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Gaia-X for SMEs

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Summary

The majority of companies in the EU are categorized as Small and Medium Enterprises (SMEs). They are a key employer and driver of economic growth and innovation. As the global economy is becoming more digitised, companies are increasingly deriving more value from the use and analysis of data. A central mechanism to take advantage of the opportunities provided by data is through increasing the amount of available data through data sharing as well as having the complementary infrastructure to analyse it effectively. However, for SMEs there are barriers to data sharing including: legal uncertainties and difficulties defining the parameters of data access and re-use, a lack of control once the data is provided, insufficient uptake of cloud computing, weak bargaining positions of SMEs in traditional contracts for data sharing and ultimately, a lack of trust. This paper outlines how Gaia-X tackles all these issues including providing legal certainty, control and sovereignty over data, providing the necessary cloud infrastructure, levelling the playing-field and creating trust. However, despite Gaia-X providing many of the necessary features and infrastructure to enable and facilitate SMEs digitisation, a certain initial level of digital capabilities and literacy is required from the SMEs themselves. Hence, to make the most out of the services provided by Gaia-X, SMEs would be best positioned to also increase their own in-house digital capabilities.

1. Background

1.1. SMEs

SMEs play a vital role and are a key driver of the European economy. Indeed, the vast majority of companies in the EU (99 percent) are classified as SMEs (EC website SMEs). Though definitions may vary depending on the region, in the EU the main characteristics that define a company as an SME is the number of staff and its turnover or balance sheet (ibid). For example in the EU, a company is classified as an SME if it has less than 250 employees, a maximum turnover of € 50 million or a maximum total balance sheet of € 43 million (ibid.). Within this category there is further differentiation between Medium, Small and then Micro-sized companies. Micro-sized companies actually make up more than 93% of the EU companies (not including the finance sector) (European Union & Statistical Office, 2021). Overall, SMEs employ over 65% of Europe's workforce, provide over half of Europe's GDP and contribute significantly to innovation in Europe (EC Factsheet 2020; Hofheinz et al. 2022). In Germany, the numbers are usually slightly lower than the EU average where for example, in 2020 though 99 percent of the companies in Germany are defined as SMEs they employ 55% of the workforce (Statistisches Bundesamt 2022).

1.2. Benefits of further digitisation and data sharing

In the 21st century, further digitisation and the effective use of data is becoming central in many areas for maintaining global competitiveness, to derive added-value and where overall, the value of the data economy continues to rise significantly (see European Data Market Study 2022). For some companies, sufficient digitisation might even mean the difference between staying in business or not. A pivotal mechanism by which the full value of the data - and the subsequent benefits derived from it - can be realised is with data sharing within a comprehensive analytical infrastructure. This is especially important for SMEs as they might not have the resources to do the data-analysis themselves. For those providing the data, benefits could simply be receiving compensation or be more far-reaching gaining - through the skills of others that they do not themselves possess - unprecedented insights into their own data. For those who gain access and receive the data there is the possibility to combine it with their own data or other data providing fresh insights and where unprecedented access could create entire new business opportunities. This is particularly relevant for SMEs. Many SMEs for example produce very specific industrial parts and thus, can be one of the few or the sole company who actually have this specific industrial data. This makes their data extremely valuable. However, for SMEs there are several barriers that limit data sharing with the subsequent loss of opportunities that can be derived from it.

1.3. Lack of digitisation and digital skills

Before though looking at certain barriers and how Gaia-X can help tackle them it should be noted that one of the largest issues for companies in the digital economy – but in particular

for SMEs - is rooted in a lack of digitisation and the required digital skills. The Lisbon Council's 2022 'Green, Digital and Competitive' SME Policy Brief provides some key insights on SMEs (see Fig.1-6). What is highlighted is not only the various discrepancies among European countries but also that in many significant areas, SMEs have still not sufficiently embraced digitisation. For example, the ECs 'Europe's Digital Decade: Digital targets for 2030' sets out eleven goals which include 75% of SMEs using big data analytics and cloud computing (Hofheinz et al. 2022). Here though, the figures show that the EU average is currently only 14% and 35% respectively (ibid.). In terms of ICT skills (Fig. 4-6), one can also perceive a similar trend where in particular, the low number of SMEs that employ ICT specialists stands out (Fig. 4). In the case of Germany, the share of SMEs using 'Big Data Analytics (Fig.1)', with 'High/very High Digital Intensity (Fig.3)', with 'ICT functions Performed by Own Employees (Fig. 5)' and providing 'Training of ICT Skills of Personnel (Fig.6)' are all above the EU average. The share of SMEs though using 'Cloud Computing Services (Fig.2)' and who 'Employ ICT Specialists (fig.4)' is below the EU average.

Fig. 1: Big Data Analytics

Rank	Country	Share of SMEs Using Big Data Analytics	Score
1	Malta	30.0%	100.00
2	Denmark	26.0%	85.60
-	Netherlands	26.0%	85.60
4	Belgium	22.0%	71.20
-	Ireland	22.0%	71.20
6	France	21.0%	67.60
-	Finland	21.0%	67.60
8	Luxembourg	18.0%	56.80
-	Sweden	18.0%	56.80
10	Germany	17.0%	53.20
-	European Union	14.0%	42.40
11	Croatia	13.0%	38.80
12	Greece	12.0%	35.20
13	Lithuania	10.0%	28.00
-	Portugal	10.0%	28.00
15	Estonia	9.0%	24.40
16	Czech Republic	8.0%	20.80
-	Spain	8.0%	20.80
-	Italy	8.0%	20.80
-	Latvia	8.0%	20.80
-	Austria	8.0%	20.80
-	Poland	8.0%	20.80
22	Hungary	7.0%	17.20
23	Bulgaria	6.0%	13.60
-	Cyprus	6.0%	13.60
-	Slovenia	6.0%	13.60
26	Romania	5.0%	10.00
-	Slovakia	5.0%	10.00

Fig. 2: Cloud Computing Services

Rank	Country	Share of SMEs Using Cloud Computing Services	Score
1	Finland	75.0%	100.00
2	Sweden	69.0%	91.69
3	Denmark	66.0%	87.54
4	Italy	59.0%	77.85
5	Estonia	56.0%	73.69
6	Belgium	52.0%	68.15
-	Malta	52.0%	68.15
-	Netherlands	52.0%	68.15
9	Ireland	50.0%	65.38
10	Croatia	38.0%	48.77
-	Slovenia	38.0%	48.77
12	Austria	37.0%	47.38
-	European Union	35.0%	44.62
13	Cyprus	34.0%	43.23
14	Germany	32.0%	40.46
15	Lithuania	30.0%	37.69
16	Czech Republic	28.0%	34.92
-	Luxembourg	28.0%	34.92
-	Portugal	28.0%	34.92
19	France	26.0%	32.15
20	Spain	25.0%	30.77
-	Slovakia	25.0%	30.77
22	Hungary	24.0%	29.38
23	Poland	23.0%	28.00
24	Latvia	21.0%	25.23
25	Romania	15.0%	16.92
26	Greece	12.0%	12.77
27	Bulgaria	10.0%	10.00

Fig. 3: High and Very High Digital Intensity

Rank	Country	Share of SMEs With High/ Very High Digital Intensity	Score
1	Sweden	47.0%	100.00
2	Finland	45.0%	95.61
3	Denmark	42.0%	89.02
4	Malta	39.0%	82.44
5	Netherlands	35.0%	73.66
6	Belgium	27.0%	56.10
-	Ireland	27.0%	56.10
-	Austria	27.0%	56.10
9	Cyprus	25.0%	51.71
10	Germany	24.0%	49.51
-	Spain	24.0%	49.51
12	Slovenia	23.0%	47.32
13	Luxembourg	21.0%	42.93
-	European Union	21.0%	42.93
14	Lithuania	20.0%	40.73
-	Portugal	20.0%	40.73
16	Czech Republic	19.0%	38.54
-	Croatia	19.0%	38.54
-	Italy	19.0%	38.54
19	Estonia	18.0%	36.34
20	Greece	17.0%	34.15
21	Slovakia	15.0%	29.76
22	France	13.0%	25.37
-	Latvia	13.0%	25.37
-	Poland	13.0%	25.37
25	Hungary	10.0%	18.78
26	Bulgaria	8.0%	14.39
27	Romania	6.0%	10.00

Fig. 4: Employ ICT Specialists			
Rank	Country	Share of SMEs that Employ ICT Specialists in Total SMEs	Score
1	Ireland	29.0%	100.00
2	Belgium	28.0%	94.71
-	Malta	28.0%	94.71
4	Denmark	27.0%	89.41
-	Hungary	27.0%	89.41
6	Finland	26.0%	84.12
7	Cyprus	24.0%	73.53
8	Poland	23.0%	68.24
9	Netherlands	22.0%	62.94
10	Luxembourg	20.0%	52.35
11	Latvia	19.0%	47.06
-	Sweden	19.0%	47.06
13	Greece	18.0%	41.76
-	Austria	18.0%	41.76
-	Portugal	18.0%	41.76
-	European Union	18.0%	41.76
16	Germany	17.0%	36.47
-	Croatia	17.0%	36.47
18	Czech Republic	16.0%	31.18
-	Spain	16.0%	31.18
-	France	16.0%	31.18
21	Bulgaria	15.0%	25.88
-	Estonia	15.0%	25.88
-	Romania	15.0%	25.88
-	Slovenia	15.0%	25.88
25	Lithuania	14.0%	20.59
-	Slovakia	14.0%	20.59
27	Italy	12.0%	10.00

Fig.5: ICT Performed by Own Employees			
Rank	Country	Share of SMEs for Which ICT Functions Are Performed by Own Employees in Total SMEs	Score
1	Finland	67.0%	100.00
2	Sweden	60.0%	85.68
3	Denmark	58.0%	81.59
4	Estonia	55.0%	75.45
5	Lithuania	51.0%	67.27
6	Belgium	50.0%	65.23
-	Malta	50.0%	65.23
8	Germany	49.0%	63.18
9	Ireland	48.0%	61.14
-	Netherlands	48.0%	61.14
-	Austria	48.0%	61.14
12	Croatia	47.0%	59.09
13	Luxembourg	42.0%	48.86
14	Romania	41.0%	46.82
15	France	39.0%	42.73
-	Hungary	39.0%	42.73
-	European Union	39.0%	42.73
17	Spain	37.0%	38.64
18	Czech Republic	36.0%	36.59
-	Portugal	36.0%	36.59
20	Slovakia	34.0%	32.50
21	Cyprus	32.0%	28.41
22	Slovenia	31.0%	26.36
23	Bulgaria	29.0%	22.27
24	Poland	26.0%	16.14
25	Greece	25.0%	14.09
26	Italy	23.0%	10.00
-	Latvia	23.0%	10.00

Fig. 6: Training ICT Skills of Personnel			
Rank	Country	Share of SMEs Providing Training to Develop/ Upgrade ICT Skills of Personnel	Score
1	Finland	36.0%	100.00
2	Belgium	31.0%	85.48
-	Sweden	31.0%	85.48
4	Denmark	29.0%	79.68
5	Malta	27.0%	73.87
6	Ireland	26.0%	70.97
7	Cyprus	25.0%	68.06
8	Slovenia	24.0%	65.16
9	Czech Republic	23.0%	62.26
10	Germany	22.0%	59.35
-	Netherlands	22.0%	59.35
-	Portugal	22.0%	59.35
13	Croatia	21.0%	56.45
14	Luxembourg	20.0%	53.55
15	Spain	19.0%	50.65
-	European Union	18.0%	47.74
16	Estonia	16.0%	41.94
-	Latvia	16.0%	41.94
-	Austria	16.0%	41.94
-	Poland	16.0%	41.94
20	Greece	15.0%	39.03
-	Italy	15.0%	39.03
-	Hungary	15.0%	39.03
23	Slovakia	14.0%	36.13
24	France	13.0%	33.23
25	Lithuania	12.0%	30.32
26	Bulgaria	6.0%	12.90
27	Romania	5.0%	10.00

Source for all images: Hofheinz et al. (2022) from Eurostat data

2. SMEs barriers to data sharing

2.1. Legal uncertainties and difficulties defining the parameters of data access and re-use

For many SMEs, entering a data sharing framework can be a daunting task. Starting already with what data exactly to share, it might not be clear what is most appropriate. Furthermore, setting the parameters for data access or sharing can also be a significant issue where the necessary expertise might be lacking. If data is accessed and shared without the correct mechanisms in place, such as for personal data, an SME might face fines as a result of non-compliance with data protection/privacy regulations. This issue and concern for non-compliance has only becomes more accentuated with the additional horizontal regulations being enacted at the EU level aimed at the digital economy, most notably, the Data Governance ACT (DGA). Overall, navigating and situating oneself within the regulatory landscape and understanding what is permitted with regards to data is difficult for many companies to ascertain. Though at times guidance or templates are provided for certain legislations, this can be particularly difficult for SMEs who have limited expertise or resources. Other issues are for example, providing data too early and hence, entailing the risk of no

longer being able to be protected by Intellectual Property Rights (IPRs) (OECD 2019). All these risks where the possible added insights and benefits can only be ascertained once the data has been shared means that many SMEs might be very cautious and ultimately, prefer not engage in data sharing.

2.2. Lack of control

Within the same line or argumentation where SMEs might ultimately choose to not share data due to the perceived risks of doing so is the loss of control. Here, not being able to control who and for what purposes the data provided is used can lead to significant damages. This could be to their reputation or because of fines as a result of the data being used for purposes or in a manner that is non-compliant with the law. Indeed, the fear of losing the control of one's data are so significant, that many SMEs choose to then not engage with cloud computing at all (OECD 2019). Many of the traditional big cloud providers do not allow the users sufficient control of the data. A significant concern in the EU with regards to the loss of control of data is also that non-European governments gain access to the data. The most notable example is the extraterritorial implications of the US Cloud Act where US governmental agencies can also gain access to the personal data of non-US citizens (Madiega 2020). Another issue is the concern that valuable information or trade secrets might be discerned by competitors. This is only accentuated by SMEs having difficulties defining the parameters of data access and re-use and who might have less know-how and resources to make certain that the data is secured against inadvertently providing valuable information.

2.3. Insufficient uptake of cloud computing

The lack of uptake and use of cloud computing by SMEs is problematic as it provides the required infrastructure for the processing and analysis of data needed for its constructive re-use (ibid). Though naturally, certain SMEs in very traditional niches for example, might not require cloud computing services and benefit as much from data sharing as others, the lack of uptake can still be problematic for all SMEs. Not only because efficiencies or opportunities might be missed and ultimately putting one at a global competitive disadvantage, but a lack of digital engagement might ultimately create an increasingly larger and more difficult to bridge digital divide for SMEs.

2.4. Weak bargaining position

Currently, the data access, sharing and re-use framework is usually dealt with through contracts. Though this provides stakeholders with the flexibility to tailor the contracts to their specific needs, it does often raise the problem that SMEs often find themselves in a weaker bargaining position. They have less resources at their disposal than the larger companies in the contract regarding the fair use of the data. This has particularly been an issue in the agricultural sector between farmers and the large agricultural companies when it comes to agricultural data (Jouanjean et al. 2020). Overall, the issue with the status quo and use of contracts is that it does not encourage data sharing where often those contracts already in

existence are perceived as unfair, particularly for SMEs. Issues related to weak bargaining positions and unfair practices when it comes to data sharing could be easily tackled with a neutral intermediary.

2.5. Trust

A lot of the reasons outlined above for SMEs not engaging in data sharing are ultimately, anchored in a lack of trust or more specifically, a trustworthy data-sharing framework. A framework where SMEs can for example, trust that they will not run into legal problems related to data sharing, where control over their provided data can be ensured as well as that non-European government agencies do not get access to it. Trust is not only vital for firms to engage in data sharing itself but also as a whole, a vital foundation for SMEs to embrace more fully digitization and the opportunities it can provide.

3. How Gaia-X tackles SME's barriers to data sharing

Originally a Franco-German initiative, Gaia-X has since garnered European support as a federated decentralised infrastructure to enable European digital sovereignty where data is accessed and shared in a trustworthy, secure and transparent environment in alignment with European values and laws. Gaia-X connects and builds upon already existing infrastructure nodes providing an interoperable data sharing framework based on common standards. Gaia-X has three main organizational structures. The first is the non-profit Gaia-X Association (or Gaia-X AISBL which has over 350 members). There is then the national 'Hubs' (currently fifteen with two international) which coordinate, build and represent the development of ecosystems at the country level. Finally, there is the 'Community'. The open-source Gaia-X community includes the entire global Gaia-X network. Users and providers collaborate in data space events, hackathons or techdives.

3.1. Legal certainty and clear parameters of data access and re-use

Gaia-X data infrastructure are by design built with European values, norms and rules in mind. Before one can share data and participate, one must conform to a common set of rules and standards and where compliance with relevant legislations (e.g. the GDPR) is verified (Gaia- X Trust Framework Release 22.04). Consequently, once in the Gaia X ecosystem, actors can share data more freely in an environment they can trust that their actions conform with the law. Important here is also the Gaia-X 'Labelling Framework' which is targeted at ensuring a trustworthy environment and provide transparency regarding the services offered providing various choices depending on each company's specific interests and requirements.

Table 1: The three labelling levels

Label 1	Data protection, transparency, security, portability, and flexibility are guaranteed in line with the rules defined in the Gaia-X Policy Rules Document and the basic set of technical requirements derived from the Gaia-X Architecture Document. For cybersecurity, with the minimum requirement being to meet ENISA's European Cybersecurity Scheme- Basic Level
Label 2	This advanced Label Level 2 extends the basic requirements from Level 1 and reflects a higher level of security, transparency of applicable legal rules and potential dependencies. The option of a service location in Europe must be provided to the consumer. Regarding cybersecurity, the minimum requirement will be to meet ENISA European Cybersecurity Scheme - Substantial Level
Label 3	This level targets the highest standards for data protection, security, transparency, portability, and flexibility, as well as European control. It extends the requirements of Levels 1 and 2, with criteria that ensure immunity to non-European access and a strong degree of control over vendor lock-in. A service location in Europe is mandatory. For cybersecurity, the minimum requirement will be to meet ENISA's European Cybersecurity Scheme - High Level.

Source: directly from Gaia-X Labelling Framework Document 25.11.2021

3.2. Provides control and data sovereignty

By giving the data providers full control regarding where their data is stored, by whom, for what purposes and the amount of time it can be used, Gaia-X's decentralised federated infrastructure tackles one of the largest barriers to data sharing that SMEs are confronted with. Gaia-X includes services for secure data transfer. End-to-end encryption ensures that data is only available to the designated sender and the designated recipient. Intermediaries do not have access unless this is explicitly intended. Furthermore, compute-to-data services means that one's data never need be transferred but rather, is kept in its original location (i.e. locally/on-premise) where instead, the algorithms for analysing data are transferred and applied (e.g. Edge analytics). With the 'Labelling Framework', a user who deals with a lot of sensitive data or is particularly concerned regarding access to their data by US governmental

agencies can then choose services with the label 3 level. Naturally, all labels including ones with the label 1 level still provide all services in alignment with EU rules and laws (e.g. data protection) but if there are additional requirements then these can be given. All these features providing SMEs control of their data also helps in mitigating against concerns that competitors will be able to gather valuable information and trade secrets from the data provided. With Gaia-X, not only the secure and standardised framework for data access and re-use provides certainty but data access can always be altered and controlled.

3.3. Gives access to cloud computing infrastructure

Not only does Gaia-X ensure that data sharing occurs in compliance with the European laws, as well as allows SMEs to maintain control of their data but also, provides SMEs ultimately, a technological infrastructure. This infrastructure is designed in an open manner. It gives large and small providers the opportunity to participate and compete. Easy market access and effective competition ensure fair prices and high-quality services, so that suitable offers can be expected for every demand. Effective data-sharing and re-use is enabled where the use of cloud computing provides unprecedented insights and analytical opportunities. Hence, not only are the major barriers to SMEs sharing data and use of cloud computing tackled but also the technological infrastructure that might be too costly for many SMEs to build themselves is also provided. In addition, due to Gaia-X's open framework, many more possible services including ones that meet more specific needs can be provided where overall, a healthy competitive environment exists.

3.4. Level-playing field

Due to its decentralised federated nature as well as the possibility provided for SMEs to control the use of their data, many issues for SMEs that currently exists with data sharing contracts are avoided. Without a centralised system or one dominant actor with all the control and data processing as well as analytical power, the traditional weak bargaining position of smaller actors are bypassed. Important is also that the possibility to choose with whom one works in a transparent labelling environment means that issues related to vendor lock-ins can also be avoided. In an open framework where many competing service providers can exist, allows the SMEs more freedom to choose with whom they partner and under what conditions they share the data. If a partner does not provide satisfactory services an alternative one can be found. Furthermore, as the Gaia-X system is inherently aligned with EU values and rules- including on competition- a fair environment is provided.

3.5. Creating trust

As a result of the transparency that permeates the Gaia-X framework, the fact that users are provided with the control of how, when and by whom their provided data is being used as well as the framework being compliant with EU regulations means that Gaia-X creates trust. Trust that a space has been provided to allow companies to experiment, become more digitised and capture the opportunities that data provides. This is particularly relevant for

SMEs as less available resources or expertise means that their risk threshold might be even lower than the larger companies and hence, need to fully trust that can reap the benefits of digitisation without for example, getting into legal trouble. Overall, a high level of trust in digitisation- to which Gaia-X contributes significantly- is essential for the continued growth of the EU's digital economy.

4. Looking ahead

Whether it is providing legal certainty, making clear the parameters of data access and re-use, ensuring data sovereignty and control as well as providing the essential cloud computing infrastructure and a level-playing field, Gaia-X provides SMEs with a trustworthy, secure and comprehensive digital infrastructure. One that allows SMEs to make the most of the opportunities digitisation has to offer. It still remains with the SMEs to ensure that the data they collect is done correctly, that it is of sufficient quality, to discover their own best practices as well as which data collection need be prioritised and which for example, can remain analogue. Whereas only the SMEs can actively increase their own ICT staff and skills, Gaia-X can nonetheless provide the required safe space for experimentation in discovering what SMEs ultimately wish to gain and prioritize from their data and learn from Gaia-X's best practices (see Büchel and Engels 2022) as well as link them to partners that meets their needs the most. There are three main ways to get involved in Gaia-X either through the Gaia-X 'Association', the 'National Hub' or the 'Community'. Many SMEs might find joining the 'National Hub' as the most useful avenue. It is free to join and one's contribution can vary depending on how much time one has. The onboarding process can be done in a few simple steps. **First step**, one contacts the coordinator of one's national hub. **Second step**, one expresses interest in one of the sector-specific domains and one or more working groups. In addition, certain documents will need to be signed such as the required data protection and confidentiality documents. **Third step**, involves new members receiving the invitation to the relevant events, workshops or working group meetings.

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