Digitalisation and corporate governance

A background note for the OECD-Asia Roundtable on Corporate Governance
20-21 October 2022

Please cite as: OECD (2022), Digitalisation and Corporate Governance: Background note for the OECD-Asia Roundtable on Corporate Governance (October 2022), https://www.oecd.org/corporate/background-note-Asia-roundtable-digitalisation-and-corporate-governance.pdf

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Introduction

This background note aims to inform the discussions at the ***OECD-Asia Roundtable on Corporate Governance*** on technological developments and some key issues related to the impact of digitalisation on corporate governance. Technological development and the growth of the digital economy have profoundly changed the character of corporations, capital markets, and indeed the structure of the global economy at large. Naturally, this carries corporate governance implications. This note provides an overview of some key issues related to the impact of digitalisation on corporate governance in Asia. It focuses primarily on the use of technology to improve market supervision and enforcement of corporate governance-related requirements and the efficiency of disclosure; digital tools to facilitate remote and hybrid participation in general shareholder meetings (GSMs); digital security risks and the role of the board in their management; and how digitalisation can encourage the development of primary public equity markets.

Corporate governance is one of many areas to experience a burst in digitalisation triggered by the COVID-19 pandemic. The pandemic resulted in several digitalisation measures being implemented by necessity rather than strategy and thus without the possibility of being subject to the rigorous regulatory evaluation that would be the case under normal circumstances. This has possibly exacerbated digital security risks such as cyberattacks. At the same time, the crisis has offered an opportunity to implement productivity-enhancing measures, as temporary measures have offered some benefits compared to the pre-pandemic normal. Notably, the widespread use of virtual general shareholder meetings has the potential to facilitate shareholder participation and engagement, and could well become a permanent feature of corporate governance.

Another important consideration is how digitalisation is changing corporate finance, in particular fundraising for some smaller, innovative growth companies and how regulators could respond to these developments. This is an important question in the context of access to equity markets, in particular when considering the balance between ensuring adequate market disclosure while avoiding onerous reporting requirements for smaller companies. It is also an important consideration when it comes to maintaining the appeal and relevance of public equity markets in light of the decreasing number of publicly listed companies observed in many countries in recent years.

This paper focuses on four key issues relating to the impact of digitalisation on corporate governance:

- Enforcement and disclosure.
- Remote participation in shareholder meetings.
- Digital security risks and the role of the board.
- The development of primary public equity markets.

1 Improving regulatory efficiency and disclosure through technology

Some technologies have the capacity to improve disclosure practices, both from a regulatory standpoint by facilitating enforcement and increasing regulatory efficiency, and from a company perspective by helping companies make better and potentially less costly disclosure. This is a relevant issue for the review of the G20/OECD Principles (see (OECD, 2021[1])). The first type of technology is sometimes called supervisory technology ("SupTech") and is used by securities and financial market regulators, and the second type is called regulatory technology ("RegTech") and is used by the regulated entities themselves (Denis, 2021[2]). These two functions are most relevant to different chapters of the G20/OECD Principles.

Regulatory and supervisory improvements (SupTech) are mostly relevant to the first Principle, which states that "[t]he corporate governance framework should promote transparent and fair markets, and the efficient allocation of resources. It should be consistent with the rule of law and support effective supervision and enforcement". In particular, it is relevant to Principle I.E, which states that "[s]upervisory, regulatory and enforcement authorities should have the authority, integrity, and resources to fulfil their duties in a professional and objective manner. Moreover, their rulings should be timely, transparent and fully explained" (OECD, 2015[3]). To the extent that new technologies can facilitate the effective realisation of these principles as well as contribute to better quality of data, they can be important corporate governance tools.

SupTech solutions have been implemented or are being developed in several jurisdictions. For example, in terms of disclosure enforcement, since 2017 the Malaysian Securities Commission (SC Malaysia) requires listed companies on the Malaysian stock exchange (Bursa Malaysia) to report their compliance with the corporate governance code using a standardised template. This is then analysed by an artificial intelligence (AI) system to evaluate the adoption of the code. The Australian Securities and Investments Commission (ASIC) has developed a real-time monitoring platform of trading on the Australian primary and secondary markets for equity and equity derivatives. This technology detects and alerts about market abnormalities. Similarly, the German Financial Supervisory Authority (BaFin) is developing a monitoring system (ALMA) for market abuse cases. Prior OECD work provides a more extensive inventory of national initiatives (Denis, 2021[2]; OECD, 2021[4]).

While technological developments may offer the opportunity of improving regulatory efficiency and effectiveness, they also bring a number of challenges for regulators. While some reports suggest that regulatory reporting has become increasingly complex, time-consuming and expensive for regulated entities, authorities face challenges related to collecting delayed and poor quality reporting data, which can in turn impact their ability to supervise (European Commission, 2020a[5]; European Commission, 2018[6]; FCA, 2020[7]). In particular, as many authorities continue to rely on heavily manual processes, challenges arise as to how to make effective use of unstructured or qualitative data, such as information from periodic disclosures or annual reports. Authorities can leverage SupTech tools to undertake complex, qualitative analyses, for example to determine compliance with laws or regulations that may involve principle-based or judgement-based rules (World Bank, 2018[8]). However, doing so effectively involves challenges related to the development of secure platforms with common definitions, formats and processes,

machine-readable electronic formats and common standards to facilitate data input and analysis (Denis, 2021[2]).

In an effort to improve data collection, a number of authorities have turned to a combination of both "push" and "pull" technologies. The former refers to the delivery of pre-defined data from the regulated entity to the regulator, whereas the latter enables the authority to draw data from the regulated entity as required. Some authorities have also developed Application Programming Interfaces (APIs) to allow regulated entities to submit data – thus lowering reporting costs and improving communication between both parties (OECD, 2021[4]). For instance, the Canadian Securities Administrators (CSA) is working to introduce APIs for its National Registration Database (NRD), which will give registered firms the opportunity to securely file information through their systems directly with the NRD rather than making manual submissions. This can reduce administrative costs, regulatory burdens and will allow them to update NRD information more efficiently and with better data quality.

In addition to the need to ensure data quality and standardisation, additional challenges may be encountered when developing, deploying, and maintaining SupTech solutions. For example, authorities may lack adequate skills and competencies with respect to technology, software, and hardware expertise, while budget constraints, rigid procurement rules and obsolete regulatory frameworks may further hinder adequate adoption of SupTech solutions. Large legacy projects may also impose risks related to third party dependencies. Appropriate mitigation strategies to reduce room for regulatory arbitrage also requires attention (OECD, 2021[4]). These risks and challenges all need to be addressed to ensure that the technologies actually fulfil their potential of improving supervisory efficiency.

In addition, as the use of AI and algorithms grows more prevalent, there is a corresponding need to maintain a human element in the process to avoid over-reliance on digital technologies and safeguard against risks of incorporating human biases in algorithmic models. This is crucial to appropriately manage the risks arising from the use of digital technologies as well as to foster trust in these processes. For example, the failure to adequately explain the outcomes of a machine learning process may impede accountability and reduce trust in regulatory processes more generally. Collaboration between data scientists and business could mitigate this risk. From a practical standpoint, it could be useful to hold regular events to share experiences with RegTech and SupTech solutions and to discuss concerns, with the aim of preventing the logic of AI and machine learning from becoming something like a black box.

An important caveat regarding the use and transparency of AI supervisory models and algorithms involves their potential to induce market participants to adjust their behaviour in order to game the technology. A recent study found that authorities' adoption of SupTech solutions has a feedback effect on companies' corporate disclosure decisions, implying that companies adjust their filings when they anticipate that such disclosure will be processed by machines (Cao, S. et al., 2020[9]). Other studies have found that market participants may seek to gain sufficient knowledge of SupTech applications to game the technology to their benefit (di Castri et al., 2020[10]).

When considering companies' use of RegTech and its implications for disclosure, Principle V of the G20/OECD Principles is also relevant. It states that "[t]he corporate governance framework should ensure that timely and accurate disclosure is made on all material matters regarding the corporation, including the financial situation, performance, ownership, and governance of the company". To the extent that RegTech can make the identification of certain issues more efficient, and improve the accuracy and timeliness of disclosure, it can play a role in the implementation of this principle. Due to more stringent regulatory requirements applicable to companies operating in the financial sector, in particular since the 2008 global financial crisis, the main current application of RegTech is within that industry. However, some recent RegTech initiatives highlight the possibility of improving efficiency in disclosure for listed companies in general. For example, in January 2022 ASIC announced it would work with a number of RegTech companies to improve poor market disclosure for listed companies within a number of areas such as

continuous disclosure; financial reporting obligations; the prohibition of misleading or deceptive disclosure; and the prohibition of price manipulation in securities (ASIC, 2022[11]).

While RegTech providers suggest that their products can improve accuracy and reduce human error, the associated challenges are very similar to those of SupTech. The European Banking Authority (2021[12]) highlights a number of such challenges, some notable examples being the skills needed to supervise the use of such solutions; interoperability and integration with legacy systems; cybersecurity threats; the cost of implementation; and future regulatory changes. It also bears mentioning that companies are often asked to provide information to other parties than the regulator, e.g. institutional investors and rating providers. To the extent that there is some degree of overlap between these types of requests and the information requested by regulators, it is possible that RegTech may simplify such procedures too, but this is not a given. RegTech does not necessarily reduce other (non-regulatory) information disclosure burdens associated with being a listed company. It also bears mentioning that initiatives for non-regulatory disclosure should be undertaken with a view to ensuring the equal access of material information to all shareholders.

A trend on which new technologies can potentially have an impact with regard to disclosure is the increased demand for companies to address, manage and disclose ESG risks. While preceding COVID-19, this long-term trend has been exacerbated by the pandemic-induced crisis, which has made ESG risks more salient. Because of its growing importance and governance implications, it has been highlighted as one of the priority areas for the review of the G20/OECD Principles (OECD, 2021[1]). Simultaneously, ESG data have become increasingly complex, and the identification and assessment of ESG risks are difficult and multidimensional tasks (OECD, 2020[13]). Technology such as AI (and natural language processing in particular) may be useful in sorting and analysing troves of complex data. This may help improve the disclosure of ESG risks by companies as well as inform investors, to the extent that ESG considerations influence their capital flows. Certain market participants, such as index providers, have begun incorporating AI technology into their ESG products to improve the efficiency of their analyses (S&P Global, 2020[14]). However, it should be noted that the risks of reinforcing existing biases or increasing the complexity of the disclosure process remain.

Another relevant area where technology is being used to improve disclosure and analysis is within the field of audit (which is also addressed by Principle V of the G20/OECD Principles). The United Kingdom's Financial Reporting Council (FRC) has found that such activity has increased in recent years, following significant investment in related technologies by audit firms. Currently, the use of audit data analytics is primarily used within high volume, low judgement transactions. The FRC's assessment is that machine-learning based predictive technologies can possibly identify unusual transactions or other issues that might be difficult or time-consuming for a human auditor to identify. It has encouraged further development within this area, while highlighting a number of expectations on audit firms, notably development, testing and approval of the tools; the integrity of data used by automated tools; and formulation of how these tools support audit procedures (FRC, 2020[15]).

2 Remote participation in shareholder meetings

Supporting shareholder engagement by facilitating remote participation in shareholder meetings is an area in which technology can play a transformative role and where the use case is very clear. Principle II of the G20/OECD Principles states that "[p]rocesses and procedures for general shareholder meetings should allow for equitable treatment of all shareholders. Company procedures should not make it unduly difficult or expensive to cast votes". The Principle also recognises the right to participate in a shareholder meeting as "a fundamental shareholder right" and that "[s]hareholders should have the opportunity to participate effectively and vote in general shareholder meetings and should be informed of the rules, including voting procedures, that govern general shareholder meetings" (OECD, 2015[3]). There are a number of ways in which technological tools can help realise this principle, notably within the areas of virtual shareholder meetings and remote voting, as well as proxy voting procedures.

Several jurisdictions had already taken measures to facilitate remote participation and voting before the COVID-19 pandemic. For example, in 2015 Israel introduced a remote voting system which allows shareholders to vote online, both on desktops and mobile phones. The system includes a confirmation of ownership and is mandatory for companies listed on the Tel Aviv Stock Exchange. In 2016, Brazil implemented a remote voting card to facilitate voting for non-resident shareholders. The measure has substantially increased remote voting, with foreign investors responsible for practically all votes (98%) in 2019 (Denis and Blume, 2021[16]).

The COVID-19 pandemic triggered a substantial increase in remote annual shareholder meetings, as limitations on in-person gatherings were put in place, and regulatory barriers to the establishment of remote shareholder meetings were removed, at least on a temporary basis. In all 45 jurisdictions surveyed in the report *The Future of Corporate Governance in Capital Markets Following the COVID-19 Crisis,* existing prohibitions against holding virtual (or hybrid) shareholder meetings were lifted, or regulations or other guidance were issued to confirm that such meetings were permitted (OECD, 2021[1]). A range of measures were implemented across jurisdictions, as illustrated in Figure 2.1. At one end of the spectrum is the approach followed by India, to allow virtual GSMs only when they were unavoidable (i.e. when an in-person equivalent would be impossible), and on the other is the approach to make virtual GSMs mandatory, as in Lithuania. While jurisdictions at either end of the range are rare, many jurisdictions enacted measures during the pandemic to allow companies to hold virtual GSMs even when there were explicit legal provisions requiring the authorisation of remote participation in company by-laws. In addition, many jurisdictions took steps through regulatory amendments not only to allow but also to encourage or facilitate virtual GSMs. In doing so, some jurisdictions defined minimum good practices that companies must follow or have established technical specifications and minimum requirements such as ensuring that GSMs allow for two-way real-time communication, live transmission and vote confirmation to shareholders if requested.

Figure 2.1. Range of COVID-related adjustments with respect to virtual general shareholders' meetings

Note: Data includes corporate governance adjustments in 37 jurisdictions.
Source: Adjusted from Denis, E; Blume, D, (2021[16]), Using digital technologies to strengthen shareholder participation, based on an analysis of data available in OECD (2020[17]), National corporate governance related initiatives during the COVID-19 crisis: a survey of 37 jurisdictions, https://www.oecd.org/corporate/National-corporate-governance-related-initiatives-during-the-COVID-19-crisis.pdf.

Asian regulators took also several measures with respect to annual shareholder meetings. For example, Indonesia's Financial Services Authority extended the deadline by two months for publicly listed companies to hold annual shareholders meetings. The Bangladesh Securities and Exchange Commission (BSEC) also relaxed the requirements to hold annual and extraordinary general meetings (and board meetings) and allowed companies to use any digital means for holding meetings. In Singapore, an alternative arrangement through electronic means was authorised even where personal attendance (e.g. AGM, board of directors meeting) is required by law. In Thailand, the government removed certain limitations on electronic meetings, including a rule that required that at least one-third of the quorum be present in the same location in Thailand.

Table 1. Regulatory measures during COVID-19 in Asia

	AGM – deadline extension and/or permission to hold hybrid/virtual		**AGM –** deadline extension and/or permission to hold hybrid/virtual
Bangladesh	●	**Mongolia**	○
Cambodia	○	**Pakistan**	○
China	●	**Philippines**	○
Hong Kong (China)	○	**Singapore**	●
India	●	**Chinese Taipei**	○
Indonesia	●	**Thailand**	●
Japan	●	**Sri Lanka**	○
Korea	●	**Viet Nam**	○
Malaysia	○		

Source: OECD (2022[18]), Corporate Finance in Asia and the COVID-19 Crisis, https://doi.org/10.1787/87861cf0-en.

Digital tools have played an important role in enabling these developments. Without a properly functioning digital infrastructure, the continuation of shareholder meetings during the pandemic would have been difficult. However, the significant increase in remote shareholder meetings and voting following COVID-19 underlines an important fact, namely that this was a development made possible through regulatory action. The digital tools used to facilitate remote participation were to a large extent already available prior to the pandemic. To ensure regulatory clarity for companies, it is therefore important both that lawmakers and regulators decide on the permanence of current measures, and that they clarify the requirements for holding virtual and hybrid shareholder meetings, in particular as the practice of virtual meetings looks set to become a more permanent feature of corporate governance. In Chile and Latvia, the regulatory frameworks for remote participation and voting have been developed, with requirements to certify investors' identity and ensure the secrecy of their votes. Similarly, in Germany and the Netherlands, the requirements for remote meetings have been clarified, notably allowing all shareholders to follow the meeting online as well as pose questions to relevant officers (OECD, 2021[1]).

As with other digital developments, it is necessary to ensure that the implementation of remote shareholder meetings and voting considers possible drawbacks and unintended consequences. In addition to the broader concerns of ensuring that relevant staff have the required expertise, and that the implementation procedure is done in a transparent manner, there have been concerns that remote meetings could disenfranchise shareholders – contrary to the intended goal – by limiting direct engagement with directors and other interactions. This concern can be particularly relevant when virtual meetings are audio-only, which was the case in 97% of remote meetings run on Broadridge's platform in 2019 (Denis and Blume, 2021[16]). Many companies rely on technology vendors to supply the infrastructure needed for virtual meetings. That makes the professionalism, data handling and digital security capacities of these vendors important to support the conduct of fair and transparent shareholder meetings that allow for shareholders' equal participation.

In some jurisdictions, remote meetings continue to have positive outcomes in terms of engagement by facilitating the attendance of a greater number of shareholders including foreign investors. In others, after an initial surge in virtual meetings and increased shareholder participation during the pandemic, the trend has changed and virtual or hybrid meetings are not always the preferred option for investors, who in some cases prefer more direct in-person engagement or voting by proxy. To better capture countries' different experiences and to meet investor demands, the framework for remote meetings should be tailored to allow for flexibility while ensuring effective engagement remains possible at reasonable cost. This makes the regulatory clarity about available options and the expected format of a virtual meeting discussed above all the more important. An additional concern is that virtual GSMs may make it easier for management to manipulate the meeting through selective responses to questions raised in meetings or exerting greater control over how questions are addressed. To address this risk, some Japanese companies post shareholders' questions on their website to show that the questions raised during the virtual GSM were not arbitrarily chosen by management. Japan's Ministry of Economy, Trade and Industry has also suggested some practical measures for the proper handling of questions and motions at virtual GSMs to ensure fairness and transparency, including the publication of the content of questions received. In terms of shareholder rights and engagement opportunities, virtual meetings should seek to replicate regular in-person meetings to the maximum extent possible. In 2018, a private sector initiative outlined a set of best practices for virtual shareholder meetings (see Box 2.1).

Box 2.1. Best practices for virtual shareholder meetings

In 2018, the *Principles and Best Practices for Virtual Annual Shareowner Meetings*, a private sector initiative, were published in response to an increase in the use of virtual or hybrid general shareholder meetings. The document was prepared by a committee comprising institutional investors, public company representatives, and proxy and legal service providers. The overarching goal is to ensure that virtual meetings are accessible and transparent, as well as "efficiently and cost-effectively managed while meeting the important business and corporate governance needs of shareowners, boards and management".

The five key principles highlighted in the document are: 1) broad investor participation in annual meetings should be valued and encouraged; 2) shareowner meetings should promote equitable and equal treatment of investor participants; 3) opportunities for meaningful engagement between investors and directors should be provided; 4) issuers should communicate the benefits of a virtual meeting to shareowners; and 5) virtual meetings should be used as a way to provide meaningful open dialogue between shareowners and companies.

In addition, the document includes a number of best practices to ensure that virtual shareholder meetings fulfil their purpose. They include:

- Disclose the format of the meeting in the proxy statement
- Ensure equal access
- Create universal rules of conduct
- Set reasonable time guidelines for shareholder questions
- Post questions received online during the meeting
- Make a technical support line available
- Archive virtual meetings for future viewings

The document recognises that these best practices may need to be amended as corporate governance practices evolve and technology advances. This may be particularly relevant in light of the sharp increase in virtual meetings during the COVID-19 pandemic and additional experience gained through that process.

Source: Broadridge (2018[18]), Principles and Best Practices for Virtual Annual Shareowner Meetings, https://www.broadridge.com/_assets/pdf/broadridge-vasm-guide.pdf.

Proxy voting is another area in which digital tools could improve the efficiency and accuracy of the process. Until relatively recently, the proxy voting system was heavily paper-based in some jurisdictions. For example, in 2007 the US SEC began allowing companies to distribute proxy materials through their websites and other means rather than by mail, generating an 81% reduction in paperwork and estimated savings of USD 1.8 billion in 2020 (Denis and Blume, 2021[16]). However, even in digital form, the corporate proxy voting process is complex and characterised by multiple layers of intermediation, which led to cost inefficiencies and inaccuracies in the voting process in a number of high-profile cases. Distributed ledger technologies (such as blockchain) have been suggested as possible solutions for these problems and several initiatives have been implemented both by regulatory bodies and the private sector. However, the technology has not yet had the wider impact that some proponents have advocated it might have. Since most securities regulators follow a technology neutral approach, they typically refrain from promoting a specific technological solution. However, they may focus on supporting more broadly ways to enhance efficiency, interoperability, and accuracy of proxy voting systems, and particularly how to accomplish such aims while reducing costs associated with voting to enhance the incentive for shareholders to vote. In this

regard, the proxy voting process would fall under the Principle III of the G20/OECD Principles, which states that "[t]he corporate governance framework should provide sound incentives throughout the investment chain" (OECD, 2015[3]).

Finally, it bears mentioning that in spite of technological advances which have the potential to improve shareholder engagement by facilitating attendance, remote voting and potentially access to information and engagement in discussions, to a certain extent the current "deficiency" in shareholder engagement is due to investor business models rather than technological or even regulatory barriers. Technology is no silver bullet and will not solve the more fundamental issue of passive investors and consequent possible undervaluation of governance rights (see e.g. (Isaksson and Çelik, 2013[19])). Technology should be seen as a way to improve shareholder engagement in particular where the current obstacles to such engagement are technical in nature.

3 Digital security risks and the role of the board in their management

As both companies and the general market infrastructure are becoming increasingly digital, the management of digital security risks also grows more important. Thirty-nine percent of respondents to the World Economic Forum's 2021 Global Risk Report named cybersecurity failure as a "clear and present danger" in the short-term (on a zero to two year horizon), the fourth most cited risk after infectious diseases, livelihood crises and extreme weather events. On a three to five year horizon, the second most cited risk, mentioned by 53% of respondents, was a breakdown of the IT infrastructure. Cybersecurity failure and tech governance failures were mentioned as medium-term risks by 49% and 48% of respondents respectively (World Economic Forum, 2021[20]). In particular, as more companies become dependent on cloud storage solutions – a highly concentrated market – regulators are worrying what might happen in case a big provider fails or is the target of a successful hacking attempt. For example, the UK's Prudential Regulation Authority is considering the effects on the banking industry of large cloud storage outages, working with the Bank of England and the Financial Conduct Authority (Morris and Noonan, 2022[21]).

As a note on terminology, it should be emphasised that this section treats cybersecurity issues under the broader term of "digital security". This is in line with the definition commonly used in other OECD work related to digitalisation and refers to "the economic and social aspects of cybersecurity, as opposed to purely technical aspects and those related to criminal law enforcement or national and international security" (OECD, n.d.[22]). It is also in line with the language in the OECD standards in this area such as the OECD Recommendation on Digital Security Risk Management for Economic and Social Prosperity, which states that digital security risk management "is an integral part of decision making and of an overall framework to manage risk to economic and social activities" (OECD, 2015[23]), and the Recommendation on Digital Security of Critical Activities, which states that operators (the public and private entities that carry out critical activities) should "[integrate] digital security risk management and digital security governance within their overall cyclical enterprise risk management framework" (OECD, 2019[24]).

It is important to recognise that digital security risk evolves. Such risk is extremely dynamic, relatively new to the corporate sector and, for this reason, still hard to fully measure or insure against. Therefore, it requires appropriate expertise to be managed, not only from a technical IT perspective, but also to mitigate the economic consequences of possible incidents. This risk has been further exacerbated by the COVID-19 crisis, as the sharp increase in remote work has led to a greater risk of cyberattacks since home networks and computers tend to be less protected than corporate ones, and procedures less strict. In a survey conducted in the United States in 2021, more than half of the companies had not fully mitigated the risk stemming from increased digitalisation in three main areas following the COVID-19 outbreak: enabling remote work (50%); increased digitisation of operations (53%); and accelerated cloud adoption (54%). Many rely on simple password-based authentication, and use of explicitly banned websites by employees is common (PwC, 2021[25]).

From a corporate governance perspective, a particularly pressing point is what the role of the corporate board of directors is in the management of such risk. The sixth chapter of the G20/OECD Principles states that a key function of the board is to set risk management policies and to ensure "the integrity of the corporation's accounting and financial reporting systems, including […] that appropriate systems of control

are in place, in particular, systems for risk management […]" (Principle VI.D.7) (OECD, 2015[3]). In a survey conducted by the National Association of Corporate Directors in the United States, 58% of respondents (all corporate board members) said cybersecurity risks constitute the most difficult type of risk they need to deal with. Underlining the role of the board in this issue, a data breach resulting in the leak of more than 60 million customers' personal information in 2013 resulted in a lawsuit where board directors and officers were charged with violating fiduciary duties through negligence of data security. The board members were found not guilty, but the CEO and CIO both resigned, highlighting the importance of proper management of such risks (Rothrock, Kaplan and Van der Oord, 2017[26]).

In order to safeguard against digital security risk in an adequate manner, it is essential that the board has the relevant expertise and tools available. Digital security risk should be considered by boards when they devise their risk management strategies more broadly (acknowledging that such risks are fundamentally governance issues). While boards do consider both risk management issues generally and cyber risks specifically as important, a recent survey found that this did not translate into higher demand for directors with specific skills in those areas, as a broader set of skills rather seems to be the priority (PwC, 2021[27]).

In response to increased demand from investors, the US SEC has recently put forward a proposal to amend its rules to "enhance and standardise disclosures regarding cybersecurity risk management, strategy, governance and incident reporting by public companies". Among other things, these amendments would require current and periodic reporting about material cybersecurity incidents, as well as periodic disclosure of policies and procedures to manage such risks, management's role, and expertise in doing so, and the board's expertise, if any, and oversight (SEC, 2022[28]).

There is significant variance between companies and industries with respect to what part of the board is responsible for digital security risks. Sometimes it is a task assigned to the audit committee, whereas some companies handle this risk through a separate risk committee. Some technology (or at least highly technology-dependent) companies have a dedicated cyber security risk committee (Deloitte, 2016[29]). Given that a commonly identified issue in dealing with digital security risks is that it requires co-ordination by fragmented teams, it has been highlighted that it is important to take a whole-of-company approach to be able to identify potential weaknesses (PwC, 2021[25]).

4 The role of digitalisation in encouraging the development of primary public equity markets

The importance of public equity finance in market economies cannot be overemphasised. Aside from providing companies with risk-willing, long-term capital to finance research and growth, and investors with an opportunity to diversify their risks and partake in corporate wealth creation, public equity markets contribute to increasing the resilience of an economy and ensure that corporate activities are continuously scrutinised and evaluated. The disclosure requirements associated with publicly offering securities and being a listed company serve to increase corporate transparency, promote investor and market protections, broaden access to critical information and facilitate the governance of these companies. Indeed, publicly traded companies are the focus of the G20/OECD Principles of Corporate Governance (OECD, 2015[3]). For these reasons, dynamic public equity markets yield important public benefits.

In light of this, it is concerning that the pool of publicly listed companies has been shrinking in recent years. Since 2005, over 30 000 companies (equivalent to roughly 75% of the total number of companies listed today) have delisted from public markets globally. In most places, the number of new listings has not matched this decrease. The effect is that in the OECD as a whole, the total number of publicly listed companies has fallen every year since 2008 (OECD, 2021[1]). Because public listings have public benefits, it is important to ensure that public policy encourages equity market development, in particular as fewer and fewer companies seem to deem the benefits of being publicly listed to outweigh the costs.

To do so, it must first be established why this development is taking place. A number of factors have contributed, notably cheaper debt capital following expansionary monetary policy after the 2008 financial crisis, easier access to private capital due to deregulation, high M&A activity, ownership concentration in the hands of institutional investors favouring large companies and similar large company biases stemming from stock exchanges' changing business models (OECD, 2021[1]). Another possible factor is the rigorous disclosure and reporting requirements associated with being a listed company. For example, an OECD survey of unlisted Portuguese companies showed that compliance costs were the third most important reason for staying private, cited by more than half of respondents. Complexity of regulation and supervision and fees were also cited among the top three reasons (OECD, 2020[30]). In line with this, the EU's new Capital Markets Union Action Plan notes that public listing "is too cumbersome and costly, especially for SMEs". Part of the plan focuses on diversifying and simplifying small companies' access to funding, notably by simplifying listing rules to reduce compliances costs, removing "a significant obstacle that holds [SMEs] back from tapping public equity markets" (European Commission, 2020b[31]).

While not addressing all elements related to the shrinking number of listed companies, one question worth considering further is whether certain reporting requirements that are onerous for smaller companies that have less capacity to fulfil them are discouraging them from listing. The need for such consideration, without compromising on fundamental disclosure requirements, is recognised both in the G20/OECD Principles and the Committee's peer review on flexibility and proportionality (OECD, 2018[32]). Overly burdensome requirements for certain companies could also have an interactive effect on the number of

(de)listings together with other factors, increasing their impact. For example, as debt and private capital become more easily accessible, cumbersome requirements may deter certain companies more from listing than what would have been the case absent access to such funding.

Capital market policies aim at finding a balance between the need to maintain the attractiveness of equity markets by making compliance less onerous and the risk of under-reporting and inadequate information. To this end, it should be considered whether digitalisation can play a role in maintaining the appeal and relevance of public equity markets. In order to do so, a number of developments related to digitalisation and corporate governance should be considered separately. Firstly, as discussed under the section on improving regulatory efficiency and disclosure through technology above, digitalisation (notably machine learning) can potentially make disclosure and reporting requirements less onerous by reducing the time needed to collect, standardise and present internal company data (RegTech). In order to justify the initial investment costs for companies, this would require regulators to ensure that their reporting systems and formats are standardised and do not fundamentally change over a reasonable time period. For example, the United Kingdom's FinTech strategy includes exploring possibilities for reducing compliance costs through RegTech, and the development of machine-readable rules in particular (HM Treasury, 2018[33]). The Bank of England has outlined the delivery of a world-class RegTech and data strategy as one of its five priorities for action in adapting to the new digital economy, including making the Prudential Regulation Authority's Rulebook machine-readable (Bank of England, 2019, p. 10[34]).

Secondly, technological developments have already enabled novel types of organising fundraising and corporate finance, especially for smaller and innovative companies. From a corporate governance perspective, among the most important trends are the increased use of direct listings and online book building. In a direct listing, as opposed to a traditional IPO process, a company can list without raising capital, and its shares are not underwritten. It allows existing shareholders access to a liquid secondary market without the need to offer additional shares to investors at the time of listing and generally without any lockup period or requirement. At the same time, it may allow for the waiver of some legal and institutional investor protection features, traditional to underwritten offerings. More specifically, based on a reference price set by the exchange (which is in turn based on private market valuations, publicly available financial information and public peer company valuations) the day before the first trading day, an order book is built in real-time based on sell and buy orders to find the equilibrium price (as opposed to book building during a traditional IPO process, where the underwriting investment bank solicits investors for bids). Once a stable price is reached, the share can trade openly (Nasdaq, 2021[35]). While direct listing has existed for many years, there have been more direct listings in recent years as some significant, technology-driven companies have chosen this route to go public.

Another notable development with respect to corporate finance may be the growth of so-called "decentralised finance" (DeFi) platforms. In a word, DeFi refers simply to financial services without traditional intermediaries, facilitated by automatically executing smart contracts operating on a blockchain. Crypto-assets, generally traded through crypto-asset platforms and protocols, are one notable application of DeFi, but not the only one. DeFi service applications relying upon blockchain technologies may also be traded on more traditional stock exchange platforms as listed securities (see e.g. (Fusang, n.d.[36]; INX, 2021[37])). While proponents say that DeFi applications hold the promise of complete disintermediation of financial services, with purportedly easier and cheaper access for entities seeking loans or other financial services, the sector remains fraught with regulatory, governance, transparency, operational and efficiency challenges. Part of the challenge relates to the unique structure and borderless nature of some DeFi applications and their trading platforms which may create opportunities for regulatory arbitrage, as well as the fact that many participants are acting outside of, or in non-compliance with, existing regulatory frameworks. There is also the risk of money-laundering, and the difficulty of ensuring disclosure of ultimate beneficial owners. In addition, as noted by the BIS, the extent of decentralisation is often less than is communicated, owing to an "inescapable need for centralised governance." Further, widespread use of DeFi may pose significant financial stability risks owing to, for example, liquidity mismatches and the lack

of shock-absorbing capacities in the system (Aramonte, Huang and Schrimpf, 2021[38]). However, in spite of these challenges, DeFi applications have emerged as a financially significant alternative used in some cases for raising and investing funds which is increasingly attracting the attention of regulators. The space has been growing at breakneck speed – in 2021 alone, the total value locked (TVL) in DeFi protocols grew from less than USD 20 billion to more than USD 180 billion, before recording a market contraction that started in May 2022 when the total value locked in DeFi suddenly dropped to USD 80 billion. The space reached a value slightly lower than USD 60 billion as of the end of August 2022, a volume that is still significantly higher than the amount of only USD 600 million estimated at the start of 2020 (DeFi Llama[39]). However, it is important to note that, TVL, the metric used to calculate these figures has been called into question as susceptible to being inflated through manipulations or double-counting of assets (Cryptonews, 2021[40]). Of course, even higher side estimations of values are still small compared to the total market capitalisation of publicly listed companies globally, which stood at USD 105 trillion at the end of 2020 (De La Cruz, Medina and Tang, 2021[41]). Nevertheless, considering both recent growth and market volatility, the priority for regulators to address and better understand DeFi's regulatory implications will likely continue with an aim to take due account of its specific risks and challenges, implications of relationships with other trading platforms and traditional market players, as well as the areas that may pose regulatory concerns (IOSCO, 2022[42]).

A final development worth mentioning is the growth of public crowdfunding websites (both equity and non-equity), typically considered as part of the broader FinTech space. In 2018, no more than USD 74 million was raised through equity crowdfunding. That figure grew to USD 211 million in 2020, possibly doubling in 2021 (Arora, 2021[43]). To an extent, regulators have already responded to and enabled this development, but overall amounts raised via crowdfunding remain quite small relative to public equity markets and the alternative forms of finance mentioned above. In the United States, the Securities and Exchange Commission's (SEC) Regulation Crowdfunding, initially implemented as part of the JOBS Act in 2016, allows companies to sell securities through online crowdfunding, provided it is done through a SEC-registered intermediary, either a broker-dealer or a funding portal, and raises a maximum amount of USD 5 million over 12 months. The rules also limit the amount individual non-accredited investors can invest across all crowdfunding offerings in a 12-month period, and mandate disclosure of certain information (SEC, n.d.[44]). In the European Union (EU), new regulation on European crowdfunding service providers entered into force in November 2020, applying across the EU since November 2021. The initiative provides uniform rules across the EU, allowing crowdfunding platforms to apply for EU passports to facilitate operation across markets. This is part of the European Commission's (EC) broader FinTech action plan (EC, n.d.[45]).

The decline in the number of listed companies globally, coupled with alternative investment opportunities, raises a question of how technology can be used to improve disclosures with appropriate cost savings (making them less onerous), without sacrificing important investor and market protections. For example, the EU's FinTech Action Plan recognises this tension between the risk of stifling useful financial innovation and the need to ensure rigorous protection for consumers as well as safeguarding financial stability. For this reason, its action plan focuses on "enabling, accommodating and, where possible, encouraging innovation in the financial sector, while ensuring at all times the preservation of financial stability and high levels of investor and consumer protection" (EC, 2018[46]). The Financial Stability Board (FSB) has highlighted that while financial innovation, notably FinTech, may lead to greater efficiency and resilience through increased competition, it also runs the risk of increasing systematic risk as incumbent players may reduce risk aversion to maintain margins in the face of new competitors (FSB, 2019[47]).

The International Organization of Securities Commissions (IOSCO) has encouraged co-operation between a wider range of authorities (including non-financial ones) as well as cross-border co-operation with respect to FinTech. Jurisdictions globally are evaluating their regulatory remits and coverages to assure that there is appropriate regulation of the crypto-asset market and important market intermediaries. Importantly, FinTech may impact emerging markets to a greater extent than advanced ones, owing to their typically

less well-established current systems. Jurisdictions have taken different approaches to keep current in their understandings of developing technologies and their implications. Many jurisdictions have used innovation hubs and regulatory sandboxes as ways to analyse technological developments (IOSCO, 2021[48]).

For example, this type of approach has been taken in Israel, which has taken measures to reform its capital markets to address an increasingly digital era. Previously, while the Israeli economy had a strong high-tech industry, the country's capital markets did not reflect its significance. Therefore, the Israel Securities Authority (ISA) implemented a strategy with the explicit goal of assimilating technological innovation within the Israeli capital markets. The associated policy initiatives were partly related to the regulatory environment, which was adjusted with reference to, for example, disclosure standards, reporting language and underwriting bidding procedures in order to accommodate global players in the local market. The ISA is also building a test environment for innovative FinTech companies called the Data Sandbox Project, where select firms that seek to provide innovation in the capital market can receive financing and data from the authority. Initiatives are also underway to lay the groundwork for broader implementation of decentralised listing technologies. A second strand of the reform process focused on providing incentives for institutional investors, who were offered funding for employing specialist high-tech analysts, as well as a guarantee of government compensation of up to 40% of investment losses in the high-tech sector (ISA, 2021[49]).

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