



Decentralized Platform Ecosystems for Data-Sharing and Digital Trust in Industrial Environments

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1 Creating Value with Industrial Data?

Many manufacturing companies and traditional service providers are trying to keep up with the digital age and connected business era. The core of connected business is about gaining access to data and generating information to monetize acquired knowledge. Platform companies have already secured an international competitive advantage concerning private user data. The strong GAF4 quartet (*Google, Apple, Facebook, Amazon*) dominates the American and European markets, while *Tencent* and *Alibaba* dominate the Chinese market. The cornerstone of connected business is the digitalization of business which began with the advent of the Internet protocol TCP/IP. When Tim Berners-Lee invented the World Wide Web in 1989 at *CERN* to enable

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simplified data exchange between Swiss and French laboratories, the enormous economic implications were not imaginable. However, the European economy did not take up the Internet; there was a lack of imagination and willingness to take risks. Why should they? The automobile industry was buzzing, and there was no end in sight. Today, we know what a dramatic development this convenience has taken for the digitalization to end user.

However, there is still the opportunity to get a foot in the door when it comes to industrial data. However, these business rules are different from those of the platform economy. The mistake of copy-pasting should be avoided in this case. The opportunity in the industrial B2B sector is decentralized platform ecosystems. Decentralized platform ecosystems are not owned by a single party but are coordinated and operated by an entire network. The technological basis is distributed ledger technologies (DLTs) like blockchain and the ideology of data sovereignty, data portability, and data interoperability. Essential for such democratization are governance models that regulate coordination and the incentives to unify the network. Similar to politics: to turn a dictatorship into a democracy, a constitution is needed to enable society's unity. A prime example of a European initiative for data sovereignty in the industrial sector is *GALIA-X: A Federated Data Infrastructure for Europe*. Initiated by the German Federal Ministry of Economics led by its minister, Peter Altmaier, and now supported, coordinated, and developed by European companies such as *Bosch*, *Siemens*, *BMW*, *SAP*, *Deutsche Telekom*, *Amadeus*, *Atos*, *Électricité de France*, and *Orange* (more members to follow). In the following chapters, we will go into more detail about the platform economy and decentralized platforms, as well as cooperation (cooperate to compete) and governance models.

2 The Benefits and Disadvantages of Digital Platforms

The platform economy is primarily based on digital, two-sided marketplaces, where supply and demand are transparently aligned. *Uber*, as an intermediary, connects drivers and passengers. *Airbnb* connects homeowners with travelers. The platform companies charge a transaction fee for matching.

The growing marginal utility is central to the success of transaction platforms: more providers of apartments on *Airbnb* result in a higher attractiveness of the platform for travelers. More travelers attract more housing providers. These self-reinforcing effects lead to dependencies, as participants no longer switch to alternative marketplaces. If one platform succeeds, it becomes more and more dominant. *Amazon* has already conquered between

42 and 49% of all internet trade in Europe. These so-called network and lock-in effects provide the primary explanation for the high company valuations of global tech giants like *Facebook*, *Google*, *Amazon*, *Alibaba*, *Uber*, and *Tencent*. Even with initially limited resources, enormous growth rates could be achieved, and entire markets orchestrated and dominated.

This dominance causes quasi-monopolistic market situations and leads to the often-excessive transaction fees for the marketplace participants, resulting in extremely high revenues per employee for the platform company. For example, *Uber* continuously receives up to 28.5% of the travel costs for the pure provision of its platform in Berlin. While the *Uber* driver is confronted with fuel costs and his time on the cost side for each trip, *Uber* has no direct costs and low risk. The more journeys are made, the more *Uber* benefits.

3 The Core of Platform Democratization Lies in Distributed Ledger Technologies

These disproportionalities, data security concerns, and excessive transaction fees are addressed by distributed ledger technologies (DLTs) such as blockchain. The primary purposes of central platforms—securing a transaction (e.g., trip or product purchase), the accounting of the transaction in progress, and the maintenance and further development of the platform—can be handled decentrally and automatically by DLTs. The consequences are revolutionary: the central platform company becomes obsolete; the current astronomically evaluated digital business models of platform companies are being stripped of their ground. The added value is once again more in the hands of the companies that provide it.

How would a decentralized superstructure work? A decentralized app (DApp) would link drivers and passengers directly with each other. The passenger orders and also pays (again) the driver directly, but the positive marketplace effects are still leveraged—this time, however, without a central platform owner. Such a decentralized platform is often set up and managed by a consortium of companies or a foundation. This is where new business models emerge, based on reorganizing the former central platform company's activities and incentives. The high transaction fees, which previously went to a single intermediary, are now shared between providers, demanders, and other value-adding network participants. However, this requires a change of mindset within the companies. Traditional platform business models are becoming obsolete or are being redefined. On the other hand, direct networking between companies and customers creates a much closer customer relationship. Not

surprisingly, companies are increasingly concerned with the implications of decentralization. The key to success is the openness to multilateral partnerships and concentration on the respective core competencies.

4 Decentralized Mobility Platforms

Particularly new emerging or reorganizing industrial ecosystems can benefit from these developments. Opportunities exist primarily for the continuously value-adding companies with non-digital core business. The desired effect of this would be to leverage the core business digitally on the common decentralized platform, but without integrating a new intermediary or creating lock-in effects. One segment currently undergoing major reorganization is mobility. Up to now, public transport companies, cab companies, and private vehicles have dominated the mobility market. Today, more than 14 mobility providers offer their services in Berlin. From e-scooters (*Tier, Circ, Lime, Voi*), e-scooters (*Emmy, Tier*), bicycle-sharing (*Uber JUMP*) to bicycle subscriptions like *Swapfiets*. In addition, there are mobility offers such as car sharing (*WeShare, MILES, ShareNow*), ride-hailing (*Uber, FreeNow*), and ridesharing (*Berlkönig, CleverShuttle*), which supplement individual mobility offers with regular bus and train services. Privatization is leading to competition between these providers. Forcing promising margins or rapid growth, each of these companies offers its services via central transaction platforms. Here, there is a new trend toward “mobility-as-a-service” (MaaS; see also chapter “Mobility: From Autonomous Driving Towards Mobility-as-a-Service”): all participating service providers are directly involved in the mobility process and correspond digitally on a marketplace. The decisive question is on what technical basis this MaaS concept will be developed in the future.

One option is the central platform. Here, a central platform company orchestrates the MaaS marketplace, similar to *Amazon Marketplace*—with the disadvantage of the information asymmetry that arises. In the long run, this leads to dependencies for the mobility providers from the platform companies. The other option would be to implement a decentralized platform operated by a platform network. On the one hand, this allows mobility providers to participate. On the other hand, complementary, additional partners, such as *HERE*, have access too. The map provider—once a joint acquisition by *Audi, Daimler, and BMW*—now integrates other companies such as *Intel, Bosch, and Continental* under one umbrella. As a consortium, the various core competencies could now be combined, and a decentralized platform operated, which avoids dependencies and thus strengthens each individual’s core

business. *Daimler Mobility* is currently developing a decentralized mobility platform. The aim is to create an intermodal platform where all heterogeneous mobility service providers can connect in an interoperable manner.

At the moment it is not clear whether the relevant actors can agree toward a decentralized platform strategy. The seduction to develop an own platform and become an *Amazon* of its business is attractive—every company tries to build up own platforms and therefore cannot realize the important direct and indirect network effects of a platform economy.

5 The Platform Economy Is Decentralizing for Further Market Growth

Existing examples for the development of decentralized platform ecosystems initiated by current platform companies are manifold: *Facebook* published in 2019 its plans for *Diem* (in Italian), a global digital currency for cashless payments, especially in emerging market. The basis for this initiative is a private blockchain, which would be coordinated by the *Diem Association*. Current members of the *Diem Association* include *Andreessen Horowitz*, *Lyft*, *Shopify*, *Spotify*, and *Uber*. *PayPal*, *Visa*, *Mastercard*, *Stripe*, and *Vodafone* have left the association due to regulatory uncertainties. *Facebook* is developing a wallet access solution called *Novi* (formerly *Calibra*). *IBM* and *Maersk* have been cooperating since 2018 to form the blockchain-based shipping platform *TradeLens*. The goal is a smooth and integrated process for international transport across national borders. It is based on the blockchain *Hyperledger Fabric*, which *IBM* once developed and made available to the *Hyperledger* project (*Cisco*, *Fujitsu*, *IBM*, *Intel*, *NEC*, *Red Hat*, etc.) through the *Linux Foundation*. *AWS*, *Microsoft*, and *Google* offer blockchain-as-a-service for enabling similar projects. The platform economy, especially the *Hyperscaler*, is already at the technological front, and they are participating in the European *GAIA-X* project.

6 DLTs: A Short History of the Most Relevant Protocols

The technological groundwork for such applications is available; the crux of the matter is the ecosystem building on top of the DLT protocols. The origins of the DLT protocols lie in *Bitcoin*, which appeared in 2008—just one year

after the financial crisis of 2007. While *Bitcoin* pushes purely monetary transactions without an intermediary, it quickly became apparent that decentralized systems could also apply in an industrial context. For this purpose, *Ethereum* was launched in 2015, developed by Vitalik Buterin, Gavin Wood, and Jeffrey Wilcke. The decisive difference was that the protocol could trigger smart contracts in addition to financial transactions. Smart contracts are programmed if-then relationships, which are automatically executed on the DLT protocol when all required conditions are fulfilled. For example, mobility services could be automated if the conditions “customer has a valid driver’s license,” “customer has the necessary amount of money,” and “car is cleared for usage” are fulfilled. With the increasing popularity of Ethereum also among nontechnical user groups, the challenges of a non-consistently formalized governance model became bigger with *Ethereum*. For instance, crypto exchanges had different interests than *Ethereum*’s core developers. Decision-making on a not exclusively technical direction led to disputes. Gavin Wood, one of *Ethereum*’s founders, therefore founded the *Web3 Foundation*, which launched *Polkadot* in 2020. *Polkadot* combines technological advancements such as interoperability with other DLT protocols and higher scalability with formalized on-chain governance mechanisms designed to streamline the decision-making processes.

The technological basis for decentralized platform ecosystems is nowadays feasible. What is required is a mindset of concurrent cooperation and competition between companies to exploit the technological advantages in the business environment.

7 Toward the European Vision of Economy of Things (EoT)

There are already projects being developed in Europe: the project *LISSI* (Let’s Initiate Self-Sovereign Identity) of *Commerzbank*’s *Main Incubator* has turned into the *IDunion* test network, which is now operated by the *IDunion* consortium. The project is supported by the German Federal Ministry of Economics, and the consortium currently includes the *Bundesdruckerei*, *esatus*, *Main Incubator*, *Bosch*, and the *Technical University of Berlin*. Associated partners include *Commerzbank*, *Creditreform Boniversum*, *BMW*, *Deutsche Börse*, *Telekom Innovation Laboratories*, *Deutsche Bahn*, *Festo*, *ING-DiBa*, *Ministry of Economic Affairs, Innovation, Digitalization and Energy of the State of North Rhine-Westphalia*, the *City of Cologne*, and *Siemens*. The goal is to create a

digital login similar to *Gmail* or *Facebook* login, but with a decentralized structure, so that the identities themselves remain in the owner's sovereignty. The *European Central Bank (ECB)* is considering introducing a digital and programmable Euro (E-Euro), which would be based on decentralized technologies but would still be controlled by the *European Central Bank*. Combining all these initiatives on digital identities (*LISSI*; *IDunion*), digital payment (E-Euro), and a decentralized data infrastructure (*GAIA-X*) with the Internet of Things (IoT) brings us one step closer to the vision of the Economy of Things (EoT).

In the Economy of Things, things are no longer just connected but can also make decisions and perform actions independently. The electric car thus decides for itself when it needs to be charged. Electricity providers and the type of power generation are selected separately. Parking, loading, and payment of invoices are also operationally and economically autonomous. *Bosch*, *Siemens*, and *EnBW* have already implemented pilot projects. An electric car (*Bosch*) and a charging station (*EnBW*) negotiate a price independently so that the vehicle can head for this charging station. In a second step, a similar project between *Siemens* and *Bosch* operates the communication between the car and traffic lights or barriers. For example, if the car is allowed to access the parking lot where the selected charging station is located, the barrier opens. These transactions run independently through smart contracts on the *Ethereum* blockchain.

However, this requires the integration of various digital basic technologies, such as artificial intelligence. Moreover, such commerce requires that things have both identities and rights and that trust exists in the system even without an intermediary. Technologies that create this trust, for example, through automated step-by-step contracts and fraud-proof rules, are DLTs. This requires a decentralized, interoperable platform that integrates stakeholders and different technologies in a nondiscriminatory and equal way and implements these "rules of the game" in the programming code. Such a platform's central element is the governance model, which defines incentive mechanisms and rules for connecting, excluding, managing, or adapting these rules itself.

In summary, the EoT is about the synergetic combination of different digital basic technologies to create economic sovereignty. IoT provides connectivity. Artificial intelligence provides decision-making and the autonomy of the devices. DLTs create a trust layer and give room for maneuver; associated governance models ensure interoperability and incentive mechanisms. The potential of the EoT is enormous. A joint implementation by several initiators—without unilateral ownership—is therefore necessary.

8 How to Set Up Coopetition Models

The keyword of such visions is coopetition: cooperation in the development and operation of the common decentralized platform to increase the efficiency of the market processes as well as own service offering processes. A subsequent competition is based on this new efficiency level with its own business models by leveraging the new efficiency level and gathering a higher value capture. For example, in the field of MaaS: The new efficiency level would be to build and operate a common decentralized mobility platform. This would reduce transaction costs for the entire network by allocating all providers and users' supply and demand transparently and bundled. By this, the customer touchpoint is shared by the whole network, while a subsequent competition between companies and their business models is achieved by the actual mobility service quality and not because the one platform owner owns also the customer touchpoint and leverages this resource independently from the service quality.

Thereby, the whole platform network wins and the customer, due to higher competitiveness of services, which leads to higher service quality or a more varied spectrum of services. Through such further organic development of the services and the platform, a decentralized platform ecosystem is ultimately created. But how is money earned in the respective mode? A distinction between incentive mechanisms and business models is essential in this context. During the joint development of the platform, there should be cooperative work. Competitive behavior through business models would be counterproductive here. The governance model of the decentralized platform must accordingly provide for compensatory incentive mechanisms. For example, the decentralized platform-inherent tokens could serve as an incentive. In the beginning, a joint monetary investment is made in the token's value. In the further course of the project, the participating companies can work on the respective aspects of the platform development to add value and receive a share of tokens that is relative to the respective activity. Once the platform is built, those who have been particularly active in value-adding activities will also be credited with a corresponding share of the tokens.

Based on the platform that is now created, the respective business models compete with each other. In this mode, thinking in the logic of business models is again decisive. Coopetition models are particularly relevant if the goal is to build up network effects. By jointly initiating the decentralized platform by companies already active in the market, network effects can be quickly established once the platform is launched. *GALIA-X* is an excellent example of this.

At present, European companies and governments are investing in developing an independent data infrastructure, which will enable digital business later on in more efficient terms and with the long-term benefits of data sovereignty. However, it is vital to have goal-oriented governance, effectively enabling access rights, incentive mechanisms, and decision-making.

Success Factors of Decentralized Platforms

- Digital identities for products and actors are a necessity for business on decentralized platforms.
- Data sovereignty as a strong value driver for companies has been recognized by European players too.
- Openness to agree on common rules and delegate governance are required for a functioning decentralized platform system.
- Thinking beyond single use cases: Too often companies think too narrow in use cases, but infrastructures are often not build on single use cases. Thus, a broader strategic thinking in real options beyond a single use case is crucial.
- Mindset of coepetition: Distinguish between precompetitive collaborative governance of the decentralized platforms on the one side and competing business models and products on the other side.

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