

Digital Entrepreneurship and the Supportive Role of Insurance

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The Geneva Association

The Geneva Association

The Geneva Association was created in 1973 and is the only global association of insurance companies; our members are insurance and reinsurance Chief Executive Officers (CEOs). Based on rigorous research conducted in collaboration with our members, academic institutions and multilateral organisations, our mission is to identify and investigate key trends that are likely to shape or impact the insurance industry in the future, highlighting what is at stake for the industry; develop recommendations for the industry and for policymakers; provide a platform to our members and other stakeholders to discuss these trends and recommendations; and reach out to global opinion leaders and influential organisations to highlight the positive contributions of insurance to better understanding risks and to building resilient and prosperous economies and societies, and thus a more sustainable world.

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Contents

Foreword	5
1. Executive summary	6
2. Introduction	8
2.1 Insurable versus uninsurable risks	9
2.2 The impact of digitalisation on entrepreneurship	9
2.3 Structure of the report	10
3. Digital entrepreneurs, platforms and business model innovation	11
3.1 Defining digital entrepreneurs	11
3.2 The platform economy	14
3.3 Developed versus developing economies	15
3.4 Local start-up ecosystems	16
3.5 Mature and growing start-up subsectors	17
3.6 Everything-as-a-Service	19
4. The risk landscape facing digital entrepreneurs	22
4.1 Cyber risks	24
4.2 Intellectual property infringements	26
4.3 Unanticipated indirect liability for third-party torts	26
4.4 New sources of professional and product liability	28
4.5 Reputational harm	29
4.6 Liability for anti-competitive behaviour	30
5. How can insurers better support digital entrepreneurship?	31
5.1 Overcoming low insurance awareness and take-up	33
5.2 Product innovation to broaden insurance cover	35
5.3 Process innovation to improve distribution	38
5.4 Organisational innovation to boost product development	39
6. Concluding remarks	42
References	44

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Foreword

Digital entrepreneurs are changing the world we live in, transforming existing businesses and creating entirely new industries. The scale and pace of digitalisation, however, is fundamentally changing the risk profile of businesses, and the nature of what they have to protect. This presents both challenges and opportunities for the insurance industry.

Digital companies face new and emerging risks, such as cyber and uncertain regulatory and legal exposures. Their value is predominantly derived from intangible, rather than physical, assets such as data, intellectual property (IP), software and talent. According to some estimates, intangible assets now make up around 90% of the total market value of S&P 500 firms. At the same time, surveys reveal that less than 20% of information assets are insured. This suggests sizeable levels of underinsurance for intangibles in the corporate sector.

Insurance is an important facilitator of economic growth, and an enabler of business innovation. Throughout history, insurance has supported companies to develop markets for new products and services, and no doubt this is the case with digital technologies too. We are already seeing commercial liability policies and affirmative covers like cyber and IP insurance evolve to accommodate some of the intangible risks digital entrepreneurs face. However, if insurers are to meet the needs of digital entrepreneurs and plug emerging gaps in coverage, they will need to enhance the value proposition of their offerings, in particular through product, process and organisational innovation.

Insurance products and services will continue to evolve to serve modern-day digital entrepreneurs as they mature and scale their initiatives, while staying within the boundaries of insurability. Through this study, we hope to promote discussion on this important topic for the insurance sector, and ensure that insurance continues to play a key role in supporting innovation in the wider economy.



Jad Ariss
Managing Director, The Geneva Association



1. Executive summary

Digitalisation is fundamentally changing the way businesses are formed and operate. This is not solely a matter of technology but reflects changes in the way new businesses collaborate, design and deploy new products/services. Digital platforms and associated application programme interfaces (APIs) are the essential architecture on which this new digital entrepreneurial ecosystem sits. While traditional entrepreneurs may be users of such platforms they are not the key engineers of this digital transformation. That mantle falls to digital entrepreneurs – broadly speaking, tech start-ups/app developers, platform owners and ‘intrapreneurs’ that innovate business models inside existing firms – who all create, interact and trade in digital artefacts and exploit complementarities.

Digitalisation is changing the way businesses form and operate. Platform users are not the key engineers of this digital transformation – that mantle falls to digital entrepreneurs.

Well-developed physical, financial and educational infrastructure means that the major advanced economies lead the world in digital entrepreneurship. North America and Europe rank highest in terms of new platform ecosystems. But developing economies are catching up fast with the emergence of key regional start-up hubs and rapid growth in new digital companies, especially those deploying artificial intelligence (AI), blockchain and robotics technologies. This is particularly true in Asia Pacific, which according to research firm Startup Genome, now accounts for close to a third of the world’s top start-up ecosystems. More generally, platformisation is spreading beyond start-ups to established companies, who increasingly use ‘Everything-as-a-Service’ business models, and charge for the use of a product rather than selling it outright.

An important corollary of new digital business models is the shift in major source of enterprise value. Compared with a traditional business, a digital firm will typically own relatively few physical assets and will generate much more of its value from intangible assets such as human capital, software and intellectual property (IP). However, the underlying processes that determine the value of intangibles are complex and difficult to quantify, in part because the legislation and litigation environment in which digital companies operate is itself still evolving. Intangible liabilities include potential obligations and contingencies that lead to reputation loss, IP infringements, claims for injuries or loss from platform/software users, or breaches of cybersecurity/privacy.

New digital firms typically generate their value from intangible assets. But risks to intangibles are complex and difficult to quantify and remain underinsured.

Not all risks are insurable, not least because some business risks are unquantifiable and largely non-diversifiable and are best carried by firms' investors. Nevertheless, insurance has a long history of adapting its solutions to help entrepreneurs cope with unexpected operational setbacks. Over time, the boundaries of insurability will move, in part due to the actions of entrepreneurs themselves, and as reliable data helps transform uncertainties into insurable risks. Commercial liability policies as well as affirmative covers like cyber and IP insurance will therefore evolve to accommodate some of the new intangible risks. Surveys by Aon/Ponemon indicate less than 20% of information assets are insured – suggesting a sizeable degree of underinsurance.

Small businesses in particular are underserved by the insurance sector. According to one U.S. survey, 44% of small businesses who have been operating for at least a year have never had insurance. This is despite the fact that almost half did not have any other mechanisms in place to help mitigate against risks. That could reflect entrepreneurs' limited appetite for insurance, perhaps because they underestimate the scale and importance of some risks, especially those outside of their control. In another survey, more than a third of small businesses experienced an event that could have led to an insurance claim. The high speed with which digital businesses can be set up and grown, as well as the changing legal environment and limited risk management expertise, may foster such blind spots.

Initiatives to increase awareness of emerging risks and take-up of existing insurances will help. This should be part of a broader portfolio of innovation to improve the value proposition of insurance for digital entrepreneurs.

Initiatives by insurers to increase awareness of emerging risks and the benefits of insurance will therefore help boost the resilience of new digital firms. In particular, specialist insurance staff who understand start-ups' risk protection needs as well as clearer, more simply-worded policies would enhance the perceived value of insurance.

Alongside such marketing initiatives, insurers need to pursue ways to sharpen the value proposition of insurance through:

- **Product innovation** – parametric insurance may be particularly suited where loss results from lack of access to or underperformance of products/services rather than physical damage or injury. Examples include reputation risk protection based on bespoke indices, insurance-backed guarantees for AI software and business interruption covers for cloud/IT outage. Insurers can also support firms through value-added services or by guaranteeing the value of intangible assets used as collateral for loans or safeguarding investors against crowdfunding fraud.
- **Process innovation** – automated underwriting and streamlined distribution, including through partnership with InsurTechs and collaboration with entrepreneurs to collect and analyse key data, will facilitate flexible and customisable cover for digital start-ups.
- **Organisational innovation** – a reconfiguration of insurers' business models to embrace APIs will allow them to connect better with digital platforms and gather business-relevant information. This will uncover meaningful opportunities to create highly granular risk calibration models and realise new insurance opportunities that appeal to digital entrepreneurs.



2. Introduction

Entrepreneurship – broadly described as any attempt at a new commercial venture or business creation – has long been recognised as an important contributor to innovation and economic growth. However, the empirical evidence for a direct causal link has been hard to establish. For example, while many studies document a correlation between smaller, younger firms and regional growth,¹ this could reflect the tendency of rapidly expanding areas to attract new firms rather than the impact of home-grown businesses on local growth.²

Entrepreneurship has long been recognised as an important contributor to innovation and economic growth.

In response, a new line of research has developed in recent years, which stresses the importance of entrepreneurial ecosystems for the impact of new businesses on broader economic development. From an ecosystem perspective, successful entrepreneurship derives from the dynamic interaction of innovators with the institutional environment in which they operate.³ Institutions are important because they influence the structure of economic incentives. Without property rights, for example, even highly talented individuals may lack the incentive to invest in physical or human capital or adopt more efficient technologies.⁴

Insurance is a key enabler by allowing entrepreneurs to focus on commercial and financial challenges without fearing the negative consequences of operational disruptions.

Insurance is a key aspect of that institutional landscape and correspondingly plays an important role in enabling entrepreneurship. Without insurance a society may be deprived of goods and services that were not produced because the risks were too great for an individual company to take on or the costs of holding liquid reserves to guard against potential loss were prohibitive. By pooling risks, insurance allows entrepreneurs to focus on the commercial and financial

1 Based on data on employer enterprises, OECD 2017 shows new businesses can create up to 8% new employment in regions, although there is considerable cross-regional variation.

2 Chatterji et al. 2014.

3 See Sussan and Acs 2017.

4 Acemoglu and Johnson 2005.

challenges of their business without fearing the negative consequences of sudden, operational disruptions. This encourages long-term investments in infrastructure and new projects, which should boost economic growth.⁵ The purchase of insurance may also help sharpen incentives to account adequately for future risks – for example, the inclusion of liability insurance is a way of incorporating the future 'quality' or performance of products in the calculation of the true costs of production. It can also enhance or promote trust in new technologies that, by definition, do not have a long track record.⁶

2.1 Insurable versus uninsurable risks

However, not all business risks are insurable. Some situations are so ambiguous – the possible outcomes or their likelihood are so unclear and/or the underlying causal factors so complex – that it is impossible to calibrate future developments and hence there is no immediate way to evaluate unforeseen eventualities.⁷ Customer demand for a new product, for instance, is unknown, at least initially, and proper solutions, technologies or business models often need to be explored. Such uncertainties appropriately reside with the providers of investment capital, including the founders of the firm, who are rewarded by the potential profits to be earned from the entrepreneurial endeavour.

Not all risks can be transferred to insurers. But over time, granular and increasingly reliable information can help transform uncertainties into insurable risks.

In contrast, for some future situations, the range of potential outcomes is tightly-enough defined and it is possible to quantify and assign individual probabilities to each of them. These events are in principle insurable in the sense that the risks can be hedged, pooled or otherwise neutralised by buying insurance to insulate against unfavourable outcomes. Obvious examples include pure risks such as natural disasters or product defects.

Over time, the borderline between insurable and uninsurable risk will move, including in response to the actions of entrepreneurs themselves. Granular and

increasingly reliable information in particular can help transform uncertainties into insurable risks. This applies to the overall amount of information as well as how it is distributed. Reducing information asymmetries can overcome problems like adverse selection and moral hazard, which undermine the ability/willingness of insurers to absorb risks.

2.2 The impact of digitalisation on entrepreneurship

Digitalisation has further shaped that dynamic, not least because of its profound effect on entrepreneurial opportunity creation and pursuit. There is no longer a tight coupling between products and their function: any digital device can be flexibly reprogrammed to perform different functions. Likewise, digital properties can be embedded in physical products, making them programmable, addressable, sensing, communicable, memorising, traceable and associable.⁸ This has fostered a new class of digital entrepreneurs whose business models are focused almost exclusively around creating value from combining different digital and physical functionalities to produce novel goods and services. A running shoe can be linked to a smartphone, for example, or online geospatial technology can be integrated within a car-sharing service.

New digital functionalities accelerate the creation and scaling up of these new business opportunities and change the contours of the competitive and risk environment by facilitating:⁹

- New types of contracts (e.g. based on the enhanced ability to monitor)
- Novel data capture and analysis (e.g. to model and influence consumers' behaviour)
- (Hyper) personalisation and mass customisation
- Crowdsourced inputs and solutions (e.g. to source capital (crowdfunding), ideas (crowdsolving), polling and voting (crowdvoting) and labour (crowdwork)).

New digital functionalities accelerate the creation and scaling up of new business opportunities and change the contours of the competitive and risk environment.

5 Using a stylised model calibrated on the U.S. economy, Robinson 2021 shows that fully completing the missing market for entrepreneurial risk improves aggregate productivity by 9% and aggregate output by 8%.

6 For a broad discussion of the role of insurance in understanding risks and promoting growth and stability, see The Geneva Association 2012.

7 For a discussion of such irreducible or radical uncertainty see for example Kay 2020.

8 Autio 2016.

9 More generally, the digital era is delivering a major shift in the nature of risks facing society. See further discussion in The Geneva Association 2018.

All these features have the effect of reducing the upfront investment required to start a new business as well as substantially reducing the cost of entrepreneurial experimentation.¹⁰

Instead of simple value chains, value-creating activities are increasingly organised around platform-centric ecosystems. Digital platforms – digital communities and marketplaces that utilise web-connected technologies to allow different groups to interact and transact on a large, disaggregated scale – provide the architecture on which digital entrepreneurs interact and engage with their partners and users to explore and exploit entrepreneurial opportunities.

Seen through this lens, digital entrepreneurship is not solely about the use of digital tools by new business founders. It refers to the whole way in which digital technologies such as the internet, social media, big data, AI and mobile and cloud solutions give rise to ways for new businesses to collaborate, design and deploy products/services, often using open shared resources and platforms. In other words, digital entrepreneurship is different from traditional entrepreneurship since the digital nature of the opportunity influences the process of entrepreneurship.¹¹

2.3 Structure of the report

Against that background, this report examines how insurers are developing insurance products and services to meet the needs of this new breed of digital entrepreneurs as their firms mature and gain scale, while ensuring that they do not overstep the boundaries of insurability. Drawing on insights from discussions with insurers and digital start-ups, a key finding is that while traditional policies are often flexible and adaptable, a portfolio of insurance innovation (product, process and organisational) will help cement the supportive role insurance plays in fostering entrepreneurship.

The next section digs deeper into who digital entrepreneurs are and the key geographies and business areas in which they operate. Section 4 discusses the emerging risk landscape facing digital firms, both in terms of potential losses to their own assets and contingent liabilities they could have to other parties. Section 5 explores the ways in which insurers are developing their underwriting solutions to support digital businesses, and the possible avenues for future insurance innovation.¹² Finally, section 6 offers some concluding remarks.

While traditional insurance policies are often flexible and adaptable, innovation by insurers will help cement the supportive role they can play in fostering digital entrepreneurship.

10 Based on Varian 2010 and Naudé and Liebrechts 2020.

11 Naudé and Liebrechts 2020.

12 Insurers may also invest in private corporations, including new business ventures, as part of their asset management portfolios. However, the focus of this paper is largely on insurers' activities in intermediating risk via the liability side of their balance sheets.



3. Digital entrepreneurs, platforms and business model innovation

3.1 Defining digital entrepreneurs

Some commentators have claimed that every entrepreneur is now a digital entrepreneur in the sense that virtually all use digital technology to grow and build their businesses.¹³ However, as discussed in Box 1, digital entrepreneurs are distinct from platform users.¹⁴ Digital entrepreneurs produce and trade in so-called digital artefacts – for example, data files of texts, pictures, audios and videos, as well as computer codes – on digital artefact ‘stores’ (i.e. platforms) or they create these digital platforms themselves.

Traditional entrepreneurs who sell goods online or independent contractors who (for example) drive a taxi as part of a ride-hailing platform, do not create digital artefacts, they merely use them to facilitate their business. By the same token, those who develop digital artefacts are not always entrepreneurs. Individuals may store and share software code or knowledge (via platforms like GitHub or Wikipedia) although their motivation is typically not to exploit a profit opportunity or develop the idea or concept into a business. Similarly, even though social media influencers (e.g. YouTubers, Instagrammers and TikTokers) may generate income from their digital outputs, this is typically reward for their labour rather than entrepreneurial effort (i.e. compensation for their work rather than the payoff from innovative yet risky business ventures).

Digital entrepreneurs are distinct from users of platforms. They produce and trade in digital artefacts – items stored on digital/electronic media that offer functionality and value to the end-user.

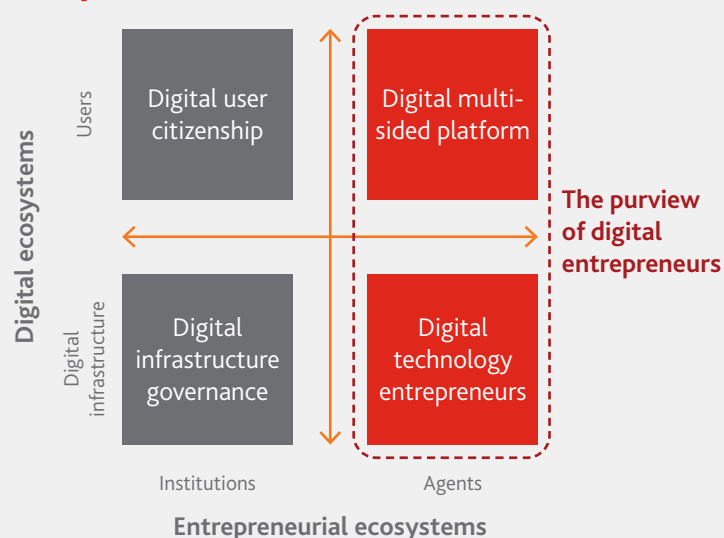
¹³ Spencer 2014; Accenture 2014.

¹⁴ Remane et al. 2017 distinguish pure digital and digital-enabled business models. Pure digital business models, like Google as a search engine, create and capture the value and build their business model on digital artefacts only, without the use of physical assets in their value creation activities. Digital-enabled business models, e.g. sensor-as-a-service, require both physical assets and digital artefacts for the creation of value.

Box 1: Who is a digital entrepreneur?

From an entrepreneurial ecosystem perspective, the outcomes of entrepreneurship derive from the dynamic interaction of innovators (agents) with the institutional environment (institutions) in which they operate. The latter includes the structure of property rights and the presence of effective markets for exchange. Combining that entrepreneurial framework with the two key defining criteria for a digital ecosystem – technological infrastructure and people (i.e. users) – permits a helpful delineation of the main features and actors of the new digital entrepreneur ecosystem (Figure 1).

Figure 1: The digital entrepreneur ecosystem



Source: Song 2019

- *Digital multi-sided platforms*: Intermediaries who facilitate the exchange of information and goods/services between users, reducing or eliminating transaction and search costs. Some platforms are two-sided. Uber, for example, connects riders with drivers. Others have more than two sides. Facebook, for example, has six sides: friends (senders and receivers), businesses (senders and receivers), advertisers and app developers.
- *Digital technology entrepreneurs*: Agents that build complementary products and services connecting to digital platforms, including new software applications (or 'apps'). These entrepreneurs are also often instrumental in experimenting with new technologies such as augmented/virtual reality, AI and distributed ledgers (e.g. blockchains).
- *Digital user citizenship*: Refers to individuals who use digital technologies for some type of exchange (or transaction) and can be either/both producers or consumers. Gig workers like Uber drivers are users on the supply side and Uber riders are users on the demand side. Similarly, Airbnb hosts and online resellers on eBay/Amazon Marketplace supply a service or good for profit, while Airbnb guests and customers of e-commerce represent the demand side.
- *Digital infrastructure governance* is based on institutions that keep the internet open, secure, transparent and free. Most obviously governments promote data security and integrity and seek to ensure digital technologies foster competition and do not inadvertently encourage monopolistic power.

Digital entrepreneurs tend to operate in the right-hand quadrants of Figure 1. They produce and trade digital artefacts – items stored on digital/electronic media that offer functionality and value to the end-user. This could be on a standalone basis, although digital entrepreneurs increasingly interact within established platforms to supply complementary products and services. For example, app developers often produce new software for exchange on platforms like the Apple Store and Google Play.

Source: The Geneva Association

Figure 2: Digital entrepreneurs and the sharing economy



(1) Self-employed refers to the sole proprietor of the business, a member of a business partnership or an independent contractor.
 (2) Online crowdwork offers paid work (sometimes subject to requester satisfaction) for specified tasks and the initiating actor is the requester.
 (3) Intrapreneurship is defined as entrepreneurship within an existing organisation whereby employees undertake innovation and pursue business opportunities.
 (4) 'Playbour' (the combination of play and labour) crowdwork is based on speculative or non-paid work and the initiative lies with the requester.

Source: The Geneva Association

Figure 2 summarises how digital entrepreneurs can be seen in the context of the broader sharing economy. They can be generally classified into three camps:

- *Owners of digital platforms*, both new and established
- *Tech start-ups/app developers* – firms that produce new hardware or software for computers or mobile devices (often distributed through an existing platform)
- *Intrapreneurs* – employees of an existing firm who develop digital innovations inside the organisation (e.g. a new platform business model).

Digital entrepreneurs can generally be classified into three camps: owners of digital platforms, tech start-ups/app developers or intrapreneurs.

3.2 The platform economy

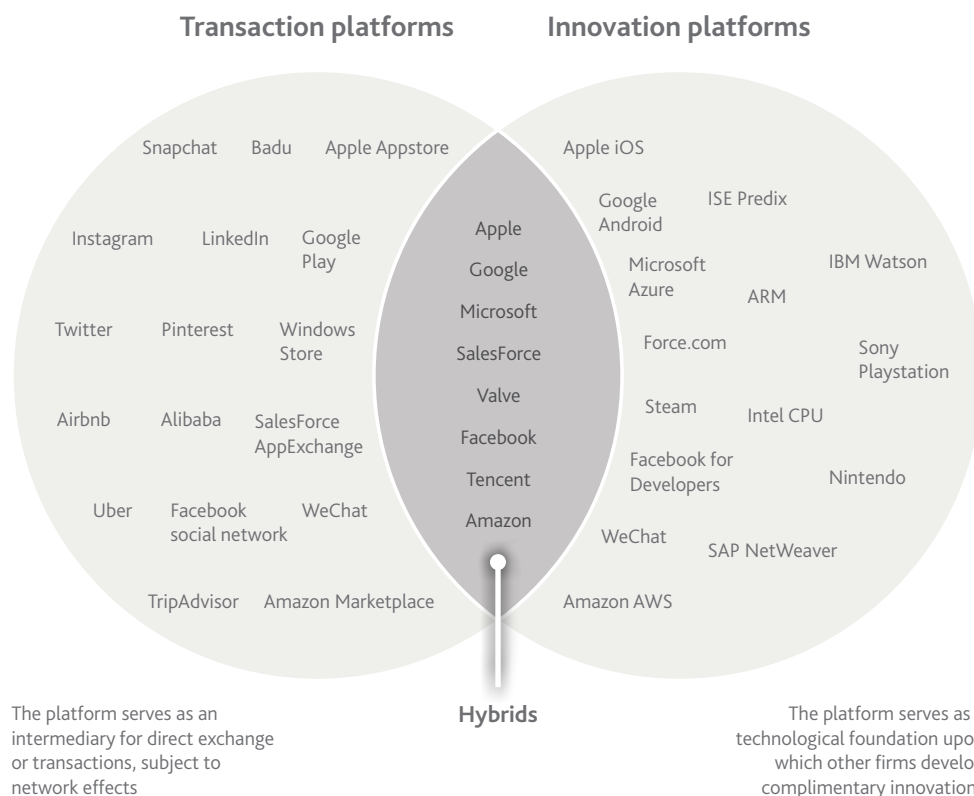
These digital entrepreneurs are the key engineers of the growing platformisation of societies – the penetration of the infrastructures, economic processes and governmental frameworks of platforms in different economic sectors and spheres of life.¹⁵ Through the design and commercialisation of new digital capabilities via new or existing platforms, digital entrepreneurs are extending the reach and scope of the internet. This enables products and services to be created, marketed, delivered and supported completely online – the platform economy.¹⁶

Digital entrepreneurs are the key engineers of the growing platformisation of societies.

Broadly speaking, it is possible to distinguish platforms on the basis of their principal activity in supporting digital commerce. This yields two basic types:

- *Innovation platforms.* These facilitate the development of complementary products and services, such as PC or smartphone apps (built mostly by third-party developers without traditional supplier contracts), that add functionality or assets to a platform. Value is extracted directly by selling or renting a product or monetisation may occur indirectly by selling advertising or other ancillary services.
- *Transaction platforms.* Online marketplaces that make it possible for participants to exchange goods and services or information. These platforms create value by enabling exchanges that would not otherwise occur without the platform. Intermediaries typically capture value by collecting transaction fees or charging for advertising.¹⁷

Figure 3: Basic platform types



Source: Cusumano et al.¹⁸

15 Poell et al. 2019.

16 The term is not always used consistently, but in general the platform economy refers to the commercialisation of digitally-enabled activities in business, politics and social interaction. It is narrower in scope than the sharing/collaborative economy where underutilised assets are shared between individuals, for monetary reward or not.

17 Cusumano et al. 2020.

18 Ibid.

A growing number of successful innovation platforms have integrated transaction platforms into their business models. Likewise, some successful transaction platforms have encouraged third parties to create complementary apps and services. The well-known, mega platforms operated by companies like Amazon, Apple, Microsoft and Google are prominent forms of these hybrid platforms (Figure 3).¹⁹

Today, platforms operate in nearly every market and the companies driving this trend are diverse and disparate. Alongside Big Tech companies, many platform businesses are actually start-ups. Platforms enable small companies to build, innovate and grow fast. Some, like Uber and Airbnb, are start-ups that became household names in less than 10 years. More broadly, many multisided platform ecosystems are populated with independent digital entrepreneurs that develop hardware/software to build products that connect to platforms, including millions of smartphone apps.²⁰ Indeed, the success of digital platforms often depends on these complementary actors.²¹

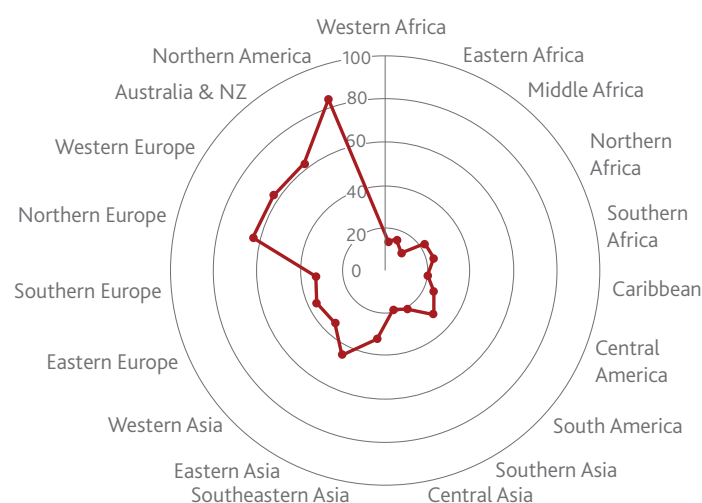
Today, platforms operate in nearly every market and they enable small companies to build, innovate and grow fast.

Established industrial firms are also creating platforms of their own or partnering with other platforms. Their aim is often to build connections of third-party firms and individual contractors that allow them to bypass traditional supply chains and labour pools. For example, Siemens have created an innovation platform for the collaborative development of additive manufacturing/3D printing. The platform connects designers and manufacturers in an open marketplace to co-create new applications of the technology and streamline production processes.²²

3.3 Developed versus developing economies

Measuring digital entrepreneurship is not straightforward and relies on indirect metrics of the degree of experimentation, innovation and value creation using digital and platform technology. Figure 4 summarises the latest international picture for country-level indices of digital entrepreneurship.²³ There is considerable variation both across and within regions. North America ranks highest with parts of Africa showing the lowest levels of digital entrepreneurship.

Figure 4: Digital entrepreneurship* by region



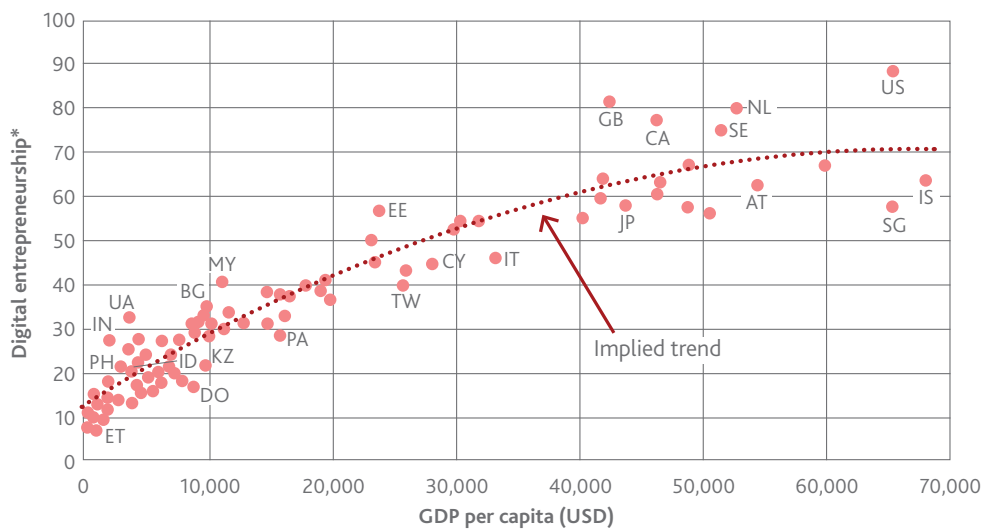
* Simple average of indices for digital multisided platforms and digital technology entrepreneurship

Source: GEDI²⁴

Measuring digital entrepreneurship is not straightforward and there is considerable variation across and within regions.

19 Akin to platform superstructures, they not only act as platforms for a certain segment of the market, but also provide the infrastructure for other platforms.
 20 According to some estimates, the number of mobile apps is increasing rapidly and approached 12 million globally in 2020, up 33% on the previous year. Chinese app stores accounted for most of the recent growth. See RiskIQ 2020.
 21 Srinivasan and Venkatraman 2018.
 22 <https://additive-manufacturing-network.sws.siemens.com/>
 23 Developed by the Global Entrepreneurship and Development Institute (GEDI), these indices bring together measurable indicators on the most important aspects of digitalisation to form national indices and subindices of the digital platform economy. See GEDI 2020.
 24 GEDI 2020.

Figure 5: Digital entrepreneurship* and economic development



* Simple average of indices for digital multisided platforms and digital technology entrepreneurship. The trend line is calculated excluding Middle Eastern oil producers and countries with GDP per capita greater than USD 70,000. The trend is estimated as a third-degree polynomial, which explains around 90% of the variation between development (measured by GDP per capita) and digital entrepreneurship. Labels refer to two-digit ISO country codes.

Source: GEDI, IMF and The Geneva Association calculations²⁵

In large part, the country variation reflects the stage of a nation’s economic development – scores for digital entrepreneurship tend to correlate positively with GDP per capita (Figure 5). The precise causal mechanisms underlining such a relationship are likely to be complex, although no doubt advanced economies benefit from well-developed physical, financial and educational infrastructure that supports digital entrepreneurs. For example, a robust telecommunications network as well as deep pools of financial capital and skilled labour are all important for entrepreneurship.

A number of countries stand out for digital entrepreneurship: the U.S., U.K., Netherlands, Canada and Sweden among developed economies, and India, Ukraine, Malaysia and Estonia among emerging economies.

Controlling for economic development by fitting a (non-linear) implied trend through the data points in Figure 5, a number of countries stand out for digital entrepreneurship. The U.S. has the highest score and is above the trend line, as are Canada, the U.K., the Netherlands and Sweden. Among

emerging economies, India, Ukraine, Malaysia and Estonia are positive outliers. In contrast, a number of advanced European countries and relatively rich Asian countries underperform relative to the size of their economies.

3.4 Local start-up ecosystems

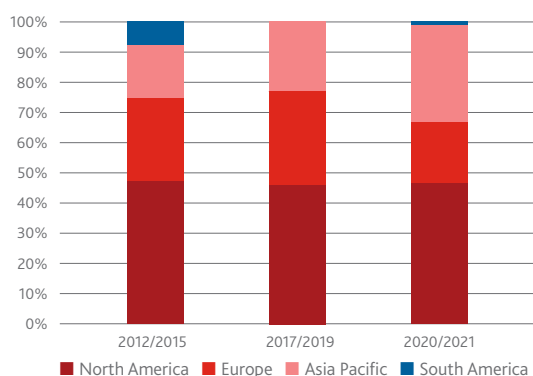
However, country-level indicators are unlikely to capture the full extent of digital entrepreneurship. In particular, within individual countries local start-up ecosystems often catalyse technology-led innovation. Concentrations of talent, resources and finance in particular regions or cities enable entrepreneurs to benefit from network effects – for example, business founders can more easily find early-stage investors – which increases the potential for economic value creation.

From that viewpoint, the digital entrepreneurial strength of the U.S. and the U.K. is echoed in the relative standing of their local start-up ecosystems. Silicon Valley, New York and London occupy the top three slots in a global ranking of start-up hubs, positions they have held for several years.²⁶ Further, U.S. cities occupy five of the top 10 slots, reflecting their relative attractiveness across a range of criteria, including a track record of start-up development, access to finance, customers and collaborators, as well as available pools of talent, experience and knowledge.

25 GEDI 2020; IMF 2021.

26 <https://startupgenome.com/>

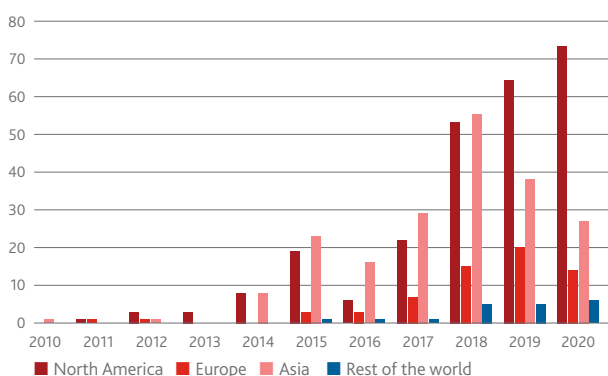
Figure 6: Share of top global start-up ecosystems, by region*



* Based on the global rankings of around 40 start-up hubs. Average ranking over the two years.

Source: *Startup Genome*²⁷

Figure 7: Number of unicorns, by region*



* Refers to currently active unicorns and excludes exits.

Source: *CB Insights*²⁸

Other cities from around the world, however, have become increasingly important start-up hubs. In particular, some cities in developing economies have rapidly developed their business ecosystems and have overtaken some counterparts in advanced economies, mainly in Europe. A major beneficiary of this catch-up process has been Asia Pacific, which in 2020/21 accounted for close to a third of the world's top start-up ecosystems, up from a fifth in 2012 (Figure 6). Furthermore, of the 11 new ecosystems that made the list of leading ecosystems, six were from Asia Pacific.

Certain cities in developing economies, particularly in Asia Pacific, are rapidly developing their start-up ecosystems and have overtaken counterparts in some advanced economies.

Mainland Chinese cities, especially Beijing and Shanghai, have had a meteoric rise in recent years, breaking into the world's top 10 start-up ecosystems.²⁹ For some market segments like FinTech, start-up hubs in Beijing and Shanghai can compete with the U.S.'s Silicon Valley. Start-ups there leverage the large domestic market and also harvest insights from financial and non-financial data in ways that expand the scope of digital platforms and complementary businesses.

The scaling up of tech businesses has also become more international. Although the majority of 'unicorns' – privately held start-ups whose value is estimated at more than USD 1 billion – are based in North America, they are increasingly emerging elsewhere (Figure 7). Asia now boasts over 200, two thirds of which are Chinese companies. Furthermore, the time taken to achieve unicorn status has fallen. For example, in India the average length of time from founding to becoming a unicorn has fallen by a third since 2005 to less than three years in 2020.³⁰

3.5 Mature and nascent start-up subsectors

Fintech is one of the more mature areas of start-up activity (along with cybersecurity, life sciences and digital media). After rapid growth in firm creation and early-stage funding – nearly one in every 10 global start-ups is linked to Fintech – many start-ups are well along their lifecycle with relatively more late-stage financing and exit transactions. Within Fintech, one fast-maturing field is developing tech-led innovations in insurance – often collectively called InsurTech. Globally, funding for InsurTech start-ups picked up sharply over the past few years, with late stage investment progressively accounting for a larger share of deals (see Box 2).

²⁷ Startup Genome 2021.

²⁸ <https://www.cbinsights.com/research-unicorn-companies>

²⁹ Ibid.

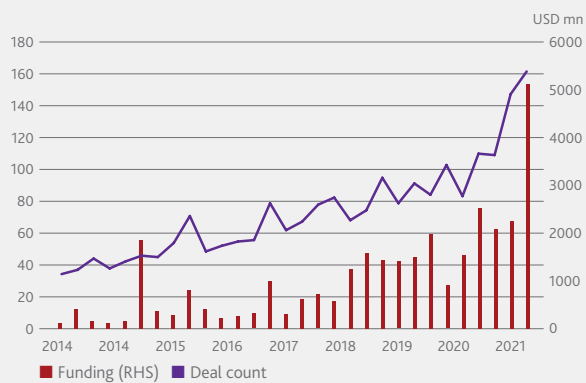
³⁰ Orios 2020.

Box 2: The InsurTech start-up boom

InsurTech start-ups deploy new technologies, analytical techniques, business processes or business models to deliver some of the services typically provided by insurers and/or traditional intermediaries. InsurTech has expanded rapidly since its first appearance in around 2010. According to some estimates there are now close to 3,500 InsurTech start-ups, up from around 500 in 2015.³¹

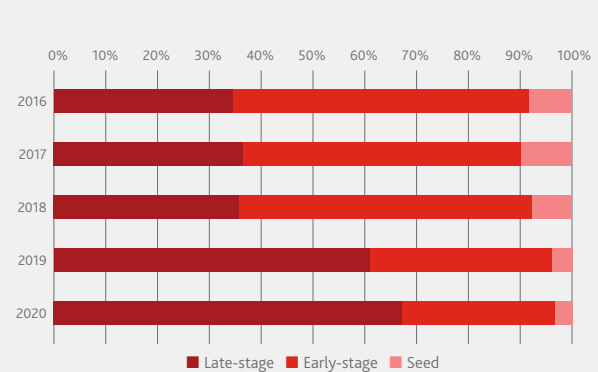
The number of venture funding transactions for InsurTech and the aggregate amounts raised have increased significantly, especially over the past three years (Figure 8). Investments increasingly feature more mature start-ups, with late-stage financing accounting for more than 60% of funds raised in 2019 and 2020 (Figure 9). The number of acquisitions of InsurTechs also picked up recently – according to Porch, as many as 81 InsurTech companies were acquired in 2020, the highest number in a single year – another sign of a maturing subsector.³²

Figure 8: InsurTech funding value and no. of deals



Source: WillisTowersWatson³³

Figure 9: InsurTech funding by stage of finance



Source: BCG³⁴

Many InsurTechs are IT or software companies that offer programming, data and analytics capabilities to incumbents in the insurance sector, including lead generation services.³⁵ Of the start-ups that distribute insurance to corporate customers, most fall into one of three types:³⁶

- *Pure intermediaries and market places*: these enjoy relationships with multiple carrier partners and licences to sell their products. Examples include CoverHound, CoverWallet and Embroker.
- *Specialised managing general agent (MGA)-brokers*: companies vested with underwriting authority from an insurer who perform key functions such as underwriting and pricing, binding coverage, appointing agents or settling claims. Examples are Corvus, Celerity Pro and Loadsure.
- *Full-stack insurance carriers*: insurers who control all the risk selection, underwriting, profitability and losses and are also responsible for licencing and meeting regulatory capital requirements. Examples are Next and Vouch.

Source: The Geneva Association

31 Porch 2021.

32 Ibid.

33 WillisTowersWatson 2021.

34 BCG 2021.

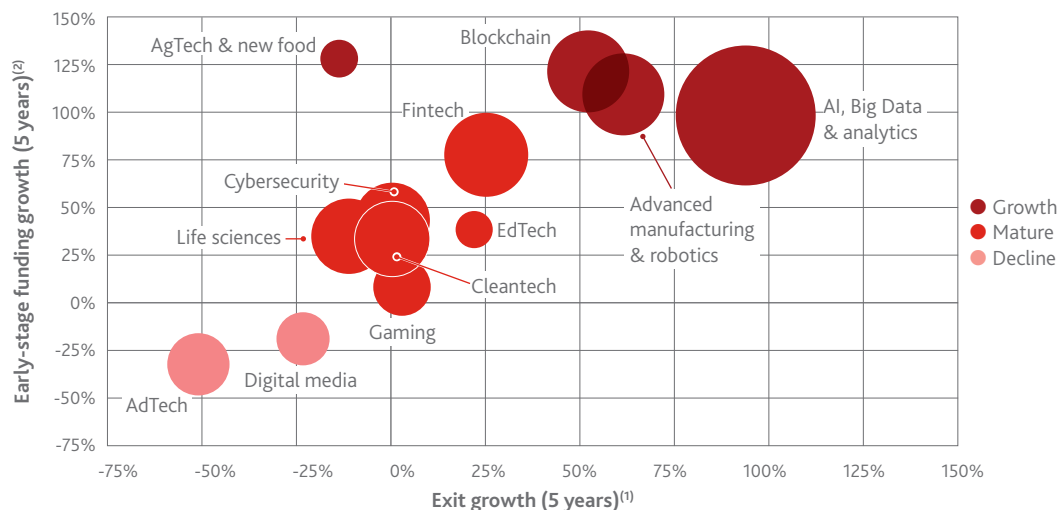
35 A recent study found that about 48% of InsurTech companies are IT and Software-as-a-Service (SaaS) companies.

36 Lazarow 2019.

Recently, subsectors like AI, blockchain and robotics, which rely heavily on technological breakthroughs, research capacity and IP to succeed, have emerged as the fastest growing areas for digital entrepreneurship (Figure 10).

Recently, subsectors like AI, blockchain and robotics have emerged as the fastest growing areas for digital start-ups.

Figure 10: Start-up activity by subsector



(1) Count of all exits, growth from 2014/15 to 2019/20

(2) Count of all early-stage funding deals, growth from 2014/15 to 2019/20

Size of bubble reflects share of global start-ups.

Source: *Startup Genome*³⁷

Some subsectors may be close or even have passed their cycle peak, with the rate of exits significantly outpacing firm creation. This is particularly true in subsectors dominated by large platforms, such as AdTech (tools for programmatic advertising), or in pure software and internet areas like digital media and gaming. Sometimes slowdowns can be temporary. For example, after waning in 2019, the COVID-19 pandemic provided a boost for start-ups deploying technology in education (EdTech), especially for those offering mobile-based tools and immersive learning experiences through augmented/virtual reality. According to data from CB Insights, EdTech investment picked up sharply in 2020 with the majority of deals involving early-stage start-ups.³⁸

3.6 Everything-as-a-Service

Beyond start-ups, digitalisation is transforming the way traditional firms organise their existing operations and unlocking new business models through intrapreneurship. In particular, the development of cloud computing, mobile telecommunications, social networking and the Internet of Things (IoT), are enabling firms to deliver value-based services instead of simply selling their own products.³⁹ What started off as a niche 'Software-as-a-Service' model in IT has evolved to become an all-encompassing business approach where almost anything can be made available as-a-service, from platforms themselves, to storage, infrastructure and equipment. For example, a compressed-air company can sell compressed air instead of air compressors; a car manufacturer or a dealership can provide transportation services instead of selling cars.

More broadly, digitalisation is unlocking new business models that allow almost anything to be made available as-a-service.

³⁷ Startup Genome 2021.

³⁸ CB Insights 2020.

³⁹ According to a recent report, 61% of enterprises already use IoT applications. See Kaspersky 2020.

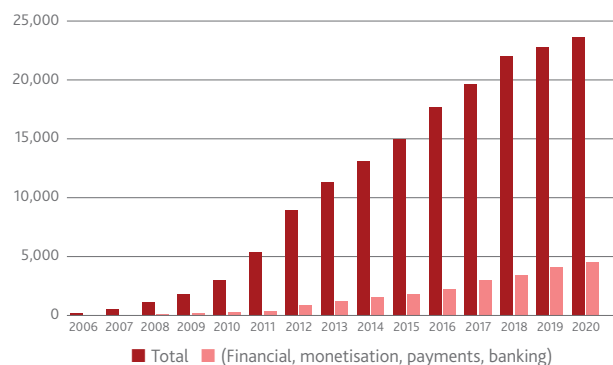
This 'Everything-as-a-Service' (XaaS) business model does not imply that everything is or will become digital or virtual; physical products are often still needed to provide the underlying services. Rather, XaaS means that ownership is uncoupled from access to those assets. In this way, firms and households pay only for what they use in areas like software, infrastructure and machinery.

For XaaS to work, asset owners or suppliers need to know what services are provided, how, when and to whom. For that, they need tools to connect the necessary sensors, store and aggregate the information and connect to enterprise resource planning systems. In tandem with cloud computing and IoT, the development of APIs that allow software applications and systems to communicate with each other has been crucial in achieving this connectivity. With the new distributed environment, an organisation's core assets can be reused, shared and monetised through APIs that extend the reach of existing services or provide new revenue streams (see Box 3).

APIs are crucial in letting asset owners and suppliers know what services are provided, how, when and to whom.

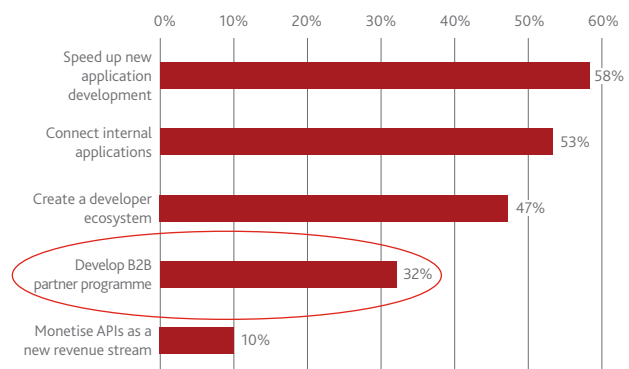
According to ProgrammableWeb, there were over 23,000 public APIs active in 2020, which represents a more than four-fold increase in less than a decade (Figure 11). These APIs cover hundreds of categories and enable independent developers to build new apps based on a firm's platform. There are many other private APIs, however, that live on corporate networks.⁴⁰ Alongside improving internal efficiencies, these private APIs are often core to building partnerships with other firms in order to deliver 'as-a-service' functionality. Surveys of technology leaders indicate close to a third of respondents use APIs to develop B2B partner programmes (Figure 12).

Figure 11: Number of public APIs



Source: ProgrammableWeb⁴¹

Figure 12: Top API initiatives (% of respondents)



Source: Google⁴²

40 A recent survey found that in 2020, 50% of APIs were solely used for internal uses, 44% for both internal and external use and 6% were exclusively designed for partners or developers outside the company. See Google 2021.

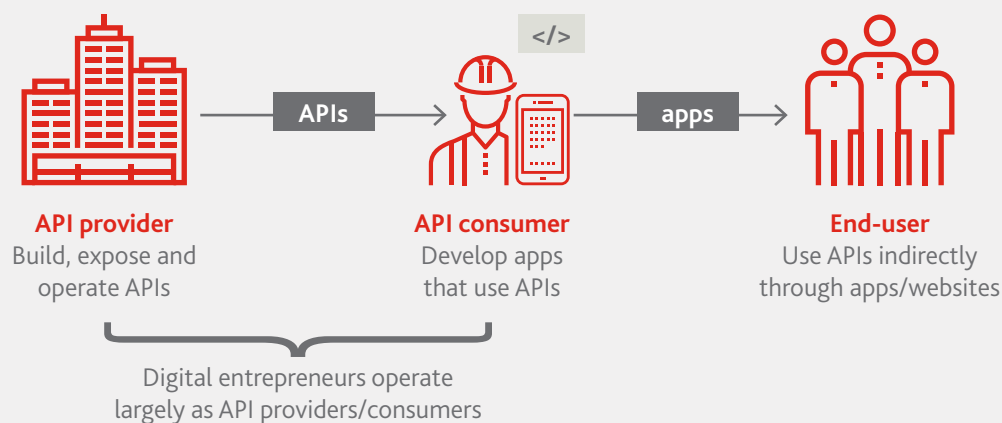
41 <https://www.programmableweb.com/category/all/apis>

42 Google 2021.

Box 3: The API economy

APIs are central to digital entrepreneurship ecosystems. They allow digital entrepreneurs – platform owners, tech start-ups and intrapreneurs – to interact with, customise and extend the functionalities of an existing platform or build their own. Most web services include APIs that can be incorporated into other tools and ultimately deployed in apps used by customers. A good example is the Google Map API, which is open so that anyone can integrate it within their own services.⁴³ Likewise, Facebook provides an open API that allows third-party tools to create photo albums or post to a user’s newsfeed or to their Twitter account.

Figure 13: Stylised representation of the API value chain



Source: The Geneva Association based on yalantis.com

The API economy sits underneath the broader digital platform economy and provides various ways for digital entrepreneurs to generate economic value (Figure 13). These include charging, on a subscription or pay-as-you-go basis, for using an API or the apps in which it is used, and online advertising revenues captured in the process of driving users to a platform.

Source: The Geneva Association

⁴³ For example, a mobile application for home buyers can incorporate interactive maps and navigation into its user experience by outsourcing that functionality to Google Maps. Each time that mobile application displays a new interactive map, it does so by sending a request across the Internet to a special API offered by Google.



4. The risk landscape facing digital entrepreneurs

An important corollary of the proliferation of new digital business models is the change in the major source of enterprise value. Traditionally, a firm generated economic value (i.e. a stream of future net cash flows) by deploying physical capital – stock, buildings, machinery and equipment – together with labour. As a result, the value of tangible assets recorded on the balance sheet (less any recognised liabilities like debt) provided a reasonable guide to the company's net worth. Today, a firm's value is much more related to intangible (i.e. knowledge-based) assets such as reputation, human capital and IP, some of which are not well represented in conventional accounting statements.

The proliferation of new digital business models underpins a shift in the major source of enterprise value towards intangible assets such as reputation, human capital and IP.

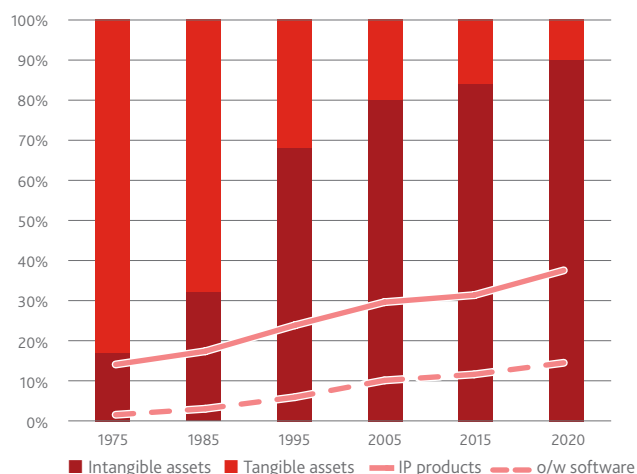
According to some estimates, intangible assets now make up around 90% of the total value of firms in the U.S. stock market, up from less than 20% in the 1970s (Figure 14). While the rise of Big Tech companies epitomise the change, the phenomenon is more general. Established industrial and retail firms as well as small and medium-sized entities (SMEs) have embraced digital business models and the associated shift in value creation. The share of intangible investments in total U.S. business investments has risen substantially (from under 15% in the early 1980s to more than 35% in 2020 – Figure 14).

This move was well underway before COVID-19, although the pandemic has accelerated the trend, with digital transformation now taking weeks rather than months or years. According to a McKinsey study, the pandemic has brought forward the digitalisation of businesses' customer and supply chain interactions by three to four years, whilst the roll out of digital offerings has been accelerated seven years.⁴⁴ Relatedly, the number of new business formations in the U.S. surged in 2020.⁴⁵

⁴⁴ McKinsey 2020a.

⁴⁵ O'Donnell et al. 2021.

Figure 14: Asset decomposition of S&P 500 and share of U.S. business investment in intellectual property



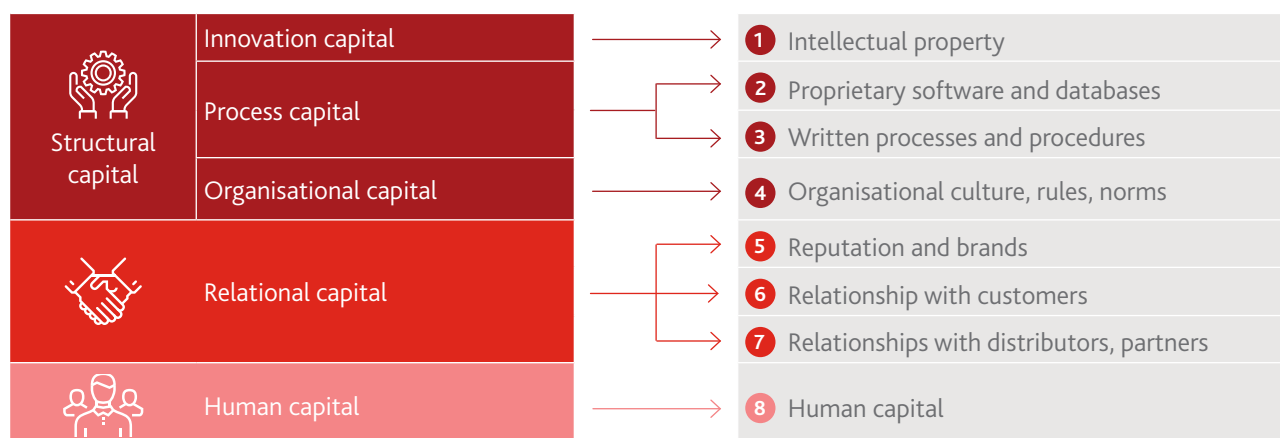
Intangible assets now make up around 90% of the total value of firms in the U.S. stock market, up from less than 20% in the 1970s.

The bars represent the estimated decomposition of the market capitalisation of the S&P 500 between tangible and intangible assets. The lines refer to the share of business investment in intangibles.

Source: Ocean Tomo and US Bureau of Economic Analysis⁴⁶

Broadly speaking, the intangible assets of a business reflect the contribution of its people, both staff and founders (human capital), relationships with customers and suppliers (relational capital), and everything that is left when the employees go home, including software and IP (structural capital) – see Figure 15.⁴⁷ For digitally native enterprises whose business model is primarily or entirely online, the intense use of software and user-generated content supporting their platforms and websites are absolutely critical to their business. In contrast, many digital start-ups own relatively few physical assets, especially if they forego a headquarters and rely on co-working spaces.

Figure 15: Categories of intangible assets



Source: Lloyd's of London/KPMG⁴⁸

As tech companies grow and mature, they may become less asset-light depending on the market place in which they operate. Well-known platform businesses such as Uber and Airbnb, for example, have invested in physical property (e.g. vehicles and hotels) as part of a strategy to gain some control over supply in a system where the providers are free to move between platforms.⁴⁹ But fundamentally, digital companies' main source of economic value is linked to how well they manage their intangible rather than physical assets.

46 Ocean Tomo 2020.

47 Ibid.

48 Lloyd's of London/KPMG 2020.

49 Lai 2019.

The factors that influence the value of intangibles are, however, complex and not always fully understood. They include those that boost the firm's value as well as obligations and contingencies that undermine its net worth (i.e. intangible liabilities such as loss of reputation or unsafe working conditions or products that injure employees or customers and lead to possible legal claims).⁵⁰ Intangible risks are difficult to quantify yet ultimately could threaten the viability of a firm. Moreover, some risks may lay dormant, especially as some intangibles are not recognised in formal financial statements, magnifying the possible damage that can occur before remedial action is taken.

4.1 Cyber risks

Digital businesses are especially vulnerable to cyber risks given they rely heavily on computer hardware, software and the internet. Many small businesses, including start-ups, have limited resources devoted to cybersecurity.⁵¹ One recent study found that a third of U.S. and U.K. companies with 50 or fewer employees use free, consumer-grade cybersecurity and more than two in five companies don't have any type of cybersecurity defence plan at all.⁵² This makes them prime targets for cybercriminals seeking business and consumer data or intellectual property and trade secrets. If lost or stolen, some forms of personally identifiable information can be used to infiltrate a victim's accounts and networks directly, such as account numbers and passwords.⁵³ As well as the cost of repairing any system damage, this presents a major liability risk, with

Intangible risks are difficult to quantify yet ultimately could threaten the viability of a firm.

large data breaches often triggering litigation from affected consumers, business partners and investors.

Greater reliance on cloud computing and integration of IoT devices also increases the routes for malicious attackers to evade a company's defences and infect its network, bringing new data privacy and security challenges. In particular, ransomware and supply-chain attacks – where hackers manipulate the code in third-party software in order to compromise 'downstream' applications – raise significant potential for business interruption.⁵⁴ It is no surprise therefore that data security and privacy, business continuity and IT resiliency are seen as the major risks for tech companies and are expected to become more important (Figure 16). Although perceived as less pressing, third-party liability exposures also feature among tech firms' top risks (e.g. tech errors and omissions), perhaps linked to the challenges of maintaining adequate controls in the face of rapid technological change.



50 The term 'intangibles' refers to the set of intangible assets and liabilities while intangible capital can be thought of as the difference between two. See for example Delgado et al. 2018.

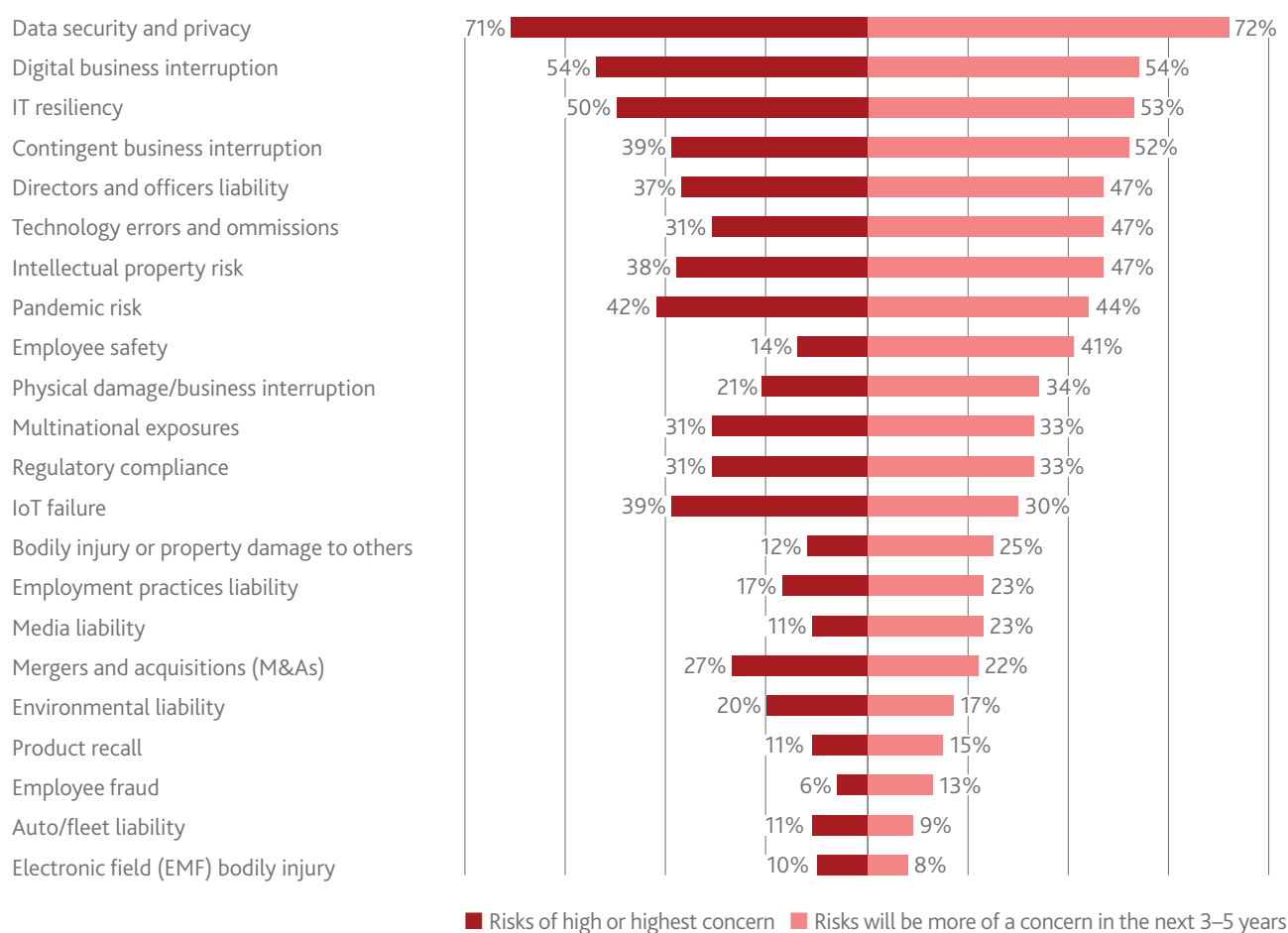
51 Research from the U.K. government found that 78% of small businesses consider cybersecurity a priority, but only 26% of those businesses have formal cybersecurity policies in place. See Department for Digital, Culture, Media and Sport 2019.

52 PRWeb 2020.

53 The loss of even seemingly innocuous forms of personally identifiable information can put companies at risk — the more cybercriminals know, the easier it is for them to manipulate and defraud their victims. See Schuler 2021.

54 The recent SolarWinds attack demonstrates the pervasiveness of potential harm from a cyberattack. Attackers used compromised software to steal data, corrupt targeted systems, or gain access to other parts of the victim's network, magnifying the overall cost of the initial breach. See Pritchard 2021.

Figure 16: How do you view the following risks in your company, now and in three years?* (% of respondents)



* Based on a responses from more than 170 technology risk professionals from around the world. The survey covers SMEs although the sample is skewed towards large firms.

Source: Marsh⁵⁵

4.1.1 Open-source vulnerabilities

Open-source software (OSS) – computer code created and developed through voluntary collaboration of independent software developers – has been a boon to digital entrepreneurs. Increasingly accessible via development platforms that allow users to extract ready-made code, OSS has enabled developers with minimal programming experience to build rapidly deployable applications.⁵⁶ According to one recent study, 90% of IT leaders surveyed use open source code, especially for IT infrastructure modernisation (64%), application development (54%) and digital transformation (53%).⁵⁷

OSS has been a boon to digital entrepreneurs but the distributed and unmanaged development model can create additional cyber risks.

While OSS may be no more intrinsically error-prone than other computer code, the distributed development model brings new operational risks. Unintentional vulnerabilities are easier for cybercriminals to uncover and exploit.⁵⁸ The unmanaged nature of OSS, especially the potential for

55 Marsh 2021.

56 See <https://thystack.technology/low-code-no-code-security-risks/>

57 Red Hat 2021.

58 In 2020, the percentage of codebases containing vulnerable open source components rose to 84%, a 9% increase from 2019. Similarly, the percentage of codebases containing high-risk vulnerabilities jumped from 49% to 60%. See Bals 2021.

abandoned or outdated components, also means bugs and persistent security weaknesses may go unchecked.⁵⁹

4.1.2 **Crypto currencies and asset tokenisation**

Small businesses, especially young firms, are embracing cryptocurrencies. According to a survey by specialty insurer Hartford Steam Boiler (part of Munich Re Group), more than one third of SMEs in the U.S. accept cryptocurrency as payment, and even more (close to 60%) have purchased crypto for their own use.⁶⁰ More generally, asset tokenisation – a process that converts assets, including fiat currencies, commodities, real estate, and art and collectibles, into digital tokens on a blockchain platform – is growing in significance, especially among tech start-ups. However, the underlying distributed ledger technology is nascent and still largely unproven, exposing firms to potential cyber fraud and security/privacy breaches, including the theft of sensitive information.⁶¹

4.2 **Intellectual property infringements**

Many businesses assume they are immune to IP liability risks (i.e. third-party infringement claims) because they hold some form of patent, copyright or trademark, which will typically require due diligence searches to be undertaken before being granted. Given the volume of existing IP rights, however, it is nearly impossible to guarantee a company does not infringe on someone else's IP. Property rights may also overlap, and patents rarely cover an entire product.⁶² Non-practicing entities (commonly known as 'patent trolls') opportunistically acquire many patents in order to sue companies for infringement or enforce licence fees. SMEs and start-ups are often targets given their limited resources to defend an action.⁶³

The volume of existing IP rights means it is nearly impossible to guarantee a company does not infringe on someone else's IP.

OSS is also often governed by protectable IP rights, most notably copyright, as set out in the associated terms of use. These may be relatively innocuous. But some licences stipulate that the right to freely distribute the software applies to any derivative programme that make use of the code.⁶⁴ There can also be multiple licences that apply to one piece of software, which can cause issues of licence compatibility if there are conflicting terms. Complying with open source licenses has become important because courts will enforce their terms and the omission of an OSS licence management or compliance system could be sufficient to establish negligence.^{65,66}

4.3 **Unanticipated indirect liability for third-party torts**

Digital platforms often claim that they simply provide matching services for their users and suppliers. Yet this passive intermediary description sits increasingly at odds with the economic realities of some platform business models and has been subject to considerable legal challenge.

Claims that digital platforms simply provide matching services for users and suppliers sit increasingly at odds with the economic realities of some business models and have been subject to legal challenge.

4.3.1 **Liability for gig workers**

To the extent that gig workers are genuinely independent contractors, the platform owner will not be liable for harm caused to third parties due to the contractors' negligence. However, depending on the circumstances, indirect liability may still arise if the contractors' relationship with the platform is akin to employment or their activities are so integral to a platform's business that the enterprise ought to be jointly liable. A platform may

59 Cybercriminals often look for bugs or security flaws in software to access company data or instruct a computer to 'flood' a system with requests, leading to issues such as Denial of Service. The self-service nature of open source use can also create challenges. With no commercial vendor to push out updates and patches, it becomes the responsibility of the developers and the business to evaluate and monitor security risks and devise a strategy to address the inevitable security problems. See Poremba 2021.

60 HSB 2020.

61 Konrad 2019.

62 CFC 2019.

63 According to some estimates, more than 50% of businesses targeted by patent trolls make less than USD 10 million in revenue per year. See Borenstein 2018.

64 Copyleft is the general method for making a programme available as free software and requiring all modified and extended versions of the programme to be free software as well. It contrasts with the traditional goal of Copyright Law to award exclusive rights to the creator of a work – hence the term 'Copyleft'.

65 Clifford Chance Talking Tech 2019.

66 This complexity around licencing terms may also extend to other aspects of software commercialisation (e.g. patent rights) that may require legal expertise to navigate. See FindLaw 2017.

Employment litigation has challenged the independent contractor status of gig workers, which could ultimately influence a platform's future liability for the torts of its suppliers.

also be unable to avoid liability for any loss suffered as a result of a breach of a 'non-delegable duty' of care by an independent contractor.⁶⁷

Employment litigation in a number of countries has challenged the independent contractor status of gig workers and established their entitlement to protections and benefits normally afforded to employees.⁶⁸ Lawsuits against ride-hailing platforms like Uber and Lyft have been particularly prominent. In some cases these have subsequently prompted legislation giving gig workers formal employment rights such as unemployment insurance, health insurance, minimum wage and collective bargaining. Most notably, in January 2020, California legislators enacted labour laws that impose stricter requirements on classifying gig workers as independent contractors versus an employee, although subsequent legislation explicitly revoked that ruling for ride-hail and delivery drivers.⁶⁹

There is no direct read-across from employment law to tort liability for, say, personal injury. Nonetheless, the fact that new technology facilitates remote surveillance of service providers and enables platforms to monitor and influence their performance, including determining how much work they receive, has arguably made it harder for platforms to rely solely on the independent contractor defence.⁷⁰

4.3.2 Liability for user content

Outside of employment relationships, third-party liability can also arise if a platform fails to discharge a legal responsibility not to publish potentially harmful or illegal content. This is most obvious in the case of social media companies, which not only host third-party content but promulgate it further through their news feed algorithms. Yet it also might apply to every platform or website that features product reviews or customer comments, including those of small businesses and start-ups.

In many jurisdictions, online intermediaries enjoy some form of statutory liability shield for material posted by their users.

In many jurisdictions, online intermediaries enjoy some form of statutory liability shield unless they are aware of harmful or illegal content and are not acting adequately to stop it. For example, in the European Union the e-Commerce Directive currently provides internet firms with liability immunity from lawsuits stemming from content posted by users.⁷¹ Similarly, in the U.S., Section 230 of the Communications Decency Act prevents online services from facing liability for third-party content on their platforms.

However, there is growing political pressure to increase the governance responsibilities of online intermediaries to keep illegal and objectionable content off their platforms, at least those meeting certain size criteria or engaged in certain activities.⁷² Reform of intermediary liability regimes is therefore likely in a number of countries, which could have wide-ranging implications for all digital businesses. Removing the immunity shield online intermediaries currently enjoy opens up considerable legal ambiguity about the perimeter of future liability. Some

67 Certain tasks, especially dangerous or risky ones, can be delegated but ultimate responsibility for how those tasks are performed cannot. This may be true even if any harmed individual signed a liability waiver, although the legal hurdles become more complicated.

68 For example, in March 2021, the U.K. Supreme Court ruled that Uber reclassify 70,000 of its British drivers as workers, giving them a minimum wage, paid vacation time and pension plans as a result. This followed similar court rulings in favour of gig workers' employment rights in Belgium, France, Italy, the Netherlands and Spain.

69 Specifically, the California Assembly Bill 5 (AB5) changed the rules employers must use to determine whether workers are employees or independent contractors. As a result of AB5, many Californian gig workers must be reclassified as employees and are entitled to employee benefits and protections. Subsequent legislation (Proposition 22) provided exemptions for app-based transportation and delivery companies, although that is subject to ongoing legal challenge in the courts.

70 See Van Loo 2020.

71 The e-Commerce Directive liability rules apply to all 'information society services', defined as services that are 'normally' provided 'for remuneration' by 'electronic means' upon 'an individual request of a user'. The notion of 'information society services' spans a wide range of online activities including selling goods online, offering online information or commercial communications, providing online search tools allowing for search, provision of electronic network and services, video-on-demand or the provision of commercial communications by electronic mail.

72 The Digital Services Act (DSA), the EU's proposal to update the e-Commerce Directive, includes an additional set of requirements for 'very large online platforms', which are those that have at least 45 million average monthly users in the EU. The DSA would also impose penalties of up to 6% of an online service's annual income or turnover for failing to comply with the obligations listed in the DSA, and up to 1% for supplying 'incorrect, incomplete, or misleading [information]'.⁷²

However, reform of intermediary liability regimes is likely in a number of countries, which could have wide-ranging implications for all digital businesses.

legal scholars point out the more platforms play an active role in moderating the content they host, the more likely they will overlook a particular illegality, increasing the risk of liability.⁷³

4.3.3 Liability for defective products and services

Besides potential increased legal responsibility for content on their platform or websites, online intermediaries must also navigate a changing liability environment for products or services delivered by their providers. Thus far, e-commerce platforms have generally been successful in rebutting third-party product liability, arguing they have limited control over suppliers and merely provide a means for merchants to meet consumers.⁷⁴ However, lawmakers and regulators increasingly perceive online platforms – at least the largest ones – as important gatekeepers in e-commerce and assign associated governance standards to their activities.⁷⁵ For example, in the U.S., the Federal Trade Commission ordered Facebook to oversee third-party app developers that make use of their users' data.

Perhaps in recognition of enhanced regulatory scrutiny, some platforms are taking steps to protect users from harm caused by their suppliers. Beginning in September 2021, Amazon announced plans to compensate customers

Lawmakers and regulators increasingly look to e-commerce platforms to address product liability of their third-party suppliers.

who suffer injuries or property damage from defective goods sold by third-party vendors on its U.S. platform. It also set up the Amazon Insurance Accelerator, a network of insurance providers that sellers can access if they choose, and updated its policy requiring more merchants to obtain product liability insurance.⁷⁶

4.4 New sources of professional and product liability

The application of new digital technology can also give rise to *direct* liability for damage caused by a firm's own product failure or improper or negligent professional behaviour. This might not involve a novel form of liability; it could simply be that because of technology liability migrates to another responsible party. Most obviously, the deployment of AI and robotics may mean that liability for losses associated with the use of hardware or software increasingly shifts to the manufacturer/designer of the equipment or computer code and away from the user. Thus, in the case of accidents involving automated vehicles, liability might be linked to faults with on-board autopilot systems rather than negligence of the driver.⁷⁷

Technology providers may also face direct liability for harm caused by their own hardware and software.

Considerable legal uncertainty surrounds these new sources of potential liability. It is impossible, for instance, to learn about all problems with software during the development and testing phase so initial releases invariably contain some type of defect.⁷⁸ The self-learning and opaque nature of machine-learning algorithms may make problems difficult to predict or diagnose, including the potential for malfunction and inherent bias.⁷⁹ When injuries occur, it may be challenging to determine what went wrong and who was at fault. Why did an algorithm obtain the results it did? Who could have prevented it or foreseen the harmful event?⁸⁰

73 Barata 2021.

74 Originally intended to shield internet intermediaries from liability for third-party content posted on their websites, Section 230 of the U.S. Communications Decency Act (1996) has been successfully co-opted by defendants to evade product liability for third-party sellers. See for example Clarke 2021.

75 A recent case in California found Amazon liable for an injury resulting from the sale of a defective laptop battery by a third-party vendor. The court highlighted the pervasive role the platform played in the transaction, especially through its 'Fulfillment by Amazon' (FBA) service, whereby Amazon agrees with merchants to handle all of the packaging and shipping of their products.

76 Amazon will directly pay customers for claims under USD 1,000 – which account for more than 80% of cases – at no cost to sellers, and may step in to pay claims for higher amounts if the seller is unresponsive or rejects a valid claim. Amazon 2021.

77 LexisNexis 2020.

78 Some software is kept in so-called perpetual beta, where new features are continually added without establishing a final 'stable' release.

79 Brookings 2021.

80 Munich Re 2020.

Statutory liability regimes for emerging technologies are currently under review in various jurisdictions.

As well as issues of tort, the marketing of a new product can create explicit and implicit warranties with respect to the performance of a product.⁸¹ If a product is not fit for purpose or fails to be of sufficient quality, and that failure is the cause of injury or loss to a purchaser who uses the product, the seller could be liable for breach of contract. For instance, if the software that powers a platform fails to perform as expected, it could lead to lost revenue for partners in the platform's ecosystem, prompting claims for breach of warranty. Contract disputes might also arise over the uses of customer data, including biometric information, that are at variance with stated privacy policies.⁸²

Legislators and regulators in various jurisdictions are currently considering the ramifications of emerging technologies for liability regimes with a view to updating relevant statutory laws. For example, the EU is undertaking a review of its Product Liability Directive. Some regulatory changes under consideration include provisions for an injured party to be able to pursue a claim against both the producer of the technology and the operator who exercises a degree of control over the operation and functioning of an AI-based system. Further, depending on the nature of the risks involved, the operator may be strictly liable for damages (i.e. on a non-fault basis) echoing the current situation for producers of faulty goods.

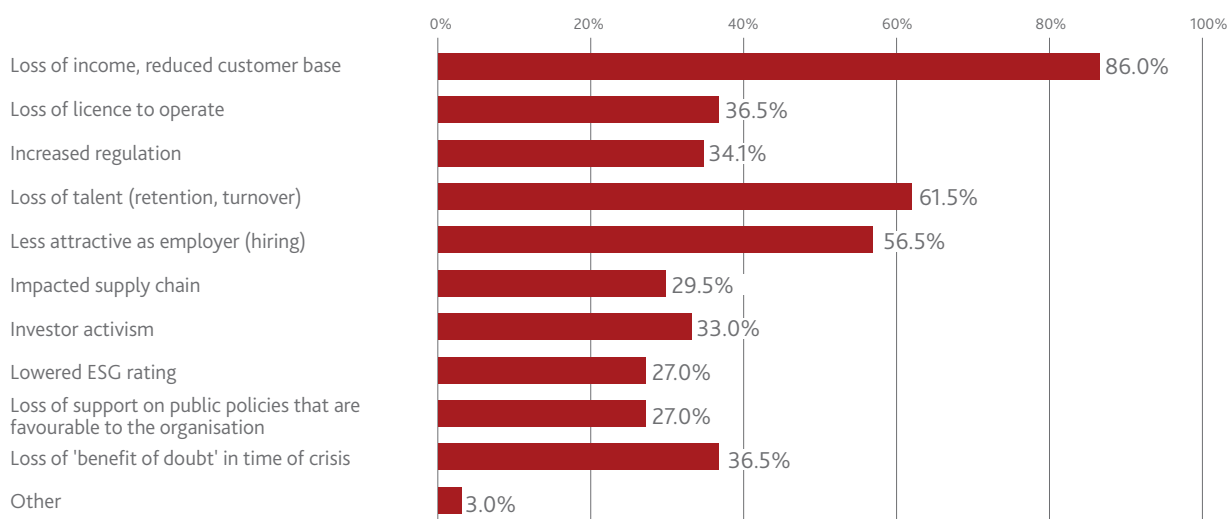
4.5 Reputational harm

A business's reputation – like its data, knowledge and IP – can be damaged quickly following events such as network security breaches, product failures and employee scandals. The adverse effects of reputational damage can be widespread, although loss of customers and income are typically the uppermost concerns for firms, followed by issues with recruitment and retention (Figure 17).

Network security breaches, product failures and employee scandals can all have adverse effects on reputation, which is often a key asset for digital firms.

Social media can turn minor issues in remote parts of the world – whether true or not – into major crises. Young digital companies may be especially vulnerable given their limited resources to manage the fall-out from an incident. The use of social media may also increase the risk of accidentally infringing others' copyrights or posting defamatory statements (for example, publishing a libellous comment about a competitor) triggering potential litigation.

Figure 17: Which of the following are serious issues and negative business outcomes that your organisation could face as a result of reputational damage? (% of respondents)



Source: WillisTowersWatson⁸³

81 Brookings 2019.

82 Claims for privacy infringement, both under tort and contract law, often fail in the absence of some form of concrete injury. Some scholars argue that other legal doctrines such as unjust enrichment (which focuses on a defendant's wrongful gains) might provide victims of privacy violations with legal redress. See for example Chao 2021.

83 WillisTowersWatson 2020.

4.6 Liability for anticompetitive behaviour

Access to and control of data is often crucial in digital market places, which, together with significant network effects, often confers market power. In some cases, this can foster 'winner-takes-most' dynamics that in turn may encourage firms to pursue unfair tactics to become the dominant provider. For example, a platform may hinder the ability of users to join multiple platforms by restricting data sharing, increasing switching costs or otherwise limit interoperability between platforms. Similarly, some companies might seek to tie ecosystem partners into exclusive supply or purchasing arrangements to impede efforts of new market entrants or existing competitors.⁸⁴

Competition authorities in many countries are reviewing their antitrust regimes to root out anticompetitive practices.

Competition authorities in a number of countries are reviewing their antitrust regimes to root out anticompetitive practices without discouraging innovation. Online platforms run by Big Tech companies are under most scrutiny given the concentration of power they enjoy in a number of key markets.⁸⁵ Yet detrimental effects on competition can develop even while markets are nascent – for example, software developers may interweave OSS with commercial software in a bid to establish a dominant commercial position.

Company directors may face civil lawsuits for antitrust violations in breach of their fiduciary duty to shareholders.

Company directors may find themselves individually liable and face civil lawsuits for antitrust violations on grounds of their fiduciary duty to shareholders. Such liability may arise directly under antitrust laws if individuals formulated, negotiated, authorised, directed or executed policies or agreements that led to the violation. It might also be the case in some jurisdictions like the U.S. that directors can be sued for unlawful acts if they failed to oversee appropriately the compliance risks or made material misrepresentations or omissions concerning antitrust risk.⁸⁶ This is not only an issue for publicly-traded companies. A private company could be the subject of antitrust enforcement as well as private litigation.

84 For a discussion of how digital ecosystems can give rise to economic forces that result in increased control of the ecosystem by platforms, see for example The Geneva Association 2018, Petropoulos 2020 and Parker et al. 2020.

85 As well as recent high-profile antitrust legislative initiatives against U.S. Big Tech firms, authorities in China have also imposed fines on their major tech companies for unfair competition practices and, in the case of Ant Financial, imposed a corporate restructuring to facilitate regulatory oversight.

86 LaCroix 2020.



5. How can insurers better support digital entrepreneurship?

An entrepreneur's preferences over which risks to retain and which to transfer to other parties like insurers will likely change over the lifecycle of a new business. As the firm grows and takes on employees and engages with third-party contractors and customers, its risk profile changes, and with it, its insurance needs (Figure 18). The involvement of external financiers will also trigger demand for risk transfer; investors typically require that a start-up has insurance to protect directors and officers against being sued (D&O insurance). Likewise, a big customer may demand a start-up take out insurance to protect it against potential liability or the law may require a business to have certain insurance.

As a firm grows its risk profile changes, and with it, its insurance needs.



Figure 18: Insurance needs at different stages of a new business development

Stage of development		Seed capital	Angel investor / venture capital funding	Broadening capital structure (mezzanine finance & bridge loans)	Towards and beyond IPO (initial public offering)
What insurance do companies need?		<ul style="list-style-type: none"> • Self-funded / bank of F&F • No / few employees 	<ul style="list-style-type: none"> • Seed funding secured • Investment needed to scale the business • Starting to actively hire 	<ul style="list-style-type: none"> • Regular revenue stream • Active workforce • Expanding into new markets, M&A, or preparing for an IPO 	<ul style="list-style-type: none"> • Public floatation to realise returns for investors • Finance expansion
Commercial property insurance	Protects building and contents, as well as exterior fixtures	✓	✓	✓	✓
General liability insurance	For claims involving bodily injuries and property damage resulting from products, services or operations	✓	✓	✓	✓
Errors & omissions insurance	Typically covers a manufacturing mistake or negligent service that results in a third party financial loss (without bodily injury or property damage)	✓	✓	✓	✓
Cyber liability insurance	Covers costs associated with the recovery from a data breach or other cybersecurity threats including extortion	✓	✓	✓	✓
Workers' compensation*	Provides medical and wage benefits to people who are injured or become ill at work		✓	✓	✓
Key person insurance	Life insurance purchased on specific key employees		✓	✓	✓
D&O liabilities insurance	Protects senior executives against personal liability claims and financial losses arising from breaches of duty		✓	✓	✓
Employment practices liability insurance (EPLI)*	Covers legal costs and compensation should an employee make a claim for negligence			✓	✓
Alternative risk transfer	For example, self-insurance, captives, risk retention groups and pools				✓

* In general, workers' compensation covers physical injuries and illnesses. EPLI is for claims for violations of an employee's rights, including discrimination, defamation and wrongful termination or demotion.

Source: *The Geneva Association*

Lack of insurance coverage is seldom the major cause of a new business failure.⁸⁷ Most of the time it can be linked to limited customer demand – one analysis of start-up post-mortems found that in more than 50% of cases the product did not fit the market or the firm made other marketing mistakes (Figure 19).⁸⁸ Many start-ups fail simply because they run out of money, especially during the early days when revenues are insufficient to cover their outgoings.⁸⁹ Such business risks stray beyond the perimeter of insurability and are best financed by equity capital and venture capital funds. Similarly, bank loans or invoice factoring are often most suited to address start-ups' and SMEs' short-term liquidity needs.

87 On average, 20% of small businesses fail within a year of inception, but the closure rate could be as high as 90% for early-stage start-ups and only falls to around 75% for those that are viable enough to obtain backing from venture capitalists. <https://startupgenome.com/> and Gage 2012.

88 Kotashev 2019. CB Insights analysis reached similar conclusions, with by far the most common cause of failure being lack of market need for the start-up's products or services (42%).

89 The 'valley of death' is a common term in the start-up world, referring to the difficulty of covering the negative cash flow in the early stages of a start-up, before their new product or service brings in sufficient revenue from real customers to cover its costs.

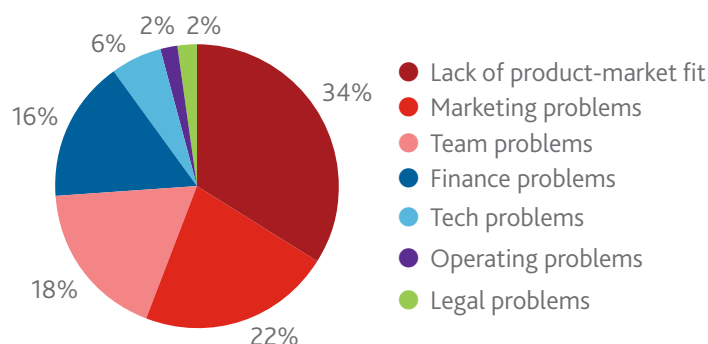
Many key business risks stray beyond the perimeter of insurability and are best financed by equity capital and venture capital funds.

That does not mean insurers have no appetite for entrepreneurial risks. Over recent years a number of large re/insurers have established corporate venture capital (CVC) arms to invest in fledgling firms as part of their asset portfolios. In particular, re/insurer CVCs have been active strategic investors in InsurTech start-ups, albeit often with the main motivation to access new product lines and customers in order to take full advantage of emerging technology, rather than solely financial returns. But from an underwriting perspective, start-up business risks are often unquantifiable and largely non-diversifiable, characteristics that don't lend themselves to effective risk pooling. Asymmetric information between entrepreneurs and insurers also creates problems of adverse selection and moral hazard, which only add to the insurability challenge. The success of a new enterprise depends heavily on the business acumen and energy that the entrepreneur puts into running the company, yet entrepreneurial skill is not directly observable and the presence of insurance could itself undermine effort incentives.

Nevertheless, insurance can help start-ups cope with unexpected operational setbacks, including meeting the costs of defending against litigation claims, which in some cases can be catastrophic (Figure 19). It is therefore somewhat puzzling that SMEs – which admittedly include both established businesses as well as start-ups – have tended to be underserved by the insurance sector. According to one U.S. survey, 44% of small businesses who have been operating for at least a year have never had insurance.⁹⁰ This is despite the fact that almost half did not have any other mechanisms in place to help mitigate against risks.

Insurance can help start-ups cope with unexpected operational setbacks, yet many small firms remain underinsured.

Figure 19: Common reasons for start-up failure (% of failures)



Source: Failory⁹¹

5.1 Overcoming low insurance awareness and take-up

To some extent, the low penetration of insurance among small business owners and start-ups could reflect the risk appetite of their founders. Business ventures typically have an options-like payoff – the downside is limited to a fixed or 'sunk' investment while the upside potential reward can be unlimited. Some researchers found that this payoff structure, together with a tendency for entrepreneurs to overestimate their ability to achieve success, can encourage risk-seeking behaviour.⁹²

The low penetration of insurance among SMEs and start-ups could reflect the risk appetite of their founders.

It may also be that entrepreneurs underappreciate the risks, especially those that lie outside their sphere of influence or control. According to one survey, more than a third of small businesses experienced an event that could have led to an insurance claim.⁹³ The high speed with which digital businesses can be set up and grown, as well as the changing legal and litigation environment, may foster such blind spots. A lack of risk management expertise in a lean start-up environment may also be a contributory factor.

90 Next Insurance 2018.

91 Failory 2019.

92 Risk-seeking people ('risk lovers') are those for whom utility increases as they gamble. See Wu and Knott 2006.

93 Insureon (no date).

Even if they have insurance, companies may not fully understand what is and what is not covered. Entrepreneurs often view insurance as a cost burden rather than a strategic priority and find policy language confusing. Although a general liability (GL) policy can include endorsements to cover additional insureds (e.g. independent contractors), standard cover will typically only apply to damages caused by the policyholder.⁹⁴ Likewise, firms may mistakenly believe their company's GL policy provides D&O liability protection or think that the latter is unnecessary because they are family run or the shares privately held.

Entrepreneurs may also underappreciate risks. The high speed with which digital businesses can be set up and grown, the changing legal environment and limited risk management expertise may foster such blind spots.

Initiatives by insurers to raise awareness of emerging risks facing digital start-ups and the value of insurance in managing them could help. In particular, specialist insurance staff who understand start-ups' risk protection needs as well as clearer, more simply-worded policies would increase the perceived value of insurance – see Box 4.

Box 4: Key insights from selected interviews with tech start-ups⁹⁵

Perceptions about operational risks and the benefits of insurance vary depending on the business model. Nonetheless, some general themes emerged:

- In contrast to traditional SMEs, tech start-ups are founded more on human and intellectual capital – software, hardware, patents etc. – as well as relational capital and collaborative knowledge creation.
- Given the fast pace of digital technology, it is much harder than in the past to predict how the sources of a firm's value will evolve. Fledgling businesses are unsure liability insurance meets their current and future protection needs. In any case, it is not a key business priority.
- Start-ups often face lengthy approval processes for insurance given their limited business track record and nascent product technology.⁹⁶ Specialist insurance staff who are familiar with the needs of start-ups and the new types of (intangible) risks they face could expedite insurance take-up.
- Insurances are often highly standardised and not designed with start-ups in mind. Bespoke solutions for individual business types are needed. Coverage (and premiums) should also adjust to reflect the evolution of risks over time and not just be amended at the annual renewal.
- Policies are typically complex and full of legalese. Clearer, more simply-worded documentation with flexible features (e.g. variable deductibles) would increase the perceived value of insurance.
- Current insurances are largely focused on protecting against very bad outcomes such as property damage or liability for injured employees or customers. Start-ups are looking for insurance that helps absorb smaller shocks to income or profitability, such as business interruption from a breakdown in critical infrastructure or loss of core customer accounts.

Source: *The Geneva Association*

Initiatives by insurers to raise awareness of emerging risks facing digital start-ups could help. As part of a broader innovation strategy – product, process and organisational – this can enhance the value of insurance.

94 Kaplan 2020.

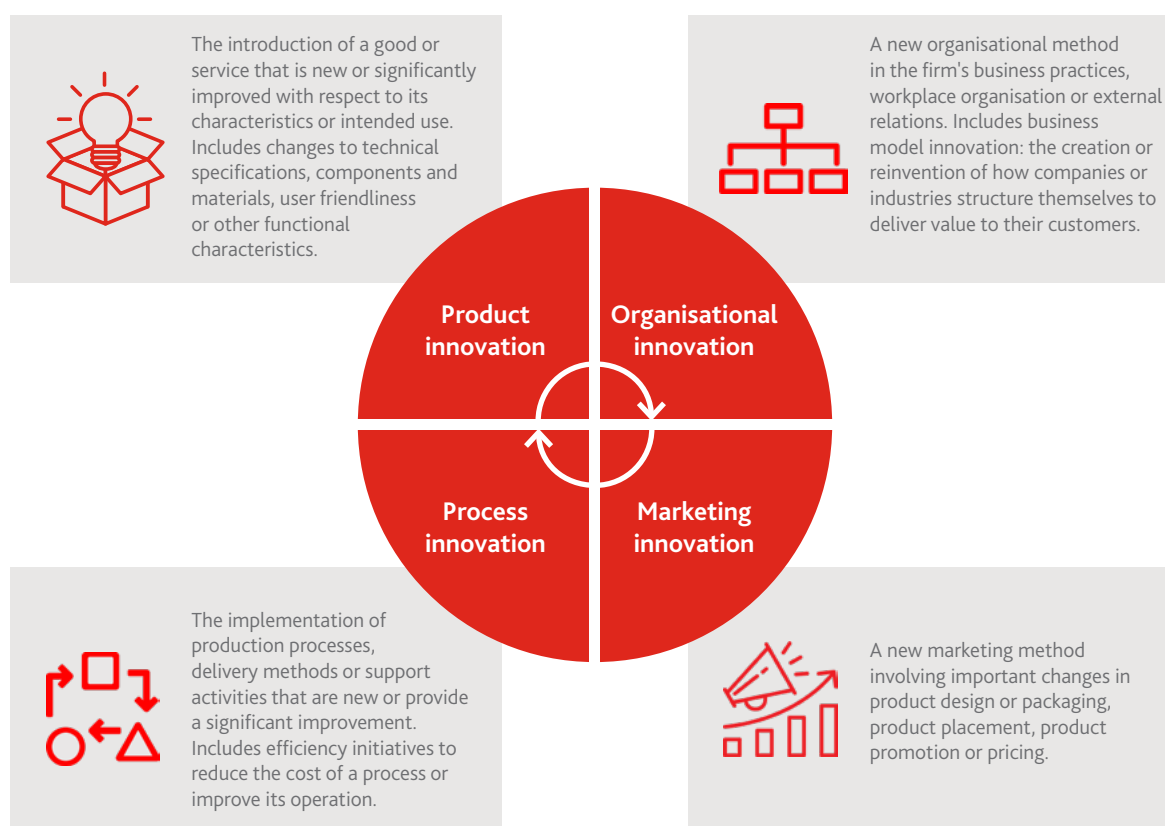
95 Based on the results of a small online questionnaire and structured interviews of around 15 start-ups/start-up associations and venture capital firms in Switzerland, the U.K. and U.S. This was augmented by interviews with around 12 insurance executives.

96 Insurers often use past profitability to assess the viability of a company, but tech start-ups might have limited annual accounts information, let alone formal evidence of regular profits, even though their business proposition is promising.

Such measures to market insurance better are likely to be most productive if part of a broader innovation strategy (Figure 20). As for other customer segments, product, process, marketing and even organisational innovation by insurers can help in delivering insurance solutions that are tailored to the needs of digital entrepreneurs as they develop and scale up their companies, including pivoting to exploit new opportunities. In turn, this can help to increase insurance penetration amongst digital firms. The boost to digital entrepreneurship in the wake of COVID-19 underscores both the commercial opportunities in this area for insurers and their role in fostering new business ventures and ultimately wealth creation.

The boost to digital entrepreneurship in the wake of COVID-19 underscores the commercial opportunities in this area for insurers and their role in fostering new business ventures and wealth creation.

Figure 20: Main types of business innovation



Source: The Geneva Association based on the taxonomy in OECD⁹⁷

5.2 Product innovation to broaden insurance cover

Property, employment practices liability, D&O, errors and omissions (E&O) and other conventional liability policies have proven flexible enough in the past to accommodate emerging risks and are capable of responding to some of the new intangible risks.⁹⁸ For instance, general liability and business owners' policies typically provide coverage for claims alleging defamation or infringement of others' copyrights and IP. Similarly, dedicated insurance classes such as some non-damage and contingent business interruption, IP as well as cyber have developed to support firms in navigating the new digital risk landscape, including cover for both first-party and third-party losses.

⁹⁷ OECD 2005.

⁹⁸ From a narrow legal perspective, once liability attachment is set up as a gateway issue – the identification of a defendant and proof of a causal connection between his conduct and the victim's injury – there is arguably little that cannot be handled by traditional liability insurance in the analogue or digital world. Emblematic of that flexibility is the recently launched Benchmark Package by Chubb, which allows commercial coverage to transition from a standard business owner's policy and scale up through higher limits and additional endorsements to create fully customised solutions as clients' insurance needs evolve. Chubb 2021.

Conventional liability policies are often flexible and are capable of responding to some of the new intangible risks.

Most product innovation in insurance tends to be of the incremental or evolutionary type – for example, extensions to cover or add-ons/amendments to existing policies – building on prevailing knowledge and infrastructure, rather than transformational shifts in the underlying product.⁹⁹ A recent example is the development of commercial auto insurance to suit ride-hailing companies like Uber and Lyft, whereby a driver may now be covered under the platform's master commercial insurance policy for the different periods of activity – signed into the app and available, en route to a fare and carrying passengers.¹⁰⁰

Nevertheless, significant coverage gaps remain and they may grow as digital businesses become more prevalent and the ecosystems they operate in more diverse. A 2020 study by Aon and the Ponemon Institute estimates that while on average 61% of property assets are covered by insurance, for information assets it is only 15%.¹⁰¹ The latter likely relate only to losses on intangibles captured in firms' financial statements, so the true degree of underinsurance could be larger. Many of the new intangible risks do not fit neatly into prevailing underwriting models designed with defined perils and pre-existing coverages in mind. Traditional risk transfer often requires clean and verifiable claims data to form accurate loss predictions, yet for many emerging intangible risks, historical loss data are limited.¹⁰²

Nevertheless, significant coverage gaps remain and may grow as digital businesses become more prevalent and the ecosystems they operate in more diverse.

5.2.1 Parametric insurance

One avenue for expanding available coverage is parametric (or index-based) insurance, which pays out if certain parameters are met or exceeded. The referenced indicator or index is correlated with the insured's exposure, although by design the payout does not indemnify the insured for the losses incurred.¹⁰³ Creative thinking around structures and parametric triggers enable parametric insurance to supplement traditional indemnity-based insurance.¹⁰⁴ These risk transfer solutions may not require a precise calculation of asset values but instead machine learning algorithms can be used to construct novel, sophisticated indices based on non-traditional data sets.¹⁰⁵

Parametric insurance, using sophisticated indices based on non-traditional data sets, can expand available coverage.

Reputation risk protection

Most reputation insurance tends to focus on reimbursing the direct expenses of mitigating harm from an incident and might not always cover the full cost of the event. Recently, however, several innovative products have emerged, promising payment based on reputation-related indices. For example, using a wide variety of data from social media and published sources, Reptrak created reputation indices which can be embedded in parametric insurance – the payout occurs if the firm's index falls below an agreed level relative to other companies in the same sector.¹⁰⁶

Insurance-backed guarantees

Another parametric-based innovation that has developed recently are insurance-backed guarantees that underwrite some of the operational risks associated with AI (see Box 5). In a nutshell, such guarantees compensate the users of AI should the software fail to perform as expected. These insurance solutions can be customised for tech start-ups as well as software developers at established industrial companies.¹⁰⁷

99 Swiss Re 2011.

100 The type and scope of coverage differ according to the activity of the driver. For example, third-party liability is capped during the period drivers are logged into the app but have not yet accepted a ride request.

101 Aon 2020.

102 Howden 2021.

103 For a contract to qualify as insurance (rather than a derivative contract) the insured must have an 'insurable interest' and provide evidence of 'proof of loss'.

104 The speedy processing and resolution of claims also helps to boost trust and customer loyalty.

105 Captive International 2020.

106 The RepTrack Company 2021.

107 For example, Hitachi purchases a parametric warranty that its predictive maintenance software will perform to the agreed standards. Swiss Re 2020.

Box 5: Innovative coverage for Artificial Intelligence solutions

Digital entrepreneurs face significant challenges in commercialising their ideas as they often cannot demonstrate a track record of efficacy. Their customers, however, typically rely on the performance of the digital service and want to avoid down-side risks such as defects or consequential business losses.

Insurance-backed performance guarantees

This conundrum is apparent with AI software as the predictive accuracy of the underlying machine learning model fluctuates in response to changing conditions and incoming data. Insurance-backed performance guarantees can, however, support the rollout of AI-based services by providing a technical assessment of the software's robustness as well as underwriting the forecasting performance of the model.

In addition to the software itself, the AI developer provides the customer with a financially-backed promise to achieve certain key performance indicators (KPIs). Should the KPIs not be met, the developer compensates the customer according to some pre-agreed payment schedule and claims back the cost via the insurance policy. The guarantee's payment design varies, although it often centres on direct losses resulting from the model's underperformance. In the case of fraud prediction, for instance, the KPIs may be a target percentage of attempted fraud that is prevented, and all losses arising from any excess undetected fraud is reimbursed by the AI software provider.¹⁰⁸

A complement to traditional liability insurance

Tech E&O policies – a type of professional liability insurance for providers of technology services – may sometimes cover third-party financial losses in the event of underperformance. Similarly, extended product liability insurance, including Pure Financial Loss or Manufacturers' E&O insurance, exists in places such as Germany (albeit not as stand-alone coverage). However, such covers are not universally available. Furthermore, customers may be left unprotected and out of pocket if the product is fully operational yet simply does not perform as well as expected. For example, a 'loss of use' trigger for Tech E&O insurance might not apply if the product can still be used, albeit at a lower than expected standard.

In general, protection against loss of future earnings or increased business costs resulting from an underperforming product is difficult to capture with traditional product liability insurance. This is because a claim often needs to demonstrate some form of negligence or design defect and proving the element of fault may be onerous. The insurance-backed guarantee removes this burden of proof. While many regimes impose strict liability against the manufacturer or developer for defective products it is unclear how far that will apply in cases of software-induced losses. For example, under the EU-wide Product Liability Directive, the manufacturer may rely on a 'state of the art' liability shield as a defence. As AI models are continuously evolving and learning, a broad application of this defence could limit customers' avenues of recourse.

Source: Munich Re¹⁰⁹

Business interruption covers

Parametric insurance can also be structured around indicators that capture when key IT infrastructure is disrupted, which for tech-dependent businesses could lead to significant business interruption costs. Such non-damage business interruption covers can avoid the complicated – and often drawn-out – loss of profits adjustment process.¹¹⁰ For example, backed by Lloyd's of London underwriters, Parametrix offers insurance for IT downtime and business interruption based on agreed parameters for cloud outages, network failures, third-party

system crashes and other hazards which exceed pre-agreed thresholds.¹¹¹

5.2.2 Insurance to support capital raising

As well as protecting the value of a firm's assets by transferring the risk of impairment, insurance can also play a role in helping to secure finance. Limited information can inhibit the ability of entrepreneurs to raise external funds even if their business is fundamentally viable. Insurance can reassure investors by providing mechanisms to cap some of their downside exposure.

108 For further information and case studies about AI insurance solutions, see www.munichre.com/insure-ai

109 By Jascha Prosiegel, Senior Underwriter at Munich Re - Artificial Intelligence Insurance, and Alexandra Matthews, Lawyer within Munich Re Facultative & Corporate - Liability International.

110 OMLX 2021.

111 <https://parametrixinsurance.com/blog-2/>

Insurance can also play a role in helping to secure finance – it can reassure investors by providing mechanisms to cap some of their downside exposure.

Residual value insurance of IP

Residual value insurance (RVI) works by guaranteeing that a properly maintained asset will have a specified value at a future date. Typically, RVI is deployed in lease and financing structures where there is a risk that an asset will be worth less than the final repayment. Recently, it has also begun to be used to transform firms' IP rights into collateral for loans. For example, specialist MGA PIUS offers a RVI programme for IP developed by technology companies. In the event of a default, the insurance provides the lender with the remaining interest and balance outstanding on the loan.¹¹²

Crowdfunding insurance

New forms of insurance are also developing to protect investors on crowdfunding platforms against issuer fraud.¹¹³ The insurance ensures investors will receive their principal back should the issuer misappropriate funds or misrepresent information in their offering documents.¹¹⁴ Standard D&O insurance for private companies may exclude crowdfunding activities (although they may be added through policy endorsements) so this type of coverage gives peace of mind to investors and company directors alike. Backed by AXA XL, the InsurTech Assurely's TigerMark insurance programme, for instance, is a D&O-based insurance specifically built for companies that raise money online or from the crowd.¹¹⁵

5.2.3 Ancillary support services

Providing additional ancillary services to prevent and/or mitigate losses can also be an important way to engage business customers. For instance, some cyber insurers offer software audits to detect vulnerabilities – such as mentions on the dark web, compromised user passwords or spam activity – as well as incident response and

remediation services. Similarly, insurers have developed services to support organisations in managing IP and reputation risks.

At some point, a new business may reach sufficient scale and maturity that alternative arrangements to manage risk, including dedicated risk retention mechanisms, become increasingly viable (Figure 18). This may be especially relevant for some platforms who gain market presence very quickly, including expanding into new areas and product lines, and where the scale of the operational risks may exceed an individual re/insurer's capacity. Nonetheless, re/insurers are well placed to guide businesses in improving how they self-insure or retain risks, including through the use of captives, risk retention groups or industry mutuals.¹¹⁶

Re/insurers often provide fronting services for captive programmes – for example, if regulations in a particular jurisdiction require insurance coverage to be written by a locally licenced re/insurer – as well as reinsurance protection to manage peak risks. They also offer novel solutions to enable firms to fully or partially self-insure their risks yet avoid the cost and the complexity of setting up a dedicated captive. Typically structured as a multi-year insurance contract, a 'virtual captive' for instance allows a company to build up premiums to cover possible losses and pays the re/insurer for administering the arrangement and providing risk-absorbing capacity in case things turn out worse than expected.

5.3 Process innovation to improve distribution

The way that insurers interact with entrepreneurs may limit insurance take-up. Lengthy and cumbersome underwriting procedures, rigid distribution methods and complicated claims handling do not sit easily with

The way insurers interact with digital entrepreneurs – who increasingly expect a fast, seamless, fully digital experience – may limit insurance take-up.

112 <https://piusre.com/>

113 There are two main types of crowdfunding. The donation model enables funders to donate money to a cause in exchange for products, special pricing on items, or rewards. Beyond the perks, donation funders don't have the opportunity to get anything in return for their money. A more recent model is investment crowdfunding. Businesses sell ownership stakes in the form of equity or debt so funders (more accurately, investors) become shareholders in a sense, and they have the potential for financial return.

114 The insurance does not, however, provide a guarantee of performance of the business nor underwrite the investment return.

115 <https://www.assurely.com/tigermark-dcv4>

116 A captive insurance company is a wholly-owned subsidiary that provides risk-mitigation services for its parent company or a group of related companies. Risk Retention Groups (RRGs) are U.S. dedicated liability insurance companies owned by their members and set up to pool their risks collectively. Similar to a RRG, an industry mutual is an insurer that is owned and governed by its member-insureds, who themselves operate within a specific industry, although the nature of pooled risks may extend beyond liability.

digital natives who increasingly expect a fast, seamless, fully digital experience. In response, many insurers are upgrading their distribution processes – not just the channels through which insurance is purchased, but all the points of interaction with customers. This includes leveraging data analytics to streamline underwriting, allow automatic quote/bind/issuance of policies and process claims, both through traditional intermediaries and directly online.¹¹⁷

InsurTechs can augment traditional insurance distribution, especially for customers who are comfortable with digital and remote interaction tools.

5.3.1 Partner with InsurTechs

This digital transformation is not always straightforward for traditional insurers, not least given legacy IT systems. Hence, some incumbents have invested or partnered with InsurTechs to improve distribution as well as foster and catalyse intrapreneurship. This often involves drawing on InsurTechs' expertise to build the tools and platforms carriers need to reach customers and distribute their products. In particular, using machine learning and other AI techniques, InsurTechs help design simple, customisable cover. Many traditional insurance products are often too complex for digital sales, even with instructions.¹¹⁸ Likewise, small businesses want flexible insurance that evolves as their business develops through its lifecycle but can also be configured in a modular fashion, including for policy periods shorter than a year.

Carriers can also engage with InsurTechs as a way to target their underwriting capacity more effectively towards fledgling companies.¹¹⁹ Whether acting as intermediaries, MGA-brokers, or full-stack carriers, InsurTechs can augment traditional insurance distribution, especially for customers who are comfortable with digital and remote interaction tools. By deploying nimble business processes, InsurTechs can reduce frictional distribution costs and in turn support competitive insurance pricing, which is crucial for newly-established firms looking to economise on expenditure. In addition, insurers may provide reinsurance or place coverage an InsurTech cannot handle itself, including in new business sectors or geographies.¹²⁰

5.3.2 Collaborate with entrepreneurs

Insurance is often an important enabler of entrepreneurship by providing assurances to users/suppliers, but carriers (both traditional insurers and InsurTechs) can find it difficult to design and price risk protection for new businesses. The shift from tangible to intangible risks, in some cases accompanied by the absence of data to calibrate and price the risk, only adds to the complexity.

Collaboration to collect and analyse key data to pinpoint the behaviours that drive loss and co-create new covers will sharpen the value proposition of insurance. This includes the whole spectrum of risk management services, from risk prevention/mitigation, risk financing and risk transfer.¹²¹ Such relationship building is especially important in regions that remain relatively underserved by commercial insurance, e.g. parts of Asia, not least because they contain countries where digital entrepreneurship ecosystems are building rapidly.

Collaboration to collect and analyse key data to pinpoint the behaviours that drive loss and co-create new covers will sharpen the value proposition of insurance.

5.4 Organisational innovation to boost product development

Enhanced data analytics will make intangible risks more predictable and provide opportunities for insurers to develop new and complementary products and services. However, fully harnessing the transformative power of data and technology and fostering more radical product innovation probably requires significant organisational change within the insurance industry. This goes beyond simply upgrading business processes (e.g. policy renewals) or distribution methods (e.g. multi-channel functionality). Investment in new infrastructure and a reconfiguration of insurers' own business models (and maybe also cultures) will be required in order to better serve digital entrepreneurs who are increasingly plugged into their own platform ecosystems. That could entail forming new cross-functional teams (or entirely new business units) focused on delivering innovative solutions rapidly.

¹¹⁷ For further discussion of tools to support price quotation, binding and policy issuance, see for example WillisTowersWatson 2019.

¹¹⁸ McKinsey 2020b.

¹¹⁹ According to McKinsey, the majority of commercial InsurTechs (63%) are focused on enabling the insurance value chain and partnering with incumbents. Only a small number of InsurTechs (9%) are attempting to fully disrupt the insurance market. McKinsey 2018.

¹²⁰ Bolt 2020.

¹²¹ For a discussion about the opportunities for insurers to play a more active role in providing risk prevention services see The Geneva Association 2021.

Investment in new infrastructure and a reconfiguration of insurers' own business models will be required to better serve digital entrepreneurs.

to market. A number of authors have highlighted how such organisational innovation can catalyse product and process innovation, although the complementary relationship is complex.¹²²

5.4.1 API integration

Embracing API architecture will likely be key to that business transformation. Building upon the success of internal APIs, progressive insurers have begun to re-orientate their operations around them in order to collect, store, analyse and apply data routinely and automatically. This includes reconfiguring internal setups and external relations to upgrade workflows across different business functions, unbundle existing product suites in favour of microservices and enhance overall risk evaluation capabilities. Plugging into cross-industry efforts to promote digitalisation, including through engagement with multilateral organisations like the OECD, could help insurers in adopting global best practices for API integration.

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Captured via APIs, access to granular data helps insurers build a dynamic understanding of the changing risk profile of insureds (as well as future policyholders) including hard-to-measure threats to intangibles. Many of the factors behind high insurance costs or limited cover can be linked back to issues with incomplete and/or asymmetric information. Microdata collected about insureds' activities

and the conditions in which they operate – which the proliferation of sensors and IoT devices make more readily available – can overcome some of those information frictions, enable more accurate risk calibration models and possibly widen the set of insurable risks.¹²³ In the case of entrepreneurs, this might ultimately include insurance that insulates them better against certain business risks over which they have no control while incentivising innovation through enhanced monitoring of their effort/decisions (i.e. to limit moral hazard).¹²⁴

By combining superior underwriting knowledge with expertise of business partners outside the industry, insurers can generate added value and achieve stronger and more diverse coverage.

5.4.2 Towards truly embedded insurance

So far, insurers' use of APIs has largely focused on ingesting and leveraging information from public databases, through business partnerships and customer agreements or linked to buying a service or product. For the most part, the adoption of open API strategies whereby insurers not only consume data but also share their own data and/or embed 'insurance as a service' within broader platform ecosystems are relatively less advanced. According to Capgemini/EFMA, less than 40% of insurers say they have access to IoT devices and natural language processing support systems to gather and exploit real-time insights. Similarly, only 35% of surveyed insurers have implemented open APIs.¹²⁵

Technological issues, in particular a lack of standardisation and limited interoperability across IT systems, continues to be a constraint. But aligning incentives is also important to encourage two-way exchange of information and promote API-driven open insurance. There must be commercial value from the exchange for both the insured and insurer, be that in terms of, for example, more accurate pricing of risk to support premium discounts, reduced frictional costs or access to new customers and risk pools.

122 See for example Torres and Augusto 2019.

123 Fundamental changes in business operations across the whole organisation of an insurance company was also highlighted as a pre-requisite for successful implementation of risk prevention services. See The Geneva Association 2021.

124 For example, a poor financial track record (e.g. previous insolvency) can sometimes be a barrier for entrepreneurs in securing insurance. More granular information about the reasons for past business failure could allow insurers to make more informed underwriting decisions and in turn increase coverage on more affordable terms.

125 Capgemini Research Institute/EFMA 2020a, 2020b.

The move towards open API insurance will involve potential trade-offs.¹²⁶ For example, incumbent insurers worry that sharing proprietary data may hand a competitive advantage to newcomers even if the exchange might also unlock hidden value. Arguably, however, legacy data may not always be the best predictor of the future given the ambiguity surrounding some of the underlying risk drivers. By combining their superior underwriting knowledge with the expertise of business partners outside the insurance industry, insurers can generate added value while achieving stronger and more diverse coverage.¹²⁷ Open APIs also offer insurers opportunities to expand their partner network, lower operational costs and drive additional business and revenue generation.¹²⁸

Open APIs also offer insurers opportunities to expand their partner network, lower operational costs and drive additional business and revenue generation.

This includes potentially charging for APIs or benefiting indirectly from enhanced customer engagement by supplying complementary services via partner platforms or perhaps ultimately developing platforms of their own.



126 Buoyed by developments in open banking, insurance regulators in a number of jurisdictions are exploring the feasibility of open insurance initiatives. They are mindful of the need to strike the right balance between data privacy, coverage and competition regulations while supporting innovation, efficiency, consumer protection and financial stability. EIOPA 2021.

127 Maletski 2021.

128 Research by McKinsey suggests that alongside gains enjoyed by customers from open financial data, financial institutions themselves may potentially benefit from increased operational efficiency, better fraud protection, improved workforce allocation, and reduced friction in data intermediation. See McKinsey Global Institute 2021.



6. Concluding remarks

Digital technology is fundamentally changing entrepreneurship. Developing a business idea into a successful commercial venture is no longer simply about combining and transforming key inputs – raw material, capital and labour – to produce a product or service that consumers may want to buy. Instead, value creation is increasingly shaped by the digital ecosystems in which firms operate and by the presence of complementarities and interdependencies between actors, which contribute to a firm's value proposition and its competitive advantage.

Digital technology is fundamentally changing entrepreneurship, with value creation being increasingly shaped by the digital ecosystems in which firms operate.

All entrepreneurs must navigate uncertainty, not least about the market demand for their new product or service. Nonetheless, insurance is often a key enabler – without it investors, customers and suppliers may not be willing to engage with a firm, fearful of the loss or harm they may unexpectedly face. The challenge for insurers is to ensure their policies and services remain relevant for new and established commercial customers in the new digital age.

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The shift towards digital business models has changed companies' risk profiles, reflecting an ongoing transition from a pure asset ownership model to one where resources are shared, often via online platforms. Digital companies may invest in more physical assets as they mature but, compared with traditional brick-and-mortar firms, they ultimately rely on intangible assets to create value. This exposes them to perils whose underlying causal factors are complex and do not always fit neatly into prevailing underwriting models, in part because the legislation and litigation environment in which digital companies operate is itself developing.

Commercial insurance policies have been flexible in the past and will respond again as the risk landscape evolves. It is important however, that their development and associated customer support adjust to keep pace with emerging intangible risks. Part of the adjustment may be increased collaboration with digital entrepreneurs to ensure they understand the risks they are running and the supportive role that insurance can play in terms of loss indemnification as well as risk mitigation and prevention. Matching coverage with protection needs will be crucial in securing businesses' trust in insurance, especially among small firms, which have traditionally been underserved by the insurance sector.

Matching coverage with protection needs will be crucial in securing businesses' trust in insurance, especially among small firms.

Allied to increased engagement with entrepreneurs, insurers themselves need to continue to innovate in three key areas:

- **Product innovation** – parametric covers can play a bigger role in situations when losses are linked less to bodily injury and physical damage and more to lack of access to or underperformance of products/services. Similarly, insurers can better support businesses in managing the risks they retain through the provision of ancillary services as well as products that guarantee the residual value of intangible assets used as collateral for loans or safeguard investors against crowdfunding fraud.

Alongside increased engagement with entrepreneurs, insurers need to continue to make further progress in three key areas: product, process and organisational innovation.

- **Process innovation** – automated underwriting and streamlined distribution, including through partnership with InsurTechs, will facilitate flexible and customisable cover for digital firms.
- **Organisational innovation** – reconfiguring their businesses to embrace API strategies will allow insurers to connect with digital platforms and gather business-relevant information. This will uncover meaningful opportunities to create highly granular risk calibration models and realise new insurance propositions that are appealing to digital entrepreneurs.

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Digital technologies are transforming the way businesses are formed and operate and providing digital entrepreneurs with new business opportunities. However, the shift towards intangible assets also comes with new risks and liability exposures. This report explores how insurers are adapting their services to better meet the needs of digital entrepreneurs, as well as possible avenues for future insurance innovation.

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