

# Articulating Value from Data

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# Executive summary

In 1975, tangible assets comprised up to 83% of a company's valuation; but today up to 90% lies in intangible assets – data, intellectual property, brand, reputation and trust.<sup>1</sup> While there is broad consensus that data is foundational to new value creation in an increasingly digitized economy, there is little consensus about how to quantify the value of data. Data and data-driven value have a number of unique attributes that make them different from other types of goods or services in the economy. As such, current economic and accounting approaches are limited. Some new approaches are beginning to emerge.

While the existing literature on data valuation models is mostly theoretical, a parallel stream of empirical work has emerged that uses financial valuation as the basis for estimation. Three basic methods are most common: 1) cost, 2) income and 3) market approaches.<sup>2</sup> However, the value of data does not lie solely in its monetization and sale. Alternative approaches are emerging that consider the wider value of data to an organization, its stakeholders and society beyond financial transactions.

Through collaborative group discussions, key considerations have emerged to guide future efforts:

1. Value may be based on a variety of cost and value drivers, both economic and non-financial, and fluctuate as it progresses through the stages of the data value chain.
2. Data can take different value paths, thus the intended use case matters when choosing a data valuation approach.
3. Given the distributed nature of data ecosystems, a stakeholder-based definition of value is most appropriate.

It is imperative for business to develop a better understanding of the unique nature of data and its value to enable data collaboration for shared value creation. Placing value on data can change the way employees within an organization think about it, use it, invest in it and steward it. Valuation approaches should evolve to address how the value of data changes when shared or opened up for collaboration.

The distinct characteristics and dynamics of data – contextual, relational and cumulative – call for new approaches to articulating its value. This requires a mindset shift – businesses should value data based on cases that go beyond the transactional monetization of data and take into account the broader context, future opportunities to collaborate and innovate, and value created for its ecosystem stakeholders. Assessing data against key value and cost drivers, in the context of different use cases and with attention to shared value for stakeholders, will encourage companies to think about the future value data can help generate, beyond the existing data lakes they sit on, and open them up to collaboration opportunities.

# 1

# Review of the current landscape

## 1.1 Despite rhetorical consensus on the value of data for business, individuals and society, organizations struggle to measure it

Today's shared wealth lies in data – it is cited as the most valuable resource in the digital age.<sup>3</sup> It promises commercial gain for business, improved public services for governments, better convenience and well-being for individuals, and positive outcomes for the planet and society.

There is rhetorical consensus that data is valuable, yet there are inconsistencies in measuring that value:

- While in 1975, tangible assets comprised up to 83% of a company's valuation, today up to 90% lies in intangible assets – data, intellectual property, brand and reputation.<sup>4</sup>
- Seven of the top eight companies in the world by market valuation are data companies – Microsoft, Apple, Amazon, Alphabet, Facebook, Alibaba, Tencent.<sup>5</sup>
- Acquisitions of data asset-heavy companies are increasing – for example, Microsoft acquired LinkedIn for \$26 billion, Facebook's acquisition of WhatsApp totalled \$22 billion, and Google has acquired Fitbit.<sup>6</sup>
- Due to the COVID-19 pandemic, United Airlines and American Airlines collateralized their customer loyalty programmes, with third-party appraisals of their data valued at \$20 billion and up to \$31.5 billion respectively, compared to their market caps of \$9 billion and \$8 billion.<sup>7</sup>

- On the dark web, stolen online banking logins cost between \$40 and \$120 on average, depending on the value of the account,<sup>8</sup> and stolen health records can be worth up to \$250.<sup>9</sup>

Organizations are under increasing pressure to collect, process and assess data – by 2022 company values will reflect their information portfolios;<sup>10</sup> going public, mergers and acquisitions require companies to answer questions about data valuation. In the US, lawmakers have introduced legislation requiring companies to disclose what data they collect from consumers and how they benefit from it; while others have proposed a data dividend to share the wealth created from consumer data.<sup>11</sup>

However, putting a precise value on data still poses a difficult challenge. The nature of data itself is complex – there are different types, it has distinct attributes, it is used in a variety of ways and it can be copied and combined with other data sets and insights. Artificial intelligence (AI) further complicates this landscape by requiring a critical mass of high-quality data to train models to solve important problems – with any one company typically owning only a fraction of this data. Many companies do not have formal data valuation expertise or practice and there is no rigorous evaluation of the impact of data initiatives. Organizations tend to focus more on the costs of storing, protecting, accessing and analysing massive amounts of data than on transforming it, quantifying its business value or

sharing it.<sup>12</sup> Furthermore, company investments do not match the professed value of data, as data collaborations are a longer-term investment with a future return that competes with priorities that have more immediate impact. While companies struggle to ascertain the value of the data stores they sit on and how they can increase it, they are also weighing the benefits and costs of sharing or opening it up.

The inability to measure the actual and potential value of data and lack of clear paths to economic impact results in complacency in its governance, analysis and sharing, and the lack of its full value realization or even distribution.

Over the past six months, a global multistakeholder group at the World Economic Forum has been reviewing existing literature and engaging in peer exchanges to explore the following questions:

- How to measure the value and return on investment (ROI) of data? What are different ways organizations are approaching this question?

- What are the value and cost drivers that could increase the value of data to an organization, its stakeholders and society?
- How can a better understanding of data's value support proper data management, investment decisions, and data collaboration for meaningful outcomes and shared prosperity?

Some of the key insights emerging from the group's collaboration are summarized below.

It is imperative for business to develop a better understanding of the unique nature of data and its value to enable data collaboration for shared value creation. Placing value on data can change the way employees within an organization think about it, use it, invest in it and steward it.

## 1.2 Data is NOT “the new X” – the limitations of economic metaphors

A common metaphor used to describe the value of data is that it is the new “oil”.<sup>13</sup> Though analogous in some ways, it has economic and informational attributes that limit the applicability of this comparison. Some of these attributes include:

1. Anyone, from individuals to governments, can generate data.
2. It is easy to use and reuse data for a variety of purposes without depleting it.
3. It is easy to copy and replicate data.
4. Data can produce both positive and negative externalities, and impact parties not related to a data transaction. For example, one driver's contributions to a mobility app can improve the experience for all users, while a social media company extracting insights from the social network of one user may lead to inferences about others who choose to remain private.
5. Additional investments in infrastructure, technology or complementary data can realize new value from a given data set on an ongoing basis; thus its value may fluctuate and be hard to predict, as new data sets are generated and the analytical capabilities and computing power of organizations increase.

6. The utility of data is closely tied to context, so it may be useful across a range of analyses or industries or have a narrow, albeit valuable, application.
7. Data can increase or decrease in quality and relevance over time, which in turn affects value.
8. Data can be sensitive in nature and thus incur costs and risks in keeping it safe.

Several metaphors have emerged to help businesses, governments and individuals better grasp the unique nature of data – it has been compared to oxygen, soil and sunlight for its prevalence and exponentiality<sup>14</sup> and negatively to carbon dioxide.<sup>15</sup> There is debate about whether it should be treated as an asset at all, with proposals based on the fact that in economic models data acts more like labour than property.<sup>16</sup> China has gone further in explicitly recognizing data as a factor of production in its own right.<sup>17</sup>

Ultimately, each of these metaphors and existing economic concepts offers something useful in communicating the foundational importance of data but has limitations in capturing data's unique characteristics. To date, there is little momentum on any one approach.



## 1.3 Current financial approaches

While the existing literature on data valuation models is mostly theoretical, a parallel stream of empirical work has emerged that uses financial valuation as the basis for estimation.

Three basic methods are most common: 1) cost, 2) income and 3) market approaches.<sup>18</sup> The Government of Singapore's Infocomm Media Development Authority provides illustrative case studies that walk through these three foundational approaches in more depth and offer a range of what the value of data is depending on the method employed.<sup>19</sup>

The "cost" approach involves identifying the total costs to generate, collect, store and replace the data, and costs if lost, determining the profit margin and calculating the value of the subject data. Although useful for data owners and processors to conceptualize the value of their data, it is limited in capturing economic value created from data or return on investment. Nor does this model capture liability costs, such as those pertaining to privacy and security.<sup>20</sup> For example, the US Federal Trade Commission fined Equifax \$575 million, or \$4 per person, for its 2019 data breach.<sup>21</sup>

The "income" approach measures the impact data has on a company's bottom line by estimating incremental revenue, costs and capital, and the impact on future cash flows that companies can derive from the data. However, it is difficult to differentiate between value added by the underlying data itself versus value added more broadly by other dimensions of product/service performance or experience. This subjectivity makes it harder to predict the potential future value created.

The "market" approach measures the current value of data based on what others pay for it or comparable assets in an active marketplace. However, it does not capture the value of data that

businesses choose not to trade for competitive advantage reasons. Without a critical mass of buyers and sellers, data markets will not settle on a price that adequately reflects data's economic value. They also fail to capture the option value of data and are limited in meeting demand for data even if it is extremely valuable in tackling societal challenges.

Additional financial valuation models have been proposed. Bill Schmarzo from Dell developed the "prudent value" approach, which measures the value of data based on how fit for purpose it is for business initiatives that advance the company's overall strategy.<sup>22</sup> It involves establishing the financial value of business initiatives the data is meant to inform, quantifying the value of data-driven decisions, determining the importance of data sources to make those decisions, and then aggregating the economic value of these data sources. Deloitte differentiates the "relief from royalty" method, which estimates how much a company would be willing to pay to acquire data it did not own from a third party.<sup>23</sup> The Bennett Institute has identified "stock market" valuations that measure the advantage gained by companies that invest in acquiring data and developing data capabilities.<sup>24</sup>

However, the value of data does not lie solely in its monetization and sale. Therefore, a pricing approach cannot always capture its value. For example, very often organizations use data to optimize their processes or generate insights into market trends or consumer behaviour patterns. Furthermore, could organizations, instead of tabulating the value of the raw data directly, measure the value of the algorithms that it trains or the insights generated from it? Alternative approaches are emerging that consider the wider value of data to an organization, its stakeholders and society beyond financial transactions.

2

# Part II: Future outlook and key considerations

## 2.1 Key considerations for the evolution of data valuation approaches

It is clear from the literature and landscape review that the current ability to systematically articulate and quantify data-driven value is in its early stages. Nevertheless, alternative approaches are emerging that take into account some of the unique attributes mentioned before – some of which are highlighted below.

Furthermore, through collaborative group discussions, further themes have emerged as key considerations to guide future efforts. This section outlines three such considerations – understanding cost and value drivers, understanding the value chain, and taking a broad stakeholder perspective. Information technology also offers a simple value chain-based framework for value creation from data.

## 2.2 Alternative approaches to valuing data are emerging taking into account data’s unique attributes.

The Bennett Institute for Public Policy at the University of Cambridge conceptualizes data value in terms of the well-being of all society – value arises from data when businesses create jobs or become more productive, when governments deliver more effective public services, when the environment is clean, and when people live happier and healthier lives.<sup>25</sup> Data consultancy firm Anmut collaborated with United Kingdom public sector agency Highways England to develop a “stakeholder” approach. They identify and weigh a list of value creating initiatives, as identified by the stakeholders, and examine the data assets that support them.<sup>26</sup> The development sector proposes an “impact-based” approach that anchors value in an assessment

of the causal effect of data on positive social and economic outcomes or on costs resulting in inefficiency or poor policy decisions.<sup>27</sup> Approaches may rely on contingent valuation, namely asking how much organizations or individuals would be willing to pay to access or allow access to data. For example, a survey of individuals in the US revealed that they would expect \$80 per month to allow access to their personal data but would pay \$5 per month to use a service that protects their privacy.<sup>28</sup> As mentioned earlier, stolen online banking logins cost between \$40 and \$120 on average, depending on the value of the account, on the dark web.<sup>29</sup>

Furthermore, although some of the approaches outlined above are helpful in determining the value and costs of an organization's existing data lake, they are less helpful in capturing future

returns. What is the value of data used to create a new value pool, business model or innovation, and what are future liability costs? What is the value of data once shared for collaboration?

**Key consideration 1: Value may be based on a variety of cost and value drivers, both economic and non-financial, and fluctuate as it progresses through the stages of the data value chain.**

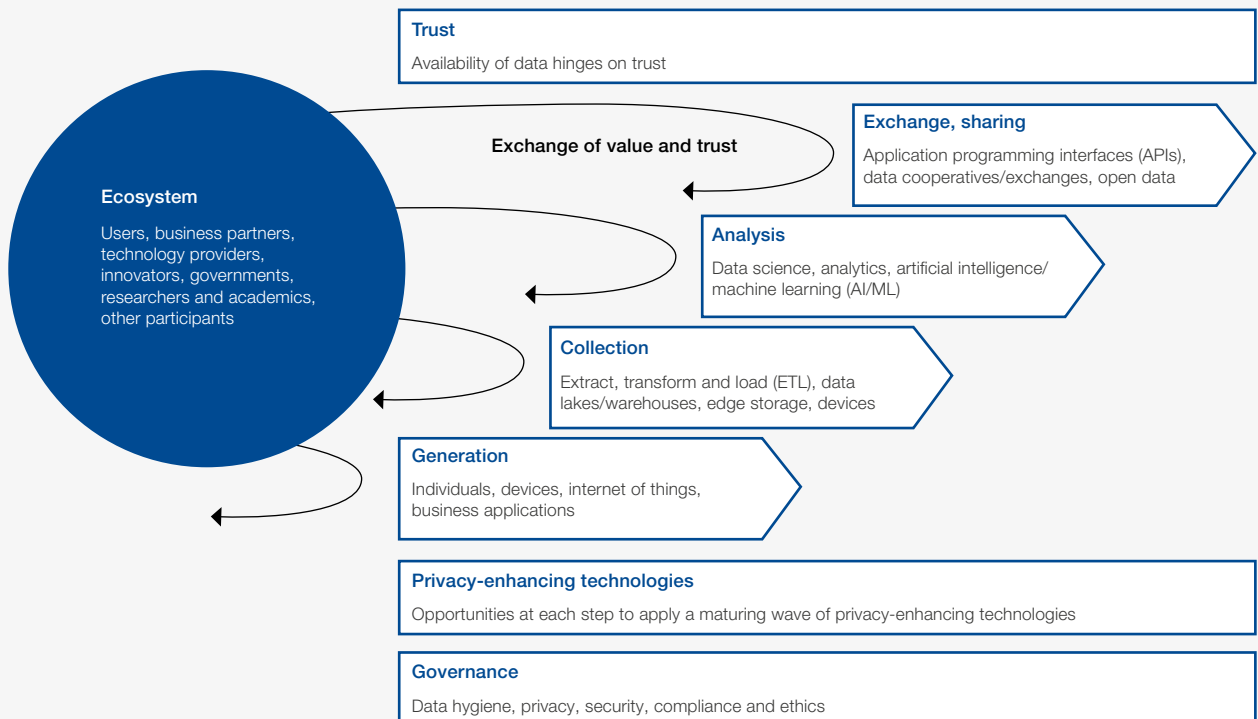
Some are based on obvious attributes pertaining to quality, such as accessibility, accuracy, completeness, cleanliness, consistency, structuredness, timeliness and usability. The exclusivity of a data set can also impact its value. Trainability for artificial intelligence (AI) models, and interoperability and the ability to link with other data sets to generate insights, which is often where the true benefits lie, also increase value. Data acquisition and storage drive costs, as do liabilities and risks associated with meeting security, privacy and other changing legal requirements or restrictions on usage.

The value of a data asset changes as it moves across the value chain, providing organizations with an opportunity to enhance value at every step, especially when paired with computing and AI

capabilities and trust with their ecosystem of data stakeholders. A raw data set may have a certain value at the initial generation or collection stage, but multiply as organizations wrangle, analyse, open up and share it with additional innovation partners. Kaggle is an example of an open data marketplace where organizations from Facebook to Tencent to NASA have opened up their data assets to an open community of data scientists to solve high-value problems. Thus, when approaching valuation, executives should keep an eye out for multi-stage paybacks for building a business case.

The following figure depicts a data value “staircase”, reflecting the opportunity to increase shared value at every step of the data value chain as an organization moves up towards exchanging and sharing data, where the greatest potential for value creation lies.

FIGURE 1 Framework for value creation from data



At the generation stage, organizations can gain a competitive advantage through the scale, usable format and exclusivity of the data they generate. At the collection stage, value drivers include reach, quality, secure storage and organization. Curating a reliable, structured, robust and machine-ready data set is crucial for use in the next stages of the

data value chain, namely analytics and sharing, where the most potential for value creation lies. Collection is becoming more accessible, as the costs of increasing processing power and storage decrease and connected internet of things (IoT) devices become more prevalent with 5G.



The analytics and sharing steps present the biggest opportunity for value creation from data, while also presenting the largest risks for organizations, demanding a new collaborative mindset and approach from leaders.<sup>30</sup> Apart from leveraging data to inform the building and selling of proprietary algorithms and other types of intellectual property, the actionable insights resulting from the analysis can create value by improving internal decision-making and operational

efficiency, improving products and services, and discovering new business models. The exchange and sharing stage involves creating value from data through collaboration, while ensuring trust in accuracy, provenance and commercial sensitivities for businesses, and privacy and security for consumers. The section on **Data valuation for collaboration and innovation** expands upon this.

## **Key consideration 2: Data can take different value paths, thus the intended use case matters when choosing a data valuation approach.**

To articulate the value of its data, an organization must understand how it impacts growth, returns, risks and other less tangible benefits and costs, such as customer experience, reputation and contributions to individuals and society. This means that valuation approaches will depend on both the existing and potential future uses of data.

For example, an innovator may take raw data and use it to create a new type of product for retail consumers. An e-commerce company may use that same data for a range of internally focused applications, such as predicting the likelihood of a consumer purchase or detecting fraudulent transactions.

The literature emphasizes the importance of identifying and evaluating use cases as part of the data valuation process.<sup>31</sup> Archetypes for data-driven value creation include new value pools, business models and innovations, better commercial applications, richer stakeholder experiences, and improved decision-making.<sup>32</sup> Furthermore, new use cases frequently draw on data from multiple sources, generate value for many stakeholders, and embed both end-user and partner interests. They depend on partnerships and ecosystems that go beyond company boundaries.

Organizations may choose different approaches or even blended approaches, depending on their respective contexts and value paths.

## **Key consideration 3: Given the distributed nature of data ecosystems, a stakeholder-based definition of value is most appropriate.**

With the paradigm shift to shared value creation for all stakeholders across the chain and increasing consideration of environmental, societal and governance (ESG) factors, businesses are focusing on leveraging data to provide value for customers and shareholders, as well as for employees, suppliers and business partners, communities, society and the planet.<sup>33</sup>

Value creation from data involves a broad ecosystem of stakeholders, including businesses that collect and process it, partners and third parties that they share it with, governments, customers, employees and especially gig workers, and individuals and communities who provide and are impacted by the data. Thus, the value of data depends on the stakeholder, their incentives, their interests, their data processing and analytics capabilities, and their rights.

Each of these actors bear different costs and gain different benefits. A business stewarding the data bears the costs and liabilities of collection, maintenance and use, and realizes value by monetizing, selling or charging access to the data, or using it to create new value pools and business models, improve decision-making and operational efficiency, or retain their customer base for future engagement by providing richer

experiences.<sup>34</sup> The intermediaries bear the costs of accessing the data or investing in computing capabilities, and gain value by creating data-driven products and services. Both businesses and their partners also contribute to other types of value, such as job creation, economic growth and innovation. Employees and gig workers make wages but bear the costs of excessive surveillance, automated assessments with potential for bias and discrimination, and punitive work environments. Governments may get tax revenues and benefits pertaining to their security and safety, health and trade priorities. Communities and the individuals that comprise them receive products, services, convenience, better experiences, and/or insights from their data to help inform their decisions but may bear the cost of their privacy and security being violated, bias from algorithmic recommendations, or a lack of value in return on data extracted from them.

This should motivate businesses to broaden their definition of value beyond revenue to encompass responsibility for promoting positive socio-economic impacts in society, and the collective prosperity and reputational benefits that come with it. Considering stakeholders in their assessment of data's value will also help companies ensure the equitable distribution of the value created from data.

## 2.3 Data valuation for collaboration and innovation

There is greater value creation from data as it moves up the “staircase” (see framework above) – when made available for analysis to produce insights, in combination with other data sets, and through sharing and collaboration. Many companies are discovering that partners, suppliers or customers have adjacent data and insights that, if combined thoughtfully through systems and platforms, can create richer value propositions for all.

From 2017 to 2019, the number of companies forming data-related partnerships rose from 21% to 40%<sup>35</sup> and by 2023, organizations that promote data sharing will outperform their peers on most business value metrics.<sup>36</sup> Businesses that share data externally generate three times more measurable economic value than those that do not. Platform business models, increasingly competitive markets and complex supply chains, and business opportunities to provide complementary products and services mean that businesses will be more innovative and develop more competitive solutions if they collaborate.<sup>37</sup> Public sector data sharing is estimated to create socio-economic benefits worth between 0.1% and 1.5% of GDP, and between 1% and 2.5% of GDP when including private sector data.<sup>38</sup> Organizations are also working to achieve better outcomes for individuals and society – including seamless mobility, personalized medicine and consumption, efficient manufacturing and enhanced well-being.<sup>39</sup> The more data is connected, the more it increases in utility and value – the network effects of positive externalities created when data is combined with other data indicates that sharing data and increasing access will drive up its value for all stakeholders.<sup>40</sup> By quantifying the network effects from data aggregation, it may be possible to encourage much broader collaboration across institutions of all types – e.g., companies, governments and NGOs – than occurs today.

**Innovator:** Ocean Protocol (Ocean) is an open-source protocol that enables data owners and consumers – individuals and businesses – to exchange and monetize data and data-driven services in a decentralized marketplace. The company introduced an initial framework for pricing data that recognizes the unique features of information and reduces friction due to seller paralysis and lack of market structure typical of data marketplaces. It pulls together practical techniques, including cost-based pricing, comparison with other offers on the market along a list of factors such as volume, frequency of updates, number of attributes, precision and brand, and analogous market and problem-based pricing.<sup>41</sup> Ocean also recently launched the Compute-to-Data environment, which allows computations to be run on data without moving it – resolving the trade-off between data owners who want privacy and control, and data buyers who want to access valuable data for analytics and to improve business outcomes without liability. Ocean introduces algorithms as a new type of asset

that can be public or private and have a dynamic or a fixed price, just like data sets in their marketplace.<sup>42</sup>

**Government:** Estimates show that open data published by Transport for London (TfL), a local government body in the United Kingdom, saves £1 million per year in customer support costs, contributes £14 million per year to London’s economy, and has created over 700 jobs, and saves time worth between £70 and 90 million per year for those travelling around London.<sup>43</sup> TfL commissioned Deloitte to build an empirical benefit framework quantifying the value of this open data, which involved mapping open data feed inputs to outputs such as apps, products and services, and tracing the socio-economic impacts of these services; examining proxy prices; identifying different stakeholders who received benefits; and applying metrics to measure these impacts.<sup>44</sup>

**Enterprise:** Hewlett Packard Enterprise (HPE) works with NGOs to apply trustworthy inference from large data sets to solve many pressing humanitarian issues. Data sets, when aggregated and selectively combined, demonstrate the power of applying context to data. In the agriculture farming sector in India, for example, many data sets are securely brought together to improve crop yields and target the sharing of farming best practices and market viability and logistical information in challenging environments. Smallholder farmers gain expertise and value from data sharing with the larger communities, Digital Green, and research groups like the Consultative Group on International Agricultural Research (CGIAR). This level of sophisticated data mining and analysis provisioning could never be achieved individually with smallholder farms.

**Individual:** Digi.me enables users to create an encrypted library of their personal data. Users permit access to their data for a business to, for example, get a credit assessment or a better insurance premium, or securely exchange their data for a reward. Solutions such as Digi.me show promise in the discovery of business models and opening up data for greater shared value while promoting individual agency and ownership. Digi.me points out that current business valuations of personal data do not take into account the “new normal” of user-centricity and the distinct way users see value – and that they may be eager to part with it in exchange for services, conveniences or rewards. Research suggests that when users are in control of their data, they keep sensitive data private but grant businesses access to most other data, improving market outcomes.<sup>45</sup>

Valuation approaches should evolve to address how the value of data changes when shared or opened up for collaboration. The Government of Singapore has done preliminary work, applying cost, income and valuation approaches for data sharing.<sup>46</sup>

## 2.4 Building trust and sharing value across stakeholders

For data-driven value, trust is a foundational element in enabling businesses to build deep, sustainable relationships with clients and stakeholders.

Individuals are realizing that their data is not being used for their benefit but to create historic profits for the companies that collect and develop insights from the data, a third party with whom the data is shared or even against the individual. This is a significant driver of the erosion of trust that customers are displaying – they are not just concerned about data security and data privacy, they are concerned about the limited benefit they receive in return for providing data about themselves. Some 85% of global consumers wish “there were more companies I could trust with my data”,<sup>47</sup> while businesses are reluctant to share commercially sensitive and proprietary information. Companies are reacting to this sentiment. For example, Apple’s new App Tracking Transparency feature requires developers and advertisers to ask for user permission prior to tracking their activity across other companies’ apps and websites and to share data about user activity with data brokers and other third parties for

ad-targeting purposes.<sup>48</sup> New technologies offer companies new choices to enable deep protection of data while it is being handled, to “move” algorithms or insights rather than data.<sup>49</sup> The Gaia-X European shared data infrastructure project is an example of this approach in action.

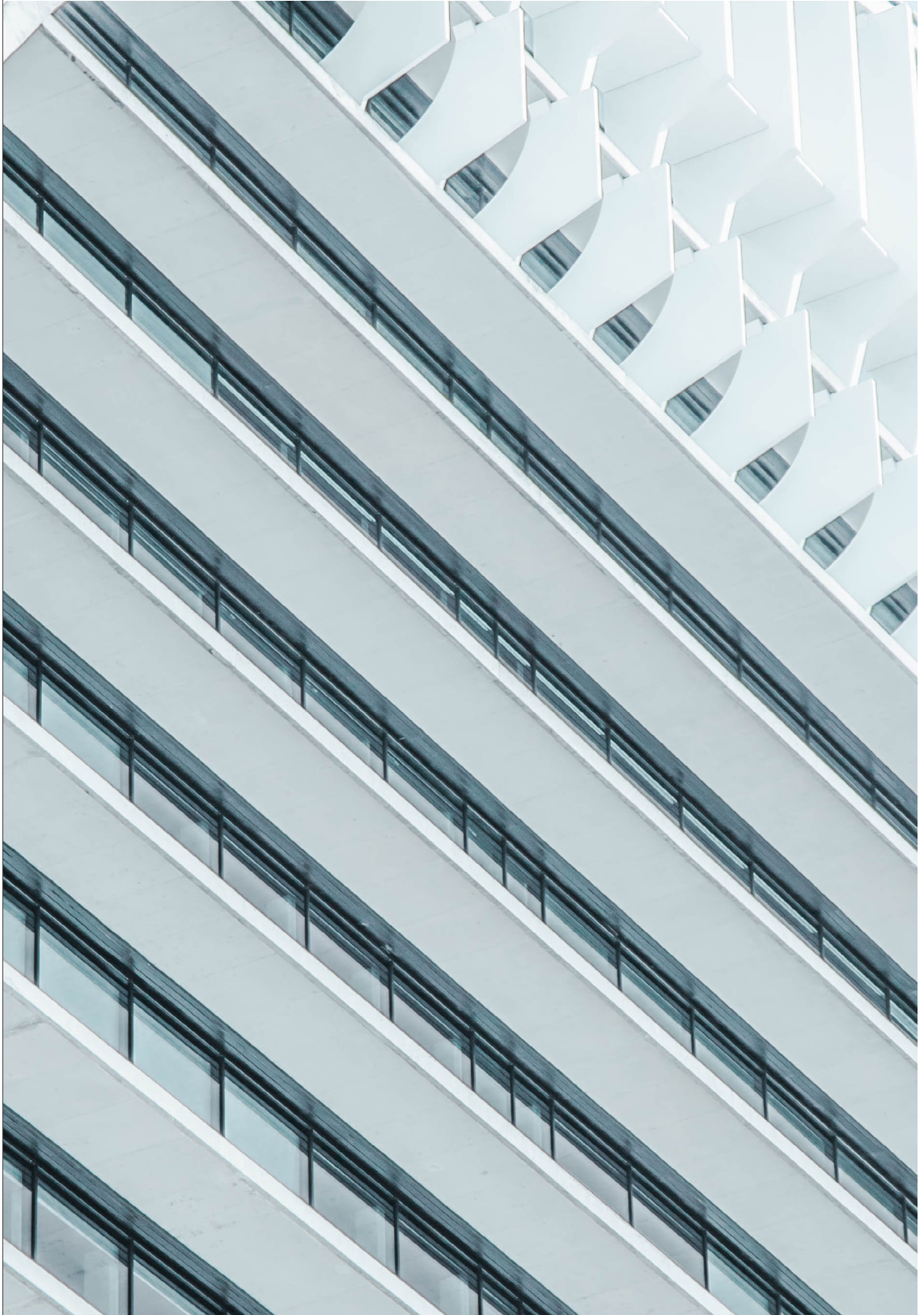
Customers need to see companies using data for their benefit, in ways that they highly value. This can make individuals eager to share and even donate their data and create a virtuous cycle of value exchange.<sup>50</sup> Gartner predicts that through 2023, organizations that can instill digital trust will be able to participate in 50% more opportunities, expanding revenue-generation prospects.<sup>51</sup>

Trust requires understanding how different stakeholders experience value and how this experience evolves over time, then making an authentic commitment to delivering that value on stakeholders’ terms. Apart from better protecting data, companies should ensure that they distribute its value across stakeholders participating in the data value chain.

# Conclusion

The distinct characteristics and dynamics of data – contextual, relational and cumulative – call for new approaches to articulating its value. This requires a mindset shift – businesses should value data based on cases that go beyond the transactional monetization of data and take into account the broader context, future opportunities to collaborate and innovate, and value created for its ecosystem stakeholders.

Assessing data against key value and cost drivers, in the context of different use cases and with attention to shared value for stakeholders, will encourage companies to think about the future value data can help generate, beyond the existing data lakes they sit on, and open them up to collaboration opportunities.





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# Endnotes

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