



HARVARD

Office of the Vice Provost for Advances in Learning



# CAPSTONE PROJECT CASEBOOK

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**Learning outcome:**

**LO5:** Review the requirements and resources for your capstone project.

## Topic 1: Implement the US Digital Dollar in a company of your choice

**Your mission:**

You are a member of the digital innovations team in your chosen company, in any region that utilizes the United States Dollar (USD). Your mission is to provide a reasonable plan of action for how your chosen company in this region will prepare for the implementation and launch of the US Digital Dollar, a Central Bank Digital Currency (CBDC).

Blockchain-based payment systems, such as cryptocurrencies or stablecoins, have introduced the concept of digital bearer instruments. This new technology provides qualities similar to those of physical bank notes, including instant settlement, privacy, and reduced transaction fees. The digital nature of the transferred value further enables a host of programmable functions which previously required trusted middlemen. While the instruments have found market adoption within the cryptocurrency ecosystem, their use for everyday payments remains nascent. However, central banks around the world have taken notice of these new technologies and their potential impact on national currencies. In December 2022, 119 countries had announced they were exploring a central bank digital currency (CBDC), 17 were piloting one, and 11 had fully launched their digital currency.<sup>1</sup>

In March 2022, US President Joseph Biden signed an executive order that outlined a whole-of-government strategy to research and develop a potential digital dollar.<sup>2</sup> The order specifically directed the government to assess the required technological infrastructure and to prioritize US participation in multi-country experimentation to permit interoperability between multiple CBDC clearing and settlement systems. It further encouraged the Federal Reserve, the US central bank, to continue its research to assess what a digital dollar might look like.<sup>3</sup>

As the world's reserve currency, the US dollar is one of the US's most valuable exports and most foreign exchange reserves are denominated in USD. However, the US's currency dominance has consistently fallen in recent years, and currently stood at an all-time low of

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<sup>1</sup> <https://crsreports.congress.gov/product/pdf/IF/IF11707>

<sup>2</sup> <https://www.whitehouse.gov/briefing-room/statements-releases/2022/03/09/fact-sheet-president-biden-to-sign-executive-order-on-ensuring-responsible-innovation-in-digital-assets/>

<sup>3</sup> <https://www.federalreserve.gov/publications/files/money-and-payments-20220120.pdf>



59.7%.<sup>4</sup> Furthermore, unique from other national currencies, eleven other countries have adopted the US dollar as their official currency, and more than 65 countries peg their currencies to the US dollar.<sup>5</sup> As of September 2022, approximately 50% of US currency circulated outside its borders.

Many US initiatives have researched the viability of a US CBDC to assert the US dollar's position as the world's reserve currency. The Digital Dollar Project has published a number of white papers outlining considerations and principles for a US CBDC.<sup>6</sup> MIT's OpenCBDC and Project Hamilton have collaborated on technical designs for a future CBDC and related transaction processors to support the currency across a US-sized payment economy.<sup>7</sup> Still, other strategy papers point to design objectives which include the needs of the currently unbanked population that stands at an estimated 1.4 billion people worldwide, according to the World Bank. In the US, FDIC research has reported that 6.5% of US households are unbanked.<sup>8</sup> Other high-priority use cases for a digital dollar, and CBDCs in general, are that of cross-border payments, micropayments, and machine-to-machine payment systems. Furthermore, without significant research and development of new international standards and coordination on cross-border financial flows, other international bodies have warned that the international financial system may face significant interoperability challenges in the near future.

While many policy papers exist on CBDC principles, design, implementation, and roll-out, less research exists on its potential impact on companies. The US Federal Reserve has highlighted opportunities for businesses to use a new safe, convenient, and electronic form of central bank money, to create new financial products and services on the CBDC platform, to benefit from increased visibility into user provenance for Electronic Know Your Customer (eKYC) and advanced machine learning purposes, and to enjoy faster and cheaper transaction costs and cross-border payments.<sup>9</sup> However, concerns have been raised about how digital currency transactions will safeguard consumer privacy rights and whether CBDC infrastructure will be resilient to cybersecurity threats. Specifically for the financial services industry, some researchers have suggested that if the US digital dollar serves as an interest-bearing substitute to commercial bank deposits, then the launch could significantly disrupt both bank deposit

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<sup>4</sup> <https://data.imf.org/?sk=E6A5F467-C14B-4AA8-9F6D-5A09EC4E62A4>

<sup>5</sup> These countries include Ecuador, El Salvador, Zimbabwe, the British Virgin Islands, Timor-Leste, the Federated States of Micronesia, Palau, the Marshall Islands, Panama, and Turks and Caicos.  
<https://www.investopedia.com/articles/forex/040915/countries-use-us-dollar.asp>

<sup>6</sup> <https://digitaldollarproject.org/publications/>

<sup>7</sup> <https://www.media.mit.edu/projects/opencbdc/overview/>

<sup>8</sup> <https://www.weforum.org/agenda/2022/09/financial-inclusion-findex-radio-davos-world-bank-economist/>

<sup>9</sup> <https://www.wired.com/story/new-digital-dollar-could-shake-us-financial-system/>



volumes and their lending services.<sup>10</sup> Nonetheless, while uncertainties remained, the question of whether the US will launch a CBDC has shifted from whether to launch it to what it will look like.

For your research into the topic of the US digital dollar, or CBDC, use the following guiding questions:

- How might a CBDC affect the financial sector differently from stablecoins or other nonbank money?
- What tools could your company use to mitigate adverse impacts of a CBDC on the financial sector? Could these tools diminish the CBDC's potential benefits?
- Which processes can be streamlined through the use of a digital dollar? Which products and services will cease to exist?
- What are the risks of not implementing a digital dollar in the near future?
- What are single points of failure for a potential implementation of a digital dollar?

**Your task:**

Create a slide deck presentation to the Executive team of your chosen company; accompanied by a well-researched, factual word write-up, which should include the following information:

1. An outline of how the US Digital Dollar (CBDC) will impact your customers & clients; your chosen company; and their industry in the region.
2. Factual reasons why your customers & clients would want your company to implement the US Digital Dollar in the region. Provide steps in your Plan of Action for your chosen company to take, to prepare for the implementation and launch of the US Digital Dollar.
3. A SWOT analysis and the risks, costs, and benefits of your recommended Plan of Action; and why the facts still support your recommendation.

## Topic 2: TradeLens and blockchain technology for shipping

**Your mission:**

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<sup>10</sup> <https://www.federalreserve.gov/econres/notes/feds-notes/central-bank-digital-currency-a-literature-review-20201109.htm>



You are an adviser at Maersk, an international shipping company. Your task is to identify a challenge that TradeLens will encounter in the near future by using blockchain to modernize shipping. Approach and convince the CEO, Michael White, of your proposed solution.

As CEO, White was proud of TradeLens well into his second decade at Maersk – proud of its growth, while simultaneously nervous about its path moving ahead.

Shipping had been the backbone of mercantilism for centuries and Maersk wanted to ensure it would remain that way. However, because of its age, complex network of relationships along each node of the supply chain, and entrenched nature, much of the shipping industry remained decades behind in terms of best practices with regards to efficient and transparent accounting, processing, verification, and transmission of data.

What compounded the gravity of this problem was that by the World Trade Organization's estimates, roughly 80–90% of global trade relied on a guarantee or source of financing.<sup>11</sup> So, critical to keeping shipping at the forefront of global trade was keeping up with modern credit provision. To this end, White knew that the foundation of credit was trust and the archaic systems plaguing much of the shipping industry did not exactly instill the kind of trust that would grease the credit wheels of this industry to the grow the global economy.

Facing this, Maersk launched a joint venture with IBM in January of 2018 named TradeLens. The charge of TradeLens was to modernize the supply chain ecosystem and promote transparency and efficiency. It did this through the use of blockchain technology. These efficiency gains were aimed at drastically reducing redundancies in the system, along with making a more well-functioning global supply chain. Moreover, with this more efficient and transparent meta-system, Maersk hoped that considerably more capital would flow into the shipping system and costs of capital would commensurately drop.

White was heartened by the early success that TradeLens achieved. By June 2019, four of the largest six ocean carriers had joined Maersk in support of TradeLens. Moreover, by December 2019, TradeLens was processing more than 2 million events per day. However, White's optimism was guarded. Unlike the behemoth ships that were the engine of Maersk and all global shipping, White did not want TradeLens to be a glacial mass that would be slow to adjust to the dynamic nature of the blockchain and its optimal application to shipping.

Visit TradeLens's [website](#) and do additional research regarding the company, including its aim and different features. Use the following questions to guide your research:

- Why should the blockchain be applied in this case? Is this just a gimmick, or is there any real value to applying blockchain technology?
- Which shipping processes will be most streamlined and aided by the use of blockchain technology?

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<sup>11</sup> [https://www.wto.org/english/thewto\\_e/coher\\_e/tr\\_finance\\_e.htm](https://www.wto.org/english/thewto_e/coher_e/tr_finance_e.htm)



- Why should competitor firms be willing to join the TradeLens platform? Is there a danger of them pulling back?
- What large obstacles stand in the way of TradeLens's success?

**Your task:**

Create a slide deck presentation and an accompanying write-up, which should include the following information:

1. An outline of your opinion on how TradeLens could modernize shipping. Ensure to include aspects where TradeLens will make the most and least impact.
2. The identification of one challenge to TradeLens's continued development and growth, and a proposed course of action that Maersk can take to address the challenge.
3. An analysis of whether White should be concerned that all competitor firms will need to sign on to a system that Maersk created and largely owns and controls for TradeLens to have industry-wide adoption.

## Topic 3: Coegil – Big Data

**Your mission:**

You are the leader of a data analytics team at a company where the following data science product leadership has been pitched. Your challenge is to provide a recommendation to leadership on whether your company should adopt Coegil's product or pursue a different cloud technology solution.

While information technology has been about collecting, organizing, and storing data, the future lies in faster data processing and utilizing information more productively. Cloud technology makes this possible by building from electronic data processing methods, thereby increasing the speed and effectiveness of data processing. Faster, better quality data allows companies to derive greater insights and make superior decisions. Financial services companies are big beneficiaries of such cloud technology solutions due to the massive amounts of information they accumulate, consume, and process daily.

See the link about the [value of big data in the cloud](#).

Coegil's solution loads, visualize, and predict with data within seconds. It loads data from your desktop, data warehouse, or third-party sources; builds sophisticated machine learning models; and shares results in seconds using a single, integrated product. It is made for those on the path from spreadsheets to big data who lack internal resources or have tight budgets. The platform was built by a team of systematic research and algorithmic execution experts from firms like Bridgewater Associates, UBS, and T.Rowe Price.



Performing complex analysis or working with large datasets is often difficult and time consuming in Excel. Moreso, big data and cloud tools are complex to set up, costly to operate, and require deep expertise to extract value. While established firms invest over US\$10m annually on data scientists and their data infrastructure, most people are not ready to make such a long-term commitment. Thus, companies either cobble together an inferior alternative from consumer products, or go without one. Despite this large addressable market, no product makes the journey from spreadsheets to big data as easy or robust as Coegil.

For your research into the topic of data processing in the cloud and, more specifically, Coegil, use the following guiding questions:

- What is the purpose of Coegil for other companies? How does Coegil compete in and attract users from its addressable market?
- Who are Coegil's competitors in the data-science-as-a-service market? How do Coegil and its peers differ from research providers such as Thompson Reuters?
- Is data processing in the cloud right for everyone and, more specifically, your company? Compare the benefits and drawbacks of on-cloud, off-cloud, and hybrid set-ups.
- How does Coegil handle issues such as data security and privacy? How do these trade-offs weigh with Coegil's processing efficiencies and speeds?
- What do you anticipate the greatest challenge will be in terms of adoption?

**Your task:**

Create an Executive leadership slide deck presentation and an accompanying write-up for your chosen company, including the following information:

1. A description of the benefits and drawbacks of big data analytics, data science, and cloud computing (and possible alternatives). Explain why this is recommended in your chosen company and what possible alternatives you might consider.
2. An analysis of Coegil's offering in relation to your chosen company's needs. Note Coegil's value proposition and its advantages and disadvantages as a smaller company that is competing for customers in the data-science-as-a-service.
3. A thorough, well-researched, factual Plan of Action recommending the adoption of Coegil (or alternative offering) and why. Also, suggest why Coegil can improve its offerings to be successful in the future to address criticisms your chosen company has of it.

Please note that students are free to choose any company they wish in this topic. While you may opt to select your current employer, you are strongly discouraged from revealing any confidential or proprietary data in this exercise and do so at your own risk.





## Topic 4: Jumia's super-app

### Your mission:

You are an adviser to Jumia's CEO (appointed by the Board after the two co-founders stepped down in November 2022). JumiaPay launched as a mobile-first strategy to compete with several FinTech super-apps in its key markets across Africa – its competitors include VodaPay (South Africa); myfawry & Careem (Egypt); MPESA (Kenya); and OPay (Nigeria & Egypt). Your challenge is to compare JumiaPay with other competitor offerings and provide a recommended fintec growth path for JumiaPay that boosts Jumia Group's profitability.

A super-app is a digital platform where users can meet all their everyday digital needs without leaving the app. It offers a seamless experience with integrations into other core applications so well that it becomes an ecosystem of digital services. In addition, a super-app incorporates many FinTech features into its platform, such as a digital wallet, rewards, currency conversion and exchange, payment aggregators (such as bill payments and utility payments), credit, insurance, SME offerings, and other digital banking features.

"We are an everything platform," Jumia co-CEO Poignonnet declared.<sup>12</sup> In 2016, Jumia was recognized by the *Financial Times* as Africa's first unicorn when the Africa Internet Group, its parent company, secured an investment valuation of more than US\$1bn.<sup>13</sup> In 2019, the company became the first African start-up to list on the New York Stock Exchange in an IPO which raised US\$200m. The company first launched as an online retail store in Nigeria in 2012, where it bought local and international products from sellers and shipped directly to customers. By the end of 2021, it was present in 11 markets in Africa with an annual revenue of \$177.9 million USD.<sup>14</sup>

Despite this, its co-founders and co-CEOs believed that the company had only scratched the surface of what was possible on the continent, so its super-app was launched in 2020 to expand its integrated ecosystem. Poignonnet asserted:<sup>15</sup>

It's better to look at how our ecosystem fits together: the sellers on the marketplace and the breadth of their respective offerings attracts more consumers to our platform. This allows us to increase consumer lifetime value

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<sup>12</sup> Ramon Casadesus Masanell, Pippa Tubman Armerding, and Gamze Yucaoglu, "Jumia's Path to Profitability," Harvard Business School Case Study 9-721-355, March 2, 2021, p. 7.

<sup>13</sup> <https://www.ft.com/content/d4bf5786-ce4b-11e5-92a1-c5e23ef99c77>

<sup>14</sup> <https://www.bloomberg.com/press-releases/2022-02-23/jumia-reports-fourth-quarter-and-full-year-2021-results>; <https://techcrunch.com/2022/04/04/ups-partners-with-jumia-to-expand-delivery-network-in-africa/>

<sup>15</sup> Ramon Casadesus Masanell, Pippa Tubman Armerding, and Gamze Yucaoglu, "Jumia's Path to Profitability," Harvard Business School Case Study 9-721-355, March 2, 2021, p. 7.



(through physical goods), increase relevance to consumers (through services), and increase consumer engagement (through payments).<sup>16</sup>

(Ibid)

The company launched JumiaPay, a mobile money wallet, in August 2016. In March 2018, the company launched its all-in-one app Jumia One, which allows customers to conduct online transactions, such as airtime and data recharge, shopping, entertainment, and utility payments, and access all Jumia services. In 2020, the company combined both JumiaPay and Jumia One into a singular super-app, which offered a broad range of lifestyle and financial services, including airtime, travel, utilities, finance, and gaming.

As Africa's largest e-commerce platform, Jumia recorded 8 million active users on its platform in 2021, and e-commerce only represented 2-5% of total retail.<sup>17</sup> With the launch of the super-app, the company could benefit from a recent increase in adoption of cheaper, lower-end phones with limited storage capabilities and high data costs in a continent with a total population of 1.2 billion people, 453 million internet users, and US\$4 trillion worth of household and business-to-business spending. For many users, a super-app offered the utility of dozens of apps with the storage and data costs of only one. Therefore, super-apps simplified the internet world for users who were coming online for the first time and enables them to access a wide variety of services on a simple, unified interface. Simultaneously, market fragmentation along regulatory, cultural, country and business environment lines challenged Jumia's ability to preserve its success across multiple markets while expanding into new ones.

Post COVID-19, Jumia noticed consumer and merchant behavior shifted to a digital-centric lifestyle and, simultaneously, new entrants were creating an increasingly competitive landscape. Industry competitors had launched super-apps, such as Nigeria's OPAY and KongaPay; Kenya's MPESA super-app; Egypt's myFawry and Careem; and South Africa's VodaPay super-app. While the company faced these competitors, Jumia was still considered to offer the widest range of products and services. However, as international players like Alibaba and Tencent enter the continent, Jumia's offerings could be dwarfed.

This set of events reaffirmed the need for its super-app to be a seamless, one-stop-shop to respond to the multiple shifting needs of its mobile phone users. Furthermore, the leadership reviews the app's verticals for underperformers and do shut down some services, including JumiaDeal's Groupon-esque marketplace and its classifieds services (Jumia Car and Jumia House). How can Jumia retain its frontrunner e-commerce position while taking full advantage of this consumer shift across multiple African markets?

[Visit Jumia's website](#) and do some additional research on the super-app's offerings. Use the following guiding questions:

- In emerging markets, what user needs does a FinTech super-app like JumiaPay solve? Think about how to apply your learnings from each module (for example, the

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<sup>16</sup> Ibid.

<sup>17</sup> <https://www.naijanewsagency.com/africa-e-commerce-market-hugely-untapped-with-potential-for-growth-says-jumia-chairwoman/>

PayNearby case study; India's UPI; India's super-apps) and how these learnings and other regional fintech super-app advances might be relevant to JumiaPay.

- What technology, fintech services, and experiences are critical to JumiaPay's super-app ecosystem for its mobile phone users and partners?
- How will super-apps like JumiaPay affect FinTech innovators, financial service incumbents, and FinTech telecommunication companies across emerging markets?
- When, why, and how should JumiaPay collaborate, build, buy, partner, or exit FinTech relationships?
- Are any FinTech trends affecting super-apps in emerging markets, such as open banking, regulations or CBDCs, new emerging technologies, etc.? How should JumiaPay navigate these new developments?

#### **Your Task:**

As the adviser to Jumia's CEO, appointed by the Board, create a slide deck presentation and an accompanying write-up, which should include:

1. An assessment of JumiaPay's super-app in relation to Africa's competitive FinTech landscape. Include lessons learnt from various other emerging market super-apps. Use SWOT analysis, scenario planning, and other strategic tools.
2. A ranking of the top FinTech opportunities and cost-saving measures for JumiaPay to ensure its profitable future growth. Propose one FinTech priority for JumiaPay to boost its path to profitability.
3. A proposed plan of action for JumiaPay with KPIs that the CEO and Board can use to measure your proposal's success.
4. A description of your proposal's downsides, risks, barriers, and costs; and the mitigations and benefits where possible.

## **Topic 5: OpenSea, Web3 & e-commerce**

#### **Your mission:**

You are an Executive at OpenSea and the company leadership has been discussing how the platform can build upon its recent successes. Your challenge is to develop a fintech plan of action to advance OpenSea's mass adoption, profitability and future successes.

After the invention of database technologies in 1960, the documentation of commercial activity and financial data rapidly shifted from paper to purely digital entries. Despite the improvements that this software provides, data stored in this way is exposed to potential



misuse by a variety of actors, including the operator of the system, its personnel, and other external actors.

### **The Web’s “original sin”**

Ad-based business models have been called the “original sin” of the World Wide Web, leading to today’s widespread calls to rein in the excess of personal data collected by Web 1.0 internet companies. While regulatory efforts, such as the European Data Protection Regulation and California’s Consumer Privacy Act, provide legal remedies for already recorded data, Web 3.0 solutions can provide users with nuanced control over personally identifiable data prior to its exposure to third parties.

Web 1.0 era e-commerce companies, such as eBay, and early FinTech companies, such as PayPal, rely on public internet infrastructure but interface with databases maintained by these companies. These walled gardens are accessible only to users that agree to the rules (i.e., terms and conditions) of the platform provider.

Conversely, Web 3.0 solutions enable permissionless peer-to-peer value transfer, with rules automatically enforced through smart contracts. Smart contracts are a collection of software programs that are executed autonomously on a distributed network of computers and maintained by independent operators.

### **Immutable record-keeping and digital ownership**

High-speed internet and Web 2.0 solutions shifted the distribution of software, music, and movies from physical media to purely digital delivery. However, while buyers of CDs and DVDs could sell the old albums or movies on secondary marketplaces, this is not possible with Web 2.0 media, which is rented or licensed to users in a purely digital form. Digital rights management solutions restrict buyers to use the media inside of the environments provided by the seller or licensee – as is the case with Amazon’s media platform and Apple’s iTunes.

The internet introduced new protocols for audio and video formatting that disrupted legacy media distribution technologies while simultaneously impacting ownership models that relied on physical products. Early blockchains, such as bitcoin, enabled the creation of digital bearer instruments, which allow ownership rights to be reliably transferred from one person to another without the sender keeping a copy of the virtual asset. While digital products are generally fungible – one bitcoin can be replaced by any other bitcoin without impacting its value or function – newer blockchain-based standards can allow for the creation of digitally unique, non-fungible, and semi-fungible virtual items.

### **Digital economies**

Purely digital economies started to emerge in multi-massive online role-playing games in the late nineties. Today these online worlds generate multibillion-dollar revenues from the sale of in-game items (According to a 2022 market report published by Grand View Research, the



global video game market reached revenues of \$195.6 billion in 2021).<sup>18</sup> However, buyers of these goods only receive limited rights to their online persona and its virtual possessions.

With the introduction of Web 3.0 technologies, publishers are able to permanently transfer digital assets to the user. E-commerce solutions built on Web 3.0 technologies also allow the transfer of digital assets directly from one user to another (peer-to-peer). One of the first solutions built in this way is OpenSea – buyers and sellers are not required to create accounts on the marketplace but connect to the service using a digital wallet under the user’s control. OpenSea collects a fee for transactions and is interoperable with other decentralized applications (dApps). Even though the goods sold on the marketplace are still mostly limited to digital art, digital collectibles, and Web 3.0 domains (as of May 2022), the company’s revenue already exceeds one million dollars a week.

Visit [OpenSea’s](https://opensea.io) website to learn more about this Web 3.0 marketplace and consider the following:

- What are the advantages for OpenSea and its users in building on Web 3.0 technologies? How might other industry players assess Web 3.0’s advantages?
- How can Web 3.0 technologies link with other digital assets and ecosystems, such as personal data, e-commerce, gaming, cryptocurrencies, lending, and the metaverse?
- What other digital and non-digital products could OpenSea add to its marketplace?
- How could OpenSea benefit from the interoperability with other Web 3.0 applications?

**Your task:**

As an Executive at OpenSea, create a slide deck presentation and an accompanying write-up, which should include the following information:

1. An assessment of OpenSea in relation to its (current and future) competitors; regulations and relevant emerging fintech technologies. Consider lessons that can be learnt and applied from the course modules; Web3, dApp use cases; and various markets globally. Use SWOT analysis, scenario planning, and other strategic tools.
2. A proposed Plan of Action detailing the recommended strategic direction and a practical execution path to mass adoption, scale, and profitability for OpenSea to ensure a successful future.
3. An assessment of the downsides, barriers, risks, and costs of your proposal and an explanation for why you still recommend it, citing some of its key benefits for OpenSea.

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<sup>18</sup> <https://www.grandviewresearch.com/industry-analysis/video-game-market>

