies for the actors. Within this ecosystem, high technology start-ups are a source of AI innovations (Garbuio and Lin 2019). Successful start-ups attract talent and capital and give back to the community ("pay it forward mentality"). Big multinational enterprises present in the incubators further attract talent, provide financial support for ppp innovation, the infrastructure and scale up opportunities. They are also interested in investing and acquiring AI start-ups to stay innovative and ahead of the competition. For example, the technology consulting giant Accenture recently announced a strategic investment in Pipeline, a start-up that "uses artificial intelligence (AI) technology to increase financial performance by closing

the gender equity gap".[6] The academic institutions in the AI ecosystems educate AI talent, provide training for start-ups and enterprises, and are a source of AI innovation via spin-offs. Public administration actors, discussed in detail above, provide infrastructure and support for the entire ecosystem and act as investors to stimulate local AI research.

Contributions to the Social Value of AI

The *social value of AI* is defined as the total value of AI for different groups of stakeholders: the actors within the organization, business customers and supply chain partners, and society at large. It consists of AI value contributions from each actor, which we discuss in detail in this section.

Firm-Related Outcomes of AI Adoption: How is AI Value Generated Within the Firm?

Increased Operational Productivity and Process Efficiency

Executives report that implementing AI in the organization improves operational efficiency: 1) through cost and time savings brought by automation, and 2) increased revenues, thanks to better products and services (see e.g. Brock and von Wangenheim 2019; McKinsey 2020a). Recently, Brynjolfsson, Jin, and McElheran (2021) demonstrated that adopting AI-based predictive analytics leads to up to an average 3% increase in productivity (equivalent to yearly revenue gains of $918,000) when comparing AI adopters vs. non-adopters in the US manufacturing industry. Elsewhere, Huang, Wang, and Huang (2020) find that AI is linked with better financial performance and market value, but not with improved labour productivity of Fortune 1000 companies.

More Informed Decision Making

[6] https://newsroom.accenture.com/news/accenture-makes-strategic-investment-in-pipeline-to-accelerate-gender-parity-in-the-workplace.htm

AI and big data implementation have been linked to better firm performance because they help improve products and services (Brock and von Wangenheim 2019); they also lead to better marketing decisions about the prices, channel management, product-service design, and development (Suoniemi et al. 2020). AI is also a knowledge management enabler which helps companies integrate information about the customers, users, and the market to support decisions leading to enhanced firm performance (Bag 2021). Therefore, the adoption of AI-based digital technologies has the potential to bring higher effectiveness due to improved decisions, higher productivity, and better use of (human) resources.

Innovation and Diversification

There is varied evidence about the impact of AI on firms' innovation activity. Research has found the positive relation between AI and incremental innovation (Brock and von Wangenheim 2019), because the technology can improve a firm's position in existing sectors through improved product-services for consumers. Furthermore, companies that possess dynamic capabilities related to technology, data, and skills (Mikalef 2019) use AI for radical innovation. Comparing different digital technologies, AI together with big data, robotics, and 3-D have been associated with the highest potential for enabling radical innovation. On the other hand, common digital technologies (like emails, videoconferencing) have a negative effect on innovation, because reduced interaction hinders creativity (Usai et al. 2021).

Improving Work Quality and Employee Engagement

AI can enable automation of well-structured, repetitive and tedious tasks, which are executed faster and with fewer errors compared to the work done by human employees, thus improving the overall labour quality and consistency. Furthermore, AI enables human-machine interactions, such as with customer service chatbot, which can be as effective and productive as human employees (Luo, Tong, Fang, and Qu 2019). As a result, AI is freeing

the capacity for employees to engage in less structured but more creative tasks, which has been linked to employee engagement (Kumar and Pansari 2016).

AI Creates Value for Business Customers and Supply Chain Partners

Efficiency Gains in B2B Exchanges

Embedding cloud-based AI solutions throughout the B2B buying process means that buyer-seller interactions and transactions can be automated and done remotely. This leads to overall lower transaction costs, benefiting all actors in the B2B exchanges. There are also time and effort savings for both purchasing and sales functions, where tedious and complex tasks such as text analysis of RFI or RFP documents can be outsourced to AI (Schiele and Torn 2020). In supply chains, predictive analytics allows more accurate forecasting and demand prediction, improving the efficiency of the supply through reduced levels of excess inventory, lower product return rates, and minimizing delays (Dubey et al. 2021).

Customized Smart Products and Services

AI together with other digital technologies is an enabler for hyperpersonalization thanks to their ability to connect the physical and virtual infrastructure. For example, manufacturers increasingly share production infrastructure and resources; with the remote access, they can configure, control and monitor the machine operations, while the production lines switch automatically (aka. flexible manufacturing). Buyers have a remote access to configure smart products and services according to their required specifications, and can create prototypes for example with the use of VR technology (Kostis and Ritala 2020). In purchasing and sales, chatbots allow for personalized and real-time communications in RFI processes and sales transactions, while automated negotiation systems and pricing systems use machine learning methods to factor in supplier-specific information (Schulze-Horn et al. 2020).

Improved Customer Relationship Management and Customer Engagement

Adopting AI systems and machine learning in customer relationship management (CRM), firms can enhance their relationships with potential and existing customers. In customer acquisition, AI integrates different data sources, such as user-generated content or Google search data about emerging market trends and new customer opportunities, which can help firms expand their prospect base. Automating lead generation and qualification process contributes to lowering the overall customer acquisition costs. AI can also help expand the relationships with current customers through upselling and cross-selling techniques, higher order frequency and longer relationship duration. Predictive analytics can improve the accuracy of customer lifetime value (CLV), which will help firms identify and target high value (prospects) customers with (acquisition) retention tactics, thereby optimizing the (acquisition) retention budgets and prevent customer churn of high value customers (Libai et al. 2020). Finally, the use of conversational agents and automated, personalized communications can lead to higher customer engagement (Chatterjee et al. 2021).

Enhanced Relationships with Suppliers

The adoption of AI can improve the company's relationship strategy with potential and existing suppliers and partners. Matching systems with big data capability broaden the base of potential suppliers for the buying firms and help to identify better sourcing opportunities which otherwise could be overlooked (Allal-Chérif et al. 2021). In supplier relationship management systems AI methods are used to monitor and evaluate supplier performance and supplier satisfaction. This improves the focal firm's supplier orientation and induces supplier development so that suppliers are ready to better serve the needs of the buying firm (Gu et al. 2021). Finally, the use of conversational agents has also been linked to increased supplier engagement.

AI Creates Value for the Societal Stakeholders

In 2015 the United Nations wrote an agenda for a better and more sustainable future, containing 17 Sustainable Development Goals (SDGs)[7]. AI is already used by the policy makers and governments in many countries to help achieve those goals. For example, governments optimally direct resources and subsidies at a local, decentralized level (ElMassah and Mohieldin 2020), and even identify individual households at risk of over-indebtedness and poverty (Boto Ferreira 2021). In this section, we discuss the benefits that AI technology can generate for society at large. We focus specifically on AI impact on the environment (SDG #6, #7, #13), on employment opportunities (SDG #8), and on health and wellbeing (SDG #3).

Reduced Environmental Impact

In industries with big environmental impact, for example manufacturing, the capabilities of AI and machine learning allow producers to pursue industrial sustainability: to realize business goals while minimizing waste and environmental impact. Circular economy is a closely associated concept: the idea that thanks to smart (re)use, recycling of materials in production, distribution, and consumption we can improve environmental quality (Ren et al. 2019). AI automation and the developments in robotics improve the operational efficiency in logistics, and help lower the total global warming effect of CO_2 emissions (Tsolakis et al. 2021). Finally, Google has used AI to anticipate temperature changes in its data centres and adjust air-conditioning settings, which led to 15% reduction in their overall energy consumption[8].

Taking a marketing perspective, Hermann (2021) discusses how AI and data science can be used to promote sustainable consumption. For example, internet search and social media information can uncover psychometric and behavioural patterns of environmentally conscious

[7] https://sdgs.un.org/goals

[8] https://www.businessinsider.com/googles-400-million-acquisition-of-deepmind-is-looking-good-2016-7

consumers and nudge them towards the ecological products with targeted advertisements. Amazon recommender systems could be programmed to promote sustainable alternatives and ecological products.

New Opportunities in the Labour Market

There is an active discussion about the impact of AI and automated predictions on the creation and disappearance of jobs. Without a doubt AI can perform many tasks faster and with fewer errors than a human agent, and it already exhibits traits of intuitive and empathetic intelligence allowing human-machine interactions even in service settings (Huang and Rust 2018). In labour intensive industries, AI may lead to a rise in poverty and isolation, iflow-wage earners are replaced by AI. On the other hand, AI offers new opportunities. Thanks to improvements in automated predictions, AI reduces uncertainty faced by organizations, so decision makers can address new, previously impossible or too costly scenarios. Therefore, thanks to AI new decisions are required and new tasks are created (Agrawal, Gans and Goldfarb 2019). Furthermore, AI has created a huge demand for skilled staff, which is currently one of the main challenges faced by organizations implementing AI (Brock and von Wangenheim 2019).

Improved Health and Wellbeing

There is a huge potential for AI to improve the overall quality of life, health and well-being. In healthcare organizations, AI and big data analytics have been associated with improved quality of care, higher patient satisfaction and lower readmission rates, contingent on existing BDA capabilities and skilled personnel (Wang et al. 2019). Applications of AI in medicine include affordable personalized health and e-health services (Oderanti et al. 2021), or social robots that help overcome loneliness and assist in active aging (Odekerken-Schröder et al. 2020). However, public acceptance of AI in healthcare is still limited and customers

may resist medical advice if it is provided by AI (Longoni, Bonezzi and Morewedge 2019). Therefore healthcare providers must overcome customer scepticism and trust barriers to realize the full potential of AI in healthcare.

Discussion

Taking a cost-benefit approach we have defined a new concept of the Social Value of Artificial Intelligence, which is the combined value of AI for all stakeholders. To this end, we look at different actors relevant for a B2B firm and discuss the advantages and disadvantages of AI diffusion, which constitute the value contributions to the overall Social Value of AI. Our analysis has focused mainly on the benefits of AI. While we have acknowledged the concerns about AI, we do not treat them in detail, since they have been extensively discussed in the extant literature. We are cautiously optimistic about the value-creating impact of AI diffusion for different stakeholders, and we theorize that the Social Value of AI will continue to increase, because over time the benefits of this technology will outweigh the concerns about it.

Academic Implications and Future Research

From an academic perspective, this research contributes to the discussion of CSR and business ethics considerations arising in the digital age. Building on the stakeholder theory and B2B literature, the purpose of this research was to initiate an interdisciplinary discussion about the pervasive impact of AI on internal and external actors relevant for a B2B company, as well as society at large.

Future research can use the concept of the Social Value of AI as a starting point and extend it in several ways. First, there is interest in measuring the impact of AI adoption on stakeholders to find causal evidence of improvements that AI can bring for stakeholders. Second, it is important to study AI adoption together with the relevant moderating factors –

understanding the differentiating effect of AI deployment across industries, SMEs vs. multinationals, firms with strong data governance, or those developing AI skills through employee training. Finally, it is important to further investigate the concerns arising from AI from a legal and ethical perspective to provide guidance for policy makers. We have treated this aspect as static, but as AI becomes prevalent, new and unanticipated ethical and moral dilemmas may arise. We acknowledge this as a limitation that can be addressed by future research.

Practical Implications

This study offers insights for the business practice about the AI adoption and consequences thereof. We first highlight general obstacles for AI adoption and how they can be mitigated: from ethical issues around automation and predictive analytics, to firm's lack of data capabilities and employee pushback. Second, we identify a wide array of stakeholders and discuss how their interests are (mis)aligned with the interests of a focal firm deploying AI. Interestingly, a B2B firm can collaborate with stakeholders when considering AI adoption. For example, AI incubators can help with access to technology (via startups), funding (via local governments and public administration institutions) and training opportunities (via academic institutions).

We have also discussed the initial empirical evidence indicating that AI adoption leads to organization-wide efficiency gains and financial benefits when the firm has IT capital, skilled employees or automated production workflows. Therefore, firms implementing AI need to audit whether they possess the complementary assets to capitalize on the technology. Finally, we conclude that firms implementing AI have a potential to generate the social value of AI. We have provided ample real-world examples of how AI is applied to achieve sustainable development goals. In light of the increased importance of sustainability efforts,

we believe that firms implementing AI ethically, responsibly and with regard to individual and societal wellbeing can strengthen their own brands and reinforce existing CSR efforts.

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