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## SECTION 2

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# DIGITAL FINANCING OF THE SDGS

*This is an extract from the report of the Secretary-General's Task Force on Digital Financing of the Sustainable Development Goals. The full report "People's Money: Harnessing Digitalization to Finance a Sustainable Future" is available from [www.digitalfinancingtaskforce.org](http://www.digitalfinancingtaskforce.org).*



# DIGITALIZATION AND FINANCE

## 3.1 ERA OF DIGITALIZATION

***The long wave of digitalization is changing the fundamentals of how we live.*** Today, over half the world's population is online, a one hundred-fold increase since 1990.<sup>43</sup> It is said that 90 percent of the world's data is created every two years, implying a 10-fold increase in data every two years.<sup>44</sup> Identities are formed, relationships maintained, and goods and services transacted online.<sup>45</sup> Tens of millions of businesses depend on digital markets, with an estimated 1.9 billion people purchasing goods online in 2019.<sup>46</sup>

***In this era of digitalization data is the lifeblood of automated decision-making and innovation.***<sup>47</sup> Massive amounts of data can increasingly be stored, shared and analysed cheaply, making it accessible, intelligible and valuable.<sup>48</sup> Artificial intelligence enables more sophisticated targeting, design, and customization of all kinds of products and services.<sup>49</sup> Application Program Interfaces (APIs) allow different companies' software to interact automatically.<sup>50</sup> Digitalization enables innovative solutions in education, energy, agriculture and land use, transportation and other sectors.<sup>51</sup>



***By 2025, 463 exabytes of data will be created each day globally - that's the equivalent of 200 million individual DVDs per day.***<sup>52</sup>

***Digital identity systems are particularly important for people to be able to operate in this world.***

Like passports, they authenticate and validate a person's unique identity.<sup>53</sup> Almost half of the world's population, about 3.2 billion people already have some form of ID able to be used online.<sup>54</sup> This is expected to rise to 5 billion by 2024.<sup>55</sup> Whilst many digital IDs are issued by national or local governments, such as India's Aadhaar<sup>56</sup> and Estonia's e-ID,<sup>57</sup> many others are issued by commercial or non-profit organizations, from the two plus billions of Facebook-registered users through to Sweden's BankID,<sup>58</sup> Belgian Itsme,<sup>59</sup> or MOSIP.<sup>60</sup> Financial institutions have said that by relying on the Aadhaar tech stack, account opening costs have decreased by over 40% and opening an account has become instant instead of taking three days to approve.<sup>61</sup>

***Digitalization reshapes the transition to sustainable development.*** Most obviously, it opens the possibility of accelerating the ‘dematerialisation’ of the economy, with associated environmental benefits, increased access and reduced costs. Digitalization could help reduce global carbon emissions by 15 percent through innovative solutions in energy, agriculture and land use, and transportation.<sup>62</sup> The Carbon Trust in collaboration with the mobile operators’ association GSMA estimates that mobile technologies may enable emission reductions in other sectors that are ten times greater than the direct emissions related to the technology itself.<sup>63</sup> Nevertheless, there is still a challenge to control energy use and impacts.

Digitalization allows many economic activities to go online; services to substitute for physical goods, small and medium-sized enterprises to access world markets, and materials to be more effectively tracked in order to be reused and recycled. Health and education services can be digitalized, with reduced costs and with distance from major urban centres becoming less of a barrier to access. Infrastructure becomes smarter, from buildings that can use less energy and clean and recycle water, to transport systems that are more flexible and less polluting. Digitalization enables physical assets to be shared and more intensively used, such as cars, roads and homes but also clothes, equipment and even food.

## Exhibit 3: Core Definitions

***Digital financing*** is broadly defined as financial services delivered through digital processes and infrastructure.

***Digitalization*** is the integration of digital technologies into everyday life, changing the way that we interact and live.

***Digitalization of finance*** comprises the systemic changes to the financial system, aided by technology including changes in business models, products and services.

***Digitization*** is the shift from paper to digital format and the shift from manual to automated processes.

***Financing*** includes processes of buying and selling, taxation, procurement, contracting, saving, credit, investment, and insurance, through both public institutions and private intermediaries.

NB: A full glossary is included on page 85.

## 3.2 FUNDAMENTALS OF DIGITAL FINANCING

Digital financing is broadly defined as financial services delivered through digital processes and infrastructure. There are three core features of digital financing:

- **Availability of more, cheaper, readily accessible and more trustworthy data.**<sup>64</sup> When data is shared, linked and combined across boundaries, and analysed using machine learning and artificial intelligence it enables targeted pricing and risk analysis, which unlocks new insights and possibilities. More and better data enables product-personalization and service innovation.<sup>65</sup>
- **Radical reduction in the cost of financial intermediation.** Digitalization, driven by market innovators, sets up a chain reaction of disruption, powered by ever-cheaper and faster computing. Digitalization allows financial value chains to be unbundled into separate components, enabling low-cost, automated customization of everything from payment processors to point of sale machines to billing and invoice management, cashflow and liquidity management, bookkeeping and payroll management, lending, equity, invoice financing and insurance.<sup>66</sup>
- **Innovation in financial products, enterprises and markets.** Digitalization enables new business models, such as cryptocurrencies and crypto-assets, peer-to-peer lending, crowdfunding platforms, online marketplaces and aggregators, smart-devices linked or index-based insurance.<sup>67</sup> These are not just cheaper ways of doing existing things, they offer new ways of bringing together hitherto fractionalized interests in financing decisions – such as by local communities, young people, parents and other interest-based groups.

These core features are driving the practice of digital financing, and its potential to make a difference.

**The transformational opportunity from digitalization is to enable evolution from financial inclusion to citizen-centric finance.** Citizens care about far more than financial returns, with those wider concerns collectively expressed in the SDGs.<sup>68</sup> Digitalization can help citizens in directing the use of their money more effectively to realize their financial and non-financial goals, by delivering the right information, improved access, greater accountability and smarter financial services.<sup>69</sup>

## Exhibit 4: Citizens and digital financing of the SDGs



Greater citizen engagement in financial decision-making can be as individuals, for example consumers, savers and investors, and as pension and insurance policy holders. However, this does not mean that digital finance's impact is solely driven by the atomized decisions of 7.5 billion people acting as consumers and individual savers and investors. Rather it concerns all of the myriad ways that people organize collectively, at family, community and city level, through trade unions, religious groups, community and identity groups, and through political processes and oversight. Citizen-centric finance concerns the effective aggregation of influence through these many channels and the way that they can shape and channel financial flows through different intermediaries.

### 3.3 DIGITAL FINANCING TODAY

**Digital infrastructure and digitalization impact every aspect of finance, starting with access, availability and affordability.** Mobile payment platforms have turned mobile phones into interfaces with the financial system and are now used by over 1 billion people.<sup>70</sup> In 2017, 69 percent of adults had an account with a financial institution, up by seven percentage points since 2014.<sup>71</sup> In many countries in Sub-Saharan Africa, over 60 percent of the adult population have a mobile money account.<sup>72</sup> Digital payments systems in developing countries have often involved new distribution models (through networks of agents,<sup>73</sup> and stable connectivity and power supply for them<sup>74</sup>) and improved interoperability so that users of different platforms and systems can make seamless transfers that are as good as cash.<sup>75</sup> For example, MTN and Orange, with the support of GSMA have developed Mowali, a system to enable interoperable transfers across Africa.<sup>76</sup>

**Digitalization has catalysed changes in existing banking systems.** Digital identity and online account opening reduces bank account opening costs dramatically.<sup>77</sup> Mobile payment systems have required changes in interbank clearing systems.<sup>78</sup> A growing number of countries in Asia, Latin America, Europe and the US have implemented fast payment systems that make funds available instantly.<sup>79</sup> Fourteen banks, including UBS, Barclays, Banco Santander, Credit Suisse, HSBC, Deutsche Bank, have invested over US\$63 million in the most ambitious blockchain-based utility settlement coin 'Finality' to make clearing and settlement more efficient.<sup>80</sup> Central banks including Canada, China, Sweden, and Uruguay are seriously considering offering central bank digital currencies, and several have moved on from research to piloting.<sup>81</sup> Banks are also using AI and advanced analytics to assess credit risk more effectively and extend credit to more borrowers.<sup>82</sup>

**Digitalization has the potential to enable every nut and bolt of financial processes to be unbundled and commoditized,** including budgeting and financial planning, payment processing, point of sale machines, billing and invoice management, cashflow and liquidity management, invoicing, bookkeeping and payroll management.<sup>83</sup> Digitalization has allowed processes and products to be redesigned for cross-border remittances, banking, foreign exchange services, retirement management tools, investment advice and management, stock broking, spread-betting, banking and lending, and loan broker services.<sup>84</sup> Digital innovations enable new business models such as financing models, cryptocurrencies and crypto-assets, peer-to-peer lending, crowdfunding platforms, online marketplaces and aggregators, smart-devices linked and index-based insurance.

Noisy stock exchange floors are being replaced by algorithmic traders. One estimate suggests that 90 percent of equity-futures trades and 80 percent of cash-equity trades in the US are executed without any human input.<sup>85</sup> Over a third (35 percent) of US public equities is run by computer-managed funds, with funds with human managers now accounting for only 24 percent.<sup>86</sup> The conversion of financial assets into digital tokens could further transform the clearing and settlement of securities trades.<sup>87</sup>

The coronavirus has triggered an unprecedented twin global health and economic crisis. With millions confined in their homes, the importance of the digital world has grown. Digital financing solutions have been used to provide social safety nets, maintain liquidity and ease financial pressure on businesses.<sup>88</sup>

## Exhibit 5: Digital Financing and COVID-19

- **Digital money transfers** are enabling governments and individuals to provide immediate support to people. Concern about physical transmission of the virus on banknotes is accelerating the shift to digital payments, which risks excluding the unbanked.<sup>89</sup>
- **Digital financing support to SMEs** includes emergency collateral-free digital loans and digital processing of trade financing.<sup>90 91 92</sup> In China, Ant Group partnered with over 100 banks to launch the Contactless Loans initiative to support SMEs to recover from Covid-19. It is using blockchain-powered supply chain finance to enable SMEs to apply for loans from banks based on their receivables from large enterprises.

**Crowdfunding platforms** are raising funds for medical supplies and emergency relief.<sup>93</sup> Yelp, a business directory with crowdsourced reviews,<sup>94</sup> and Intuit QuickBooks<sup>95</sup> partnered with GoFundMe to allow businesses affected by the Covid-19 launch fundraisers and accept donations. Ecommerce platforms have been developed that sell goods locally for immediate or future consumption.<sup>96</sup>

- **Innovative digital insurance products** are being launched to provide coverage for those affected by coronavirus. WeSure, the insurance arm of Tencent developed insurance products including free Covid-19 insurance for Chinese citizens under 65.<sup>97 98</sup> Riskcovry, a Mumbai-based start-up, introduced coronavirus insurance in-a-box solution for businesses that want to offer hospitalization and lost wages coverage.<sup>99</sup>
- **Fiscal transparency** will play an important role in ensuring government accountability for spending on crisis response and recovery. Portals like Recovery.gov and or Fuerza Mexico<sup>100</sup> that tracked relief and reconstruction activities following 2017 earthquake in Mexico can serve as models and provide lessons.



***Digitalization is changing the financial sector and bringing in new players.*** Many existing financial institutions have digitalized their services through acquisition, in-house development, outsourcing and partnerships. Banks have invested over US\$1 trillion in developing, integrating and acquiring emerging technologies.<sup>101</sup> Mainstream financial institutions are developing digital first services, including for underserved clients and new markets.<sup>102</sup> There is an increasing trend towards open source initiatives in the financial industry. Open source projects and shared standards allow interoperability and open innovation rather than tying companies into proprietary technology and locking data into incompatible formats.<sup>103</sup>

Mobile operators and new innovators have become key players. In 2018, 'fintech' investment hit a record high US\$120 billion,<sup>104</sup> representing about a third of global venture capital funding.<sup>105</sup> Meanwhile, fintech and telecom companies are also acquiring banks, such as Lending Club's recent purchase of Radius Bank<sup>106</sup> and Telenor's acquisition of Tameer.<sup>107</sup>

To date, the relationship between incumbent financial institutions and innovative start-up firms appears to be largely complementary. Partnering allows fintech firms to viably operate while still being relatively small and benefitting from access to incumbents' client base. Incumbents benefit from access to innovative technologies.<sup>108</sup> For example, BBVA Bancomer in Mexico has run pilots with fintech startups through their open sandbox project to test new types of data for alternative credit scoring, and to drive customer engagement through automated SMS messaging.<sup>109</sup>

***Digital retailers and social media platforms are moving into financial services.***<sup>110</sup> They are able to amass large volumes of data, which allows them to offer highly relevant, personalized financial services directly or in partnership with traditional financial companies. Ant Group, a related company of the Alibaba Group has launched services including mobile wallets, savings accounts, personal investing, lending, and credit scoring serving 900 million people in China, by partnering with financial institutions. Its Yu'e Bao cash management platform uses liquidity prediction and management technology to help fund managers plan and execute investment strategies.<sup>111</sup>

Other established tech giants are also increasingly venturing into financial services. Apple has moved from 'Apple Pay' mobile payment services to providing credit through 'Apple card',<sup>112</sup> online retailers undertake small business lending.<sup>113</sup> Facebook is consolidating its payment products under a new brand Facebook Pay<sup>114</sup> in addition to developing a global cryptocurrency Libra,<sup>115</sup> which will use Facebook's digital identification infrastructure.<sup>116</sup> Google is planning to expand into banking.<sup>117</sup> Ride hailing platforms such as Grab<sup>118</sup> and Uber<sup>119</sup> are moving into financial services, including offering credit lines and insurance products to drivers.

***In public finance governments are making investments to digitalize their financial systems.***

This goes beyond government IT systems to developing interoperability between public and private sector information systems, mandating digital identification, and undertaking digital (financial) literacy education.<sup>120</sup> The Government of Benin, for example, is working with Estonia's IT solutions provider to roll out a secure, interoperable data exchange platform to facilitate digital service delivery.<sup>121</sup> Digitalization has boosted efficiency and transparency of budgets, payments and procurement enabling cost savings, efficiency gains, and improvements in accountability.<sup>122</sup> According to a CGAP estimate, switching from cash to electronic delivery of government benefits generates roughly 40 percent in savings per transaction.<sup>123</sup>

## Exhibit 6: Digital Financing Trends and Insights

### TRENDS

**Core infrastructure is undergoing substantive changes** as legacy institutions invest in the overhaul of core systems and keep up with new market entrants that exploit niches with newer technology.

**Front-office innovations are being implemented** to engage customers and collect data, both helping to decrease costs and provide the data needed for better product design, services and choices.

**There is a proliferation of digital business models**, both within finance and in the real economy, built on digital finance (e.g., ecommerce and pay-as-you-go models).

**Global monetary systems face new questions and challenges**, as new models mature, and blockchain-powered cryptocurrencies emerge and seem poised to go mainstream.

### INSIGHTS

**Retail innovations are leading the pack**, as tech-based models proliferate across finance and the real economy, primarily as a force for greater inclusion and choice.

**Public finance lags behind, as governments are slow to adapt and unlock the potential that digitalization provides** in the mobilization and utilization of finance and the possible innovations for financing public infrastructure and goods.

**Technology solutions are still developing and finding valuable uses**, with artificial intelligence making great leaps in recent years and blockchains and the Internet of Things still in search of the best applications to finance.

**There will be a period of competition of ideas and business models and a race for data**, but companies with existing or possible future datasets, which fuel the growing digital economy, that can absorb the best ideas will have the advantage.

Source: Adapted from Secretary-General's Task Force on Digital Financing of the Sustainable Development Goals and Accenture Development Partnerships, 'Harnessing the Digitalization of Finance for the Sustainable Development Goals' (New York, 2019).<sup>124</sup>



# DIGITALIZATION, FINANCING AND SUSTAINABLE DEVELOPMENT

## 4.1 THE FINANCING GAP

“Mobilizing sufficient financing remains a major challenge in implementing the 2030 Agenda for Sustainable Development”. So concludes the UN’s Inter-Agency Task Force on Financing for Development (IATF) in its 2019 annual report.<sup>125</sup> The Sustainable Development Solutions Network estimates the shortfall as US\$400 billion per annum to 2030 for 59 less developed countries.<sup>126</sup> The United Nations Conference on Trade and Development (UNCTAD) estimates the shortfall as being of the order of US\$2.5 trillion per year to 2030 for developing countries, with US\$5-7 trillion per year investment required over the same period globally.<sup>127</sup>

***The gap does not arise from a lack of finance.*** The world is awash with money. With increased volatility and uncertainties, private capital is increasingly focused on finding safe harbour and even minimal financial returns. The likely economic downturn in the face of the coronavirus is driving the cost of capital even lower after a decade of historically unprecedented zero and negative interest rates across tens of trillions of dollars of privately held assets. Governments with robust borrowing capabilities are responding to the emerging economic crisis with an expansionist period of debt-based public spending.



***“The financing for sustainable development is available, given the size, scale and level of sophistication of the global financial system.”***

UN Secretary-General’s  
Strategy for Financing the  
2030 Agenda<sup>129</sup>



**Financing is not aligned with the SDGs because of lack of data and standards, misaligned incentives and regulations, and gaps and weaknesses in the institutions and markets through which finance is deployed.** These flaws are well understood. Most obvious is the lack of low cost, trustworthy and timely data that enables SDG-related risks and impacts to be taken into account in private and public financing decisions. Other flaws are more structural, such as weaknesses and gaps in capital markets and the multilateral trading system.<sup>130</sup> Financial and capital markets fail to take SDG impacts into account because of perceptions that such action would reduce financial returns. This is reinforced by short-termism, missing and costly data, and weak or absent standards and definitions.<sup>131</sup>

Yet other problems concern the impact of climate and other environmental factors on the availability and cost of capital in, for example, climate-stressed countries, particularly Small Island Developing States and Least Developed Countries, with the shortfall estimated by one study as already amounting to US\$62 billion per annum.<sup>132</sup> For public finance, institutional weaknesses perpetuate a cycle of insufficient and poorly-used resources, and citizen distrust, despite a growing pool of domestic savings in many developing countries.<sup>133</sup>

**Much is being done to overcome barriers to financing the SDGs, but we are still not on course.** Many initiatives are actively seeking to overcome these flaws and inequalities in capabilities.<sup>134</sup> Many are private sector led and focused on improved risk assessment, such as the Task Force on Climate-related Financial Disclosures.<sup>135</sup> Others are government-led, such the European Commission's Sustainable Finance Framework.<sup>136</sup> There have been advances in international tax information exchange and related measures to address financial crime and money laundering. Despite such efforts, financing remains misaligned with the SDGs.

## 4.2 TODAY'S DIGITAL FINANCING OF THE SDGS

**Today's digitalization of financing is already delivering financing for the SDGs.** The DNA of digital finance – more and better data on risks and impacts, cheaper and wider accessibility of financial services, and innovative products and services – is already being harnessed to finance the SDGs.<sup>137</sup>

### **More and better data drives better accounting of SDG-related risks and impacts**

**Better quality, more granular data allows assessment of social, environmental and financial risks and impacts.** Satellite data, sensors, cloud computing and artificial intelligence, provide information on everything from food production to people's movements. This allows risks associated with climate change such as floods, rising sea levels, heat stress, wildfires and hurricanes, as well as carbon emissions and deforestation to be factored into calculations and scenarios automatically to influence financing decisions.<sup>138</sup> Such data can underpin SDG-related products, market rails such as decarbonization indexes, regulatory performance disclosure and stress testing requirements.

Specialist data analytics tech firms, such as Truvalue Labs use AI to scrape, analyse and interpret alternative data to uncover trends and risks before they manifest themselves.<sup>139</sup> Banks increasingly use big data to segment their customers, assess risks, and prevent fraud. Public authorities are also using big data to identify tax evasion. For example, Russian, Armenian and Italian tax offices use analytics from patterns in reported transactions to identify suspected cases of Value Added Tax (VAT) fraud to better target tax audits.<sup>140</sup>

**Wider availability of data on social, economic and environmental impacts has enabled new sustainable financing instruments.** Availability of investor relevant data on environmental and social risks and opportunities supports their incorporation into financial decision-making. For example Refinitiv manages a database of over 7,000+ global companies and over 400 metrics, including ethical screening criteria, percentage of women in senior positions, CO2 and other emissions.<sup>141</sup> Green bonds, with a global issuance value of US\$770 billion by the end of 2019, rely on better and cheaper data to track use of proceeds.<sup>142</sup> Likewise for impact investing which hit \$715 billion in 2019.<sup>143</sup> 'Gender lens' investing is also growing.<sup>144</sup>

Better data has also enhanced blended financing approaches, as funders diversified their risk-mitigation (e.g. guarantees, risk insurance, subordinated structures) and impact-rewarding methodologies (such as early-stage grants for impact models and social impact bonds).<sup>145</sup> For example, Brazil's national development bank BNDES is transitioning from being direct financier to mobiliser of finance with the issuance of a green bond in 2017 and the Sustainable Energy Fund. BNDES will focus on carrying risks the private sector cannot readily take on and demonstrating project viability to attract further investment.<sup>146</sup>

There is increasing experimentation with the use of distributed ledgers for government transactions. By 2018, there were 202 blockchain initiatives in the public sector across 45 countries in areas including identity validation, personal records, benefits payments, land registries, contract and vendor management, voting, and streamlining interagency processes.<sup>147</sup>

## Exhibit 7: Climate and Digital Finance

Digital finance can support investment in climate change mitigation and adaptation:

- **Digital finance can make it easier to raise investment funds for green projects and performance.** Green bond standards are increasingly well established.<sup>148</sup> High quality data and automatic 'smart contracts' can dramatically reduce costs of issuing green securities.<sup>149 150 151</sup>
- **Big data and standardized analytical frameworks allow climate risks to be factored into investment decisions.** Procurement offices in the Netherlands use a digital platform DuboCalc<sup>152</sup> that accurately assesses environmental costs of different projects. The platform also helps bidders to optimize their designs for sustainability.
- **Scaling carbon markets:** Blockchain and big data are being used to support simpler cheaper measurement, reporting, verification and trading of carbon credits.<sup>153</sup> One example is AirCarbon Exchange, the world's first blockchain based distribution and trading network for carbon credits for the airline industry.<sup>154</sup>
- **Renewable energy financing platforms:** Digital platforms connect users and producers of energy and allow users to provide crowd-funding for green energy investments as well as drawing and contributing energy to the system.<sup>155</sup>
- **Automated index-based insurance:** Index insurance products pay-out based on simple trigger like wind velocity or rainfall, removing the cost of expert assessment are already being piloted across Africa and Asia.<sup>156</sup> Blockchain applications<sup>157</sup> could further reduce costs by an estimated 30-60 percent through the automation of pay-outs and verification.<sup>158</sup>

**More transparent and reliable data can enable SDG impacts to be factored into production and consumption decisions.** Digitalization enables affordable and accurate tracing of global supply chains from sourcing of materials, to manufacturing and distribution.<sup>159</sup> The potential and market for this is being tested through new applications like Everledger<sup>160</sup> for diamonds and Provenance<sup>161</sup> for food, clothing, and other consumer goods which empower companies to make sustainable sourcing decisions. Consumer facing apps, such as HowGood<sup>162</sup> or Giki,<sup>163</sup> aggregate sustainability information and make it accessible to users who scan products while shopping.

## **Reduced transaction and intermediation costs broaden access to financial services**

**Digital financing has broadened access to financial services for millions of low-income customers and MSMEs around the world.** Banks across Asia, Africa and Latin America have offered services to millions of previously underserved customers. For example, in:

- **China**, MYbank uses Alipay's technology to serve millions of SMEs with loans taking less than three minutes to apply, one second to approve and needing zero human intervention. The lending model comes with a steady non-performing loan ratio of about 1 percent.<sup>164</sup>
- **India**, fintech start-ups such as LenddoEFL and CreditVidya offer collateral-free, credit lines, augmented with social media, psychometric, big data, and geo-location information.<sup>165</sup>
- **Kenya**, Equity Bank used ATMs, mobile branches and agents to reach a previously unserved customer base.<sup>166</sup> In Indonesia, BTPN has over 250,000 agents.<sup>167</sup>
- **Latin America**, Mercado Libre provides SME loans, one third of which would have been assessed as 'high risk' based solely on traditional credit bureau information.<sup>168</sup>
- **Mexico**, Banco Azteca has grown its customer base from 0 to 8 million in 5 years by connecting electronic banking to large retail chains.
- **The Solomon Islands**, National Provident Fund's "You Save" account enables people to pay money into their retirement savings accounts using a simple three-digit code to transfer airtime credit.<sup>169</sup>
- Major banks are applying machine learning to assess credit risk. While initially concentrated on consumer credit and large corporations they are now also beginning to apply this to the SME sector.<sup>170</sup>

Digital agriculture platforms such as HeveaConnect,<sup>171</sup> a digital marketplace for sustainably processed natural rubber, offers trade financing and insurance to rubber producers. Similarly, DigiFarm and AgriBuddy provide finance in addition to agricultural inputs, farming information and product markets.<sup>172</sup> This not only offers access to financing but tailored services that enable economic advancement of MSMEs and women<sup>173</sup> as well as youth education and employment.<sup>174</sup>

Using digital finance can be a key step towards formalization for the two thirds of the global workforce that is engaged in the informal economy.<sup>175</sup> Mobile money accounts can be a first step towards access to finance, social safety nets, and formalization of small savings and microinsurance, which aggregated can provide a source of capital for SDG implementation on a broad scale.

CEO Partnership for Economic Inclusion developed by the UN Secretary-General's Special Advocate for Inclusive Finance for Development (UNSGSA) has catalysed Mastercard and Rabobank to scale up a digital platform that connects small-scale farmers with buyers, provides mobile payment tools, giving users a financial track record.<sup>176</sup> The Better Than Cash Alliance, a partnership of governments, companies and international organizations is working to accelerate the transition from cash to digital payments to advance the Sustainable Development Goals.<sup>177</sup> Central Banks are considering issuing their own digital currencies in order to support financial inclusion, operational efficiency, financial stability, monetary policy effectiveness, and financial integrity.<sup>178</sup>

Banks, mobile operators, digital platforms and fintech start-ups are using big data to expand access and lower the cost of credit, reduce application times, and offer existing debt refinancing alternatives.<sup>179</sup> A recent Consumer Financial Protection Bureau study found that digitally enhanced scoring resulted in 27 percent more loan approvals with 16 percent lower interest rates across all customer segments.<sup>180</sup> Research finds that digital finance in developing countries increases savings behaviour.<sup>181</sup>

In developed countries, new fintech-enabled entrants are offering substantially higher interest rates on deposits, often double or triple those offered by traditional banks.<sup>182</sup> Robo-advisors have expanded people's access to well-diversified asset pools by lowering capital thresholds and cutting out expensive financial advisors.<sup>183</sup> These services charge as low as 0.25 percent of assets managed compared to 0.75-1.5 percent by traditional intermediaries.<sup>184</sup>

***Marketplaces and exchanges can link producers and consumers concerned with sustainability, facilitating sales of carbon credits, biodiversity offsets and ethically sourced and labelled products.*** IHS Market's Environmental Registry is the world's largest and allows buyers and sellers to track environmental projects, list, issue, transfer and retire credits for carbon, water and biodiversity.<sup>185</sup> Other digital exchanges such as Puro,<sup>186</sup> AirCarbon<sup>187</sup> or ClimateTrade<sup>188</sup> are supporting the decentralization and scaling of carbon markets. Some online platforms specialize in sign-posting sustainability: a wide range of generalist<sup>189</sup> and specialized ethical and sustainable digital marketplaces<sup>190</sup> are targeting consumers in developed countries and emerging markets such as Indonesia.<sup>191</sup> These platforms have given consumers wider options for aligning their investment and consumption decisions with their values.

***Cheap digital money transfers facilitate both private remittances and public assistance disbursements, supporting greater economic security.*** Remittance providers like WorldRemit, allow people to send money home cheaper and faster than incumbents.<sup>192</sup> Companies like TransferWise are partnering with banks to offer compelling remittance products,<sup>193</sup> while mobile money seems positioned to transform the remittance market.<sup>194</sup> The G20 and Bank of International Settlement's Committee on Payments and Market Infrastructures cross-border payments initiatives are addressing barriers to cheaper and faster cross border payments including remittances.<sup>195</sup>

Governments and humanitarian agencies use electronic transfers to distribute social payments, improving efficiency and transparency and reducing leakage. Digitalization has saved India's government an estimated US\$22 billion to date,<sup>196</sup> and Mexico saw US\$1.3 billion annual savings after digitizing its treasury functions.<sup>196</sup> UNHCR, WFP, UNICEF and UN Women who collectively deliver over half of global humanitarian cash assistance have digitized transfers in contexts where connectivity, payment infrastructure and digital financial services were available, and are currently working on scaling up and harmonizing their approaches.<sup>198</sup>

## ***Innovative business models are emerging in response to growing demand by citizens concerned with SDG impacts.***

***Parametric insurance products can support greater resilience to climate change.*** Index insurance is a model which triggers automatic pay-outs to farmers based on automated satellite readings and weather and rainfall meters. Public-private initiatives are experimenting to remedy challenges of imperfect coverage, liquidity constraints and lack of trust among farmers, and improve contract design and marketing to reach more people.<sup>199</sup> The World Bank's Global Index Insurance Facility (GIIF) has supported the rollout of index-based insurance for over 27 million smallholder farmers and micro-entrepreneurs across Africa and Asia.<sup>200</sup> Central banks are implementing policies to enable digital product innovation for SMEs and micro businesses to mitigate and build resilience to climate change, including climate-risk insurance, post disaster reconstruction and pay-as-you-go renewable energy.<sup>201</sup>

***Specialist crowdfunding and P2P platforms are democratizing sustainable investments,*** primarily in easily financialized SDG areas, such as renewables and sustainable infrastructure. Crowdfunding platforms like Bettervest<sup>202</sup> and Oneplanetcrowd<sup>203</sup> channel investments to community and small businesses' renewable energy projects. Sustainability robo-advisors, like Betterment<sup>204</sup> that specializes in sustainable investments and Ellevest<sup>205</sup> that applies a gender investment lens are another option for conscious investors. These AI-based products offer reduced commissions with low capital thresholds<sup>206</sup> and integrate users' risk-adjusted returns preferences with their social and environmental priorities, based on companies' environmental, social, and governance data.<sup>207</sup>



## Exhibit 8: Gender and Digital Financing

Digital finance improves women's access to secure, affordable financial services and can better enable investors to direct investment towards women's empowerment.<sup>208</sup>

- **Digital services overcome barriers women face in accessing finance, such as lack of collateral or formal bank records.**<sup>209 210</sup> Mobile payments providers for small businesses, such as Kopo Kopo in Kenya, offer merchants cash advances, based on digital transaction records. The business owner repays electronically based on the day's revenues. Pay-as-you-go systems reduce time spent fetching wood or water<sup>211</sup> and ecommerce opportunities can be compatible with family responsibilities.
- **Building digital capabilities:** In Tanzania and Mozambique a partnership between TechnoServe, the ExxonMobil Foundation and Vodacom is trialing a combination of mobile savings accounting with business skills training for urban businesswomen, using a combination of face to face access and interactive mobile learning platform. The training leads to women saving and taking out microloans through mobile accounts.<sup>212</sup>
- **Data for smart gender budgeting:**<sup>213</sup> Austria is a world leader in gender budgeting with requirements to set and report against gender-related outcomes and integrate them into performance contracts, and impact assessments. A web portal ([www.wirkungsmonitoring.gv.at](http://www.wirkungsmonitoring.gv.at)) publishes sex disaggregated data and budget information and offers a gender and diversity atlas.<sup>214</sup>
- **Digitalization can support the collection of sex-disaggregated data critical for informing gender-sensitive public and private investment strategies.**<sup>215</sup> 'Gender lens investing' includes investment strategies aimed at advancing women in finance and corporate leadership, supporting products to improve women's lives, and improving women's treatment in the workplace.<sup>216</sup> More sex-disaggregated data can further improve the ability to better serve women clients. It also contributes to growing evidence on the positive relationship between gender equality and financial performance.
- **The digitalization of social protection programmes** can positively impact the way women participate in economies. It can provide women with independent access to predictable income streams and give female recipients greater control over how the money will be used within households.<sup>217</sup>

It is critical that digital financing solutions are grounded in the reality of the challenges women face. Lack of affordable devices, data, skills and social norms such as online harassment, prevent women accessing the digital world.<sup>218</sup>

The Alliance for Financial Inclusion (AFI) has developed a Policy framework for women's financial inclusion using digital financial services. It includes guidance on policy, regulation, infrastructure and demand side capabilities and consumer protection.<sup>219</sup> UNSGSA is collaborating with Melinda Gates and the French Minister of Finance to promote a major G7 Partnership for Women's Digital Financial Inclusion in Africa.<sup>220</sup> Efforts to improve sex-disaggregated statistics include work by UNSGSA, UN Women, Data2X, World Bank, AFI, IMF.<sup>221</sup>

**Digitalization enables circular economy, sharing and usership-based models** which can optimize processes to reduce cost, waste and environmental impacts.<sup>223</sup> These innovations allow citizens with limited resources to get on-demand access to products or services, and even food. These are as relevant in East Africa, where Hello Tractor provides on-demand access to farming machinery, as in Europe with co-use of cars and bikes, office space, household equipment, and clothing.<sup>224</sup>

Sharing models have had positive SDG effects on the economy through increased productivity and supplementary income streams, and on the environment through reduced production and waste.<sup>225</sup> However, they can also provide highly contingent and insecure employment and income streams, which risk leading to higher levels of inequality, exploitation and poverty.<sup>226</sup>

**Digital assets are starting to redefine how and what value is captured**, offering a transparent, verifiable means for backing and exchanging values that traditionally were not priced in the financial system.<sup>227</sup> Natural capital-backed digital assets, such as CarbonCoin,<sup>228</sup> BioCoin<sup>229</sup> or CedarCoin,<sup>230</sup> are experiments in offering citizens the opportunity to invest in outcomes like reforestation and conservation. Applications and initiatives such as RecycleBank<sup>231</sup> and JouleBug<sup>232</sup> and 'city coin' developed by Colu<sup>233</sup> use 'gamification' strategies to link real world sustainable behaviours through online 'points' to rewards and discounts.<sup>234</sup>

While many of these are early stage enterprises, they demonstrate the potential for innovation using digital finance towards sustainable development challenges.

### 4.3 DIGITAL FINANCING FOR EVERY SDGs

**Digital finance helps to channel more resources toward all of the SDGs, albeit through different pathways.** Goals in areas such as sustainable infrastructure, energy, water, transport, and financial services, are more easily financialized because they have paying users. Digitalization helps direct existing public and private investments but also empowers individuals to invest in sustainable infrastructure and utility services by reducing information gaps.<sup>235</sup>

Digitalization allows transaction visibility and traceability of production, employment, and business conditions related to **economic SDGs**, such as decent work, manufacturing, agribusiness, sustainable production and consumption. Such transparency, coupled with lower cost of services delivered through digital platforms, supports expanded provision of affordable and tailored financial services. Digitalization also supports unconventional mechanisms for financing economic activities that bypass the traditional financial system, such as crowdfunding or (community) crypto-currencies and facilitate sustainable consumer purchases.<sup>236</sup>

Digital finance can target reduction in the negative effects of global consumption and production patterns on **environmental SDGs**. Satellites, sensors, publicly available scientific data and ESG disclosure help capture and integrate information about climate change, biodiversity loss, pollution and disaster risks into financing decisions, for example via green securities and sustainable robo-advisors. Digital platforms support carbon markets, which grew fivefold between 2017 and 2019, reaching US\$215 billion.<sup>237</sup> Objective, automated verification through data tokens can support scaling up of carbon trading.

Progress on **social SDGs** hinges, to a large extent on the ability to effectively manage public financing and assess performance of institutions. Digitalization improves availability of data on public services and citizens' ability to review and demand accountability. Digital finance reduces remittance and e-transfer costs and enables e-service provision. It also supports innovations such as gender lens investing, P2P international giving, micro-insurance, or bias-detecting algorithms. Analysis of macro level data shows that access to mobile phones is positively associated with multiple indicators linked to social development, such as lower gender inequalities, enhanced contraceptive use, and lower maternal and child mortality.<sup>238</sup>

# Exhibit 9: Digitalization Already Enables Financing of the SDGs

	Economic	Environmental	Social
			
More and Better Data	<ul style="list-style-type: none"> <li>Transaction records</li> <li>Credit scoring</li> <li>IoT data / smart metering</li> <li>Supply chain tracking</li> <li>Open government data</li> <li>Crowdsourced project accountability data</li> <li>Open finance</li> </ul>	<ul style="list-style-type: none"> <li>Satellite imagery</li> <li>IoT data / smart metering</li> <li>ESG data</li> <li>Data tokens for climate impact reporting</li> </ul>	<ul style="list-style-type: none"> <li>Gender-disaggregated data</li> <li>Open public finance data</li> <li>Transparent public records</li> <li>Crowdsourced project accountability data</li> <li>ESG data</li> </ul>
Cheaper Intermediation and Aggregation	<ul style="list-style-type: none"> <li>Mass-market digital finance</li> <li>Pay-as-you-go utility financing models</li> <li>Digitalized value chain / trade finance</li> <li>Fair trade, ethical, sustainable ecommerce/ digital marketplaces</li> </ul>	<ul style="list-style-type: none"> <li>Digital exchanges for carbon credits / bio-diversity offsets</li> <li>Platforms for climate project financing</li> <li>Aggregation / securitization of assets</li> <li>Green banking products</li> </ul>	<ul style="list-style-type: none"> <li>Remittances / humanitarian transfers</li> <li>Digital marketplaces / ecommerce platforms</li> <li>Mass-market digital finance</li> <li>Digital education / health care financing schemes</li> <li>E-government services</li> </ul>
Disintermediation and New Business Models	<ul style="list-style-type: none"> <li>Crowdfunding / P2P lending</li> <li>Gamified 'green' consumption</li> <li>Circular economy models</li> <li>Fractional asset ownership</li> <li>Digital currency-based project finance / community services</li> <li>AI-enhanced tax optimization</li> </ul>	<ul style="list-style-type: none"> <li>E-trading of natural capital backed digital assets</li> <li>Remote verification insurance and financing</li> <li>Gamified sustainable behaviours</li> <li>Sustainability robo-advisors</li> </ul>	<ul style="list-style-type: none"> <li>Gender-lens crowdfunding &amp; investing robo-advisors</li> <li>Bias detection algorithms</li> <li>Robotized m-education / health</li> <li>Digital micro-insurance</li> <li>Participatory budgeting</li> <li>Algorithmic illicit flow tracking</li> <li>Digital donation platforms</li> </ul>





## CITIZENS, DIGITALIZATION AND FINANCING THE SDGS

To scale up the potential of these early signals of digital finance aligned to the SDGs requires citizen-centric finance that empowers people as buyers, savers, investors, borrowers and lenders, as well as tax-payers and the users of public services and infrastructure.

***Digitalization's heartbeat is the valued aggregation of many small parts.*** Digitalization enables large amounts of data, to be cheaply collected and quickly analysed and used. It enables servicing hard to reach mass market at lower cost. Massive volume of payments data can enable automated lending. Cheap aggregation of small amounts of money can mobilize smaller-scale crowdfunding as well as larger scale financing, exemplified by Kenya's M-Akiba retail bonds<sup>239</sup> or UK's PrimaryBid<sup>240</sup> that allows retail investors to participate in corporate equity fundraising.

***Citizens can be informed and empowered through digitalization.*** Citizens are the ultimate owners of all financial capital. Yet the opaque complexity of modern finance has, as we have argued above, stripped out their effective agency in most financing decisions. Digitalization is potentially a game changer in reconnecting citizen's priorities with financing decisions.



***Digitalization's  
heartbeat is the valued  
aggregation of many  
small parts.***

***Digital finance increases financial inclusion.*** Digitalization can first and foremost empower citizens by providing basic financial inclusion.<sup>241</sup> While the vast majority of account owners have an account at a bank, a microfinance institution, or another type of regulated financial institution, mobile money accounts are also growing and reaching new customers, particularly in Africa and least developed countries.<sup>242</sup> Digital finance has enabled millions of women, youth, rural residents, people with low incomes, and small business owners to save safely, borrow cheaply, invest securely, and insure easily. There is further potential to reach other groups such as the elderly



and forcibly displaced people.<sup>243</sup> The broader development impact of greater financial inclusion has become a topic of some debate,<sup>244</sup> highlighting the need for adequate consumer protection safeguards.<sup>245</sup> However, what is clear is that digitalization has enhanced citizen's ability to manage their finances and their agency within the formal financial system.

New entrants and traditional financial institutions are diversifying the range of financial services available to currently 'underbanked' citizens who lack appropriate and affordable options. They are also devising solutions to help customers improve financial management through automated reminders, alerts, and nudges.<sup>246</sup> For example, research shows that people save more when savings products are supported by two-way SMS, mobile learning platforms, and commitment mechanisms like default contributions and locked savings pots.<sup>247</sup>

***Citizens care about more than financial returns and, if they are given information can make decisions which steer their money more effectively towards their goals.*** Digitalization enables citizens to be more informed and engaged in steering the use of funds intermediated by public or private intermediaries on their behalf. Financial intermediaries can and need to play a critical role in connecting financial markets to individual end-users in an efficient way and in mitigating many risks for end-users. However, while intermediaries optimize risk adjusted financial returns within any given investment universe, citizens have broader concerns, most directly including the fear of job loss and the health and safety of their families, through to wider issues such as climate change. Wider disclosure of companies' environmental and social impact, reliable information on global supply chains and production processes, and open data on public budgets and projects allow citizens to direct their own financial decisions in line with their values. Responding to customer demand, banks such as Dutch Triodos Bank, German UmweltBank AG, Indian YES BANK, BNP Paribas, ING Bank, and Société Générale are increasingly offering sustainable products such as green deposit and savings accounts, funds, lending and mortgages.<sup>248</sup>

***By making more and better data available and actionable, digitalization enables citizens to make more informed financing decisions,*** expressing both their direct financial and non-financial interests. Environmental, social and governance data is increasingly being produced, standardized and used by financial intermediaries. European Union (EU) regulations require pension funds to consult with intended beneficiaries,<sup>249</sup> in shaping their investment strategies and mandates, digital data and technologies offer a means to do this effectively. In 2018, over 50 percent of shareholder resolutions filed in the US focused on environmental and social issues. Greater access to data can further inform SDG-related shareholder resolutions.<sup>250</sup> Credit Suisse suggests that 'responsible consumption' could amount to US\$4.5 trillion annually by 2030.<sup>251</sup> Robo-advisors, including DBS' digiPortfolio,<sup>252</sup> are playing a role in democratizing investment management services by reducing commissions and lowering capital thresholds.<sup>253</sup>

***Citizens and their representatives have used open data to hold governments to account for the use of public finance.*** Open government data standards and portals and information crowdsourced from citizens allows civil society organizations, media and parliamentarians to track public spending on social services or infrastructure projects. For example, in Mexico, citizen groups used the Budget Transparency Project to push for more sustainable transportation,<sup>254</sup> in Argentina, women's rights groups insisted on adequate budget allocation for action on gender-based violence after identifying budget

gaps,<sup>255</sup> and in Colombia information on projects funded with mining royalties published on MapaRegalias platform improved project completion rates and increased the number of irregular cases brought to court.<sup>256</sup> Registries of company ownership are being made public enabling citizens, regulators, law enforcement and potential business partners to more easily see who they do business with and identify any government connections. The Open Corporates database aggregates information from public registries and to date covers 160 million companies, with 1.2 million users a month.<sup>257</sup>

***Digitalization creates new ways for citizens to connect and to act collectively through aggregation of individual financing decisions.*** Digital platforms and marketplaces connect producers and consumers, capital holders and capital seekers allowing them to make deals together. Integration of sustainability information into online shopping sites<sup>258</sup> and greater convenience in accessing sustainable products and services have boosted sustainable consumption.<sup>259</sup> Crowdfunding platforms and peer-to-peer lending has opened new avenues for aggregating atomized interests, enabling citizens to overcome trust barriers and free riders to act collectively in financing things they value. Through special-interest platforms, citizens have mobilized and funded each other's sustainable development projects ranging from renewable energy to legal cases to protect the environment and human rights.

UK-based crowd-funding platform, Abundance, for example, is offering small investments in sustainable municipal projects to residents of these city areas.<sup>260</sup> Alipay Ant Forest platform has 550 million users who have collectively reduced carbon emissions by over 12 million tons by May 2020.<sup>261</sup> Digital currencies and assets are being used to tokenize sustainable behaviours and natural capital, allowing citizens or citizen groups to back them. Digital community currencies are testing ways to unlock citizen choice in consuming and supporting local businesses and economies.<sup>262</sup>





# CHALLENGING DIGITAL FINANCING FUTURES

## 6.1 UNCERTAIN FUTURES

***Predicting the future of digital finance would be foolhardy.*** Whilst Bitcoin has moved quickly from headline news to systemic irrelevance, emerging plans for global digital currencies might, or might not, prove to be of huge importance. Digitalization will play an important role in improving investor-facing corporate disclosure, but such disclosure might ultimately become less significant with the growth of so-called 'alternate' data from non-corporate sources.



***“Growing opportunities created by the application of digital technologies are paralleled by stark abuses and unintended consequences.”***

UN Secretary-General's High-Level Panel on Digital Cooperation<sup>263</sup>

In the face of intense competition from new entrants, some of today's banks will falter but those that grasp the right opportunities could become dominant players in tomorrow's digital world. The advance of digitalization may be an inevitable aspect of this moment in human history. But its future pathways and impacts are by no means set in stone.<sup>264</sup>

- Barriers to digitalization of financing may not only delay the speed and breadth of its roll-out, but also how it emerges and with what effects.
- Risks that accompany digitalization, likewise, will have uneven effects, possibly benefiting some whilst harming others.

Whether digitalization supports the acceleration of financing for the SDGs depends, in short, on whether these barriers are overcome, and risks mitigated.



## 6.2 BARRIERS AND RISKS

### *Today's patterns do provide some indications of tomorrow's possibilities.*

Despite such uncertainties, today's trends point to some likely features of tomorrow's world of digital finance. Today, for example, 750 million people remain without physical access to a mobile or broadband network.<sup>265</sup> Poor ICT infrastructure in less developed countries is often compounded by economic, educational or energy access limitations. Challenges such as basic mobile device ownership or high service costs caused by market distortions continue to exclude the poor in digital finance, as does lack of education or consistent access to reliable energy sources. In low and middle-income countries, women are 23 percent less likely than men to use the internet. This gap is growing and is largest in the Least Developed Countries (LDCs).<sup>266</sup> While it is likely that access to affordable internet connectivity will expand, deliberate efforts are needed to close gaps in inclusion, including the gender gap.<sup>267</sup>

Nearly half (45 percent) of digital financial accounts created in the spirit of financial inclusion have not been used over the past year,<sup>268</sup> due to barriers including usability, costs, safety and security concerns, relevance, skills gaps and societal norms.<sup>269</sup> Women, rural residents, low-income people, especially in LDCs, remain disproportionately excluded. Women and girls are less likely to have the education, skills and confidence to participate in digital financing, largely due to poverty and cultural norms.<sup>270</sup> The elderly, a growing segment of most populations, will face increasing challenges as the pace of technology-driven financial innovation accelerates.

Digital finance is likely to come to all countries, and to be available to most people. Yet most countries will remain the recipients not the suppliers of such services. Shortages of entrepreneurial and tech talent, or a lack of resources to support their efforts, pose challenges for many countries, but will be most marked in less developed countries.<sup>271</sup> Tech talent in particular is highly competitive. Women are systematically underrepresented in IT, finance, fintech, and in regulatory and policy making positions. An industry that intends to serve women but has no women in its leadership and technical positions will miss complementary perspectives and will likely fail to serve the entire population.



*The advance of digitalization may be an inevitable aspect of this moment in human history. But its future pathways and impacts are by no means set in stone.*

Policy makers and regulators in most countries also struggle to keep pace with the rapid evolution of digital finance, again notably in developing countries. Such gaps, if not overcome, at best cement dependency in those countries on the enterprises and regulatory norms of better endowed countries.

**Citizens' benefits come with increased risks.** Digitalization offers growing potential benefits to citizens who can access and make valuable use of improved, customized, cheaper financial services. Individual saving and investments should become easier and more rewarding, with more choice, portability and transparency. Growing numbers of people working as independent traders and contractors or running small businesses will have cheaper and faster access to borrowing. Such benefits will however come with risks.

Digitalization puts people at risk of privacy violations and data security breaches,<sup>273</sup> fraud, irresponsible lending, and discrimination based on profiling.<sup>274</sup> This might be through, for example, cryptocurrency exchanges,<sup>275</sup> fake transactions on ecommerce sites or peer-to-peer marketplaces<sup>276</sup> or online gaming, and fraudulent crowdfunding campaigns.<sup>277 278</sup> Traditional consumer protection risks such as lack of transparency, unfair or discriminatory treatment, disproportionate, improper or unauthorized use of data by financial service providers, deceptive sales and marketing techniques can also be amplified through digital channels.<sup>279</sup> New types of financial service providers, such as mobile operators and digital platforms, may be operating outside of traditional financial regulations leading to lack of consumer or investor protection.<sup>280</sup>



**UNDP's Human Development Report 2019 points to convergence of 'basic' capabilities, whereas 'enhanced' capabilities underpin a 'new generation of inequalities', focused on two seismic changes - technology and climate change.<sup>272</sup>**

**Data gaps, biases and ownership limit finance's alignment to the SDGs.** To be useful economic, social, environmental and governance data must be able to be aggregated, analysed and used across multiple platforms.<sup>281</sup> Many factors mobilize against this. Data from the informal sector is harder to gather, let alone aggregate, all the more so if individuals and companies lack the capabilities and tools to produce such data, or are anxious not to be observed by their respective governments. Lack of disaggregation by critical factors, such as sex, makes segmented analysis more difficult. When such data is available, fragmented, non-interoperable systems restrict useful data aggregation and analysis. Too often data quality and integrity remain a challenge.<sup>282</sup>

Digitalization of finance creates a possibility that product design, artificial intelligence and algorithmic decisions will replicate gender and other biases and discrimination.<sup>285</sup> Small developing economies which have not yet harvested large pools of data are particularly vulnerable to biases since lending algorithms will be trained on foreign data, in particular when virtual banks are established by global banking groups or BigTech firms. Automation and machine learning based on incomplete or bias-saturated data may also further marginalize sections of the population already facing disadvantages.<sup>286</sup>

Privacy and security of personal data has become a critical issue, especially with digital platforms and mobile operators gathering so much data about users. Encouraging access and use of data that supports innovations aligned with citizens' needs may take precedence in the short-term in countries looking to establish the bases for digital financing ecosystems. However, securing adequate protection of citizens' personal data and privacy is increasingly viewed to be paramount for lasting, sustainable citizen benefit.<sup>287</sup> Different countries are adopting different approaches to use, ownership, and protection of data. The European Union has introduced General Data Protection Regulation (GDPR) to secure people's rights over their data,<sup>288</sup> but the impact of this legislation is too early to judge despite moves by several jurisdictions to emulate it.<sup>289</sup> In the main, consumer consent remains a challenging construct.<sup>290</sup>

## Exhibit 10: Barriers and Risks

### BARRIERS

**Lack of basic access:** 750 million people lack broadband connectivity,<sup>283</sup> 1 billion lack formal IDs<sup>284</sup>

**Capability gaps:** illiteracy, poverty, social norms and lack of digital capabilities hinder uptake and usage and reinforce inequality

**Access to appropriate digital financial services:** lack of affordable, secure, relevant digital financial services

**Patchy data to support financial decision-making** and digital financing innovation, particularly in relation to low income countries

**Siloed and non-interoperable IT systems** hinder use of data to price risk, describe impacts and underpin accountability

**Talent shortage** hinders digital financing innovation, particularly in less developed countries

**Weak regulatory capabilities** undermine the establishment of enabling policy and regulatory environment for digital financing innovation

**Incumbent resistance** to disruption, disintermediation, and digitally-enabled transparency of their activities and rewards

### RISKS

**Data security and privacy** risks are amplified

New **fraud and money laundering**, for example on digital marketplaces, cryptocurrency exchanges, crowdfunding platforms

**Irresponsible digital financial products** with opaque or misleading terms and conditions and insufficient recourse measures

**Data monopolization** or exploitative use of data can stifle future digital financing innovation and undermine consumer trust

**Unfair treatment** can arise from discriminatory algorithms based on biased data or hyper-personalization of financial services

**Short-termism, volatility trading and herd behaviour** has grown with digitalization and algorithmic trading

**Market concentration and rent-taking** derives from ever increasing returns to scale and growing complexity and opacity

**Lack of, incomplete or over-regulation** stifles market innovation



***Data access and protection pathways reflect tensions between competing visions - openness, paternal control, bourgeois civility, or commercial and state interest.<sup>291</sup>***

Data localization requirements continue to impact the shift to digital. Data issues also have an important cross-border dimension, requiring regional if not global alignment of data privacy, protection, access, and trade frameworks. The G20 Summit in Japan highlighted the importance of “data free flow” for productivity, innovation and sustainable development but reaching concrete agreements has proved difficult, in part due to sovereign interests and concerns around national security matters.<sup>292</sup> The United States, Mexico and Canada Agreement (USMCA) Digital Trade chapter prevents restriction of cross-border information transfers. Yet exceptional circumstances remind us of the urgency of reaching such global convergence, especially when cross-border data proves so vital for pinpointing infectious diseases outbreaks, predicting progression and saving human lives.<sup>293</sup>

***Cybersecurity is becoming the most important systemic risk in digital financial services.***

Just as citizens become more vulnerable, so do businesses, governments and the financial system as a whole. Cyberattacks affected over 4 billion records in the first half of 2019 alone, representing a 54 percent increase from the same period in 2018.<sup>294</sup> Over the past two years, cyber insurance premiums have tripled<sup>295</sup> as the costs associated with cybercrime continue to grow.<sup>296</sup> Financial institutions increasingly rely on a handful of cloud infrastructure providers, with similar IT features and systems. Such data concentration increases the risk of it being targeted and compromised and creates the potential for cascading effects from breached entities.<sup>297</sup> Global standards such as Financial Action Task Force (FATF),<sup>298</sup> CPMI-IOSCO guidance on cyber resilience<sup>299</sup> and CMPI strategy against wholesale payment fraud related to endpoint security<sup>300</sup> provide a first barrier against these risks.

***Digitalization can improve market efficiency but may drive an over focus on volatility trading and rent-taking.***

Digitalization increases the volume of short-term transactions focused on profiting from market volatility.<sup>301</sup> The UK’s Financial Conduct Authority (FCA) has highlighted the costs of high-frequency trading, or ‘latency-arbitrage’ races where market actors front run traditional equity traders such as pension funds and their intermediaries.<sup>302</sup> The FCA estimates that such arbitrage can cost traditional equity traders using UK markets as much as US\$5 billion a year in lost, profitable trades. To



***Digitalization supports steeply increasing returns to scale, with near-zero marginal costs of service, and dramatic synergies in the application and value of data.***

curb the negative effects of this practice IEX, a US-based stock exchange, has for example introduced a 350-microsecond delay designed to prevent high-speed traders with faster data feeds from trading with disadvantaged individual investors at potentially stale prices.<sup>303</sup> The Bank of International Settlements has established an Innovation Hub to explore critical trends in financial technology relevant to central banks such as digital currencies, stablecoins, and the use of technology in financial regulation.<sup>304</sup>

**Digital disruption drives innovation but is likely to be followed by growing market concentration.** New entrants offer financial services through product and enterprise innovation, operating on the edges or outside of existing financial regulatory regimes. Digitalization supports steeply increasing returns to scale, with near-zero marginal costs of service, and dramatic synergies in the application and value of data. As enterprises grow, they can further enhance service offerings in broader areas. Grab and Uber are leveraging payments data to offer credit lines and insurance products to drivers, and M-KOPA is using M-Pesa payments data to supply 'pay-as-you-go' access to clean energy and consumer debt.

Digital platforms succeed when they can harness network effects and associated increasing returns to scale. The associated benefits may also have costs resulting from increasing market concentration and the use and privacy of data.<sup>305</sup> Macroeconomic impacts and systemic risks also need to be considered, arising from this increased market concentration, and associated risks such as algorithmic pro-cyclicality and contagion, and potential dilution of full control over monetary outcomes.<sup>306</sup>

**Rent-taking by financial intermediaries** remains a major risk of digitalization to the extent that it contributes to increasing levels of complexity and opaqueness in well-developed financial and capital markets and poses a regulatory challenge of tracking rapid evolution of digital finance. A landmark study highlighted that the margin taken by the financial sector for intermediation of investment in the US has remained constant at about 2 percent for more than a century despite increased volumes and technological developments, suggesting that intermediaries have absorbed the financial benefits from the associated cost reduction effects.<sup>307</sup>

The recent promulgation by the European Union of a revised Payment Systems Directive (PSD2)<sup>308</sup> illustrates a context specific regulatory approach to securing a level playing field for new players, which could support partial disintermediation. For incumbent financial institutions, cost reduction from digital represent both an opportunity and threat to their bottom line as their market is opened up to radically cheaper competition. Many incumbents are racing to invest in emerging technologies to improve service to customers and enhance operations. Some, however, may resist increased transparency of their activities and rewards.

For public financing, similarly, realizing the digital dividend is largely dependent on both sound investment in functional digitalization, and the willingness of governments to underpin the 'trust ecosystem' with enhanced transparency, targeting and assessment of public spending.





***Inherent uncertainties, barriers and risks combine to make the future a place to be shaped rather than predicted.***

***Digitalization depends on energy access and supply.***

While digitalization supports the rapid transformation of our economic systems, it could equally drive emissions higher.<sup>309</sup> The energy intensity of the ICT sector itself is increasing by 4 percent per year, in contrast to the 1.8 percent annual decrease in global GDP's energy intensity.<sup>310</sup> In telecommunications mobile networks are more energy intensive than fixed networks<sup>311</sup> and connectivity drives demand for data and content. Much of the energy use is by centralized network and data centre infrastructure rather than consumer devices.<sup>312</sup> For example, Cambridge Bitcoin Electricity Index estimates that bitcoin alone uses 84.23 TWh of energy a year<sup>313</sup> which is comparable to the power consumption of Austria.<sup>314</sup> As a response, the ICT industry has recently launched a first sector-wide pathway to net zero.<sup>315</sup>





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