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ROLE OF TECHNOLOGY IN INNOVATIVE FINANCIAL SERVICES AS REFLECTED IN THE BREAKTHROUGH OF BIGTECH COMPANIES

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ABSTRACT

Fast digitisation can be observed in everyday life including financial services. The analytical tools of Big Data, such as artificial intelligence and machine learning are able to promote user awareness in terms of the characteristic features of financial products and can offer personally tailored information on how to utilise their financial products and the management of their financial sources. Financial service providers proactively apply artificial intelligence and machine learning in customer support (for instance, virtual assistants are added to telephone customer service). In addition, the appearance of BigTech companies triggers further turbulent development and service innovation in the financial services industry.

Non-bank competitors appearing in the field of financial services and the proliferation of digital innovation and new technologies are a constant challenge and risk to banks' everyday operations and clientele as they must face risks and fight competitor pressure while the regulatory environment places strict limitations on their operations. In this paper the authors offer a comparative status survey of banks and BigTech companies as they investigate the factors, development paths and operational areas that reflect the differences in cross-sectoral and industry regulation and have an impact on the cyber security risks of digitisation.

JEL codes: G20, G21

Key words: digitisation, business intelligence, BigTech

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1 DIGITISATION IN BANKING SERVICES

The banking sector is a key player for the operation and running of the economy. Digitisation taking off over the past decade has created new service opportunities there coupled with new types and measure of risk exposures, which may affect trust as the most important value of the sector.

The term 'digitisation' has no strict specific definition. By one approach, it means processes that used to be physical or analogue becoming digitised. Digitisation allows the effective implementation of search, analysis, correction, and development; a digitised object can be freely and easily transformed, modified while an unlimited number of exact copies can also be made (*Fichman–Dos Santos–Zheng*, 2014).

In terms of technological development, mobile applications represent one of the most important achievements of digitisation. Almost all people in every part of the world carry smartphones and the banking applications downloaded to them provide access to many financial functionalities (e.g., balance inquiry or money transfer) (Bagó - Forgács, 2021).

Table 1
Card payment and cash withdrawal transactions in Hungary (2019–2022)

Reference period	Purchase at POS terminal with a domestic card (traditional transaction)	Purchase at POS terminal with a domestic card (touch transaction)	Online shopping with a domestic card	Cash with drawal at an ATM with a domestic card	Total valu	Change compared to the previous period
1st quarter 2019	15 842 454	151 939 310	15 832 272	23 844 582	207 458 618	
2nd quarter 2019	16 053 552	176 250 552	16 098 321	26 210 148	234 612 573	13.09%
3rd quarter 2019	15 271 883	191 441 365	17 154 767	25 626 446	249 494 461	6.34%
4st quarter 2019	14 314 029	198 685 221	18 987 071	25 959 617	257 945 938	3.39%
1st quarter 2020	12 086 306	193 197 079	22 314 893	22 680 208	250 278 486	–2.97%
2nd quarter 2020	11 829 330	177 827 603	24 249 818	20 063 640	233 970 391	–6.52%
3rd quarter 2020	13 957 916	224 749 052	26 305 474	23 546 162	288 558 604	23.33%
4st quarter 2020	10 388 603	218 653 645	27 974 909	22 265 838	279 282 995	–3.21%
1st quarter 2021	6 293 483	204 918 449	26 866 723	19 288 308	257 366 963	–7.85%
2nd quarter 2021	6 358 224	245 162 157	29 791 201	21 631 824	302 943 406	17.71%
3rd quarter 2021	6 475 525	283 095 367	32 226 597	22 153 690	343 951 179	13.54%
4st quarter 2021	5 042 545	285 405 091	36 395 770	21 742 694	348 586 100	1.35%
1st quarter 2022	4 113 212	272 647 077	37 350 061	19 826 964	333 937 314	–4.20%
2nd quarter 2022	4 943 835	318 334 751	38 855 098	21 422 611	383 556 295	14.86%
3rd quarter 2022	5 680 602	334 168 351	40 921 017	20 920 440	401 690 410	4.73%

Source: data from MNB Tables of Payments (2020, 2021, 2022)

Debit and credit cards are often used in daily life for different transactions such as payment or cash withdrawal. Despite a reduction due to the Corona virus (2.98% and 6.52%, respectively), the number of transactions at POS terminals, Internet purchases or cash withdrawals from ATMs was over 200 million in all quarter years of 2019 and in Q1 2020 (*Table 1*). Compared to 2019, the number of transactions doubled by Q3 2022 including a 2.6 times growth of Internet purchases; on the other hand, traditional card transactions declined to one-third and cash withdrawal was also reduced.

Banks need a variety of IT applications to ensure uninterrupted and efficient operation. Big Data is the term used for the large quantity of different items of information that are generated in an increasing volume and at accelerating speed often from targeted data mining. Proper skills are needed to analyse those data. Data analysts often research the links/connections between the data, which will allow the analysis of data sets of different origin and structure (in terms of Big Data, they can be both structured and unstructured). Large volumes of data may be used in several banking operations, for instance, competitive advantage can be achieved through appropriate data analysis (*Segal*, 2019). The business solutions of artificial intelligence can help the analysis.

The business solutions of AI can be used to connect data originating from different systems, to reveal interconnections or to visualise them for better understanding and helping economic decision-making in that way.

As other firms, financial service providers have a vested interest in meeting their customers' needs at the highest possible standard in a cost-effective way to reach profit, in which business intelligence solutions assist them (*Szedmákné*, 2017). You can see those systems, among others, in producing reports, generating indicators, business models, timeline analyses, data visualisation, data mining or statistical analyses (*Kővári*, 2007). It is there that data assets held by banks (Big Data) and the solutions of business intelligence are linked, and that is why one must mention it, since financial institutions can have an advantage over their competitors if they can effectively utilise the huge volume of data they have. Analyses made of customers' habits can point at new opportunities for product development to provide better services, which will drive higher profits. The two concepts of Big Data and business intelligence and their connections are an organic part of digitisation in the banking sector.

The use of artificial intelligence (AI) can already be seen in several service areas and is expected to spread fast in future. It can appear, for instance, in the form of a so termed chatbot in a pop-up window on a bank's website, where customers communicate with a talking robot built on AI rather than a real person. The robot can answer questions most frequently occurring in banking, and it can also help users find out what to do next (*Dahiya*, 2017). Significant savings on human

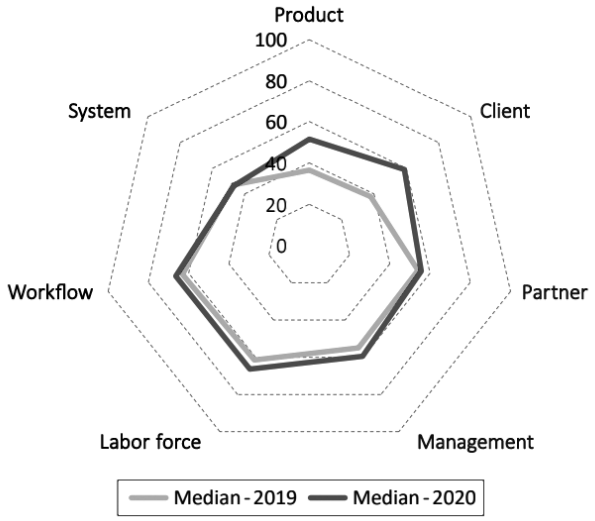
resources can be achieved with its help, which is a real deal for financial service providers if one considers current labour market relations.

The combined use of different technologies (Big Data, AI and machine learning algorithms) offers even more profitable opportunities for service providers (*Csiszárik-Kocsir*, 2022; *Király*, 2019). Efficient data analyses and the combination of technologies can generate systems that perfect themselves in operation, since they can become increasingly efficient as they learn from the data continually generated. Banks can apply the process in several parts of their operating cycles. High level knowledge of customers' habits allows for targeted product development, and clients can be offered made-to-measure solutions (*Pintér–Bagó*, 2021). Risk assessment can also become more exact, so pricing of different loan products will be more attractive since their prices are highly affected by risk factors.

1.1 Status of digitisation in the Hungarian banking sector

The Hungarian banking sector had to act in response to the loss of trust at the time of the 2008 crisis and the start of an explosion of technological development at about the same time. The 50-60 age group is a decisive source of income for banks, so they had to introduce immediate technological improvements for the younger generations so that they could be present parallelly with the product range of their elders who were less open for a digital transfer. However, as a result of the acceleration of digital shift during the pandemic, older generations have also started to use digital solutions actively. Also, a generation has grown up who clearly expect the IT innovations mentioned above (they are the ones termed 'digital natives' in the literature), so IT development has appeared in several fields at the same time.

Figure 1
Digital development index of the Hungarian banking system



Source: MNB, 2022

As for the everyday internal operation of banks, the picture is quite mixed. Internal communication with colleagues and management is highly digitised; in practice, it means correspondence and document management systems. In addition, different systems are available to monitor the processes, which help follow-up projects and tasks preventing several future problems in that way. They are the areas surveyed by the National Bank of Hungary (MNB) in which the digital level of Hungarian banks is the highest. On the other hand, there are specific banking areas (e.g., treasury transactions) where the human factor continues to be significant.

Managing data assets and exploiting their possibilities are at an initial stage, however, providing made-to-measure product offers is increasingly catching on with Hungarian financial institutions. Managers are committed to developments as they appreciate the opportunities they offer. Side by side with the areas in an advanced phase of digitisation, however, there are features in the components of the internal operations of financial institutions with room for improvement (MNB, 2021). Such are, for instance, customer relations or the structured integration of systems. According to a proposal by the Hungarian Bank Association, the government may also contribute to the digitisation of internal operations using different means (e.g., tax reduction) the institutions can spend on electronic development (for instance, on the further improvement of their systems). Since high

IT spending is a major component of operating costs, such stimulus can drive further progress (*Becsei–Bógyi–Csányi–Kovács*, 2019).

A service provider must have the appropriate outward channels so that its customers better perceive the bank's digital solutions.

2 GLOBAL REGULATORY ENVIRONMENT

A financial crisis situation has dominated the agenda of regulators for most of the past decade with financial stability and prudential security in focus. Nevertheless, because of current technological trends, an economic recovery and new customer needs, it has shifted to cross-sectional risks such as cybercrime, fraud and money laundering (Finsac, 2019).

At present financial issues are often subject to a combination of sector-specific regulations (obviously in the scope of financial decision makers and regulators) and inter-sectoral ones (partly in the competence of other decision makers in a society). Two categories of finance can be differentiated: specific and inter-sectoral (horizontal) regulations.

The specific regulations of finance target the following goals:

- Financial stability: the framework of the institutional system, recovery and resolution, and operational flexibility (to minimise the impact of institutional errors on the system).
- Prudential principles: capital adequacy and liquidity requirements to ensure companies can resist any unexpected economic incident. Prudent risk assumption and strong risk management are also important.
- Conduct and customer protection: external and internal codes of conduct for the company and its employees, sales practices, pricing, fair treatment of customers and market integrity.

Inter-sectoral and horizontal regulations comprise the following:

- Competition and anti-trust: the regulatory framework on collusion and cartels, market dominance and monopolies, control and reporting of mergers and acquisitions and the protection of intellectual property.
- Data protection and management: standards of data protection, data sovereignty, data management (gathering, retention, use) and inter-sectoral or cross border data interchange or inter-operability.

- Company management: standards defining the roles and responsibilities of Boards of Directors and executives, accountability of employees, monitoring and preventing conflicts of interest.
- Economic and financial crime: including standards of proper customer due diligence and the „know your customer" (KYC) processes, management of money laundering and terrorism financing related risks, and the prevention of fraud and other economic crime.
- Cyber security and flexibility: framework systems and standards on the minimum-security requirements of critical infrastructure. The Digital Operational Resilience Act (DORA) of the EU aims to strengthen and support the secure operation of IT systems at financial institutions in the event cyber risks increase.

There may be a big difference among regions in how they apply the above standards and rules, which is independent of the presence of BigTech companies (e.g., legal environment, stringency or strength of the executive power).

BigTech companies are technology corporations of high capital strength in their mature life cycle. They are engaged in different core operations that may be linked to social media platforms of a non-financial nature. Their common feature is that their core business generates huge volumes of data, and they are highly professional in managing and analysing them. Traditional financial and other service providers tend to respond to the characteristic features of local markets (e.g., penetration of financial services), political goals (competition, innovation) and proportionality (where, for instance, the rules to be applied to different licenses, activities or entities are set suitably for their own risk profile). An obvious consequence of the above is that financial institutions may face different and sometimes overlapping regulatory environments depending on the country they operate in even if they develop similar business offers in every country.

Further, different regulations may apply to banks and non-bank institutions within and without country borders. It largely depends on market position and financial activity mix, as different activities are subject to different licenses (for sector specific regulation), while the diversity and importance of their non-financial activities is another decisive factor (for inter-sectoral regulation).

As the market develops, the legal environment develops too, albeit with a time delay. The 2008-2009 fiscal crisis is an example of efforts made to overcome such differences, but prudential rules have not even been stabilised by now because of Covid-19.

Nevertheless, new products such as personal loans, new procedures such as artificial intelligence and cloud technology, fresh players such as FinTech, BigTech and

telecommunication companies and cross-sectoral and cross-border enterprises keep on testing the limits of legal frameworks and legislators' response time.

Common principles are being laid down in some inter-sectoral areas, such as data protection. However, the lack of national and international bodies particularly in the field of technology may lead to convergence and standard setting, as it happened with financial services following 2008. True, many regulators respond to the challenges independently and only few joint initiatives seem to be appearing.

3 BIGTECH COMPANIES IN FINANCIAL SERVICES

As discussed above, the objectives motivating how BigTech companies appear in financial services are to make as much profit as possible by exploiting the competitive advantage of a large clientele and the volume of data and to offer problem free user experience. It is the reason they offer a wide range of products; it also explains their place in the value chain, and why they refrain from engaging in strictly regulated activities, such as deposit services. Their primary objective does not involve making use of opportunities of regulatory arbitrage or the difference between regions.

The differences are limited in theory. In most cases, both banks and non-bank financial institutions need to obtain the same licenses and must comply with the same regulatory requirements if they are engaged in the same activities. For instance, if a 'non-bank' provides its clients with payment services, it can only do so if it is holder of an operating license for payment services and in compliance with the relevant requirements. The requirements typically apply the principle of proportionality, i.e., the stringency of rules depends on the risk of the activity. In that sense, the rules relating to operating payment services subject to licensing are much more lenient than the ones requiring full-scale banking license also allowing deposit collection.

In reality, however, 'non-banks' – such as BigTech companies offering financial services -, must conform to different legal requirements for two reasons (*Wyman*, 2022).

The first reason is that BigTech companies often offer innovative products and delivery mechanisms that go beyond the scope of existing financial regulations. This can happen, because their services are similar to traditional financial services, but they have not been fully categorised under the existing legal provisions. One reason is because some regulations are entity-based, i.e., it is unclear which set of requirements should be applied if a given entity does not have the exact license traditionally needed for a given activity. For instance, is issuing a Community loan considered lending, or the mediation of payment transactions? Are the

balances of electronic wallets and monies used for online payment deemed cash equivalents or customer deposits? Must one comply with different requirements if the same activity is performed by an entity holding full-scale banking license or by one having the license needed to operate payment services?

Another reason is that a significant part of the activities of BigTech companies rely on data out of the scope of the finance sector and make use of market positions subject to inter-sectoral rules (e.g., rules relating to data or market competition). In many cases it is a grey area. Given the consequences of the fiscal crisis, they are areas where financial regulators need extended scope, regulatory and supervisory background (for instance, relating to the use of financial data). On the other hand, except within the framework of the given financial license, those rules cannot be applied to 'non-financial' entities. For instance, the data protection requirements stipulated in the Gramm-Leach-Bliley Act mainly targeted financial institutions in the USA. Likewise, BCBS 239 in the European Union explicitly applies to financial institutions.

BigTech companies have proved to be able to assume positions strategically (and flexibly) for performing specific activities or occupying certain parts of the value chain. In addition, as soon as they perceive a new opportunity, they act making use of their large database, being less dependent on legal provisions, company structure and risk appetite. The combination leads to major differences in how BigTech and FinTech companies or banks are affected by the regulatory environment. Regulatory asymmetry and non-existent policy reforms may trigger fast change in market structures and risk profiles.

4 REGULATORY ASYMMETRY BETWEEN BANKS AND NON-BANKS

The rifts hidden in financial regulations are significant in international terms including new products and services (e.g., Community loans, cryptocurrencies, e-wallet balances, etc.) as well as new delivery mechanisms (use of recent technologies) not fully integrated into existing provisions. For instance, regulators are trying to figure out globally how to categorise the new products (are they assets or securities), new services (within or out of the scope of existing licenses) and recent technologies (e.g., licensing credit scoring or other applications).

The imbalance in enterprises and activities includes new products and services. In this case it has not been clarified yet how to ensure proportionality, because the value chains are split up among different players. It hampers accountability from the aspect of companies. For instance, in a SME lending transaction (Csiszárik-Kocsir–Dobos, 2022) there is a BigTech company on the front end (say, it distributes short term loans on its sales platform), a FinTech company providing credit

scoring (say, connects customer data collected on its own platform to external databases and bank data) and a bank performing customer rating and providing the capital for lending, who shall be made responsible if a customer fails to understand risks, their loan defaults or they prove to be swindlers?

The split causes some disturbance when the risk of an activity must be identified. For instance, does the provision of personal loans carry the same risk if it is performed by a specialised FinTech company or a BigTech company (linked to the customer more commercially) or a bank (that also collects deposits)? Does the difference in risk justify the difference in prudential requirements between an independent FinTech company and the subsidiary of a banking group even if the two are engaged in the same activity?

The differences of monitoring and enforcing standards also include anti-money laundering and the fight against terrorism financing, corporate governance and e-commerce, where there are standards, but they are based on self-assertion, i.e., there are no clearly identified actors having enforcement power in each sector. For instance, anti-money laundering and fighting terrorism financing are areas where international standards were established by the Financial Action Task; all signatories from the financial or non-financial sectors have acknowledged them as mandatory. Although practical implementation greatly varies from country to country, (*Dziubak*, 2018), it is the most developed in the financial sector (using dedicated regulations, on-site inspections, sanctions, ongoing reviews and financial supervision). If customers want to open an account, they have to undergo a strict due diligence process that is the responsibility of the bank in question and is supervised by the relevant authority. On the other hand, if a customer wants to open an online payment account or a trust fund, due diligence is not as strict as in a bank, or at least there is no authority to enforce it. As a result, BigTech companies can offer services built on banking products and services relying on the processes and infrastructure of banks, such as KYC. If the importance of BigTech companies grows, the operating costs of the different players will be disproportionate.

Finally, inconsistencies between countries and industries are increasingly problematic as activities are globalised. At present, legal provisions are still legal system and industrial branch specific, while business and financial operations tend to go across borders, industries or companies, which require cross-sectoral or horizontal regulation such as data protection and data security, cyber security, anti-money laundering and terrorism financing, tax-free zones, uninterrupted provision of vital services and public goods. The application of existing legal provisions at entity and activity level is a challenge. Cooperation and harmonisation are needed, but it is a major challenge if policy goals are diverse.

Market analysis clearly proves that technological changes including the appearance of BigTech companies may be advantageous for consumers. Customer satisfaction may increase because of the new products and services, faster processing of payment transactions or credit rating, financial integration and cheaper services (due to both lower prices and higher yields on e-wallet balances than on bank deposits.) As mentioned above, most BigTech companies arise in uncharted fields, which leads to a growing market even if, in time, they may replace traditional financial products and services.

It may lead to improved effectiveness of the markets, automation, and digital solutions at system level, which may reduce operating costs. But it can also have the result that one must use digital capabilities to maintain robust systems in key areas such as the management of cyber-risk, data security, operational flexibility, and risk management.

To fully exploit advantages, BigTech companies must develop their risk culture, the transparency of data-related business practices and participation in important policy discussions about the industry (e.g., economic crime, cybersecurity). It can help society manage the risks arising from technological changes in the area of financial services, which may be helped by BigTech companies.

To mention just a few, the management of cybersecurity and data security, anti-money laundering and the fight against terrorism financing are still at an early stage particularly with new players. Also, there are other risks. They include blurred authority because of cross-border, cross-industry and cross-company activities, the reduced transparency of risks and the reduced accountability of the players. Consumer protection may also present a problem, as consumers do not necessarily understand the different levels of protection and risk between the products of banks and non-banks, e.g., between e-money balances and deposits.

The concentration of market strength may present a risk for large platform providers, because it reduces the probability that market mechanisms prevail (an equilibrium price evolves) in the field of products and services, and digital capabilities and R&D activities are concentrated. Also, a conflict of interests of financial and non-financial operators may arise (for instance, discount loans if purchase is made on a given platform, or discriminative pricing). Eventually, the new business models may intensify anti-competition monopolising practices such as the application of dumped prices based on financial data and the limitation of services on other platforms (Wyman, 2022). The challenge of large platforms exploiting the network effect and the economies-of-scale is particularly big.

BigTech companies represent a risk for financial stability because of their size, their operations crossing country borders, natural networking effect and dominance in certain parts of the value chain (e.g., risk of operational flexibility around

the cloud platform of a bank). For instance, large platforms can spread viral content quickly, which may increase the risk of growing panic, so banks may suffer liquidity shortage due to the shock.

Viewing financial and commercial activities the question arises how unethical behaviour encouraging risk taking, for instance, targeted adverts appearing days right after wages are paid should be controlled and prevented. We have no idea what the BigTech model can produce if a recession occurs when customers will likely be less supported including the risk of the reduction of credit volumes of banks as proposed by the Bank for International Settlements (BIS). The crisis caused by Covid-19 with its significant and long-term macroeconomic impacts can be a test case, since it is still unclear how such a crisis can affect BigTech companies and their place in the financial markets.

5 BANKING IMPACT, CHALLENGES, AND OPPORTUNITIES

BigTech companies tend to be increasingly active on the market of financial services, which is good news for the market because customer experience improves, consumer values get higher, and operations become more effective. However, traditional companies have to face increased competition for market share. Companies with higher investment capacities than traditional players will be the largest competitors. It may have a significant impact on profitability, business models, the type of demand and customers' expectations of banks.

In response, many traditional institutions have already made major investments into own-developed innovations, more sophisticated business offers and digitisation of internal processes. Online banking applications, contactless payment and many lending applications are everyday practice in the most developed banking systems. They are expected to proliferate as banks start imitating the methods and value creating processes of BigTech companies to improve their position in the market competition. Since such advantages reduce transactional costs, the volume of activities offering financial services is growing. Nevertheless, as explained in Oliver Wyman's report of 2022 (State of Financial Services), traditional institutions must face a challenge: they must design the companies of the future under the pressure of making profit in the short run in a hostile environment of external threats.

5.1 Challenges for traditional actors

The appearance of BigTech companies may render the banks' business models, profitability and competitive edge vulnerable. Their impact is particularly massive as traditional banking models used to rely on providing certain consumer groups with services at increased prices (high risk groups), so that they could attract others with lower pricing (low risk groups). That is termed cross support or cross-subsidisation. The new business models may create high value and redirect profits away from traditional banking players because of low operating costs, networking or economies of scale, or because they can launch or terminate relations with customers. Investments into new technologies and digital capabilities increase the success of response to new challenges, but old infrastructures, systems, investors' scepticism and low budgets may stand in the way. Also, digitisation increases demand for third-party management and cybersecurity. Capital adequacy and accounting standards are often different in some countries, which encourages banks to digitise by developing own software.

Banks, challenger companies, and other stakeholders still recognise the strengths of traditional market leader companies in market competition. These include confidence, physical presence, high volume of available customer data, solid processes (of well-defined standards facilitating cooperation between the banks), adherence to familiar basic banking relations and past information on financial behaviour. Traditional players can exploit those opportunities, although some of the factors do have competitors (e.g., e-wallets vis a vis deposits).

Consumers' trust in financial institutions is particularly important, mainly in the long run and in terms of complex services such as savings, mortgage loans and project financing. Physical presence and customer relations are necessary to develop customers' trust. Confidence in banks may be driven as data abuse committed by BigTech companies has recently become public knowledge. Ongoing monitoring of and compliance with changes in legal provisions may be an advantage in terms of obtaining new licenses, increasing activities, and making use of economies of scale with respect to non-retail functions; the areas involved may be credit risk, customer due diligence, transaction monitoring and banking services provided for wholesalers and corporates. In addition, digital capabilities may convert the data and knowledge gained about customers' financial behaviour into new competitive advantage through, for instance, establishing systems built on open banking standards and communicating with each other, which will allow banks to liaise with other players to offer a wider range of products.

Regulations may present a barrier of entry in many market segments. For instance, deposit collection and central banking financing would be low-cost forms

of funding, but they can only be delivered by players that hold full-scale banking licenses.

The above competitive advantages carry many opportunities for banks (Oliver Wyman, 2020). Most banks are already engaged in or plan to do the following:

- Invest into digitisation to improve the quality and efficiency of offers to customers. Almost all banks have some kind of digital strategy or plan beginning from partial efficiency gain of project portfolios because of automation up to full-scale back-end or IT renewal and front-end innovations (e.g., online banking applications, online payment systems, spending categorising functions, etc.). It is unclear as yet how much of the plans can be implemented by traditional financial institutions, as their market capitalisation and return on equity (ROE) are mostly stagnant and fall short of those of the BigTech companies, so funds to be invested are rather tight in most cases.
- Establish „digital banks" allowing banks to appear on the market with new offers much faster and to serve their customers' new demands relying on their knowledge and customer data they have access to. Some banks have already started it, for instance, Standard Chartered has obtained virtual bank license in Hong Kong to set up a special (digital) bank.
- Enter into partnership with technological players to be able to provide customers with state-of-the-art offers and to improve their efficiency with, for instance, using data, business-to-business-to-consumer platforms, analyses and new digital distribution channels. One can find many examples among both small and large players, the latter including Apple-Goldman, Google-Citi partnerships and WeBank.
- Perform acquisitions: particularly, acquisition of players whose capabilities supplement their own, such as FinTech companies with expertise in AI or analysis, or minor banks having specialised digital platforms or product focus. It is already in progress; Goldman Sachs, for instance, has acquired many FinTech companies (Clarity Money, Final, Bond Street) to obtain skills necessary for digital retail banking and to establish, at the same time, its own online bank 'Marcus'; in another example, the Citi Group actively acquires FinTech companies engaged in blockchains (Symbiont, Axoni) to build an open banking infrastructure.
- Make strategic decisions about positioning (market segment, products, value-chain functions) to exploit their competitive advantage and to be less vulnerable. The dominant „universal banking model" based on cross-subsidisation is under pressure in many cases. Different models may develop. Sometimes a market player vows to become a front-end champion (e.g., it invests into im-

proving customer experience) while others may focus on platforms (e.g., offers developed for existing commercial or other platforms).

- Support inter-bank cooperation and consortia to share expenses and mitigate risks in areas where you have a competitive advantage, for instance, building „market-driven" payment infrastructure, digital identity or services related to customer due diligence. There are many examples of the cooperation of banks; some have led to the establishment of consortia to integrate technology and other market players and to jointly contribute to solving key issues such as economic crime, fraud or the challenges of market infrastructure.

There are, naturally, many factors including, for instance, market size, funding sources, product specialisation or market features to define the decisions and capabilities a company may choose from the above options.

6 SUMMARY

To remain viable and competitive, banks must decide which of their capabilities they want to invest into. Wherever they enter competition, their investments will be directed to the use of technologies to improve productivity (e.g., use of higher rate of automation and artificial intelligence for customer analysis and risk management). They will also strive to make their internal systems more flexible (e.g., using cloud-based systems to allow the integration of new proposals, the acquisition of FinTech companies or response to changes on the market or in the regulatory environment) and to develop the ability necessary to measure the profitability of processes and digital investments. Many of them must realise which areas are their strengths, which products, services and value-chain functionalities have proved to be the most profitable so that they could suitably inform strategic decision makers.

Digital capabilities must be applied in any case irrespective of the strategy chosen. Many banks will make a profit from improving their communication towards investors, the public, and legislators – clearly indicating the yield of digital investments and how much values bank offers have generated for consumers. Another factor is the banks' positive contribution to societal goals through loan mediation and other policy goals, such as financial integration, the mitigation of climate risk and the reduction of economic crime.

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