



DIGITAL TECHNOLOGIES ACTING
AS A GATEKEEPER TO INFORMATION
AND DATA FLOWS

D8.2 Dissemination, Communication, Exploitation and Stakeholders Engagement Report - Intermediate Version

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List of Acronyms

Abbreviation / Acronym	Description
AI	Artificial Intelligence
API	Application Program Interface
DoA	Description of action
Dx.y	Deliverable number y belonging to WP x
EBSI	European Blockchain Services Infrastructure
EC	European Commission
eIDAS	Electronic Identification and Trust Services
ER	Exploitable results
IP	Intellectual property
IPR	Intellectual property rights
KER	Key Exploitable Result
KPI	Key Performance Indicator
MBA	Master of Business Administration
Mxy	Month xy of the project's timeline
PCT	Project Coordination Team
PESTLE	Political-Economic-Social-Technological Legal and Environmental
SoTA	State-of-The-Art
SWOT	Strengths-Weaknesses-Opportunities-Threats
TANGO	Digital Technologies ActiNg as Gatekeepers to information flOWs
TRL	Technology readiness level
WP	Work Package

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Executive Summary

The main goal of TANGO is to establish a stronger cross-sector data sharing, in a citizen-centric, secure and trustworthy manner, by developing a novel platform exhibiting the following capabilities: user-friendly, secure, trustworthy, compliant, fair, transparent, accountable and with environmentally sustainable data management.

Apart from the critical work conducted at TANGO's technical research level, another essential work package (WP) of the project is WP8 concerning the dissemination, communication, exploitation and stakeholders' engagement. These activities are critical parts of TANGO's strategy to raise awareness and inform the project's results to the targeted audience. The exploitation of expected outcomes is nonetheless one of the major activities involved in TANGO, as it concerns the future opportunities or obstacles that may arise with the project. The exploitation strategy is thus strictly linked with communication and dissemination.

After the first 18 months – halfway through the project overall duration – the initial dissemination and communication and exploitation strategy (see D8.1), which serves as a guide for all the actions that will be carried out until the end of the project, has been put into application with the joint efforts of the consortium. This report presents the dissemination and communication activities that have been carried out during the first and second year of the project from February 2023 (M6) until February 2024 (M18), including an overview on the status of the related KPIs. In line with TANGO's three stages of the communication and dissemination plan, the first 12 months of the project primarily focused on raising awareness and engaging with a wide audience, focusing on the key targets and potential stakeholders but truly communicating about the problems that TANGO aims to solve and the innovative solution envisioned. During the second year of TANGO, the focus of the strategy will be on promoting and distributing the project's developments and findings to the targeted stakeholders. In parallel and in alignment with TANGO's life cycle, the initial exploitation plan has been revised and adapted. This report presents an overview of the innovation management plan and exploitation activities conducted during the first 18 months of the project. The updated exploitation plan including an initial list of KER is also presented: this list will be monitored and reviewed regularly by the team to update it in accordance with the progress of TANGO, leading to the final version at the end of the project at M36. In the report, a SWOT and a PESTLE analysis has been conducted about the 5 prioritized KERs, and the initial Business Model Canvas for 1 of the prioritized KERs has been developed. Moreover, a detailed reference to the actions related to the IPR allocation is presented. In Section 3, the relative legal measures that could be implemented in order to ensure protection of the IPR are also mentioned and general rules related to their exploitation and use in general. In Section 4, a list of the exploitable results of the TANGO project is presented, with references to the projected owners of the ERs and the relative tasks.

In conclusion, the report serves as an interim project analysis point to monitor the progress achieved so far and to validate the necessary steps to successfully complete the strategy up to M36. The coordination and joint effort of the consortium partners, who are actively involved in dissemination, communication and exploitation activities, will be crucial to achieve the targeted results, in line with the technical developments of TANGO that will be achieved in the coming months of the project.

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1 Introduction

1.1 Purpose of the document

This document constitutes the intermediate report of dissemination, communication, and exploitation activities conducted for project TANGO (Digital Technologies ActiNg as Gatekeepers to information fLOws) from February 2023 (M6) to February 2024 (M18). The present report describes the dissemination and communication activities that took place during the last 12 months of the project and outlines the planned activities for the remaining duration of the project. In addition, it presents the tools and activities that were undertaken to accomplish the set objectives, disseminate the project, and implement the strategy as it was set out in the deliverable D8.1 “Dissemination, Communication, Exploitation and Stakeholders Engagement Plan”.

1.2 Relation to other project work

Deliverable 8.2 “Dissemination, Communication, Exploitation and Stakeholders Engagement Report - Intermediate Version” plays an important role within the TANGO project, directly addressing Objective No. 6, which centres on the extensive communication and scientific dissemination of the project results. This deliverable serves as an updated and comprehensive report on the current status of dissemination, communication, and exploitation activities carried out by project partners. The report encompasses a wide array of initiatives, including scientific publications, conference presentations, workshops, and other means to share project outcomes with the research, academic, and international community. Additionally, it highlights the efficient exploitation activities related to TANGO concepts and tools across various domains. It also presents the actions that have taken place related to the allocation of the IPR of the exploitable results, with references to the legal requirements to ensure proper protection and the rules related to the exploitation and in general use in any way of the exploitable results. Finally, D8.2 ensures that the conducted activities align with the objectives outlined in the project's Description of Action, providing a comprehensive overview of the project's progress and impact on a broader scale.

1.3 Structure of the document

This document is structured in 6 major sections. Following this introduction, section 2 gives a high-level report on the TANGO communication and dissemination activities and efforts performed by the partners until M18, providing the status of the KPIs. Section 3 presents the overview on the innovation management plan and activities conducted until M18. Section 4 provides a list and classification of the Key Exploitable Results (KERs), and Section 5 details the exploitation activities and strategy for 5 identified KERs. In order to examine the Exploitation Path of the project, a SWOT and PESTLE analysis have been conducted for 5 prioritized KERs, as well as the initial Business Model Canvas for 1 prioritized KER. The overview on the standardisation activities is also outlined in this Section. Finally, the conclusions summarise the report.

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2 Dissemination, Communication, Exploitation and Stakeholders Engagement Plan

This section presents a high-level overview of TANGO's dissemination and communication activities to be undertaken throughout the whole duration of the project. During the last 12 months of project (M06 – M18), WP8 focused its efforts on engaging with the stakeholders and promoting the project to all the personas. The activities resulted in an effective promotion of the project at a national, European, and international level. This was achieved through the contributions of the project partners and through the effort of diversification in dissemination and communication activities.

2.1 Objectives

The objectives of the Dissemination, Communication, Exploitation, and Stakeholders Engagement Plan are based on the key objectives of the project, in particular those regarding the expected impact of TANGO. Overall, TANGO aims to:

“Improve the efficiency and the use of trustworthy digital technologies to address the requirements of citizens, companies and administrations/public organisations on privacy and commercial and administrative confidentiality as well as responsible, fair and environmentally [...] [sustainable] data operations in data spaces, across the data life cycle.”

The TANGO project's Grant Agreement defines the objectives of the dissemination and communication strategy of TANGO as follows.

Define a clear and distinctive brand identity
Ensure broad visibility and promotion of TANGO
Ensure broad visibility of TANGO's work
Facilitate the exploitation of TANGO outcomes
Support the sustainability of TANGO beyond its lifetime.

For their fulfilment, the Grant Agreement also defines some basic principles for communication and the approach to and engagement of stakeholders.

Personalised, multi-channel communication
Participation to and organisation of events
Long-term relationship building and earning trust
Empowerment

Which, as the Grant Agreement illustrates, ultimately aims to:

Support the community and capacity building
Establish and manage of liaisons and synergies

The dissemination and communication strategy of TANGO aims to ensure that a clear and distinctive identity for TANGO project is developed and used coherently to broaden the visibility of the project among potential stakeholders. This, in turn, is expected to facilitate the exploitation of TANGO's outcomes by the members of its consortium and the sustainability of TANGO as a whole. To secure this, the Grant Agreement outlines few clear principles: personalised and multi-channel communication directed to target audiences, participation to and organisation of events to share TANGO's achievements and attract stakeholders. The latter shall be empowered and engaged in long term relationships. This ensures the support to the TANGO community and facilitates the establishment and management of liaison and synergies.

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2.2 Personas

TANGO aims to make significant contributions in research and technology by leveraging six demonstrators whereby it aims to reach six different industries, in as many Countries across Europe. In order for these contributions to lead to the expected impacts of TANGO, it was necessary to define an appropriate communication and dissemination strategy to be implemented, which in turn will lead to the exploitation of the project results. To convey this strategy, a set of personas was identified in order to provide a comprehensive understanding of the target audience, their characteristics and their needs. A representation of the identified personas and communication funnel identified in D8.1 is provided below:

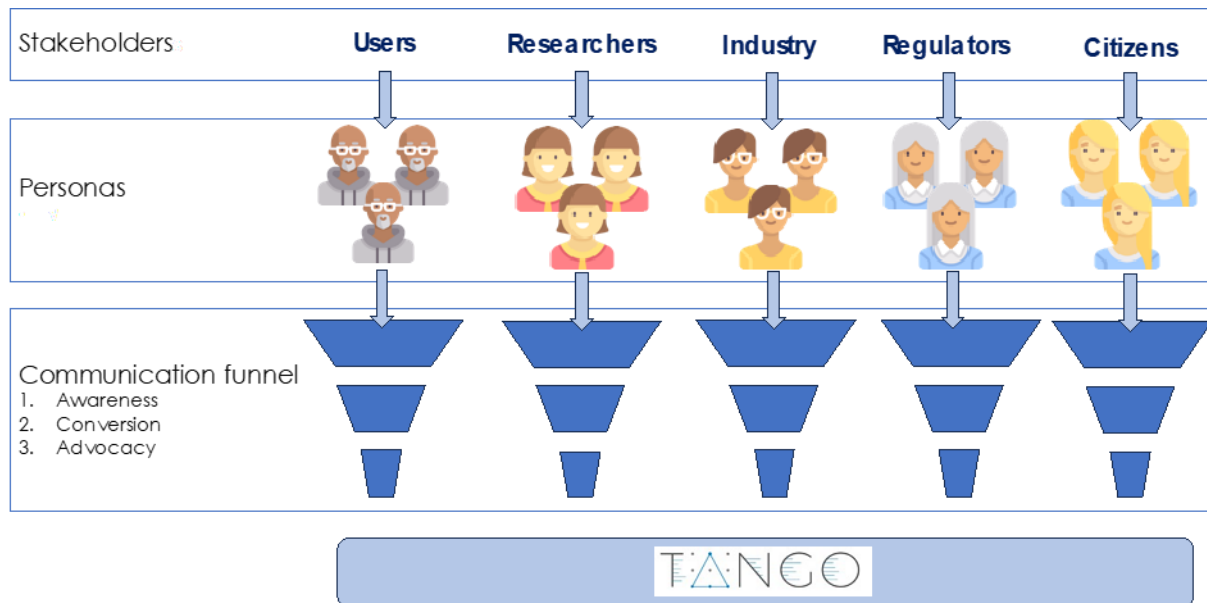


Figure 1 - TANGO Communication funnel and personas

To efficiently target the different needs of each persona, the consortium has addressed the audiences through distinct channels and messages. Moreover, the WP8 leader has used website and social media internal analytics to monitor most KPIs and collect data related to audience profiling. The findings of such analysis are detailed in the following paragraphs that describe each communication tool.

For the period from M06 to M18 of the project, the main objectives for the dissemination and communication were the following:

- 1) Reinforce the TANGO brand by utilising it in all dissemination materials;
- 2) Present the project in relevant events;
- 3) Disseminate the project's vision & objectives to key partners;
- 4) Create scientific content and share it to stakeholders such as the scientific community;
- 5) Reach out to the wider community of non-experts with social media posts.

To create better coordination between all partners of the project and monitor the ongoing activities, a file was created and shared among partners to keep track record of every activity conducted and monitoring of the target KPI values. The log file is monitored by the WP8 leader that periodically collects the input related to all activities (events, publications, social media posts, etc.) performed by

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the partners. In addition, a file has been created as an editorial calendar shared among all partners, to keep track of all communication activities conducted on the websites and social media and also to collect contributions about relevant topics or project's development that can be disseminated by the partners through blogs and social media posts.

The use of these files is supervised by the WP8 leader who periodically collects contributions from the different partners in order to monitor the progress of activities on a regular basis and to actively involve the whole consortium in the communication and dissemination of project results, creating a centralised point of contact where all parties can access information.

In the following paragraphs, an overview of the dissemination and communication tools used to set the brand identity of the project and promote the project's concept, activities and initial results is provided.

2.3 Dissemination and communication tools and channels

As described in D8.1, the communication strategy implemented for TANGO included the definition of the brand used for communication to stakeholders in all channels used for the project's online presence: the official website, social media channels (Twitter, LinkedIn, Mastodon, YouTube), and communication materials.

After an initial dissemination period dedicated to the development and positioning of the project in the digital channels, both towards the general and more specialised target audience, the second communication phase began on M12.

As a result of the development of the brand identity and its positioning on the website, the various social media channels and communication materials, TANGO now enjoys greater distinctiveness given by a well-defined logo and colour palette, as well as active communication channels with a follower base on each platform identified during the strategic phase. This visual process was also accompanied by an adaptation in naming, which took the form of changing the handle of all social media profiles. The name of the project on the channels has changed from TANGO PROJECT to TANGO EU, as the word "EU" immediately and unequivocally identifies the affiliation to European projects.



Figure 2 - TANGO new naming on social media

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It was possible to make this change successfully, without affecting but rather facilitating TANGO's visibility, only after the initial phase of the project, in order to benefit from the brand awareness already developed and the project's already consolidated distinctiveness.

In the following paragraphs, a detailed description of the actions and impacts of the communication activities carried out through these channels up to M18 is provided.

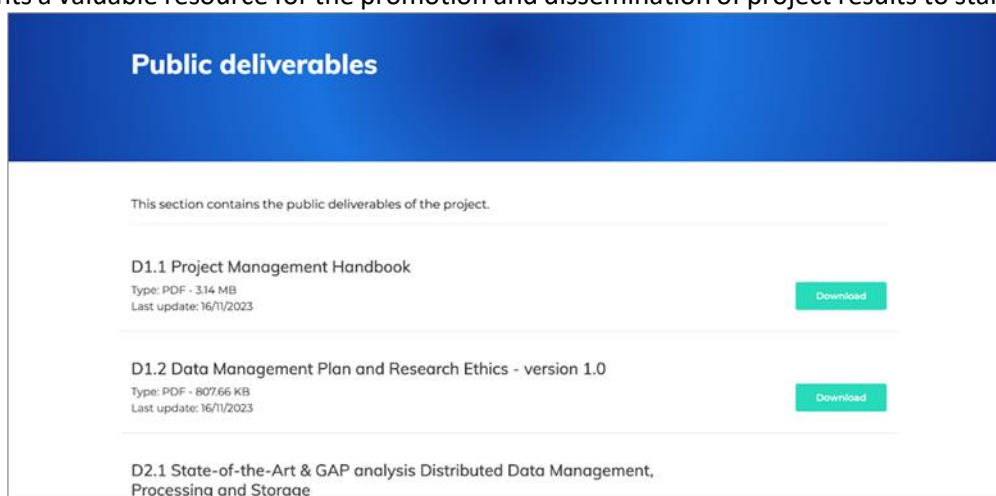
2.3.1 Project website overview and analytics

As the central node for dissemination purposes and the main dissemination and communication channel, the TANGO official website (<https://tango-project.eu/>) was built in the early stage of the project. The website serves for results consolidation and dissemination support, as well as a collaboration tool for knowledge, experience and best practice sharing. The project website is continuously maintained to provide up-to-date information and material on the project deliveries and news. The website was developed and indexed on search engines by uploading specialised and project-related content and articles. In the dissemination strategy, the website plays a crucial role, as it is the most comprehensive channel for information, often representing the destination for individual content posted on social networks.



Figure 3 - TANGO Website Homepage

In the navigation menu, which consists of several sections, a new subsection called “Public Deliverables”, reported under the “Materials” section (<https://tango-project.eu/materials/public-deliverables>) has been introduced, where the official public deliverables are progressively uploaded and available for download. In this section are already listed all the deliverables of the project, which provides an overview on the results that will be distributed at Work package level. This section represents a valuable resource for the promotion and dissemination of project results to stakeholders.



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Figure 4 - Public deliverables section on TANGO Website

Over the last 12 months, 13 articles written with the contribution of partners were published on the site in the 'Blog' section. Each article covering a topic or an in-depth study on the areas of research and application of TANGO, constitutes a knowledge capital of the project. Therefore, each blog was shared on TANGO's social media channels through dedicated posts, to help drive traffic and visits to the website.

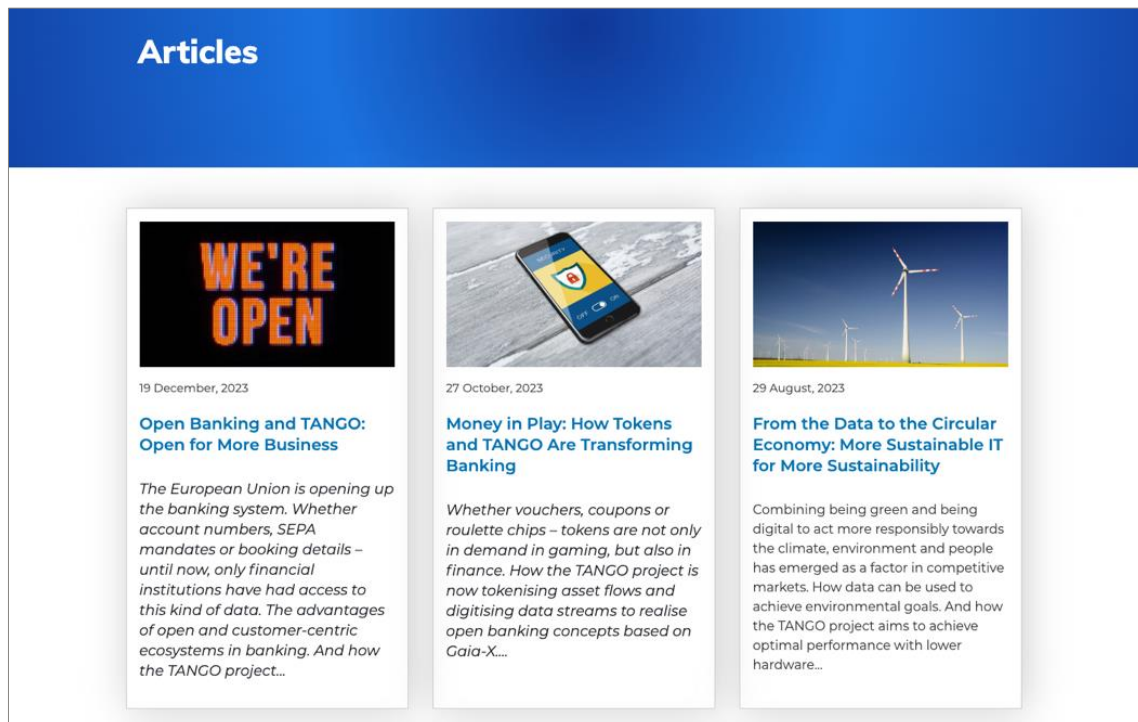


Figure 5 - Articles section on TANGO Website

From the perspective of the data, through the analysis of insights on website visits, it can be seen that the number of unique visitors expected during the three-year project period has already been reached and exceeded (KPI >3000 unique visitors). The analytics are retrieved using the Matomo tool. [1] Currently, 3791 unique visitors have visited the website. This number is a sign that the communicative resource can be easily found via search engines and easily consulted; this is also reflected in the data on the duration of the visit on the website. From the visits overview, it can also be seen that the average visit duration is 1:25 minutes, which is a good benchmark to achieve and that users are spending time navigating the and visiting the website. This data therefore confirms a positive trend regarding the effectiveness of the website as a communicative resource and further reinforces the centrality of the website's role in dissemination, which will continue to play a pivotal role in the following project phases.

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Figure 6 - Visits Overview on TANGO Website

Looking at the traffic data relating to the main resources from which site traffic comes - which means where the visitors who reached the TANGO site came from - provides further confirmation of the successful consolidation of the TANGO brand through dissemination actions. The primary source of traffic is direct traffic, i.e., users have actively searched on search engines for the exact name of the project, a sign that a clear and consolidated brand awareness has been created. The second source of site traffic are social networks, which will be described in detail in the next section. The third source of traffic are other specialist or partner sites: this confirms the importance of creating synergies with all the actors involved in order to increase awareness of the project. In particular, this traffic source is the one with the longest navigation time on the site, a symptom that these visits are made by users belonging to a more specialised target, coming from more vertical sectoral channels. Finally, the last source of traffic is represented by specialised campaigns that have taken the form of email marketing.

Channel Types						
CHANNEL TYPE	VISITS	ACTIONS	ACTIONS PER VISIT	AVG. TIME ON WEBSITE	BOUNCE RATE	
Direct Entry	2,009	3,768	1.9	1 min 18s	70%	
⊕ Search Engines	1,513	3,067	2	1 min 18s	61%	
⊕ Social Networks	281	579	2.1	1 min 59s	62%	
⊕ Websites	273	590	2.2	2 min 12s	62%	
⊕ Campaigns	4	4	1	0s	100%	

Figure 7 - Overview on web traffic sources

The traffic results emerging are very positive and consolidate the communication strategy adopted so far by TANGO. The data show that the actions conducted on TANGO's social channels and website contribute to creating traffic, and the project's awareness is already sufficiently high that the largest number of visitors to date are people actively searching for TANGO via search engines, a sign of growing interest in the project and targeting of the right audience.

2.3.2 Social media channels overview and analytics

This paragraph provides an overview of TANGO's different social media channels as well as an analysis of their traffic data: LinkedIn, Twitter, Mastodon and YouTube. As already outlined during the elaboration of the dissemination and communication strategy in D8.1, having different official project

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communication channels allows reaching different targets and maximising scientific dissemination actions.

All the social media icons have been included in the footer of TANGO website in order to allow visitors to click directly on the social media profiles, where all profile pictures contain the same project logo. All social profiles have been customised following the same consistency criterion to make themselves immediately recognisable.

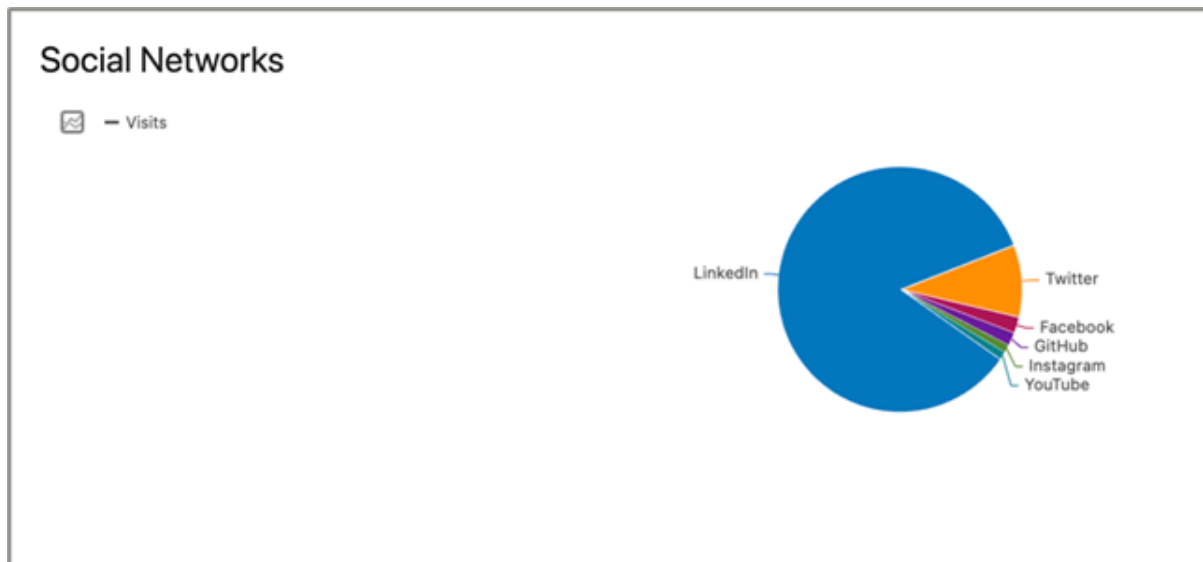


Figure 8 - Overview on traffic share from social networks

Figure 8 shows the percentage of traffic data coming from each social media channel. The details and data of each channel are described and analysed below.

2.3.2.1 LinkedIn

LinkedIn is one of the most powerful social networks in terms of disseminating professional information. The TANGO page in LinkedIn is mainly used to connect with the scientific and technical community of the project. The blog posts on the website are replicated as posts and articles (depending on the content) on the LinkedIn page to attract more visitors to the website. In order to further engage the audience, along with the creation of traditional posts, several polls were also created with questions on cybersecurity, artificial intelligence and privacy, in order to increase the interactivity of the content created on the page.

From the graph above, it is clear that LinkedIn is, among the various social networks, the main source of traffic to the site. The follower base on this channel currently stands at 293 people, of which 244 were gained during the last 12 months, from January 2023 until January 2024. These people have contributed to viewing the page and its published content on an ongoing basis, with special peaks of visits at certain times of the year.

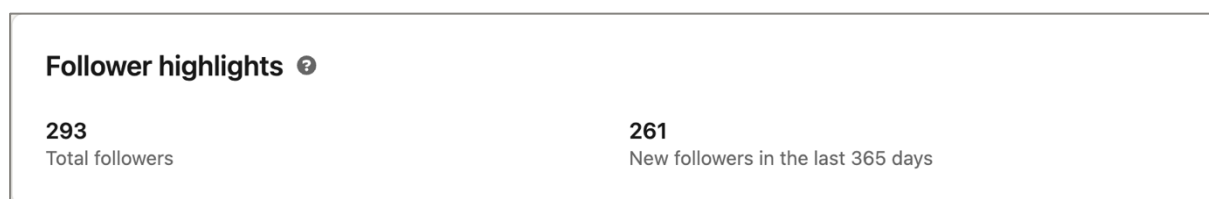


Figure 9 - Total of LinkedIn Followers

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The traffic generated on this social network occurred organically, without using sponsored advertising. From January 2023 until January 2024, the total number of impressions is 20,986 which means that the pieces of content posted on the TANGO LinkedIn profile have been displayed to the target audience almost 21,000 times.

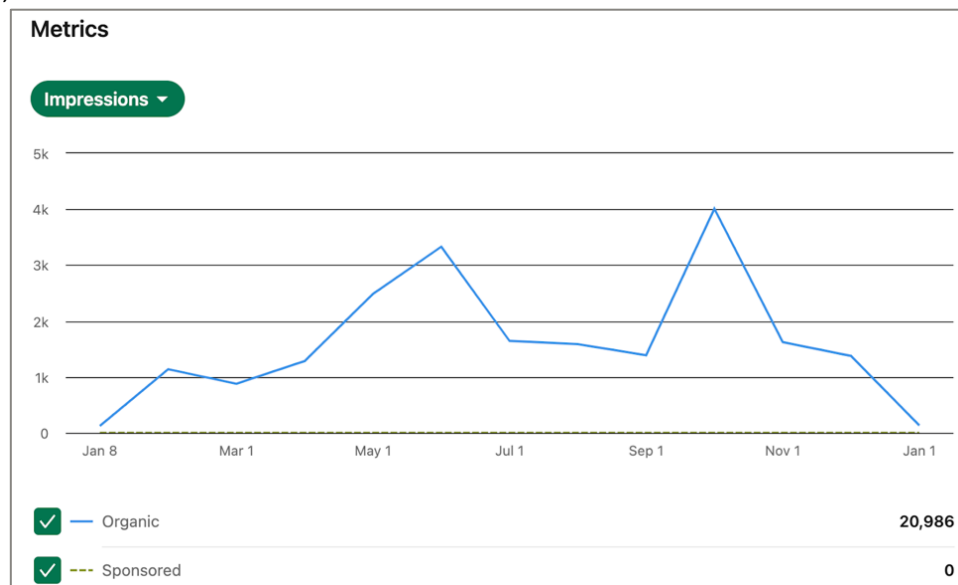


Figure 10 – Total number of Impression on LinkedIn

One of the most useful pieces of information that emerges from LinkedIn is being able to see the industries where the people interacting with the page work with, as shown in Figure 11. In the case of TANGO, it's possible to see that these are mainly people from IT Services and consulting, Researchers also from Think Thanks and Software Development companies. Overall, it's clear that the targeted industries are aligned with the target personas identified in the communication funnel and can comprise relevant stakeholders for the project.

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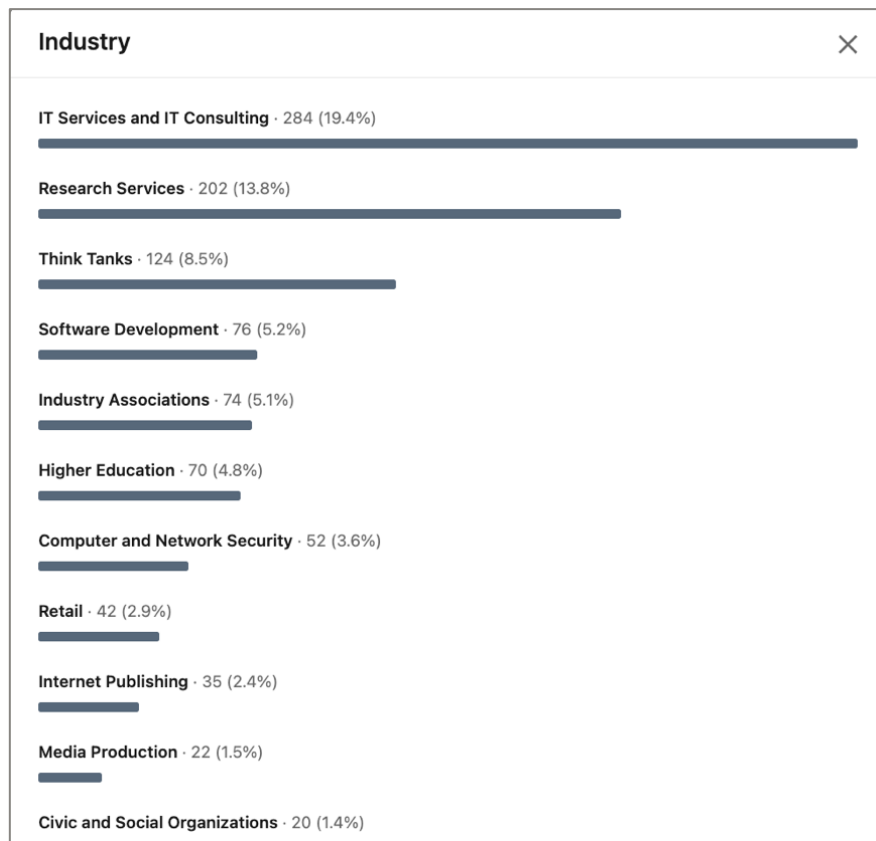


Figure 11 - Industry overview of TANGO LinkedIn visitors

Finally, Figure 12 shows that the navigation on the LinkedIn channel occurs both from desktop devices and from smartphones in a substantially equivalent manner, another indicator that dissemination actions do not penalise users who prefer to use smartphones over computers. This data therefore reinforces the thesis that dissemination actions through these channels are yielding concrete results regardless of the device of use.

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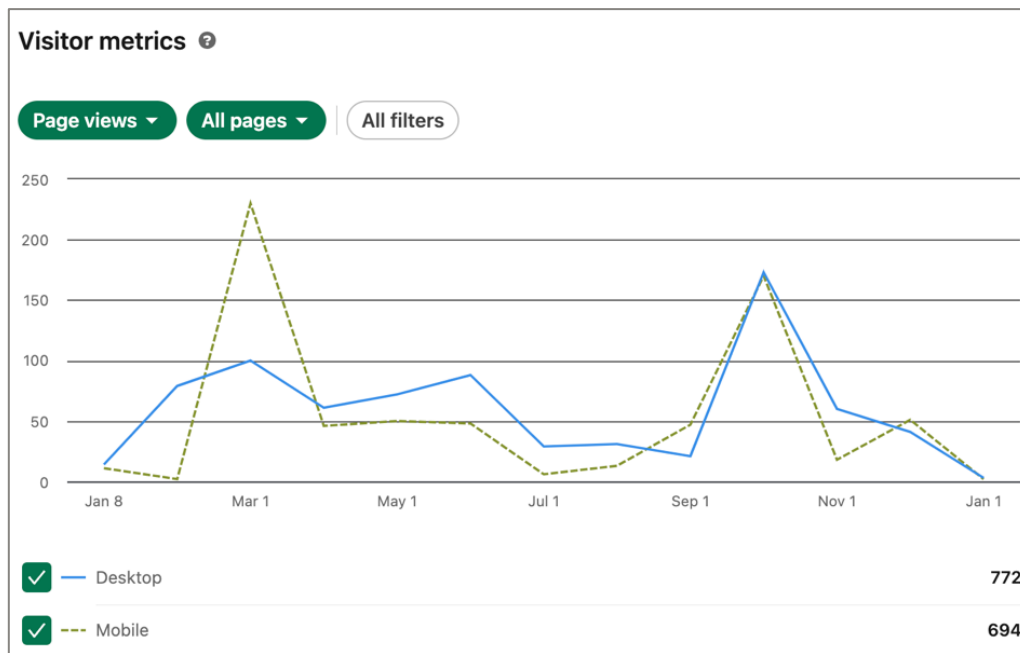


Figure 12 - LinkedIn visitors metrics

2.3.2.2 X

X, formerly known as Twitter, is a highly content-based social media and extremely concise, mainly used by 'insiders' and opinion leaders from different sectors. This is considered particularly suitable for the communication needs of the project, which on a strategic level aims to engage this type of audience that works with information, knowledge and news.



Figure 13 - TANGO Account on X

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As shown in Figure 13, the total number of followers acquired on X over the past year is 110. This is a positive result as it indicates that a target audience has been intercepted that is expected to increase in the following months, as the project's dissemination activities progress towards the more advanced stages. It is important to point out that since the conception of the TANGO communication strategy and the creation of the social media profiles, there have been profound changes on this channel in particular. The purchase of Twitter by Elon Musk in September 2022 led to radical changes and continuous updates, culminating in the name change to X in August 2023. To this end, it is thus important that the WP leader oversees and operationally coordinates the dissemination and communication strategy in order to monitor and evaluate the performance of activities on all social networks and especially on X, to identify any reinforcing and/or corrective actions to be implemented to reach the target number of followers by the end of the project. This is to ensure that actions to promote and communicate the results of TANGO have the estimated impact on the target audience and are not compromised by external factors related to social media platforms.

2.3.2.3 Mastodon

Mastodon is a micro blogging platform consisting of several servers managed by private users, groups and organisations, where there are no algorithms or advertisements. The software is open source and is based on the logic of 'rooms' known as instances, where each has its own moderation rules. Compared to the instance used during the first phase of the project, called 'Mastodon.uno' dedicated only to posts in Italian, TANGO's profile was changed to 'Mastodon.social', which is more suitable for the project's content. This therefore generated a change in the URL of the mastodon profile, from https://mastodon.uno/@tangoproject_eu to https://mastodon.social/@tangoproject_eu.

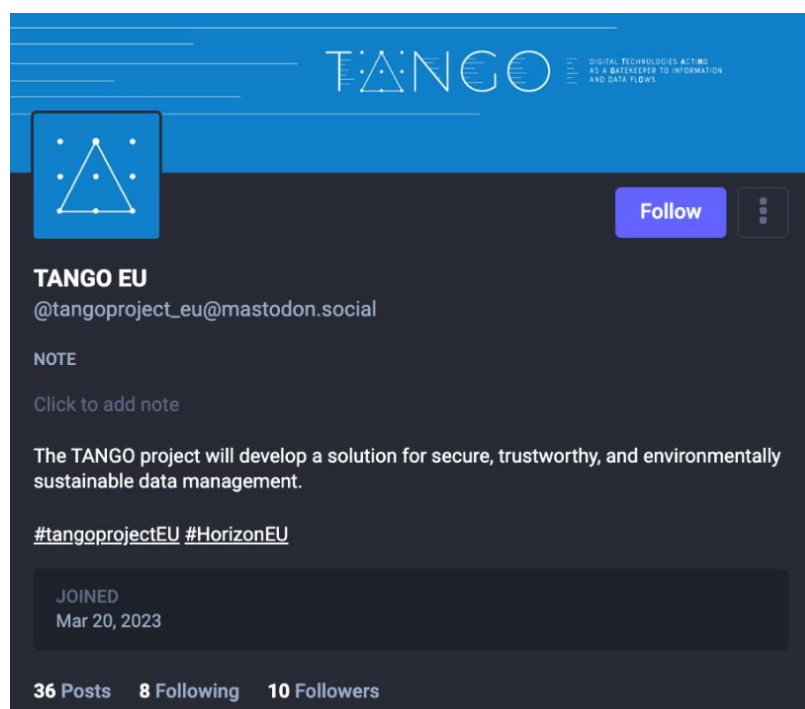


Figure 14 - TANGO Account on Mastodon

Due to its decentralised nature, Mastodon is mainly used by insiders and early adopters. This is the category of media consumers to be reached through the content strategy on this platform. In fact, their contribution is crucial in the process of diffusion of innovations: as they are among the early adopters of products and services that have just been launched on the market, they create the

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necessary conditions for the majority of consumers (early and late adopters) who will arrive later, to feel safe in consuming the novelty. Currently, TANGO's customer base on this channel is 10 followers, but it is foreseen, for the reasons mentioned above, that the dissemination of content on this channel has an important role to play and could greatly facilitate public debate on the issues of this project. Therefore, the communication strategy is to continue to share content on this social channel to create the necessary engagement to expand the follower base.

2.3.2.4 YouTube

Videos, due to their communicative language, are an excellent tool for dissemination. TANGO's YouTube channel plays a very important and transversal role among all the social channels because it allows all the video content to be uploaded and collected over time, which can be shared on social networks and reach different targets, in addition to driving traffic through the site visitors. To this end, within the first 12 months from the start of the project, two videos with a high communicative impact were produced, which make up the storytelling of the project:

1. An introductory video called "Introducing Horizon Europe Project TANGO" aimed at a more generalist target audience.
2. A more technical and descriptive video called "TANGO PROJECT: Digital technology for secure and Trustworthy Data Flow", designed for a more specialised target.

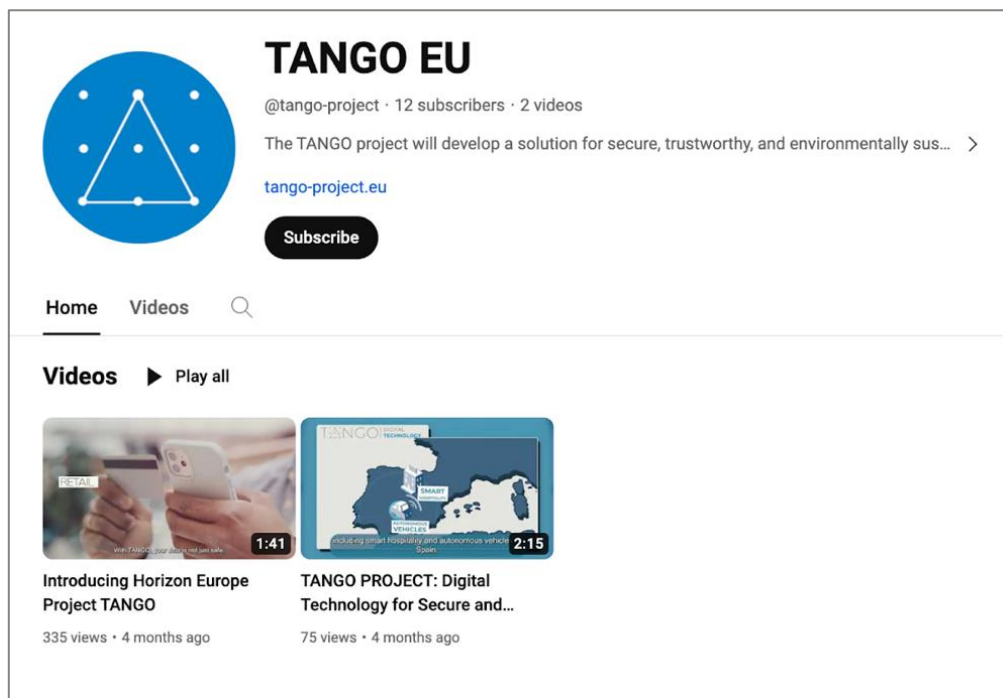


Figure 15 - TANGO YouTube Account

The contents of the video are described in more detail in sub paragraph 2.4.4. The videos together have already totalled more than 400 views, a good result that denotes a high interest on the part of visitors to both the website and TANGO's social channels in opening the shared link of the video and viewing it on the channel. TANGO's YouTube channel currently has 12 subscribers; this number is envisioned to grow along with the number of contents that will be uploaded to the channel in the coming months (such as webinars, conference recordings, presentations, videos from Partners).

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2.4 Communication and dissemination activities

This section summarises the communication and dissemination activities that have been performed by the TANGO consortium throughout the last 12 months of the project. These activities are split into the following categories:

- Scientific Publications;
- Participation in events;
- Workshops;
- Project videos;
- Collaborative web posts and consortium synergies;
- Synergies with other projects.

2.4.1 Scientific Publications

From the initial phases of the project, the partners worked on publishing the first deliverables along with several publications presented at relevant scientific events, with the aim of dissemination the first results of the project. In the following table are the details of the materials published so far:

Table 1 - TANGO List of publications

Partner(s)	Type	Title	Main author(s)	Publisher/Conference	DOI/Status
UoG, EXUS	Conference Paper	Privacy Impact Assessment of Cyber Attacks on Connected and Autonomous Vehicles	Sakshyam Panda, Emmanouil Panaousis, George Loukas, Konstantinos Kentrotis	ARES'23 Proceedings / ACM	https://doi.org/10.1145/3600160.3605073
UoM	Conference Paper	A Multifaceted Memory Analysis of Java Benchmarks	Orion Papadakis, Andreas Andronikakis, Nikos Foutris, Michail Papadimitriou, Athanasios Stratikopoulos, Foivos Zakkak, Polychronis Xekalakis, Christos Kotselidis	20th ACM SIGPLAN International Conference on Managed Programming Languages and Runtimes / ACM	https://doi.org/10.1145/3617651.3622978
UoM	Conference Paper	Scaling Up Performance of Managed Applications	Orion Papadakis, Andreas Andronikakis,	The 2023 ACM SIGPLAN International	https://doi.org/10.1145/3591195.3595270

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Partner(s)	Type	Title	Main author(s)	Publisher/Conference	DOI/Status
		on NUMA Systems	Nikos Foutris, Michail Papadimitriou, Athanasios Stratikopoulos, Foivos Zakkak, Polychronis Xekalakis, Christos Kotselidis	Symposium on Memory Management (ISMM 2023) / ACM	
UoM	Conference Paper	Unified Shared Memory: Friend or Foe? Understanding the Implications of Unified Memory on Managed Heaps	Juan Fumero, Florin Blanaru, Athanasios Stratikopoulos, Steve Dohrmann, Sandya Viswanathan, Christos Kotselidis	20th ACM SIGPLAN International Conference on Managed Programming Languages and Runtimes (MPLR '23) / ACM	https://doi.org/10.1145/3617651.3622984
UPRC	Conference Paper	The Use of Digital Technologies in a Common Data Space and Sustainable development Context: A Conceptual Framework Focus on Smart Hospitality	Asterios Stroumpoulis, Ioannis Katsanakis, Evangelia Kopanaki	ICOT2023	https://iatour.org/icot2023/wp-content/uploads/2023/06/Book-of-Abstracts-ICOT2023-ver.1.pdf
UPRC	Conference paper	Exploring Digital Technology and Sustainable Development Integration in a Shared Data Environment: A Conceptual Framework on	Asterios Stroumpoulis, Ioannis Katsanakis, Evangelia Kopanaki	19 th HSSS National & International Conference 2023	https://confe.hsss.eu/wp-content/uploads/2023/10/HSSS-2023-TIMETABLE.pdf

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Partner(s)	Type	Title	Main author(s)	Publisher/Conference	DOI/Status
		the Retail Sector			
CEA	Conference Paper	Hiding behind the one that I hide: Combining Loop Shuffling and Code Polymorphism for Enhanced AES Side-Channel Security	Nicolas Belleville, Loïc Masure	COSADE 2024 / Springer	Accepted
DUT	Conference paper	The Power of Bamboo: On the Post-Compromise Security for Searchable Symmetric Encryption	Tianyang Chen, Peng Xu, Stjepan Picek, Bo Luo, Willy Susilo, Hai Jin, Kaitai Liang	2023 Network and Distributed System Security Symposium	https://dx.doi.org/10.14722/ndss.2023.24725
DUT	Conference paper	High Recovery with Fewer Injections: Practical Binary Volumetric Injection Attacks against Dynamic Searchable Encryption	Xianglong Zhang, Wei Wang, Peng Xu, Laurence T. Yang, Kaitai Liang	32nd USENIX Security Symposium	https://www.usenix.org/system/files/usenixsecurity23-zhang-xianglong.pdf
UoM	Workshop paper	Cross-Language Interoperability of Heterogeneous Code	Athanasios Stratikopoulos, Florin Blanaru, Juan Fumero, Maria Xekalaki, Orion Papadakis, Christos Kotselidis	In Companion Proceedings of the 7th International Conference on the Art, Science, and Engineering of Programming	https://doi.org/10.1145/3594671.3594675

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Partner(s)	Type	Title	Main author(s)	Publisher/Conference	DOI/Status
				("Programming" '23)	
UoM	Workshop paper	Beehive SPIR-V Toolkit: A Composable and Functional API for Runtime SPIR-V Code Generation	Juan Fumero, Gyorgy Rethy, Athanasios Stratikopoulos, Nikos Foutris, Christos Kotselidis	2023 Workshop on Virtual Machines and Language Implementations	https://doi.org/10.1145/3623507.3623555

The publications made so far are in line with the main objectives of the outreach activity, enabling academia and other research organisations to build on TANGO developments for further research, provide key insights into technology offerings and lay the groundwork for future innovative projects.

Aside from the publications listed above, the consortium partners are currently working on more materials that will be submitted for publications during 2024 and in 2025 in different formats, such as scientific papers in academic journals, white papers, posters, banners, workshops and papers in scientific conferences. The partners are constantly monitoring all relevant publication opportunities for the project results (in particular scientific conferences and peer-reviewed journals) to help raise awareness about TANGO and the progress made during the project. In the next phase of the communication and dissemination strategy, which will be more focused on promotion and exploitation of the project results, the efforts and expertise of all partners will be essential in identifying future opportunities to contribute to the dissemination of TANGO advancements in big data, AI, identity management, privacy and block chain through the most relevant channels.

2.4.2 Participation in events

All the events TANGO partners attended during the last 18 months of the project are reported in Table 2. The events consist of conferences, symposia and presentations in relevant events.

It should be noted that project partners were very active in different taking part to different events covering a wide variety of TANGO related topics, including the pilots, such as data spaces, big data, cybersecurity, retail and tourism sector. Most of the events partners attended had an international reach and audience, while the presentations of project results that took place were attended by a significant number of researchers, policy makers, social scientists, and public administration employees, resulting in widespread and effective dissemination of TANGO and its goals. The events that the partners participated in were both online and in presence.

Table 2 - TANGO list of attended events

Date	Partner(s) Name	Event
9 March 2023	UPRC	TRUSTEE Workshop on Co-designing Data Spaces
21-23 March 2023	ANYS, EGI	IDSA - Data Spaces Symposium & Deep Dive Day
27 April 2023	QBE	Payment 360° Conference

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Date	Partner(s) Name	Event
14 June 2023	LIC	Dataweek 2023
19-23 June 2023	EGI, LIC	EGI Conference 2023
22 June 2023	UPRC	ICOT 2023
5 October 2023	UoM	Devovx 2023
11-14 October 2023	UPRC	HSSS 2023
16-17 October 2023	IDSA	Data Spaces Discovery Day in Naples
19 October 2023	IDSA	Macchine Connesse 2023
6-9 November 2023	ABI	22 nd International Conference of the Italian Association of Artificial Intelligence AIXIA2023
15-16 November 2023	QBE	1st Microsoft CEMA Partners Summit
30 November – 1 December 2023	ANYS	I International Seminar on Tourism Law of the World Tourism Organization
1 December 2023	UPRC	TRUSTEE Workshop on Cross-Border Data Exchanges
15-18 December 2023	ANYS	IEEE BigData 2023
19 December 2023	ABI	Online presentation at Meeting AI Hub and CYSKA Observatories ABI Lab
26 January 2024	ANYS	FITUR 2024
4 February 2024	UoM	FOSDEM 2024
6-7 February 2024	IDSA	Data Sharing Festival – Presentation during session Deep-dive on the role of Privacy-Enhancing Technologies in data sharing initiatives

The events and conferences are of international relevance and have given the partners the opportunity to reach a wider audience and raise awareness about the project. The events represented also an opportunity for networking activities with participants and stakeholders. The partners are constantly seeking opportunities to participate in events and will continue to monitor the ones that more relevant to TANGO project and attract the right target audience, in order to maximize the impact of the dissemination efforts.

2.4.3 Workshops

At Dataweek 2023, LISC with research center RI.SE [2], EUHUBS4DATA [3] and BDV [4] co-organized a workshop titled “Policy challenges in artificial intelligence and data governance”. The session saw the participation of the H2020 Projects TANGO, GLACIATION [5], MobiSpaces [6], PISTIS [7], TEMA [8] and the European project GovTech Incubator [9]. The workshop aimed to identify common challenges that are foreseen in implementing standardisation, open-source development and regulatory sandboxing approaches to develop responsible Artificial Intelligence solutions, exploring the current policy landscape with a focus on data spaces and Artificial Intelligence in Europe.

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Figure 16 - Dataweek'23 Workshop Banner

The workshop involved an audience of 50 participants coming from industry and project consortia, researchers and policymakers. During the session, the speakers have guided participants in enabling them to identify the most relevant and common issues and challenges from the perspective of key stakeholders, including Horizon Europe projects. The participants were guided in a challenge setting phase, where they elaborated on their perspectives and developed an agreement on the most pressing challenges. Finally, the participants worked together on the policy canvas and described the challenge they identified towards a shared understanding. The workshop represented a valuable opportunity to raise awareness around TANGO and facilitate rich exchanges among participants, allowing them to discuss common challenges in Artificial Intelligence and Data Governance. The partners will host and organize at least 2 more workshops in the next months, either online or in person.

2.4.4 Project videos

During M12, LISC has released 2 videos on TANGO, with the aim of narrating the project in a clear and engaging way that could reach out to different target audiences. All videos clearly display the project logo in addition to information about funding through the Horizon Europe 2020 program, along with the logos of all partners, contacts and social media profiles.

The first video, titled "Introducing Horizon Europe Project TANGO" is addressed to a more general public, thus aiming to intercept a broader and more unspecialised target audience that approaches TANGO via the YouTube channel and the LinkedIn channel. The purpose of the video is to provide an overview of the objectives of the platform developed in the TANGO project, focusing in particular on the aspect of security and data in the various pilot sectors. The video is published on TANGO YouTube channel at the following link: <https://youtu.be/OFHMngs8CII?si=X5x1gYs6JY1NaY-u>

The second video is titled "TANGO PROJECT: Digital Technology for Secure and Trustworthy Data Flows" and it aims at a more specialized target audience. Through animation, the video shows an overview on the solution offered by TANGO for businesses citizens and public administrations to use and share their data while ensuring privacy and the creation of an ecosystem of trust. The video emphasizes that TANGO enables users to share data in a secure and privacy preserving manner across

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departments or organizations and how they can also analyse data directly through the TANGO solution benefiting from features supporting the exploration of data privacy and security that are insured through decentralized data management as well as federated learning algorithms, continuous authentication of users and devices, and self-sovereign identity. In the final part of the video, it is shown that the TANGO digital technology is already being tested and implemented in various industries including smart hospitality and autonomous vehicles in Spain, smart manufacturing in Italy and Portugal, banking in Italy, public Administration Services in Germany and retail in Greece and Cyprus. The video is available on the project's YouTube channel at the following link: <https://youtu.be/2ngxWfUoTGw?feature=shared>

Through the use of engaging and simple images and animations, videos are a useful communication tool that can reach out to a wide audience. Videos are also effective for communicating the project through social media but also to be shown during events, conferences and presentations. The aim for the following months is to produce more video contents involving also the partners in order to create more dissemination and communication materials useful for creating insights on the aspects of the project.

2.4.5 Collaborative web posts and consortium synergies

Each partner has publicised about the project in their own website, in different formats. Initially, the Partners shared the press release of the launch of the TANGO project on their websites and social pages, describing their role and contribution within the project and referring to the official TANGO website. In addition, on the official websites of some partners, there is a section dedicated to TANGO where all the most important information concerning the project is provided, thus further contributing to its visibility even among the stakeholders of the individual partners. Below are some of the links where the project has been featured:

- Web post on EGI website on 11 November 2022: <https://www.egi.eu/article/launch-of-the-new-horizon-europe-project-tango/>
- Web post on INTRA website on 22 November 2022: <https://www.netcompany-intrasoft.com/news/launch-new-horizon-europe-project-tango>
- Section dedicated to TANGO on ABI website: <https://www.abilab.it/progetti-europei/tango>
- TANGO listed on IDSA website: <https://internationaldataspaces.org/make/projects/>

As outlined in paragraph 2.2, to create more synergy among the consortium, an editorial calendar has been created and shared among the partners in order to keep track of all communication activities conducted and to collect contributions about relevant topics or project's development that can be disseminated by the partners through blogs and social media posts. Partners have the freedom to choose what content they want to replicate in their website. In the shared dissemination and communication log file, Partners can list the different types of posts they have created on social media and articles they have written about TANGO on their website or other channels.

2.4.6 Synergies with other projects

An essential part of the TANGO dissemination strategy is to establish synergies with other similar initiatives. To this end the Partners actively seek out and engage with other projects and campaigns that share a similar goal or complement TANGO's efforts, in order to reach out to potential partners to explore opportunities for collaboration and exchange. In this section are listed the synergies created so far by the Partners. Below are listed some of the outcomes of the synergies established with other projects.

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As already reported in D8.1, the TANGO consortium is engaged in communication with the project TRUSTEE [10]. The collaboration between the two projects regarding user research and user requirements has so far seen the joint participation of TANGO, represented by UPRC, in two workshops organised by TRUSTEE. The first workshop titled “Co-designing Data Spaces: Empowering Usability” was held on 9 March 2023. During the workshop five different EU-funded projects (TEDAL [11], GLASS [12], AUTOFAIR [13] along with TRUSTEE and TANGO) presented their projects and requirements and discussed on Secondary use and Legal and ethical considerations, sharing their perspective and exchanging knowledge. The second online workshop organized by TRUSTEE, titled “Cross-border Data Exchanges – From Theory to Reality” was held on December 1st, 2023. The workshop represented a valuable occasion for TANGO to present the project along with TEDAL, Prometheus-X [14], OASEES [15] and MobiSpaces, and to discuss about opportunities and challenges from open data, data manipulation and AI.

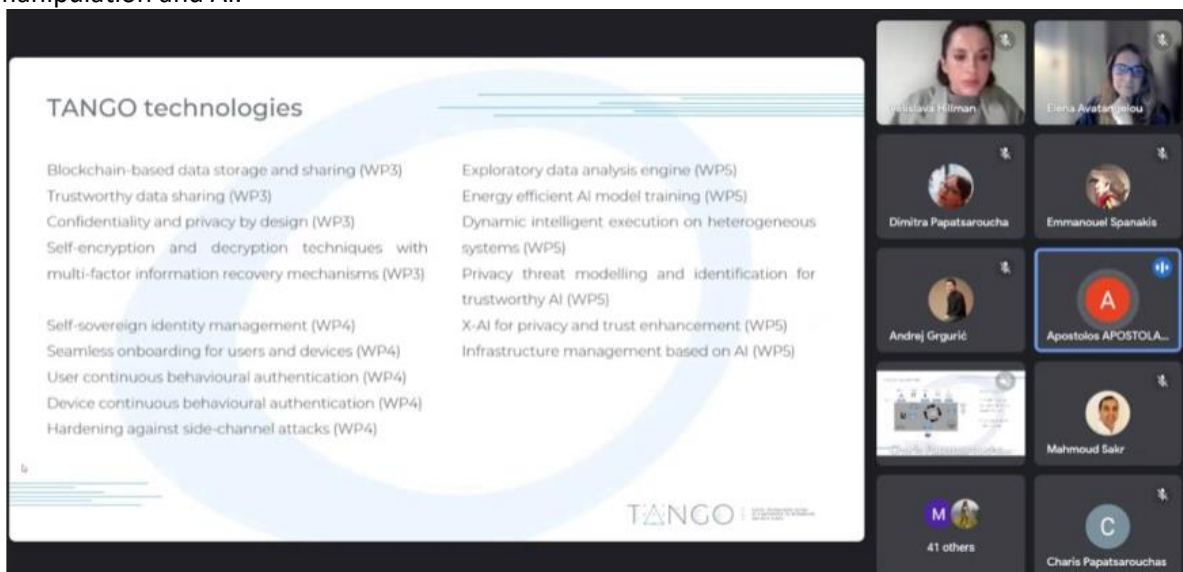


Figure 17 - TANGO presentation during 2nd TRUSTEE workshop

Synergy initiatives with other projects dedicated to data spaces include TANGO's involvement in several webinars held by IDSA. TANGO has been reported as a sponsor in several of the webinars, including:

- Dataspace protocol Preview (March 2023, 100+ participants)
- DSA Tech Talk | The TRUE Connector – Essential in a data space (March 2023)
- Unveiling the dataspace protocol (November 2023)

IDSA has also invited TANGO to present in a call for association members ("IDSA Ecosystem Building Call") on 20 November 2023. Tomás Pariente Lobo (ATOS) and Kaitai Liang (TU) presented to 47 participants from about 25 countries on that occasion.

Regarding future activities, TANGO partners are currently investigating possible synergies with other European projects for joint presentations and workshops at international events and conferences. These activities will help TANGO gaining a wider exposure and increase its impact, while also supporting the broader goal of advancing the data economy in Europe. Furthermore, these collaborations will also enhance the quality and efficiency of the project's outcomes and increase its potential for success.

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2.5 Dissemination and Communication monitoring

This section deals with assessing the impact of the performed dissemination and communication activities by comparing their quantitative indicators against the KPIs as set in TANGO's dissemination and communication plan (D8.1).

2.5.1 Key performance indicators overview and status

Based on the KPIs and their description in D8.1 "Dissemination, communication, Exploitation and Stakeholders Engagement Plan", and considering the dissemination and communication activities so far, the following table presents an indication of how effective these activities were during the first 18 months of the project (M01 – M18).

Table 3 - Dissemination and Communication KPIs tracking

Measure	KPI	Target	KPIs M01-M18
TANGO Brochures	No. Of brochures distributed	600	-
Posters	No. Of posters produced	2	1
High-level materials for policy makers	Number of sets (mission statement, slide-deck, brochure)	3	1
TANGO Website	Number of unique visitors	3000	3791
Social Networks	Number of followers on Twitter	500	110
	No. of followers on LinkedIn	2000	293
	No. of followers on YouTube	100	12
TANGO Workshops	No. of workshops	3	1
	No. of participants	300	50
Videos	Number of videos published on the project's YouTube channel	2	2
	Avg. no. of views	1000	420
Scientific Publications	Number of peer-reviewed conference workshop/papers	At least 15	10
Scientific Publications	Number of peer-reviewed papers in academic journals	At least 10	-
Other Publications	White Papers	> 2	1

All of the objectives (Y1 – Y3) have been defined in the description of action of the project. As it is possible to see in the table above, that some KPIs have already met their target value, in particular the total number of visitors of TANGO website and the number of project videos. All the KPIs are progressing towards the target and the consortium will continue to track them to ensure that all the key dissemination and communication objectives will be achieved by the end of Y3. For the next 18 months, the consortium will keep on focusing on creating scientific material and improving on the dissemination activities such as workshops and participation to conferences in order to promote the project's results. The dissemination process will be endorsed also through the communication strategy in order to grow and engage with the TANGO community.

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2.6 Immediate next steps

During the next months until the end of the project, the focus will shift to effectively communicating and disseminating research results and policy implications to various target audiences, creating materials that highlight the project's results, and collaborating with other relevant communities and research projects across Europe. The partners will continue to participate in events, conferences, and workshops and will actively seek opportunities to promote the project through publications. Collaboration with the project's stakeholder panel will be strengthened through more stakeholder meetings and ongoing communication.

Every step is monitored by the WP leader that will check with partners regularly to evaluate if other courses of actions are needed in order to reach the KPIs defined in the description of action of the project. A list of immediate next steps for the communication and dissemination of TANGO is provided in the table below.

Table 4 - Immediate next steps

What	Responsible Partner	Planning
Update and share editorial calendar	LISC	M19
Newsletter publication	LISC	M19
Organization of workshops	All Partners, LISC	M25
Discuss synergies with TANGO's sister projects	LISC	M25

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3 Innovation Management Plan and Activities up to M18

3.1 Updated exploitation plan

The initial exploitation plan of the project (including innovation and IPR management) was presented in D8.1. Based on the latest project developments, TANGO employs a dynamic innovation management and exploitation strategy, slightly updated compared to the initial version, to ensure the effective utilization of project results by relevant stakeholders. The strategy is divided into five phases, emphasizing practical and business-driven approaches, as illustrated below.



Innovation Management

- Innovation management log creation
- Identify the project ER and KER
- Taxonomy of ER (TRL, type, features, benefits)
- Individual and joint exploitation paths per ER
- Stakeholder groups, users and customer segments
- Innovation management task force (INTRA, FN, DBC)



IPR Strategy

- GA and CA analysis
- IP Ownership
- IPR Log (Foreground IP, Background IP)
- IP protection, Access rights, Licenses



Visibility of Key Results

- Innovation Radar and Standardisation Booster
- Synergies with established initiatives (Gaia-X, EOSC, Catena-X)
- Alliances with industrial and research organisations



Business modelling and Market Research

- Barriers, obstacles and analysis of the standards and regulation
- Market research and competition analysis
- SWOT and PEST analysis
- Business models for the KER



Roadmap to commercialisation

- Business planning and marketing strategy
- Go-to-market strategy
- TANGO validation campaigns

Figure 18 - TANGO Exploitation plan and Innovation Management Strategy

The key points and activities of the TANGO exploitation plan are described below:

Initial Phase - Exploitable Results Identification

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The consortium focused on updating and identifying new Exploitable Results (ER). Each Task Leader analysed technical activities, proposing modules, software components, datasets, or guidelines with academic or commercial potential. Exploitable results have been classified by type, TRL level, value proposition, and features. Two main exploitation types per result are considered: Individual Exploitation and Joint Exploitation. Out of the list of ER, a set of Key Exploitable Results (KER) has been identified and will be updated.

Innovation Management and IPR Strategy

The Innovation Management Log, jointly managed by INTRA, FN, and DBC, facilitates innovation management activities. It is an excel template aiding in ER and KER identification, classification, design of exploitation paths, and contributor definition. Simultaneously, DBC implemented IPR Management processes to meticulously identify and manage both Background (BG) and Foreground (FG) IP.

Diverse Partners for Joint Exploitation

The project involves diverse partners, categorized into technology providers, use case owners, universities/research organizations, and associations. Each partner group has different expertise, goals, networks, and geographical coverage, contributing to the joint exploitation of project results.

Visibility of the KER and Business Model Design

The dissemination phase involves uploading key project results to EC-backed platforms (i.e., Innovation Radar and Horizon Results Platform), emphasizing synergies with relevant initiatives and networking with associations. For each KER, a collaborative business model is designed, incorporating market analysis, competitive landscape evaluation, business barriers, regulatory frameworks, and a dedicated business plan.

TANGO Roadmap to Commercialization

The exploitation strategy follows a three-stage roadmap.

- **Short-term Stage:** Design go-to-market strategies for the identified TANGO KER, validate innovations through real-life scenarios, and build viable business cases during the project's implementation.
- **Mid-term Stage:** Design semi-commercial products and services, seek early adopters, expand the customer base, and utilize KER in further research activities 1-3 years post-project completion.
- **Long-term Stage:** Commercialize validated KER with significant business potential based on partners' objectives, resources, and available funding 3 years after project completion.

3.2 General description related to Intellectual Property

The purpose of the TANGO project is the development of a platform that will enforce data sharing in various sections of the economy, such as smart hospitality, autonomous vehicles or banking, in citizen-centric, secure and trustworthy manner, while addressing environmental and climate change challenges. Following the project activities and in accordance with its purpose, results related to the development of the platform will be created and their exploitation is considered a matter of utmost importance.

As a result, and according to the Grant Agreement's recommendations regarding the exploitation of the project's results and the respect to the IPR related provisions and rights, clear IPR agreements and flexible ownerships schemes are required. As a starting point, the following factors need to be identified - addressed:

- Description of the results developed during the course of the TANGO project.
- Management of the aforementioned results.

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- iii. Cases of joint ownership.
- iv. Protection of the aforementioned results from unauthorized use.
- v. The way the aforementioned results will be disseminated.
- vi. The way the aforementioned results will be exploited.

Furthermore, the cornerstone of the whole procedure is the conduction of IPR related agreements on a later stage of the project and, if applicable, before the end of the project, with which the allocation of the IP related rights will take place. In order to be more precise, in these agreements, the forementioned contracts will address in detail at least the following matters, ensuring and strengthening the process of IPR protection:

- i. Proper, lawful and accurate allocation of the IPR related ownership to the partners, according to their level of contribution - involvement to each result.
- ii. The exploitation rights and royalties appointed to each partner.
- iii. The type of the IPR protection (e.g. Patent, trademark etc.).
- iv. IPR exploitation strategy at consortium and partner level.

In the current subsection, the procedure to be followed for the exploitation purposes is presented, with references to the intellectual property plan methodology, which is related to the process of collection and assessment of the relative information from the partners, and the knowledge management framework, which is related to the actions that will be followed and the measures that will be implemented for the purposes of ensuring the respect to the IP related rights of the partners.

3.2.1 Definitions

For the purposes of understanding of key terms related to the IP management and the IPR rights, the following definitions are provided:

1. **“Intellectual Property”** is intangible property resulting from creations of the mind. It falls into 2 categories: i) industrial property, such as patents on new inventions, trademarks, designs and models, as well as service brands and protected designations of origin and ii) copyright and related rights, such as music, literature, paintings and sculptures. [16]
2. **“Intellectual Property rights”** are those that allow owners - creators as inventors or artists or any rightsholders to decide how, when and where their creations are used and/or exploited. [16]
3. **“Grant agreement”** refers to the one signed and related to project 101070052 – TANGO, as it stands up to the day of conduction of this deliverable or may be amended in the future.
4. **“Consortium agreement”** refers to the one signed by the partners of the TANGO project, as it stands up to the day of conduction of this deliverable or may be amended in the future.

3.2.2 Intellectual property plan methodology

As a starting point and in order to ensure proper IPR allocation, the collection of the necessary information from the partners was of utmost importance and the identification of key aspects of the project activities, such as the background provided by each partner, their actual activities per project task and the expected outcome, is crucial.

As a result, an IPR matrix was created on Excel form. The IPR matrix is divided in three main sections, with the first one providing the necessary guidance to the partners in order for them to fill it properly. In the second section, the partners had to fill the background they provide to the project in order to proceed to their respective tasks, with reference to the conditions of use of the background from any other partner or any third party and the conditions in terms of exploitation. In the third section, the expected exploitable results are presented, with references to the projected owner(s) and contributors to its development, relatable project tasks, any kind of protection needed (patent, license etc.), the exploitation value and whether it could be considered a key exploitable result.

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In terms of background, the ones listed in the project's consortium agreement were added and the partners were asked to review them and update the list in case there was any additional background, not included in the Consortium agreement. In terms of the exploitable results, the partners in charge of their development were asked to provide detailed information regarding the factors presented above in order for the partners in charge of the allocation of the IPR to have a detailed information regarding their project related activities and their contribution to each exploitable result.

Following the collection of the input from the partners, it will be possible to identify any conflicts between the partners in terms of the IPR allocation. In case any issues as such may presented, the authorized partner will seek even more detailed information regarding the related exploitable result, engage to meetings and calls between the related partners and the project coordinator and consult any other relative body needed in order to ensure that the conflict will cease to exist. Finally, in case any conflicts are avoided or resolved as part of the competent partners' actions, the allocation of the IPR will take place via the conduction of IPR agreements.

3.2.3 Knowledge management framework

A key aspect of the current deliverable is the definition of the framework for managing the knowledge, both in terms of background and the exploitable results. As a result, in subsection 3.3.3, comprehensive information is provided regarding matters such as:

- i. the access rights to the forementioned knowledge,
- ii. the ownership of the exploitable results,
- iii. the case of a joint ownership,
- iv. the way the ownership could be transferred,
- v. protection of the exploitable results,
- vi. the exploitation of the results and
- vii. their publication.

Sources of information regarding the matter presented in detail in subsection 3.7 are the following:

- viii. any applicable IPR related European or national legislation,
- ix. the Grant Agreement of the project,
- x. the Consortium Agreement.

3.2.4 Types of knowledge

3.2.4.1 Background

According to the Consortium agreement, *"background means, according to the definition of the Grant Agreement, any data, know-how or information - whatever its form or nature (tangible or intangible), including any rights such as intellectual property rights - that is: a) held by the beneficiaries before they acceded to the Agreement and b) needed to implement the action or exploit the results."*

As mentioned above, the background utilized for the purposes of the TANGO project is provided in detail in the IPR matrix, with reference to the conditions of use of the background from any other partner or any third party and the conditions in terms of exploitation. In case any of the background used by any partner in order to proceed to the project related activities was not included in the list provided in the consortium agreement, the relative partner was able to fill the matrix, providing all the necessary information. The collection of such information is deemed of utmost importance since background is one of the indications that could help identify each partner's cooperation on any exploitable result's development.

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3.2.4.2. Exploitable results

According to the consortium agreement, “Results means, according to the definition of the Grant Agreement, any tangible or intangible effect of the action, such as data, know-how or information, whatever its form or nature, whether or not it can be protected, as well as any rights attached to it, including intellectual property rights”.

As mentioned above, the partners had to fill the “exploitable results” section of the IPR matrix in order to provide all the necessary information to the competent partners. Moreover, in order for each partner to prove its cooperation and enhance the IPR allocation procedure, they have to maintain the necessary documentation in regards either the procedures that had followed or the source of their knowledge, in order to be able to provide any additional information, in case of a dispute, and prove their contribution to each project related activity – task.

Furthermore, in case employees of any partner or any other personnel or third party are entitled to claim rights on the exploitable results, the partner shall ensure that a relative agreement has been conducted in order for the partner to be able to meet its contractual obligations. In such cases, the authorized partners in charge of the IPR allocation shall be informed in order to proceed to all the necessary additional actions required.

To conclude, the provisions of all the information regarding the exploitable results, their development, expected ownership and exploitation level is a matter of absolute importance in order for the best possible outcome regarding the IPR allocation procedure to be succeeded. It is considered one of the most important outcomes of the project since all the partners provide their insight and expertise during the course of the project and in order to accomplish its goal and, as a result, the outcome of the project activities shall be allocated in a justified manner and according to the applicable European and national legislation, the grant agreement and the consortium agreement.

3.3 Record of intellectual property assets

3.3.1 Ownership schemas and IPR matrix

Each partner has indicated in TANGO innovation management log whether they consider themselves as an owner of an exploitable result or a contributor in its development. Table 5 in Section 4 contains the feedback received up to the time of compiling this deliverable.

Two types of ownership were identified following the evaluation of the input related to the ownership of the exploitable results/components:

- i. Single ownership
- ii. Joint ownership

That said, matters related to IP management and exploitation have yet to be decided and conclusive information regarding this matter will be provided in the final version of this deliverable.

3.3.2 Instruments for protecting exploitable results

A crucial stage in IP management is the implementation of the necessary measures, and the acquisition of the necessary credentials, in order to ensure lawful and successful protection of the exploitable results. The adoption of the proper legal requirements is a factor of utmost importance in order to ensure that the ownership of the exploitable results is properly secured.

The following applicable forms of protection can be utilized depending on the nature of the exploitable result:

- i. Patent
- ii. Copyright
- iii. Trademark

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iv. Trade secret

3.3.2.1 Patent

Patents are exclusive rights granted for a new technical invention that provides its owner the legal right to exclude others from producing, using in any way or selling it for a period of time in exchange for publishing an enabling disclosure of the invention. A patent holder can grant a licence to somebody wishing to produce copies of the invention against payment of a fee (or royalty), thus obtaining a return on the investment.

Patents must be applied for and are granted by national or regional patent offices (e.g. the European Patent Office (EPO)). The application for a patent at a national or regional office means that the geographical scope of protection of the invention may differ. Application for a European Patent at the EPO still requires validation at national offices to benefit from the protection. A patent applicant must disclose the invention to the Office in a manner sufficient, clear and complete for the invention to be carried out by a person skilled in the art (in so-called “patent claims”). The term of a patent is of 20 years from the date of filing of the application. A standard essential patent (SEPs) is a patent essential to implement a specific industry standard or technical solution. In order for a patent to be granted, the following procedures shall be followed:

- i. Filing of an application, which shall consist of a request for grant, a description of the invention, claims, any additional applicable information and an abstract.
- ii. An assessment to identify whether all the necessary information and documentation have been provided in order for the application to have the necessary context.
- iii. Conduction of a European search report, listing all the documents available to the Office that may be relevant to assessing novelty and inventive step. The search report is based on the patent claims but also considers the description and any additional information applicable (drawings etc.).
- iv. Publication of the application and the search report 18 months after the date of filing or, if priority was claimed, the priority date. Applicants then have six months to decide whether to pursue their application by requesting substantive examination. Alternatively, an applicant who has requested examination already will be invited to confirm whether the application should proceed. Within the same time limit the applicant must pay the appropriate designation fee and, if applicable, the extension fees. From the date of publication, a European patent application confers provisional protection on the invention in the states designated in the application. However, depending on the relevant national law, it may be necessary to file a translation of the claims with the patent office in question and have this translation published.

3.3.2.2 Copyright

Copyright is a type of intellectual property that provides exclusive rights to a developer / author / creator to make copies, license, and otherwise exploit a creative work in a literary, artistic, educational, or musical form. Copyright is intended to protect the original expression of an idea in the form of a creative work, but not the idea itself. The requirement of originality essentially means that a work must reflect the author’s personality, i.e. whether he/she has been able to express his/her own creativity by making free choices. It also implies an intellectual effort from the author. Contrary to patents and trademarks, copyright protection is automatic and not granted by a particular governmental institution. It should be kept in mind that copyright law is not harmonized, which means that the principle of territoriality applies. As a result, protection in one region or country does not automatically extend to the rest of the world. In Europe, copyright protection lasts for the lifetime of the author of the work, plus an additional 70 years after the death of the author.

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3.3.2.3 Trademark

The term trademark refers to a recognizable insignia, phrase, word, or symbol that denotes a specific product and legally differentiates it from all other products of its kind. A trademark exclusively identifies a product as belonging to a specific company and recognizes the company's ownership of the brand. As indicators of business origin, trademarks can be words, logos, devices or other distinctive features, or a combination of these.

Trademark owners may prevent third parties from using, during trade, identical or similar signs for goods or services which are identical or similar to those registered for a trademark, when such use would result in a likelihood of confusion. Like patents, trademarks must generally be registered at national or regional offices. The application for a trademark at a national or regional office means that the geographical scope of protection of the sign will differ. There are 6 steps to register a trademark in the EU:

- i. Trademark search in order to define whether a similar mark has already been registered in the EU before you begin the task of applying with the EUIPO.
- ii. In case there is no similar registration, the next step will be filing in a trademark application.
- iii. In case additional information are required by the EUIPO, the applicant shall provide them without undue delay.
- iv. In case the application process was successful, the trademark will be published in the EU Trademark Bulletin.
- v. In case no oppositions have been filed, the EUIPO will finally approve the trademark.

A trademark registered in the EU is valid for 10 years from the date it is issued. The trademark rights must be renewed every 10 years in order to be maintained.

3.3.2.4 Trade secret

Trade secrets may include a vast amount of information and know-how that is not protectable or cannot be protected properly through patents, such as early-stage inventions, manufacturing processes and/or lists of suppliers and clients. In order for valuable information on technology or on any other aspect to be properly protected and considered as trade secrets, the following condition shall be met:

- i. The information should not be publicly available at large or by the experts of the sector in question.
- ii. The information has commercial value and
- iii. Necessary steps to keep the information secret shall be followed such as the conduction of non-disclosure agreements with everybody who has access to it in any way.

3.3.3 Management of knowledge and protection of results

3.3.3.1 Access Rights

The treatment of Access Rights is presented in section 9 of the Consortium Agreement and section 2 article 16 in the Grant Agreement. This term refers to the permissions a partner holds to read, write, modify, delete or otherwise have access to the background or the exploitable results. The use of Exploitable Results as well as Background data shall be limited restrictively to the necessary project related operations and in accordance with the level of access granted. Access rights shall be free of any additional expenses unless otherwise applicable in relevant intellectual property laws and regulations. All requests for Access Rights shall be made in writing. Access rights to other entities whose activities fall within the scope of the background or the exploitable results process and aim at exploiting the results of each party concerned should be exercised under the circumstances of territorial perspective and the relation with the other Parties.

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Regarding the background, as mentioned above, it is summarized in the Consortium agreement and the IPR matrix, in which any additional background, not included in attachment 1 of the Consortium agreement, is presented. The partners shall give each other access to background information needed in order for them to be able to proceed to their project related activities effectively. Restriction regarding its use by the rest of the partners and/or third parties and exploitation are provided in detail by each partner – owner of the background.

Regarding the access rights to the exploitable results, different conditions are implemented. As a general rule, access rights to exploitable results in terms of exploitation shall be granted on Fair and Reasonable conditions, whether financial or not. Furthermore, in section 9 of the Consortium Agreement, there are several specific provisions related to access rights related matters such as:

- i. New partners entering the project consortium.
- ii. Partners stepping down or leaving from the project consortium.
- iii. Teaching activities.

Finally, in subsection 9.8, specific provisions regarding access rights to software are foreseen in the case of exploitable results, apart from the already foreseen general provisions. In such case, access to Object Code and, if it necessary, access to an Application Programming Interface (API) and/or Source Code should be ensured. On the other hand, background shall only be provided in Object Code or API unless agreed otherwise between the partners.

3.3.3.2 Results ownership

The ownership of the exploitable results is provisioned in section 8 of the Consortium Agreement and section 2, article 16.2 in the Grant Agreement. As a general rule, the exploitable results are owned by the project partner who generates them. The granting authority does not hold ownership of the results that are produced. Results are owned by the party that generates them.

3.3.3.3 Joint ownership

Two or more parties hold joint ownership if they have together produced the result, or it is not possible to verify which party has contributed and to what extent to the result. The joint ownership must be allocated in written form, so that explicit clearance regarding the shared activities is ensured. The people that compromise the joint ownership and the tasks that each one has taken over are crucial from an early stage.

If joint ownership cannot be identified in detail, the party that contributes to an activity resulting in this situation, must contact the other to ensure the possibility of joint ownership. The joint owners should discuss internally all the issues related to and arising from this relationship including matters of costs, filing applications for Intellectual Property Rights etc.

In case of any disputed related to this matter, the issue will be resolved by the PCT who will report to the Plenary Board for final decision, or as per article 11.8 of the consortium agreement, in case the conflict cannot be solved amicably. Of course, any applicable European or national legislation will be respected during this process.

3.3.3.4 Transfer of results

The transfer of exploitable results is also addressed in section 8 of the Consortium Agreement. The partners have the right to transfer ownership of their own results as well as their share on joint ownership results unless different provisions are met by virtue of other applicable laws, regulations, or agreement. The obligation of noticing other parties of the transferring is applicable as well as the noticing of other Parties regarding the access rights is crucial. The other parties have the right to object to this transfer, demonstrating it could end up harmful for their activity.

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3.3.3.5 Granting licenses

The partners can grant licenses to their results or give the right for exploitation. Exclusive licenses for results may be granted only if the other beneficiaries are not interested in exercising their right of access anymore. Specific terms are also provisioned for access rights to software (controlled license terms).

3.3.3.6 Exploitation of results

Provisions addressing the exploitation strategy of the results are described in part B of the Grant Agreement. It includes a total of several exploitation activities such as:

- i. the refinement of the innovative exploitable assets,
- ii. the conduction of market analysis,
- iii. the documentation of an IPR management strategy
- iv. a risk management analysis and
- v. the alignment with other relevant organizations

3.3.3.7 Publication notification procedure

In Annex 5 of the Grant Agreement, the procedure of the publication of the results is described. According to this, prior notice of 30 calendar days should be given to other parties before every publication. Objections should always be filed in a written form within 20 calendar days from the receipt of the publication and if no objection has taken place, then the publication is permitted.

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4 List of Exploitable Results and Classification

The current list of the TANGO Exploitable Results is presented in Annex A. The table provides a comprehensive overview of each ER identified so far in the project, detailing ownership (single or joint), names of owners, contributors, related tasks, result types, and the current Technology Readiness Level (TRL). It serves as a comprehensive list of project innovations, which possess significant potential for further exploitation, setting the frame for the business planning and go-to-market strategies of the project. Following the technical developments in the project and partners business views, this list of ER might change in the next version of the deliverable.

Out of this list of ER, following the innovation management activities so far, a set of pre-selected 5 Key Exploitable Results has been identified. These KER constitute the most promising innovation of the project, as perceived so far. This pre-selection was based on two factors. First, partners' business views so far – partners indicated if they perceive their result as KER based on their views and exploitation strategies. Second, the market needs of the result, based on project's current analysis. Hence, the initial list of KER is described below:

- ER#2c: User Behaviour Exchange Module (UBEM)
- ER#8: User continuous behavioural authentication
- ER#14a: Privacy Threat Modelling and Identification for Trustworthy AI Privacy Enhancing Component (PEC)
- ER #16: Infrastructure Management based on AI
- ER #17: TANGO Platform

A table with the initial list of KER, along with their short description is provided below. As mentioned, this list of KER might change in the future pending on technical developments, market needs and exploitation views of the partners.

Table 5 - Initial List of TANGO Key Exploitable Results

KER#	ER#	Exploitable Result (ER)	Short Description of the Result
1	2c	User Behaviour Exchange Module (UBEM)	A symmetrical component, present on both user and vendor sides, aggregates user behaviour data through the exchange and storage of Volatile Random Numbers (VRN). UBEM evaluates VRN collections for privacy-preserving recommendations.
3	8	User continuous behavioural authentication	UCBA is an Android mobile technology allowing the continuous assessment of the user, when they are accessing a particular mobile app, through learning their behavioural patterns related on how the user is interacting with the device for example on how the user holds the device, the way they perform swipes, gestures and typing behaviour. UCBA constitutes a security mechanism that provides high reassurance to the user and the administrators of a system, that only the account owner has access to the system. Considering that no action is required from the user as the system processes information in the background, UCBA offers better user experience as they do not have to perform any action to authenticate themselves, in

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KER#	ER#	Exploitable Result (ER)	Short Description of the Result
			comparison to existing cumbersome 2-factor authentication that creates huge frustration to the users.
4	14a	Privacy Threat Modelling and Identification for Trustworthy AI Privacy Enhancing Component (PEC)	A component supporting privacy risk assessment for data processes and ML services.
5	16	Infrastructure Management based on AI	An ensemble model, accessible via REST API, provides information on renewable energy potential for any location up to 5 days in advance.
6	17	TANGO Platform	The TANGO platform efficiently processes substantial data volumes from diverse sources, ensuring secure sharing through privacy-enhancing operations. Embracing decentralization, TANGO adopts a distributed identity management framework, aligns with data space paradigms like GAIA-X and IDSA, and promotes interoperability with contemporary standards for robust, trusted, and privacy-preserving operations.

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5 Exploitation activities

5.1 Exploitation activities until M18

In alignment with the TANGO exploitation strategy described in the previous section, several exploitation and innovation management activities have been implemented by project partners (under the management of INTRA as the innovation manager), addressing all the business aspects of the plan. These activities set the grounds to ensure proper exploitation of the project results, focusing in creating dedicated business strategies for the KER. Therefore, as of M18, the following innovation management activities have been implemented.

Design, creation, and continuous management of the TANGO Innovation Management Log: The TANGO Innovation Management Log serves as a comprehensive tool (designed and continuously managed by INTRA) to streamline the identification and documentation of the TANGO exploitable results. Following the technical activities in the project, various innovations – mostly in the form of software modules – have been identified. The ones that hold the most potential for further use commercial and /or research activities have been classified as exploitable results. The innovation management log was shared with all project partners and presented via dedicated online explanatory presentations, and emails with guidelines. Based on partners' inputs, in parallel with an analysis of the TANGO innovation management team (including INTRA, FN and DBC), 18 exploitable results have been identified and documented in the TANGO innovation management log. This constitutes an initial list of exploitable results, which will be further fine-tuned and analysed as the project evolves, in alignment with the technical activities and the underlying developments. Complementary to the identification of exploitable results, during this period, several business-related aspects of the project have also been identified, including key business features, and Intellectual Property Rights (IPR) elements, target markets, value propositions, as also described below. The TANGO innovation management log, constitutes a nimble tool to facilitate a systematic approach to categorizing and managing exploitable results, ensuring that critical information is easily accessible for strategic decision-making in the project. It will be updated every 6 months, to align with partners' business views and technical developments.

#	Exploitable Result (ER)	Ownership (Single or Joint)	Name(s) of Owner(s) (add contributors, even if you think you're not an owner of their result)		Contributors	Related Task(s)	Short Description of the Result (max 1000)		
1	Blockchain-based data storage and sharing	Single	NOR		NOR	T3.1	NOR: Sharing of regulated, verified data in a legally compliant way with high level of redundancy, using nonblockchain solution connecting (at least) 2 entities.		
2a	UCON	Single	FHG		FHG	T3.2			
2b	Trustworthiness Score	Integrated platform	Result type (select from dropdown)	Current TRL	Stakeholder Groups (owner(s) to respond to D13)	Value Proposition (owner(s) to respond to D13)	Exploitation strategy (owner(s) to respond to D13)	Licence of ER (proprietary, open source, license 2.0, GPL, MIT, etc.)	Indicative type of protection, if applicable (patent, trade mark, etc.)
2c	User Behaviour Exchange #		TRL 6 - technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)					NOR: Several components of our solution is proprietary IP: DBILL (Data redundancy in legal limitations), DoAMS (decentralized nonblock Access management system)	
			System/ Model	TRL 4 - technology validated in lab				TBD, probably proprietary	
	Innovative Solution - SW (software in which the algorithms are embedded); standalone		TRL 3 - experimental proof of concept	Business networks, local or virtual ecosystems, which have a common pool of users and/or common pool of offerings.	Make it easy for consumers to find goods and services that interest them, increasing sales and/or customer loyalty.	Step 1: Demonstrate in real environments (domains). Step 2: Focusing on a selected domain, prepare a commercially viable solution. Step 3: Include more domains.	TBD	3 Patent families	

Figure 19: TANGO Innovation Management Log

Identification of 18 Exploitable Results: Through a meticulous process, 18 exploitable results have been identified within the project, reflecting a diverse range of innovative outcomes. Each exploitable

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result is characterized by its unique business attributes, including technological maturity, potential market impact, and relevance to the project's overarching objectives.

Prioritization and pre-selection of 5 Key Exploitable Results (KERs): A strategic focus has been placed on identifying and prioritizing 5 Key Exploitable Results within the set of exploitable outcomes. These KERs have been singled out for their potential in terms of innovation, exploitability, and impact. The pre-selection of these KER was based on current market trends and needs, also respecting TANGO partners' business views, and aligning with them to identify the initial list of KER. The current list of KER, might be updated in the future, pending on the project's tech developments, and market needs.

Target markets and value proposition per ER: An examination was undertaken to pinpoint the target markets for each Key Exploitable Result (KER) within the framework of TANGO. This involved a meticulous evaluation of industries, sectors, and specific customer segments, poised to gain the most from the project innovations. Concurrently, the value propositions of the KER were refined to precisely cater to the distinctive needs and challenges encountered by the identified target markets.

Tailored Exploitation Paths per KER: Detailed exploitation paths have been crafted for each of the identified KER, offering a roadmap for maximizing their potential. The paths encompass thorough descriptions, Technology Readiness Level (TRL) assessments, business model considerations, and in-depth analysis of key business features, including customer segments and value propositions.

Design of the TANGO IPR Management Strategy: It includes defining key terms, outlining the methodology for the intellectual property plan, establishing a knowledge management framework, categorizing types of knowledge, maintaining a record of intellectual property assets, creating ownership schemas and an IPR matrix, and employing various instruments for protecting results. Additionally, the strategy covers the management of knowledge and protection of results, addressing aspects such as access rights, results ownership, joint ownership, transfer of results, granting licenses, exploitation of results, and implementing a publication notification procedure. The IPR management strategy is a comprehensive framework ensuring effective protection, ownership, and exploitation of intellectual property generated throughout the TANGO project.

Competitors analysis focusing on the KER: This analysis aims to provide actionable insights for strategic decision-making, including marketing strategies, pricing considerations, and identifying opportunities for successful market entry and sustainable growth for the identified KER.

SWOT Analysis Templates: Structured templates have been also deployed for conducting SWOT analyses. These templates facilitate a comprehensive evaluation of internal Strengths and Weaknesses, as well as external Opportunities and Threats, providing a holistic view of the project's position in the market landscape.

Initial Business Models for the Key Exploitable Results: Initial business models have been developed for the 5 prioritized KERs, laying the groundwork for their commercialization. These plans outline key strategies, market entry approaches, and revenue models, ensuring a practical and business-driven approach to exploiting the innovative outcomes. The initial Business Model Canvas for 1 of the prioritized KERs has also been defined, in order to capture the key elements of the business model and ensure an actionable plan for the commercial exploitation.

Boosting Project Visibility with Horizon Results Booster: To enhance the project's exploitation efforts and fortify the go-to-market strategy for key innovations, TANGO has applied to receive support from the EC-backed Horizon Results Booster¹ service. Specifically, targeting the Business plan development, training in innovation management and support and guidance for Intellectual Property Rights services – the project's application shall focus on the TANGO platform, with potential consideration for other KER. This provides access to tailored business strategy, market insights, networking, and potential

¹ <https://www.horizonresultsbooster.eu>

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funding, aligning with our goal of creating practical business plans. Implementation by Horizon Results Booster experts shall begin in the second quarter of 2024.

Preparatory work to create synergies and communicate the project's key innovations: Preparatory work has been conducted to establish synergies with other relevant EU and international initiatives. This includes similar projects funded under the H2020 topic ICT-13-2018-19, projects within Cluster 3 of the Horizon Europe framework, and well-established initiatives like Gaia-X, EOSC, and related endeavours such as Catena-X. The primary focus is on fostering knowledge exchange and sharing best practices to strengthen the adoption of dataspace. To systematize and manage this initiative effectively, a comprehensive template – an .xlsx tracking document – has been created. This template serves as a tool to record, analyse and engage relevant initiatives, for the benefit of the project. It should be populated by all project partners, updated on an ad-hoc basis, as soon as an initiative is identified.

Standardisation activities: Between M14 and M16, FSDE has identified the existing and potential contacts in standardisation bodies, forums and initiatives, as well as adding the ones deemed most relevant and not yet connected to the contact list created with the contribution of the Partners. The contacts have been sorted and prioritized by importance and timing for communication and have been included in a file shared among the consortium. The outcomes of the standardisation activities are described under paragraph 5.8.

5.2 Exploitation paths for KER2c

5.2.1 Competitor analysis per KER

In analysing competitors for the "User Behaviour Exchange Module", three distinct categories were identified: recommendation engine providers, advertising ecosystems (e.g., Facebook, Google Analytics), and shopping basket analytics providers. Each category targets a specific market segment; recommendation engine providers focus on online media and web shops, advertising ecosystems cater to anyone engaging in online advertising, and shopping basket analytics providers primarily serve retailers. Despite the diverse target markets, a commonality among all competitors lies in their approach to pricing. Rather than offering a standardised pricing catalogue, each competitor customises pricing based on factors like location, duration, and the volume of data provided to the customer. This flexibility ensures that pricing aligns with the unique needs of each customer.

5.2.2 Market Analysis per KER

The "User Behaviour Exchange Module" is targeting the e-commerce market. The E-Commerce Market size was valued at USD 24029.23 billion in 2021 and is poised to grow from USD 26673.64 billion in 2022 to USD 62415.2 billion by 2030, growing at a CAGR of 11% in the forecast period (2023-2030). As for the share of the market for VTT, it is not defined yet.

5.2.3 Value proposition analysis per KER

The primary focus of the "User Behaviour Exchange Module" lies in its ability to offer personalised and privacy-preserving predictions. The UBEM (distributed) module operates by communicating with peers, facilitating the exchange of information to enhance its predictions. On the other hand, the UPCV (centralised) module processes simple user/item transaction data to generate predictions. While Recommendation engine providers and Advertising ecosystems concentrate on ranking user interests within the vendor's selection, highlighting their emphasis on tailored recommendations, Shopping basket analytics providers distinguishes itself by specialising in clustering users or items. The core offering across all competitors' categories revolves around delivering precise and privacy-conscious

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insights into user behaviour, aligning with the contemporary emphasis on personalization while respecting individual privacy concerns.

5.2.4 Barriers, obstacles and analysis of the standards and regulation per KER

Navigating the user behaviour analysis and targeted advertising industry presents several challenges. Data privacy regulations such as GDPR impose compliance burdens on companies, requiring investment in secure data handling practices. Some ethical considerations concerning user privacy and manipulation demand. Technical complexity arises from the need for advanced technology and skilled personnel to develop and maintain recommendation engines and analytics platforms.

5.2.5 Technology and market watch per KER

Item	Description	Possible Impact	Actions	Link
Emerging trend or development	EU restrictions for Facebook et al. to collect profiling data across services, breaching users' privacy.	UBEM (UPCV) approach is designed to enable personalised services without privacy concerns.	Find application(s) that would be used as a commercial PoC for the technology.	https://www.ibc.org/download?ac=10484

5.2.6 SWOT analysis

This KER is about the “User Behaviour Exchange Module (UBEM). The stakeholder groups are: Business networks, local or virtual ecosystems, which have a common pool of users and/or common pool of offerings. The following figure includes the SWOT analysis that has been completed for the topic. The descriptive SWOT analysis is provided in Annex B.

The type of commercial Exploitation is “Consultative selling, technology integration, deployable implementations of the technology and IPR licensing”.

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Figure 20 - KER 2c SWOT analysis

5.2.7 PESTLE analysis

The following figure provides the PESTLE analysis conducted for this KER. The descriptive PESTLE analysis is provided in Annex C.

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Figure 21 - KER2c PESTLE analysis

5.3 Exploitation paths for KER8

5.3.1 Competitor analysis per KER

In the competitive analysis of continuous behavioural authentication, several competitors have emerged with varying degrees of funding and market presence. BioCatch stands out prominently with its substantial funding rounds totalling \$250M across Seed, Series A, B, and C rounds. BehavioSec, acquired by LexisNexis, has also garnered attention, having secured multiple rounds of funding (Seed, Series A, and B) amounting to \$25M. Zighra, albeit with a relatively modest Seed round of \$2.76M, is positioned as another contender in this space. Shifting focus to the biometric authentication sector, CallSign has demonstrated a formidable presence, having secured funding across Preseed, Angel, Seed, and Series A rounds, amassing a total of \$38.8M. Additionally, AimBrain, recently acquired by BioCatch, has made notable strides with its Seed and Series A rounds, accumulating £4.4M in funding. These competitors collectively contribute to the dynamic landscape of continuous behavioral authentication and biometric authentication, each vying for market share and technological advancement.

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5.3.2 Market analysis per KER

The “User Continuous Behavioural Authentication” market, valued at USD 2.01 billion in 2022, is expected to surge to USD 11.64 billion by 2030, boasting a remarkable CAGR of 24.5%. Factors driving this growth include escalating cyber threats and the demand for stringent security solutions. Identity proofing emerges as an essential segment, driven by digital transaction surges.

5.3.3 Value proposition analysis per KER

User Continuous Behavioural Authentication presents a revolutionary approach to security, surpassing existing systems with its autonomous continuous multi-biometric authentication. It stands as the sole system offering a self-compensating continuous authentication framework that learns user behaviour autonomously. With no user input required, it combines over 14 behavioural traits, including biometrics and transactional patterns, ensuring robust authentication. Setup is effortless, requiring just one selfie or passport. By eliminating passwords, it establishes primary standalone authentication, enhancing security. It also replaces traditional multi-factor methods like one-time passwords, ensuring PSD2 compliance. Moreover, it ensures device independence, maintaining a unique user profile across all devices. User Continuous Behavioural Authentication not only promises increased security but also simplifies the authentication process, offering a seamless, reliable, and regulatory-compliant solution for modern digital environments.

5.3.4 Barriers, obstacles and analysis of the standards and regulation per KER

Adopting User Continuous Behavioural Authentication presents a number of standards and legal obstacles. First of all, the privacy concerns associated with the collection and processing of behavioural data make it difficult to ensure compliance with regulatory standards like PSD2 and data protection laws like GDPR. This calls for the implementation of strong user consent management and data protection mechanisms. Second, the diversity and complexity of behavioural biometrics make it difficult to create industry-wide standards; instead, regulatory agencies and stakeholders must work together to harmonize standards across different industries and jurisdictions. Moreover, the dynamic nature of technology and the absence of established protocols for behavioural authentication delay communication and integration with current systems, which may lead to platform incompatibilities. To overcome these obstacles, industry participants, regulators, and standards organizations must work together to create precise guidelines and frameworks emphasizing on collaboration, transparency, and ongoing dialogue in navigating the complicated field of standards and regulations in User Continuous Behavioural Authentication.

5.3.5 Technology and market watch per KER

Item	Description	Possible Impact	Actions	Link
Hot start-ups and innovators	The entry of new start-ups and innovators can reshape market dynamics by introducing fresh competition, driving innovation cycles, and potentially	Customers may increasingly demand features and capabilities inspired by the innovations of start-ups and innovators.	Seek partnerships or collaborations with hot start-ups and innovators to leverage their expertise, technologies, and market insights. These partnerships can facilitate	N/A

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Item	Description	Possible Impact	Actions	Link
	lowering barriers to entry. This can lead to increased investment and attention in the behavioural authentication sector, spurring growth and diversification	Technology providers must stay attuned to these evolving customer expectations and be prepared to adapt their offerings accordingly to remain competitive in the market	knowledge exchange, accelerate product development, and create synergies that benefit both parties	
Emerging trend or development	Keep an eye on advancements in behavioural biometrics technology such as new algorithms, machine learning techniques, and sensor innovations that enhance accuracy and security.	Increased customer experience, enhanced security, prevention of unauthorized access, and address specific challenges such as identity fraud and financial fraud while adhering to relevant regulations.	Continue focusing on enhancing the reliability of inference results in various conditions and use cases, collecting additional behavioural data, obtaining user feedback, fine-tuning the component based on specific use cases, and training improved models to prevent fraud and malicious activities	N/A

5.3.6 SWOT analysis

This KER is about “User continuous behavioural authentication” which is an Android mobile app technology. The solution will be offered as a Software-as-a-Service, based on the number of subscribed users. The actual organization that deploys the solution will be the customer. The end-users will use the service. The descriptive SWOT analysis is provided in Annex B.

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Figure 22 - KER8 SWOT analysis

5.3.7 PESTLE analysis

The following figure provides the PESTLE analysis conducted for this KER. The descriptive PESTLE analysis is provided in Annex C.

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Figure 23 - KER8 PESTLE analysis

5.4 Exploitation paths for KER14a

5.4.1 Competitor analysis per KER

The competitive analysis of the "Privacy Enhancing Component" identifies three main competitors: HiddenLayer, Robust Intelligence, and OneTrust. HiddenLayer specialises in security solutions for machine learning systems, with target customers in sectors like finance, government, and defence. Robust Intelligence offers a range of products and services to secure enterprises from AI risk, catering to clients in finance, technology, consulting, retail, and government. OneTrust is a prominent company providing a comprehensive platform for privacy, governance, risk, compliance, ethics, and environmental, social, and governance (ESG) management, serving a diverse customer base across various industries.

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HiddenLayer targets organisations extensively using machine learning (ML) in their operations, including finance, government, and defence sectors. Robust Intelligence focuses on customers heavily utilising AI and ML, with notable clients spanning finance, technology, consulting, retail, and government. OneTrust serves a diverse customer base across different industries, including finance, technology, retail, and cultural institutions, catering to large multinational corporations, government, and non-profit organisations.

While specific pricing details for HiddenLayer's products and services are not publicly available, the company encourages potential clients to contact them directly for customised pricing based on specific needs, scale, and context. Robust Intelligence and OneTrust both offer customised pricing, involving direct consultations to understand the organisation's requirements, the size and complexity of AI models, and other factors affecting pricing. OneTrust also provides different pricing options tailored for large enterprises, growing businesses, and special industry sectors such as education, public sector, and non-profits, acknowledging the unique financial and operational contexts of these organisations.

5.4.2 Market analysis per KER

The focus of the "Privacy Enhancing Component" is on the niche market of cybersecurity, specifically concentrated on AI or safe AI. The Total Available Market (TAM) for this specialised cybersecurity sector poses challenges due to its specificity and the dynamic nature of this niche within the broader cybersecurity landscape. Despite these challenges, gaining insights into the overall AI in the cybersecurity market can provide valuable context. For instance, according to GlobeNewswire, the global AI in cybersecurity market was valued at USD 17.4 billion in 2022 and is expected to reach approximately USD 102.78 billion by 2032, growing at a CAGR of 19.43% from 2023. Allied Market Research reported the global AI in cybersecurity market at \$19.2 billion in 2022, projecting it to reach \$154.8 billion by 2032, with a CAGR of 23.6% from 2023.

Estimating market share for a start-up focusing on assessing data privacy risks posed by AI and generative AI involves various considerations. Given the rapid evolution of AI and generative AI fields, the market for assessing their data privacy risks is likely still in the early stages of development. In such emerging markets, early entrants can potentially capture significant market share swiftly, particularly if they offer innovative or unique solutions.

In the initial years, achieving a market share of approximately 1% to 3% seems like a realistic target, especially if the competitive landscape is not overly saturated. If the start-up can establish itself as a thought leader or innovator in the field, and as the market grows with increasing awareness about the importance of AI data privacy, this market share could potentially expand to 5% to 10% over a more extended period (5 to 10 years), contingent on how the market evolves and the start-up's ability to scale and adapt.

5.4.3 Value Proposition analysis per KER

The "Privacy Enhancing Component" developed by University of Greenwich Is dedicated to ensuring the responsible and ethical harnessing of AI and generative AI's revolutionary benefits. Acknowledging their potential for innovation alongside significant data privacy risks, University of Greenwich aims to empower businesses to use AI safely and sustainably. University of Greenwich does this by assessing data flows and associated cyber-physical threats, mapping these to privacy risk metrics, and quantifying risks to offer targeted recommendations for mitigation. University of Greenwich provides a comprehensive privacy risk assessment score, reflecting the impact of AI use, thereby protecting organisations and our customers, and contributing to a more secure, ethical digital landscape. This approach underscores UoG's belief in the critical importance of responsible AI use for sustainable technological advancement.

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5.4.4 Barriers, obstacles and analysis of standard regulation per KER

The “Privacy Enhancing Component” faces several barriers in its mission to assess data privacy risks associated with AI and generative AI. Firstly, the "technical complexity" inherent in advanced AI and generative AI technologies poses significant challenges during the assessment of privacy risks. As these technologies evolve rapidly, navigating their intricacies demands a deep understanding and expertise. Secondly, the challenge of "limited resources," encompassing funding, manpower, and technology, is a typical hurdle for start-ups. Adequate resources are vital for developing and implementing effective privacy risk assessment methodologies. Lastly, "market competition" presents a significant barrier, with established players in the cybersecurity and data privacy sectors posing substantial competition. Obstacles to success include safeguarding the UoG's proprietary methodologies and technologies while managing potential legal liabilities associated with providing expert advice. Protecting intellectual property and maintaining legal compliance are critical considerations in this competitive landscape.

In terms of standards, University of Greenwich must address varied compliance requirements across different industries such as healthcare and finance. This necessitates a flexible software approach that can account for industry-specific regulations and standards.

On the regulatory front, University of Greenwich must stay abreast of emerging AI-specific regulations that govern the responsible use of AI and generative AI. Additionally, navigating global data privacy regulations, such as the General Data Protection Regulation (GDPR), presents an ongoing challenge. The ability to understand and comply with diverse and evolving regulations is crucial for the start-up's success in the dynamic landscape of AI and generative AI privacy assessments.

5.4.5 Technology and market watch per KER

The technology and market watch of "Privacy Enhancing Component" is in progress.

Item	Description	Possible Impact	Actions	Link
IBM Watson	IBM Watson offers AI and machine learning solutions tailored to various industries, providing security solutions for machine learning	Enhanced data security, improved compliance with privacy regulations, and reduced AI-related risks for organizations.	Keep track of the latest updates	IBM Watson
Microsoft Azure	Microsoft Azure provides comprehensive AI and machine learning tools and services, including security solutions for enterprises.	Strengthened data privacy, minimized AI risks, and ensured regulatory compliance for organizations	Keep track of the latest updates	Microsoft Azure

5.4.6. SWOT analysis

This KER refers to the “Privacy Threat Modelling and Identification for Trustworthy AI, Privacy Enhancing Component (PEC)”. The type of commercial is Privacy risk assessment software. The descriptive SWOT analysis is provided in Annex B.

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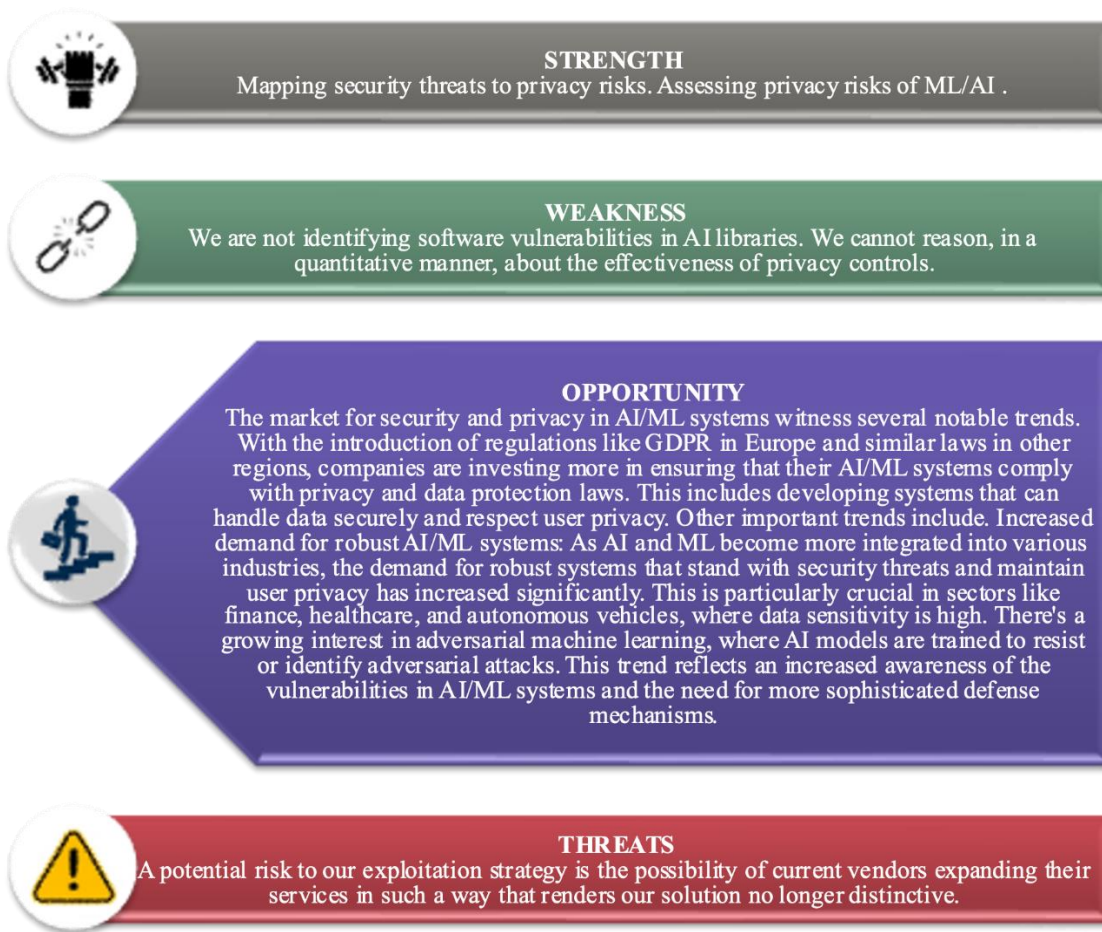


Figure 24 - KER14a SWOT analysis

5.4.7 PESTLE analysis

The following figure provides the PESTLE analysis conducted for this KER. The descriptive PESTLE analysis is provided in Annex C.

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Figure 25 - KER14a PESTLE analysis

5.5 Exploitation paths for KER16

5.5.7 Competitor analysis per KER

A strong competitor to "Infrastructure Management based on AI" is a product called Electricity Maps, developed by a Danish start-up. Electricity Maps offers information on past and current carbon intensity for numerous countries, primarily targeting consumers interested in electricity data. Specific details regarding the pricing structure for "Infrastructure Management based on AI" are currently unavailable.

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5.5.8 Market analysis per KER

The target market for XLAB's solution, "Infrastructure Management based on AI," primarily focusing on big data centres, extends beyond the current energy market where XLAB is not yet present. An annual growth rate of 4.84% is expected for the energy market (CAGR 2024-2028). This potential market encompasses any sector extensively using substantial electrical energy and possessing the flexibility to shift tasks temporally or geographically. Notably, big data centres emerge as major consumers within the electrical grid, presenting a significant opportunity for the "Infrastructure Management based on AI." By addressing this sector, the innovation can contribute to reducing reliance on non-renewable energy sources such as coal and gas-peaker plants.

This broader application of "Infrastructure Management based on AI" has the potential to lead to a substantial reduction in carbon footprint and lower utility costs across various sectors. The mentioned 50% likely represents a target market share that XLAB aims to capture, indicating the significant impact it envisions in terms of market penetration and influence within the identified segments.

5.5.9 Value Proposition analysis per KER

The objective of "Infrastructure Management based on AI" is to empower users with informed solutions for efficiently balancing and shifting their computing loads. XLAB achieves this by developing the most comprehensive model in the industry, offering an automated solution that surpasses conventional approaches. The goal is to grant customers autonomy in choosing how they execute their work, optimising computing resources according to their unique needs and preferences. By delivering a holistic and automated solution, XLAB enables users to make informed decisions, enhance operational efficiency, and ultimately take control of their computing environment.

5.5.10 Barriers, obstacles and analysis of standard regulation per KER

Barriers to the widespread adoption of our technology include challenges related to data inputs and a general hesitancy to embrace new technologies. The effectiveness of our solution relies heavily on the availability and quality of data inputs, and the reluctance of users to adopt unfamiliar technologies can impede the seamless integration of our solution into existing workflows. Overcoming these barriers involves addressing concerns related to data reliability and instilling confidence in users regarding the benefits and ease of adopting our technology. Additionally, obstacles arise in the acquisition of high-quality data, a crucial component for the accurate functioning of our solution. Ensuring a robust data acquisition process becomes pivotal in overcoming these obstacles and establishing a foundation for the successful implementation and widespread acceptance of our technology.

5.5.11 Technology and market watch per KER

Item	Description	Possible Impact	Actions	Link
Active companies and their R&D strategies	Electricity maps	A technology that could push us out of the market, especially with the cooperation of big players as Google	Keep on radar	https://app.electricitymaps.com/map and https://www.electricitymaps.com/client-stories/google

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5.5.12 SWOT analysis

This KER refers to the Innovation “Infrastructure Management based on AI”. The type of Commercial is RENOPS and it would be exploited as a service, providing the most optimal execution times for energy intensive task via renewable factors. The descriptive SWOT analysis is provided in Annex B.

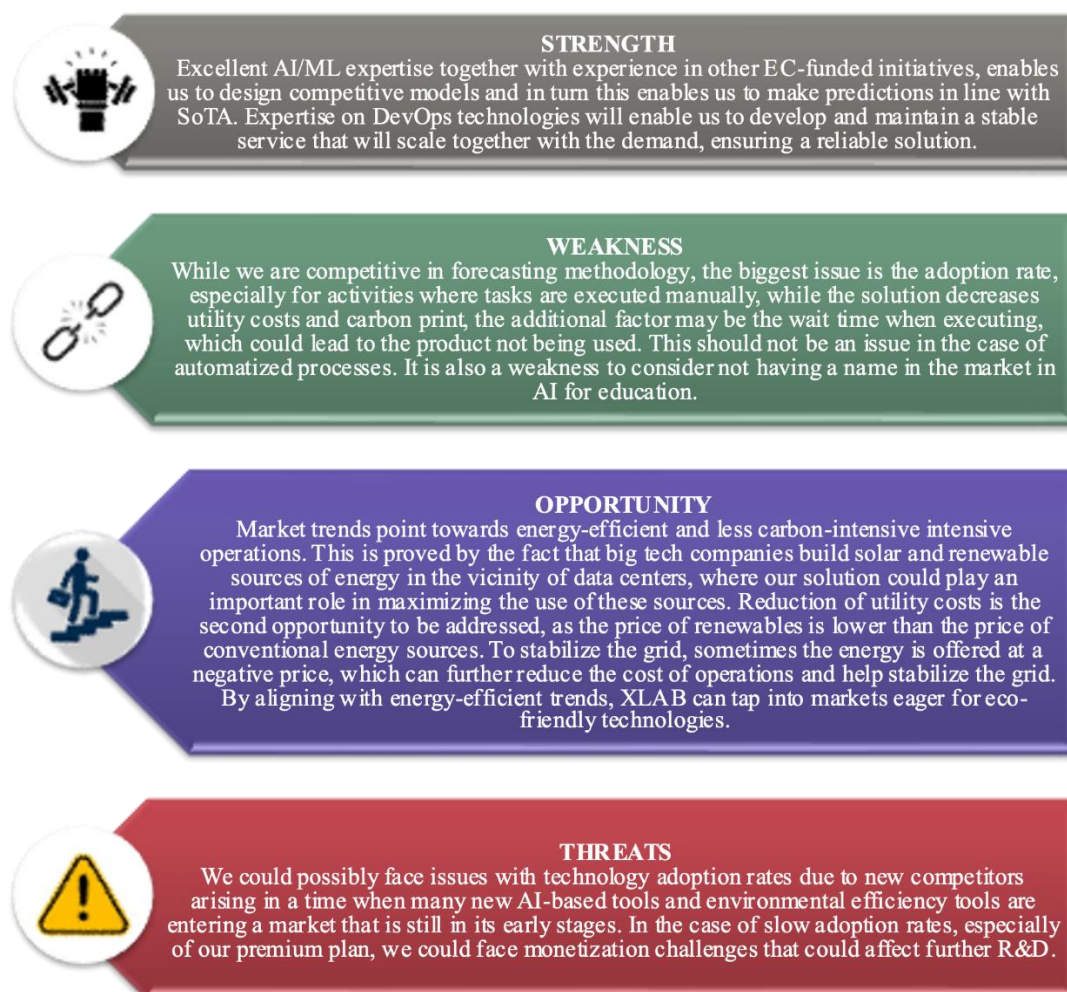


Figure 26 - KER16 SWOT analysis

5.5.13 PESTLE analysis

The following figure provides the PESTLE analysis conducted for this KER. The descriptive PESTLE analysis is provided in Annex C.

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Figure 27 - KER16 PESTLE analysis

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5.6 Exploitation paths for KER17

5.6.1 Competitors analysis per KER

The cybersecurity data sharing and management space is dynamic, with several players offering solutions across various industries. Based on current analysis, some of the potential indirect competitors in the field include: SafeHarbor Solutions (established player in data security and privacy), CyberArk (led the market in securing enterprises against cyber-attacks), Darktrace (global leader in cybersecurity AI), and CrowdStrike (advanced cloud-native platform for protecting critical areas of enterprise risk – endpoints and cloud workloads, identity and data). TANGO's emphasis on comprehensive data processing, privacy, decentralization, and alignment with contemporary data space paradigms positions it uniquely. The platform's capability of addressing challenges in multiple industries and its focus on innovation can be key differentiators.

5.6.2 Market analysis per KER

The TANGO Platform positions itself within the landscape of cybersecurity solutions for data sharing and management IT systems, targeting organizations and businesses that prioritize secure, efficient, and decentralized data practices. The global cyber security market size was estimated at USD 222.66 billion in 2023 and is projected to grow at a compound annual growth rate (CAGR) of 12.3% from 2023 to 2030.² The primary focus is on sectors where data privacy, interoperability, and compliance with regulatory standards are important, especially within the European Union. Hence, target markets and customer segments include, among others:

Hospitality providers

- Potential customers: Hotels managing guest data, reservation systems, and collaborating with various service providers.
- Needs: Secure and efficient data sharing for guest services, integration with booking platforms, and compliance with data protection regulations.
- Market trends: Increasing digitalization in the hospitality industry, demand for personalized guest experiences, and the need for secure data sharing in a guest-centric ecosystem.

Retailers (Supermarkets)

- Potential customers: Supermarkets handling customer transaction data, inventory management, and supply chain collaboration.
- Needs: Streamlined data exchange for inventory optimization, integration with suppliers, and compliance with data privacy standards.
- Market trends: Growing reliance on data-driven strategies in retail, need for real-time inventory management, and collaborative supply chain initiatives.

Financial services

- Potential customers: Banks, financial institutions, and fintech companies dealing with vast amounts of sensitive financial data.
- Needs: Robust cybersecurity measures, compliance with financial regulations, and efficient sharing of financial information within a secure framework.
- Market trends: Growing reliance on fintech solutions, increased digitization in financial transactions, and the need for secure financial data sharing.

Technology providers and IT services

² <https://www.grandviewresearch.com/industry-analysis/cyber-security-market>

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- Potential customers: Tech companies, IT service providers, and organizations in the digital domain.
- Needs: Interoperability with diverse technology stacks, secure data sharing for collaborative projects, and compliance with data protection regulations.
- Market trends: Growing demand for digital solutions, emphasis on data-driven decision-making, and the need for secure data exchange in tech collaborations.

Government and public sector

- Potential customers: Government agencies and public institutions dealing with citizen data and inter-agency collaboration.
- Needs: Secure data sharing, adherence to government data protection standards, and integration with existing government systems.
- Market trends: Increased trend towards adherence to government regulations, ensuring data integrity, and addressing potential resistance to change.

Healthcare sector

- Potential customers: Organizations handling sensitive patient data, research institutions, and pharmaceutical companies.
- Needs: Strict adherence to data privacy regulations, seamless interoperability for collaborative research, and secure sharing of healthcare data.
- Market trends: Rising demand for collaborative research, increasing digitalization in healthcare, and the need for secure patient data sharing.

5.6.3 Value Proposition analysis per KER

The core value propositions of the TANGO platform include:

- Seamless integration of technological capabilities
- Privacy-enhancing operations for secure sharing
- Decentralization and distributed identity management
- Interoperability and alignment with contemporary data space paradigms

5.6.4 Barriers, obstacles and analysis of the standards and regulation per KER

Implementing the TANGO Platform may face challenges related to the complex integration processes with existing systems in user organizations. Ensuring a seamless transition and compatibility is crucial to overcoming this barrier. Moreover, given the sensitive nature of the data shared on the platform, cybersecurity is a critical concern. TANGO will implement robust security measures to mitigate the risk of data breaches and unauthorized access. There is also one challenge related to market-specific aspects. Different industries and sectors may have unique data-sharing requirements. TANGO needs to be adaptable to varying user needs, ensuring its versatility and relevance across diverse market segments.

5.6.5 Technology and market watch per KER

Item	Description	Possible Impact	Actions	Link
The future of Europe's data economy	A comprehensive report published by the Economist, on European data economy and data spaces	Main trends and structure of the European data economy	Keep on radar	https://impact.economist.com/perspectives/sites/default/files/ei233_msft_futuredadata_report_-_v7.pdf

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5.6.6 SWOT analysis

The following figure provides the SWOT analysis for this KER. The descriptive SWOT analysis is provided in Annex B.

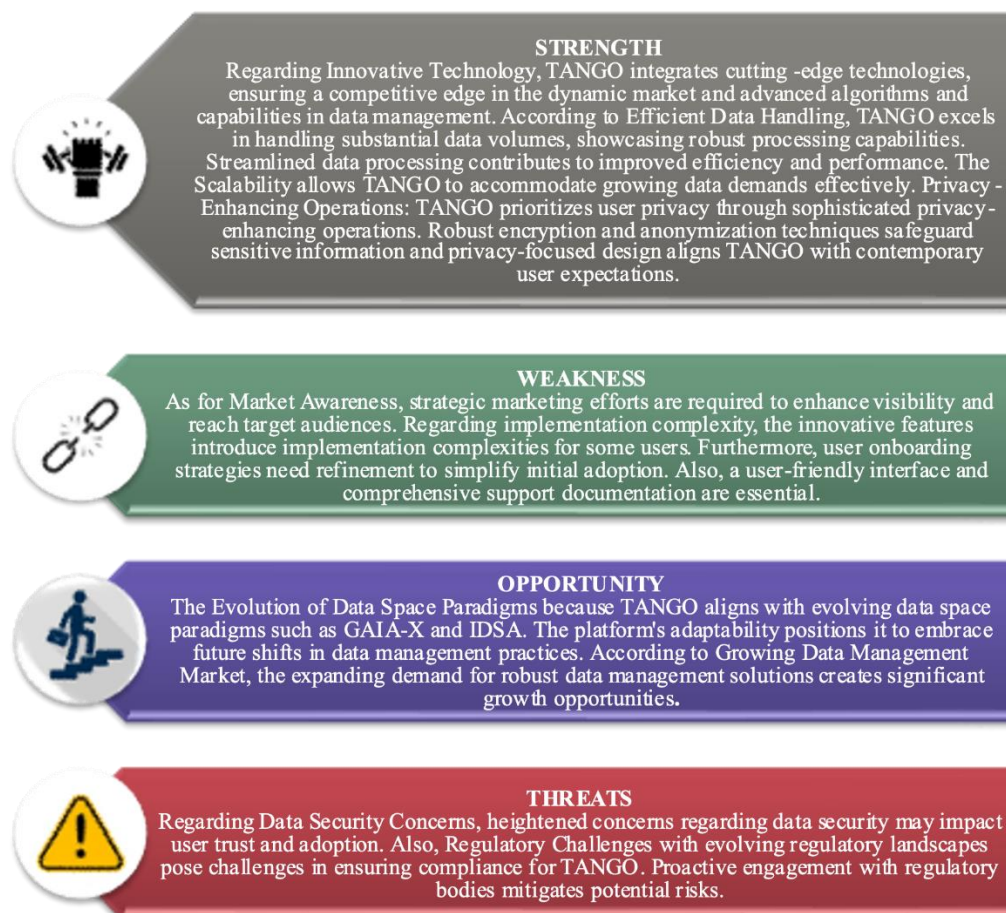


Figure 28 - KER17 SWOT analysis

5.6.7 PESTLE analysis

The following figure provides the PESTLE analysis conducted for this KER. The descriptive PESTLE analysis is provided in Annex C.

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Figure 29 - KER17 PESTLE analysis

5.7 Business Model Canvas of TANGO Platform (KER17)

5.7.1 Product description

The TANGO platform is an advanced solution for secure data sharing and storage, utilizing blockchain technology to manage large volumes of data from diverse sources. It ensures privacy and security through decentralized operations, making it ideal for industries prioritizing data protection. Aligned with GAIA-X and IDSA paradigms, TANGO offers a secure, interoperable, and efficient data

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management system. The platform leverages the Fides ecosystem to ensure the secure exchange of documentation across multiple sectors, maintaining data integrity and security through blockchain technology. This foundation protects against unauthorized access and breaches, enhancing trust and reliability in data transactions. TANGO employs distributed privacy-preserving mechanisms, advanced self-encryption, and multi-factor information recovery to ensure data security even in the event of a breach. Its decentralized identity management framework, compatible with eIDAS and OpenID, provides robust identity verification. The platform ensures smooth and secure integration for new users and devices, making it easy for organizations to manage access and maintain high levels of security. Additionally, continuous behavioural authentication, energy-efficient AI model training, dynamic intelligent execution, and privacy threat modelling enhance the overall security, efficiency, and reliability of the system. Users of the TANGO platform can utilize it for secure data sharing and storage by integrating their data sources into the platform. They can manage data access and sharing permissions, ensuring that only authorized parties can access sensitive information. The platform's advanced encryption and identity management features provide robust security, while its seamless onboarding process ensures that new users and devices can be easily and securely integrated. In parallel, the continuous monitoring and behavioural authentication service further protects against unauthorized access and fraudulent activities, ensuring the highest levels of data security and trustworthiness.

5.7.2 Value proposition

The TANGO platform integrates these technologies to create a cohesive and secure data storage and sharing system:

- **Data storage and sharing** - blockchain technology ensures secure and immutable data transactions only when it is needed, and usage of the IDS-compliant connectors facilitate data sharing.
- **Identity management** - self-sovereign identity frameworks provide robust user verification and management.
- **Data privacy and confidentiality** - Advanced encryption and privacy controls protect sensitive information.
- **Behavioral authentication** - Continuous monitoring of user and device behavior enhances security.
- **AI and ML capabilities** - AI-driven analysis and infrastructure management optimize performance and efficiency.

5.7.3 User Interaction with the TANGO Platform

By using the TANGO platform, users can perform the following functionalities and business operations:

- **Identity verification:** users and devices are seamlessly onboarded and verified through self-sovereign identity management systems.
- **Data sharing:** Organizations can share data securely with partners and collaborators using privacy-preserving mechanisms.
- **Behavioral monitoring:** Continuous authentication processes ensure that only authorized users and devices can access sensitive data.
- **Data analysis capabilities:** users can also leverage the exploratory data analysis engine to gain insights from sensitive data, aiding in decision-making processes.

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5.7.4 Target Markets of the TANGO Platform

- **Hospitality providers:** Hotels and service providers need secure data sharing and integration with booking platforms.
- **Retailers (e.g., supermarkets):** Require streamlined data exchange for inventory management and supplier integration.
- **Financial service:** Banks and fintech companies need robust cybersecurity measures and compliance with regulations.
- **Technology and IT service providers and:** Tech companies need interoperability and secure data sharing for collaborations.
- **Healthcare sector:** Organizations handling patient data require strict privacy controls and seamless data interoperability.
- **Manufacturing companies (Industry 4.0):** For data exchange in factories.
- **Government and public sector:** Agencies need secure data sharing and adherence to regulations.

5.7.5 Marketing and Monetization Strategies

We aim to employ two distinct channels in order to engage stakeholders and marketise the project offering via the platform:

- **Create strategic partnerships and promotion via events and marketplaces:** Collaborate with technology providers and industry leaders to enhance credibility and reach. In parallel Publish white papers, research reports, and participate in industry conferences to establish TANGO as a leader in cybersecurity.
- **Market penetration by using our project use cases as initial adopters:** For instance, we aim to target specific industries with tailored solutions and case studies, based on the outcomes of the pilot use cases.

5.7.6 Business Model of the TANGO Platform

The main idea is to offer the TANGO platform via dedicated service bundles, enabling extra customization. In this model, potential customers can select from a range of predefined service bundles or create customized bundles tailored to their specific needs. Service bundles can include:

- **Core services bundle:** Basic data sharing, retrieval, and identity verification.
- **Enhanced security bundle:** Advanced encryption, continuous behavioural authentication, and privacy-preserving mechanisms.
- **AI and analytics bundle:** AI-driven data analysis, energy-efficient model training, and dynamic intelligent execution.
- **Or even an industry-specific bundle:** Tailored solutions for specific industries like healthcare, finance, and retail, incorporating relevant compliance and integration features.

5.7.7 Delivery Channels of the TANGO Platform

- **Cloud-Based Platform as a Service (PaaS):** The primary delivery model for TANGO platform, allowing customers to access and use the platform via the cloud. Some of the solutions are bound to be installed at the customer premises or devices, therefore the cloud platform will provide mechanisms to deploy them.

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- **On-premises installation:** For organizations with strict data sovereignty and security requirements, TANGO offers on-premises installation of the whole platform. This option could include setup, configuration, and ongoing maintenance support, ensuring compliance with local regulations and internal policies.

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5.7.8 Business Model Canvas of the TANGO Platform

Key Partners <ul style="list-style-type: none"> Technology providers for integration Regulatory bodies for compliance Industry associations for outreach and credibility Cloud service providers for infrastructure support European data spaces organisations IDSA GAIA-X BDVA 	Key Activities <ul style="list-style-type: none"> Developing and maintaining the platform Customizing solutions for different industries Marketing and outreach Continuous research and innovation Key Resources <ul style="list-style-type: none"> Advanced technological infrastructure Skilled IT professionals Intellectual property and proprietary technologies 	Value Propositions <ul style="list-style-type: none"> Enhanced data sharing using novel technologies Improved identity management Novel behavioural identification Improved data privacy and confidentiality of information Enhanced AI and ML capabilities 	Customer Relationships <ul style="list-style-type: none"> Personalized consulting services Community forums and knowledge bases Regular updates and enhancements Channels <ul style="list-style-type: none"> Online platforms and marketplaces Industry conferences and events Strategic partnerships and alliances Direct sales teams of industrial partners in TANGO Via IDSA marketplace 	Customer Segments <ul style="list-style-type: none"> Hospitality providers (hotels, booking platforms) Retailers (supermarkets, supply chains) Financial services (banks, fintech) Technology providers and IT services Healthcare organizations (hospitals, research institutions) Manufacturing companies Government and public sector
Cost Structure <ul style="list-style-type: none"> Technology infrastructure and maintenance Marketing and sales expenses Personnel costs Compliance and regulatory costs 		Revenue Streams <ul style="list-style-type: none"> Subscription fees for platform access (for the service bundles) Licensing fees for enterprise usage (using the TANGO platform) Consulting and customization services (for new use cases and customisation of existing proprietary solutions of partners into new contexts based on customers' needs) 		

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5.8 Standardisation activities

The main objective is to identify a standardisation strategy for TANGO, mainly by thoroughly analysing the standardisation potential of the key exploitable results, and to map them to the standardisation bodies and objectives, in order to prepare a concrete plan to submit contributions to relevant standardisation forums and monitor the standards compliance of the project itself.

FSDE created a questionnaire asking all partners for their existing and suggested memberships/participation in standardisation bodies and activities outside of the project including the relevance to TANGO. Between M14 and M16, TANGO has identified existing and potential contacts within various standardisation bodies, forums, and initiatives followed by the addition of relevant initiatives and contacts that were previously not connected or mentioned by the project partners. The list of initiatives and contacts was then sorted and prioritized based on their relevance, ensuring a strategic approach to the project's engagement efforts. In total there were 28 standardisation bodies and legal frameworks identified.

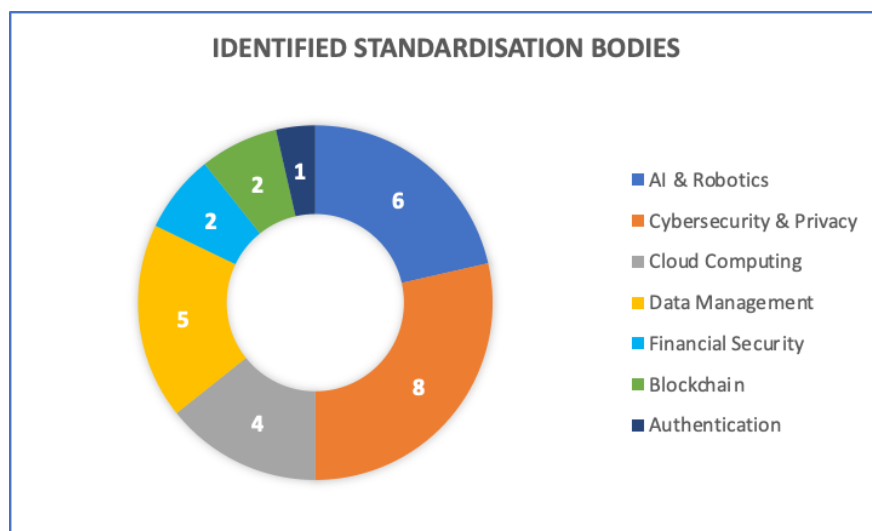


Figure 30 - Amount and type of identified standardisation bodies

In the list below these are sorted by topics and added with a short description describing their relevance to TANGO:

a. AI & Robotics

- European Commission High-Level Expert Group on AI [17] - Advises the European Commission on AI policy and strategy.
- ISO/IEC JTC 1/SC 42 (Artificial Intelligence) [18]- Standardisation in Artificial Intelligence.
- CEN-CENELEC JTC 21 (Artificial Intelligence) [19]– Standardisation of AI in Europe.
- NIST AI Risk Management Framework [20] - Provides guidelines to manage risks in AI systems.
- ITU-T Focus Group on AI for Autonomous and Assisted Driving [21] - Develops standards for AI in autonomous and assisted driving.
- BDVA (Big Data Value Association) - Focuses on advancing big data and AI in Europe.

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- ADRA (Data, AI and Robotics International) - Promotes data, AI, and robotics integration and standardisation.

b. Cybersecurity & Privacy

- Cybersecurity Working Group promoted by the European Banking Federation (EBF) [22] - Focuses on cybersecurity issues within the banking sector.
- FI-ISAC (Financial Institutions Information Sharing and Analysis Centre promoted by ENISA) [23] - Enhances cybersecurity in financial institutions.
- ECSO (European Cyber Security Organisation) [24] - Supports all types of initiatives to develop, promote, and encourage European cybersecurity.
- ENISA Guidelines on Authentication [25] - Provides guidelines for secure authentication methods.
- Privacy Threat Modelling and Identification for Trustworthy AI [26] - Ensures responsible and ethical AI use.
- ISO/IEC 27001 (Information Security Management) - Provides a framework for managing information security.
- NIST Special Publication 800-53 (Security and Privacy Controls) [27] - Offers a catalog of security and privacy controls for federal information systems and organizations.
- Privacy Threat Modelling and Identification for Trustworthy AI Privacy Assurance Tool (PAT) [26] - Aims to enhance AI trustworthiness through privacy assurance.

c. Cloud Computing

- ISO/IEC JTC 1/SC 38 (Cloud Computing and Distributed Platforms) [28] - Focuses on standardisation in cloud computing and distributed platforms.
- ITU-T Study Group 13 (Future networks including cloud computing, mobile and next-generation networks) [29] - Develops standards for future networks and cloud computing.
- European Union Blockchain Observatory and Forum [30] - Monitors and analyzes blockchain developments to provide guidelines and recommendations.
- Dataspace Protocol [31] - Promotes secure and privacy-preserving data sharing.

d. Data Management

- International Data Spaces Association [32] - Aims to create a secure data sharing framework.
- ECLIPSE Data Spaces WG [33] - Works on standardising data spaces and related technologies.
- CEN/CENELEC Trusted Data Transactions [34] - Develops standards for trusted data transactions across Europe.
- ISO/IEC 19941 (Cloud Computing - Interoperability and Portability) - Focuses on interoperability and portability standards for cloud computing.
- GDPR (General Data Protection Regulation) [35] - Provides regulations for data protection and privacy in the European Union.

e. Financial Security

- Payment Security Support Group and Card Fraud Prevention Forum promoted by European Payment Council (EPC) [36] - Focuses on payment security and fraud prevention.
- FS-ISAC (Financial Services Information Sharing and Analysis Centre promoted by ENISA) - Enhances cybersecurity in financial institutions.

f. Blockchain

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- Blockchain-based data storage and sharing - Facilitates secure data storage and sharing using blockchain technology.
- Privacy-preserving distributed ABC scheme [37] - Ensures privacy-preserving credential management using blockchain technology.

g. Authentication

- FIDO Alliance [38] - Develops standards for simpler, stronger authentication.

h. HS Booster [39]

- Besides the collection of standardisation bodies and initiatives, the HS Booster is used as an additional support, fitting into multiple of the above-mentioned categories. TANGO has been registered and assigned to an HS Booster expert with whom communication was initiated.

Identifying and prioritizing TANGO's KERs (T8.4) served as necessary input for the next steps and initiation of communication. Strong alignment throughout all tasks in WP8 is continuously implied due to co-dependencies. TANGO was mapping these KERs to the relevant standardisation bodies and more bodies/initiatives/frameworks were added to the list where necessary. This process involved assessing each KER to identify its standardisation potential and aligning it with appropriate bodies, initiatives, and legal frameworks. This activity shall be finished before M22.

Listed in the table below are the five highlighted KERs mapped to relevant standardisation bodies/legal frameworks. This activity included the mapping of all KERs but the overview below was limited to the ones with highest priority for this chapter. The full list is reported in Annex D - Exploitable Results Standardisation Mapping.

KER No.	KER	Relevant standardisation bodies
2c	User Behaviour Exchange Module (UBEM)	GDPR (General Data Protection Regulation) ISO/IEC 27001 (Information Security Management) NIST Special Publication 800-53 (Security and Privacy Controls)
8	User continuous behavioural authentication	ISO/IEC 30107 (Biometric Authentication) FIDO Alliance ENISA Guidelines on Authentication
14a	Privacy Threat Modelling and Identification for Trustworthy AI Privacy Enhancing Component (PEC)	ISO/IEC JTC 1/SC 42 (Artificial Intelligence) CEN-CENELEC JTC 21 (Artificial Intelligence) IEEE Standards Association (AI Standards) GDPR
16	Infrastructure Management based on AI	ISO/IEC JTC 1/SC 42 (Artificial Intelligence) CEN-CENELEC JTC 21 (Artificial Intelligence) IEEE Standards Association (AI Standards) ITU-T Focus Group on AI for Autonomous and Assisted Driving
17	TANGO Platform	ISO/IEC JTC 1/SC 42 (Artificial Intelligence) IEEE Standards Association (AI Standards)

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KER No.	KER	Relevant standardisation bodies
		CEN-CENELEC JTC 21 (Artificial Intelligence) European Commission AI HLEG

Starting from M21, based on the mapping, TANGO is creating a concrete plan to align its KERs with the identified standardisation objectives before M23. The identified standardisation bodies are contacted by either the partners that are members of them or by FSDE with approval from the partners and their contacts (for GDPR reasons). Standardisation bodies and working groups that were identified outside of existing memberships/participation are contacted by FSDE. Initial discussions with standardisation contacts, such as the registration of TANGO at HS Booster, the assignment and contact with an expert, have started. The project is maintaining consistent efforts to establish and nurture relevant connections. Even if not all identified bodies turn out relevant for actual communication throughout the project, the aim was to identify as many as possible as continuous engagement with these bodies is challenging due to long response times, colliding timeframes, etc.

Starting in M23 the next steps involve collecting considerations from ongoing discussions, such as with HS Booster, and incorporating them into the project's standardisation activities. Additionally, TANGO plans to align its activities with forums and standardisation organizations to ensure integration and compliance to relevant standards.

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6 Conclusions

The deliverable at hand represents a significant asset in project TANGO as it provides the consortium with a clear overview on the progress of the communication, dissemination and exploitation activities conducted so far. The following are the main highlights of the deliverable. The deliverable provides a report on the joined efforts of the consortium to effectively communicate and disseminate the project's results, with an update on the KPIs status that are under way on reaching the target value by the end of the project. The information provided is essential to all the partners in order to monitor the progress made so far and for the WP leader to coordinate the joint efforts towards the final outcome of TANGO's impact on society and its long-term success. The deliverable also offers a comprehensive a well-structured plan for the innovation management and exploitation activities, outlining the legal requirements regarding the IPR allocation and protection, the exploitable results of the project identified until now and the initial exploitation activities for the 5 prioritized KERs, including the actions put in place for the standardisation activities. The outlined information is essential for the consortium in order to validate the potential for further exploitation of the project results. The deliverable provides a well-developed and detailed SWOT and PESTLE analysis; moreover the 5 prioritized KERs of the project have been further analysed and examined by the SWOT and PESTLE analysis introduced in Section 5. The Business Model Canvas of 1 prioritized KER is also presented as part of the exploitation activities. In conclusion, the efforts of the consortium on the communication, dissemination and exploitation of TANGO for the first 18 months of the project have been successful. In the next version of the deliverable, the definitive overview on the impact of communication and dissemination will be provided, along with the final list of ERs following the project's technical developments.

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Annex A – List of TANGO Exploitable Results

#	Exploitable Result (ER)	Ownership	Owner(s)	Contrib.	Related Task(s)	Result type	Current TRL
1	Blockchain-based data storage and sharing	Single	NOR	NOR	T3.1	Integrated platform	TRL 6
2a	UCON	Single	FHG	FHG	T3.2	SW (standalone)	TRL 4
2b	Trustworthiness Scoring Module	Single	FUJ	FUJ, NOR, SVI, SQD, FHG, VTT, DUT, UOG	T3.2	System/Model	TRL 4
2c	User Behaviour Exchange Module (UBEM)	Single	VTT	VTT	T3.2	SW (standalone)	TRL 3
3	Confidentiality and Privacy by Design	Joint	UMU, ATOS	NOR, QBE, FHG, DUT	T3.3, T4.1	SW (standalone)	TRL 4
4	Self-encryption and Decryption Techniques with Multi-Factor Information Recovery Mechanisms	Joint	DUT	NOR, FHG, DUT, UMU	T3.4	Algorithm	TRL 3
5	ePrivacy Mechanisms, Protocols and Processes	Single	KUL	NOR, SQUAD, DBC, DUT, UTH, LIC	T3.5	Guideline	N/A
6a	Personal Credential Manager	Single	VTT	UMU, ATOS	T4.1	SW (standalone)	TRL 4
6b	Privacy-preserving distributed ABC scheme	Single	UMU	VTT, ATOS	T4.1	SW (standalone)	TRL 4
6c	Issuer and Verifier for SSI Mgmt	Single	ATOS	Dependency: - ZKP Library (UMU)	T4.1	SW (standalone)	TRL 4

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#	Exploitable Result (ER)	Ownership	Owner(s)	Contrib.	Related Task(s)	Result type	Current TRL
7a	Seamless onboarding for users	Single	QBE	ATOS, SVI, QBE, KUL	T4.2	SW (standalone)	TRL 5
7b	Seamless onboarding for devices	Single	ATOS	ATOS, SVI, QBE, KUL	T4.2	SW (standalone)	TRL 5
8	User continuous behavioural authentication	Single	QBE	SVI, QBE, UMU, KUL, UTH	T4.3	SW (standalone)	TRL 5
9	Device continuous behavioural authentication	Single	UTH	UTH	T4.4	SW (standalone)	TRL 4
10	Hardening against Sidechannel Attacks	Joint	CEA	CEA, VTT, DUT	T4.5	SW (standalone)	TRL 2
11	Exploratory Data Analysis engine (EDAE)	Joint	EXUS	EXUS, UOM, UOG	T5.1	SW (standalone)	TRL 3
12a	Energy efficient AI model training Support for MLOps	Joint	ATOS	ATOS, EXUS, XLAB, UOM, ANYS	T5.2	SW (standalone)	TRL 4
12b	Energy efficient AI model training Support for Federated Learning	Joint	ATOS	ATOS, EXUS, XLAB, UOM, ANYS	T5.2	SW (standalone)	TRL 4
12c	Energy efficient AI model training Support for AutoML	Joint	ATOS	ATOS, EXUS, XLAB, UOM, ANYS	T5.2	SW (standalone)	TRL 4
13	Dynamic Intelligent Execution	Joint	UOM	UOM, ATOS, UTH, EXUS, TUB, ETH, FORTH, LUX	T5.3	SW (standalone)	TRL 6 – TRL7
14a	Privacy Threat Modelling and	Single	UOG	UOG, FUJ_LU,	T5.4	SW (standalone)	TRL 4

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#	Exploitable Result (ER)	Ownership	Owner(s)	Contrib.	Related Task(s)	Result type	Current TRL
	Identification for Trustworthy AI Privacy Enhancing Component (PEC)			SQUAD, EXUS, QBE, SQD, IDIADA			
14b	Privacy Threat Modelling and Identification for Trustworthy AI Privacy Assurance Tool (PAT)	Single	FUJ_LU	UOG, FUJ_LU, SQUAD, EXUS, QBE, SQD, IDIADA	T5.4	SW (standalone)	TRL 3
15	X-AI for Privacy and Trust Enhancement	Joint	SQD	SQD, ATOS, EXUS, SVI, QBE, XLAB, KUL, UOG	T5.5	AI & ML Model/ Method	TRL 4
16	Infrastructure Management based on AI	Joint	XLAB	XLAB, ATOS, EXUS, UOM, IDIADA	T5.6	AI & ML Model/ Method	TRL 4
17	TANGO Platform	Joint	All involved partners	-	T6.1, T6.2, T6.3, T6.4	Integrated platform	TRL 4
18	TANGO Connectors	Joint	UTH, INTRA	Other partners	T2.5, T6.1	SW (standalone)	TRL 4

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Annex B – SWOT Analysis per KER

This Annex includes the definition of SWOT analysis and the description of the SWOT analyses conducted per each KER identified.

Introduction

What is a SWOT analysis? A SWOT analysis is a framework to understand and analyse external and internal forces that may create risks, opportunities and chances for an organization or a topic that is analysed. The analysis when it is conducted will support strategic planning and risk management. SWOT stands for Strengths, Weaknesses, Opportunities and Threats. A SWOT analysis is used differently by different stakeholders. The internal factors are the strengths and weaknesses which are characteristics of a topic that provide a relative advantage or disadvantage over the outcome. On the other hand, opportunities and threats are external factors that could have an effect on the topic/business that is being analysed. Opportunities are the elements of the external environment that could be seized to improve the topics/business/product performance, namely revenue growth or improved margins. Threats are the elements of the external environment that may endanger a firm's/topics/ product competitive advantage, or its ability to operate as a going concern, for example regulatory issues, technological disruption, weather conditions etc. When you need a broad analysis of your business, department, organizational or team potential, you should look no further than the SWOT analysis. It can provide an overview of all the major points that add up to potential success and help you draft a road map for potential growth. A management. SWOT assists visualize the product's relative advantages and disadvantages to better understand where and how the stakeholder should allocate resources, either towards growth or risk reduction initiatives.

When and why to conduct a SWOT analysis:

- i. Launching a new product. To ensure success a SWOT analysis should be launched as you are launching a new product or a new business idea. Not doing your research beforehand could lead to targeting the wrong customers or not preparing for the competitive landscape. Improving team processes. It could be beneficial to evaluate the performance of the team, the members of the team and to check the success or the new opportunities that exist in the team or in the project that is introduced. Also, every time a new feature is added to the product/idea that is analysed, a SWOT analysis should be completed to see what impact it could have on the competitive landscape.
- ii. Marketing team launching a campaign. Whenever a new target audience or method for reaching them is considered, the marketing team can complete a SWOT analysis to determine its potential.

Strengths: Strengths may be any number of areas or characteristics where the product that is analysed excels and has a competitive advantage over the others. Advantages may be more qualitative in nature and therefore difficult to measure namely a great corporate culture, strong brand recognition, proprietary technology, etc., or they may be more quantitative namely best-in-class margins, above-average inventory turnover, category-leading return on equity, etc.

Weaknesses: Weaknesses are areas or characteristics where the product/idea that is examined is at a competitive disadvantage relative to the others. Like strengths, these can also be more qualitative or

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quantitative. Examples include inexperienced management, high employee turnover, low or declining margins, and high or excessive use of debt as a funding source.

Opportunities: The “Opportunities” section should highlight external factors that represent potential growth or improvement areas for a business. Consider opportunities like a growing total addressable market (TAM), technological advancements that might help improve efficiency, or changes in social norms that are creating new markets or new sub-segments of existing markets.

Threats: Threats are external forces that represent risks to a business and its ability to operate. The categories tend to be alike the “Opportunities” section, but directionally opposite. Consider examples like an industry in decline (which is the same as a decreasing TAM), technological innovation that could disrupt the existing business and its operations, or evolving social norms that make existing product offerings less attractive to a growing number of consumers.

KER2c SWOT Analysis

The first KER is about the “User Behavior Exchange Module (UBEM). The stakeholder groups are: Business networks, local or virtual ecosystems, which have a common pool of users and/or common pool of offerings. The type of commercial Exploitation is “Consultative selling, technology integration, deployable implementations of the technology and IPR licensing”.

Strength: The technology is proven as a centralized approach, with a reference as a large-scale library recommender (100’s of thousands of book titles and patrons). The current evolution performs well in the lab and can be implemented as decentralized privacy-preserving solution. It also enables collaboration between vendors, without sharing private user data.

Weaknesses: Regarding collaborative advertising, the market leaders have made their solutions easy to deploy. They are deeply rooted, by third party systems supporting them, and providing advertising metrics widely understood. Compared to that, there is essentially have technology only, with too low TRL.

Opportunity: Privacy is a value proposition that may resonate in some environments. Successful demonstration of the distributed model in a field (e.g. in TANGO Smart Hospitality use case) would provide credibility and some reputation for the technology. The UBEM itself may be implemented in a way that it would fit into ecommerce and even point-of-sales systems (insight to be studied in TANGO Retail use case). Apps of our own, for specific purposes, are also an opportunity.

Threats: Few people and players care for privacy, and even less in the future. Generic UBEM implementations may turn too difficult, rendering the implementations to tailored, federated, or even centralized approaches. Legacy big tech players (GAFAM) improve their offerings to address privacy as well.

KER8 SWOT Analysis

This KER is about “User continuous behavioural authentication” which is an Android mobile app technology. The solution will be offered as a Software-as-a-Service, based on the number of subscribed users. The actual organization that deploys the solution will be the customer. The end-users will use the service.

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Strength: User continuous behavioral authentication will be a more secure and reliable replacement for the systems listed above: autonomous continuous multi-biometric authentication by learning the user's behavioral patterns. BehavAuth will be the only system that introduces a multi-biometric self-compensating continuous authentication system that autonomously learns the users' behavioral patterns. User continuous behavioral authentication is the only system that offers: Continuous behavioral authentication that does not require any user input. Authentication combines more than 14 behavioral traits such as biometrics, human, device, and transactional behavioral patterns.

Weaknesses: Considering that the solution combines multiple behavioral patterns, the cloud consumption for the solution is quite high, thus the pricing for the solution will be quite high to be sustainable.

Opportunity: As online transactions, systems and fraudulent activities increase, the global behavioral biometrics market is expected to grow at a compound annual growth rate of 24.4% from 2020-2027.

Threats: The risks that may arise are new fraud cases where the human factor is not involved, or where the human factor is artificially emulated. Furthermore, if any other authentication mechanism arises that is more secure and more user-friendly than behavioral authentication, this could constitute a risk.

KER14a SWOT analysis

This Ker refers to the "Privacy Threat Modelling and Identification for Trustworthy AI, Privacy Enhancing Component (PEC)". The type of commercial is Privacy risk assessment software.

Strength: Mapping security threats to privacy risks. Assessing privacy risks of ML/AI

Weaknesses: Software vulnerabilities in AI libraries are not being identified. It is not possible to reason, in a quantitative manner, about the effectiveness of privacy controls.

Opportunity: The market for security and privacy in AI/ML systems witness several notable trends. With the introduction of regulations like GDPR in Europe and similar laws in other regions, companies are investing more in ensuring that their AI/ML systems comply with privacy and data protection laws. This includes developing systems that can handle data securely and respect user privacy. Other important trends include. Increased demand for robust AI/ML systems: As AI and ML become more integrated into various industries, the demand for robust systems that stand with security threats and maintain user privacy has increased significantly. This is particularly crucial in sectors like finance, healthcare, and autonomous vehicles, where data sensitivity is high. There's a growing interest in adversarial machine learning, where AI models are trained to resist or identify adversarial attacks. This trend reflects an increased awareness of the vulnerabilities in AI/ML systems and the need for more sophisticated defense mechanisms.

Threats: A potential risk to our exploitation strategy is the possibility of current vendors expanding their services in such a way that renders our solution no longer distinctive.

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KER16 SWOT Analysis

This KER refers to the Innovation “Infrastructure Management based on AI”. The type of Commercial is RENOPS and it would be exploited as a service, providing the most optimal execution times for energy intensive task via renewable factors.

Strength: Excellent AI/ML expertise together with experience in other EC-funded initiatives, enables us to design competitive models and in turn this enables us to make predictions in line with SoTA. Expertise on DevOps technologies will enable us to develop and maintain a stable service that will scale together with the demand, ensuring a reliable solution.

Weaknesses: While forecasting methodology is competitive, the biggest issue is the adoption rate, especially for activities where tasks are executed manually, while the solution decreases utility costs and carbon print, the additional factor may be the wait time when executing, which could lead to the product not being used. This should not be an issue in the case of automatized processes. It is also a weakness to consider not having a name in the market in AI for education.

Opportunity: Market trends point towards energy-efficient and less in carbon-intensive intensive operations. This is proved by the fact that big tech companies build solar and renewable sources of energy in the vicinity of data centers, where our solution could play an important role in maximizing the use of these sources. Reduction of utility costs is the second opportunity to be addressed, as the price of renewables is lower than the price of conventional energy sources. To stabilize the grid, sometimes the energy is offered at a negative price, which can further reduce the cost of operations and help stabilize the grid. By aligning with energy-efficient trends, XLAB can tap into markets eager for eco-friendly technologies.

Threats: Possible issues to face lie within technology adoption rates due to new competitors arising in a time when many new AI-based tools and environmental efficiency tools are entering a market that is still in its early stages. In the case of slow adoption rates, especially of our premium plan, possible monetization challenges could be faced that could affect further R&D.

KER17 SWOT Analysis

Strength: Regarding Innovative Technology, TANGO integrates cutting-edge technologies, ensuring a competitive edge in the dynamic market and advanced algorithms and capabilities in data management. According to Efficient Data Handling, TANGO excels in handling substantial data volumes, showcasing robust processing capabilities. Streamlined data processing contributes to improved efficiency and performance. The Scalability allows TANGO to accommodate growing data demands effectively. Privacy-Enhancing Operations: TANGO prioritizes user privacy through sophisticated privacy-enhancing operations. Robust encryption and anonymization techniques safeguard sensitive information and privacy-focused design aligns TANGO with contemporary user expectations.

Weaknesses: As for Market Awareness, strategic marketing efforts are required to enhance visibility and reach target audiences. Regarding implementation complexity, the innovative features introduce implementation complexities for some users. Furthermore, user onboarding strategies need

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refinement to simplify initial adoption. Also, a user-friendly interface and comprehensive support documentation are essential.

Opportunity: The Evolution of Data Space Paradigms because TANGO aligns with evolving data space paradigms such as GAIA-X and IDSA. The platform's adaptability positions it to embrace future shifts in data management practices. According to Growing Data Management Market, the expanding demand for robust data management solutions creates significant growth opportunities.

Threats: Regarding Data Security Concerns, heightened concerns regarding data security may impact user trust and adoption. Also, Regulatory Challenges with evolving regulatory landscapes pose challenges in ensuring compliance for TANGO. Proactive engagement with regulatory bodies mitigates potential risks.

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Annex C – PESTLE Analysis per KER

This Annex includes the definition of PESTLE analysis and the description of the PESTLE analyses conducted per each KER identified.

Introduction

What is a PESTLE analysis? A PESTLE analysis is a framework or tool used by marketers to analyse and monitor the macro-environmental (external marketing environment) factors that have an impact on an organization, company, or industry. It examines the Political, Economic, Social, Technological, Legal and Environmental factors in the external environment. A PESTLE analysis is used to identify threats and weaknesses which are used in a SWOT analysis:

- i. Political factors include government policies, leadership, and change; foreign trade policies; internal political issues and trends; tax policy; regulation and de-regulation trends.
- ii. Economic factors include current and projected economic growth; inflation and interest rates; job growth and unemployment; labour costs; impact of globalization; disposable income of consumers and businesses; likely changes in the economic environment.
- iii. Social factors include demographics (age, gender, race, family size); consumer attitudes, opinions, and buying patterns; population growth rate and employment patterns; socio-cultural changes; ethnic and religious trends; living standards.
- iv. Technological factors affect marketing in (1) new ways of producing goods and services; (2) new ways of distributing goods and services; (3) new ways of communicating with target markets.
- v. Legal factors include health and safety; equal opportunities; advertising standards; consumer rights and laws; product labelling and product safety.
- vi. Environmental factors are important due to the increasing scarcity of raw materials; pollution targets; doing business as an ethical and sustainable company; carbon footprint targets.

KER2c PESTLE Analysis

Political factors: Political decisions and regulations regarding data protection, privacy, sales practices, technology integration and intellectual property rights could have an impact on the user behaviour data. Also, the Government Policies related to technology and data governance can influence the behaviour exchange modules. The International trade policies could affect the cross-border movement of technology and the licensing of intellectual property.

Economic factors: Economic fluctuations and trends could influence the willingness of a business to invest in technology, consulting services, and user behaviour exchange modules. Also, the demand for such modules could be affected, especially if they are characterized as essential for affecting either positive or negative the user experience and the business outcome.

Social factors: Social Trends can influence the acceptance and adoption of the user behaviour exchange the cultural considerations and the new social trends that exist among the users may affect either positive or negative in the preferences and the expectations. Cultural factors may impact the

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acceptance and adoption of technology, requiring adjustments in consultative approaches specialized in the technology area.

Technological factors: Innovations based on the rapid technological advancements can create new aspects of consultative selling. However, they pose challenges in keeping with the latest innovations, developments, and applications of the users.

Legal factors: The Intellectual Property Laws can impact the licensing of technology and require legal consideration. The Data Protection Regulations may be crucial especially with integrating technologies that have an impact on the collection and the process of personal data. Changes in patent laws affect the licensing landscape and the development of technological innovations.

Environmental factors: Green Technology and the new market environmentally technologies create new opportunities for consultative selling. The emphasis on Sustainability could influence the choice of technologies and the way they are developed, deployed, and sold.

KER8 PESTLE analysis

Political factors: Government regulations and the political decisions about data privacy and cybersecurity have a significant impact on the implementation of the continuous behavioral authentication. Also, compliance with GDPR, CCPA or other protectional laws is crucial. Furthermore, they could have a specific requirement list or concern issues about the use of continuous behavioral authentication for sensitive sectors or critical infrastructure.

Economic factors: The cost of implementation and the economic feasibility of deploying continuous behavioral authentication, including initial setup costs, ongoing maintenance, and potential return on investment. The overall economic climate can affect organizational budgets for investing in advanced security technologies.

Social factors: User acceptance: Social attitudes towards privacy, trust in technology, and the general perception of continuous behavioral authentication can influence user acceptance. Effective communication and user education are essential. Cultural considerations: Different cultures may have distinct views on the collection and use of behavioral data, affecting the adoption of this authentication method.

Technological factors: Technological advancements: Rapid advancements in machine learning, artificial intelligence, and biometrics directly impact the effectiveness of continuous behavioral authentication. with devices: Compatibility with a variety of devices (smartphones, wearables, etc.) and applications is critical for seamless user experience.

Legal factors: Data protection laws: Compliance with data protection laws and regulations, ensuring that the continuous behavioral authentication system adheres to the principles of user consent, data minimization, and transparency. Legal responsibilities and liabilities in case of security breaches, unauthorized access, or false positives/negatives in the behavioral authentication process.

Environmental factors: Energy efficiency: The environmental impact of continuous behavioral authentication systems, considering the energy consumption of sensors, algorithms, and related

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technologies. Green computing: Aligning the implementation with environmentally friendly practices and considering the overall carbon footprint of the technology.

KER14a PESTLE analysis

Political factors: Regulatory Landscape: Government regulations and policies regarding data privacy and AI greatly impact the development and deployment of Trustworthy AI. Compliance with existing and emerging laws, such as GDPR in Europe, CCPA in California, or other regional regulations, is crucial. Government Surveillance Practices: Political decisions on surveillance practices and the role of AI in national security can pose challenges to privacy. Striking a balance between security needs and individual privacy rights is a political consideration.

Economic factors: Funding and Investment: Economic conditions influence the availability of funding for AI projects. Economic downturns may limit resources for developing privacy-centric AI solutions, while economic growth can foster innovation and investment. Monetization Pressures: Economic incentives for companies to monetize user data may create privacy threats. Balancing economic interests with the need for ethical and privacy-respecting AI practices is essential.

Social factors: Public Perception: Societal attitudes and concerns about AI's impact on privacy shape public acceptance. Building trust requires addressing societal concerns and ensuring transparency in how AI systems handle personal data. User Awareness and Education: Lack of awareness or understanding among users about AI and privacy can lead to privacy threats. Ongoing user education is vital for responsible AI adoption.

Technological factors: Rapid Technological Advancements: Advances in AI technologies, including machine learning algorithms and data processing capabilities, can introduce new privacy challenges. Regular updates to privacy safeguards are necessary to keep pace with technological developments. Security Measures: Implementing robust security measures, including encryption, secure data storage, and access controls, is essential to prevent unauthorized access and protect privacy.

Legal factors: Data Protection Laws: Compliance with data protection laws is foundational. Adapting to changes in existing laws and anticipating new regulations is critical for ensuring that Trustworthy AI aligns with legal requirements. Liability and Accountability: Legal frameworks defining liability for AI actions and holding developers accountable for privacy breaches are essential components of a trustworthy AI ecosystem.

Environmental factors: Data Center Sustainability: The environmental impact of data centers supporting AI infrastructure is an environmental consideration. Striking a balance between computing power needs and sustainability goals is important. Resource Usage: AI models may require significant computing resources. Considering the environmental impact of resource-intensive AI processes is crucial for ethical and sustainable AI development.

KER18 PESTLE analysis

Political factors: Policies and regulations regarding data storage, security, and privacy can significantly have an impact on how AI-based infrastructure management systems are implemented. Along with

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the laws and regulations related to cybersecurity is crucial. Government funding or incentives for the adoption of AI in infrastructure management can influence the pace and extent of implementation. Also, Governments investments about AI and cybersecurity have an impact not only on the implementation of the program but on the demand of the system.

Economic factors: Cost of Implementation, such as the economic feasibility of adopting AI in infrastructure management, including the initial setup costs, training, and ongoing maintenance. Economic conditions can affect either positively or negatively the organizations' budgets for investing in advanced technologies. The economic impact of potential job displacement due to the automation in infrastructure management has an impact on the infrastructure management based on AI. Also, considerations regarding retraining and workforce transitions are important about the efficiency of the management infrastructure on AI.

Social factors: Workforce Acceptance namely the social attitudes toward AI and automation in infrastructure management can influence the readily the workforce accepts these technologies. The readily of the workforce could be easily influenced by the way that are implemented and how they are implemented. Ensuring proper training and communication is crucial for a smooth transition. The social impact on local communities, mainly in areas where manual labor is traditionally prevalent, could affect the management infrastructure. The concerns and the support for affected communities is essential and should be easily accessible for all members of society members.

Technological factors: Rapid advancements in AI and related technologies directly have an impact on the effectiveness of AI-based infrastructure management. Also, the new technological achievements such as new innovations, applications, platforms have an impact on the management based on AI. Regular updates and integration with the latest technologies are critical for optimal performance. Compatibility and integration with existing infrastructure and technologies can be a technological challenge that the project based on AI could possibly face. On the other hand, ensuring seamless integration without disruptions is essential.

Legal factors: Data protection laws and regulations, especially when handling sensitive data in infrastructure management. Ensuring that AI systems adhere to privacy and data protection standards is vital for the project and the user's performance. Legal frameworks addressing liability for AI-based decisions in infrastructure management are essential. Determining responsibility in case of errors or failures is an important legal consideration that the project should implement or address.

Environmental factors: The environmental impact of AI-powered infrastructure management, including energy consumption should be considered for example, striving for energy-efficient solutions aligns with environmental sustainability goals. Consideration of the environmental impact of resource-intensive AI processes in infrastructure management and Implementing measures to minimize resource usage is essential for sustainable practices.

KER17 PESTLE Analysis

Political factors: Political consistency can contribute to a conducive environment for the adoption of technological solutions. Political factors which are assessed help to ensure regulatory compliance and support for initiatives promoting fair and environmentally friendly practices. Political regulations and

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decisions could have an impact not only on the implementation of the TANGO project but also on the way that the project is being used by the users.

Economic factors: Increased adoption of innovative solutions may be promoted by economic stability and growth. TANGO's project capacity to provide real benefits and efficiency could be leveled with economic goals. The Economic fluctuations and the demand for this project but in general the demand for the sub-projects that TANGO includes influence the users and in general in the implementation of the project.

Social factors: The platforms bring into clear view fair and accountable practices aligns with growing anticipations for responsible data collection. Platform's adoption can be boosted by social acceptance of privacy-enhancing technologies. The Social trends can influence the use of TANGO and can have either positive or negative impact in the preferences of the users. Also, the social interactions among the users have a possible effect in the approach in technology area.

Technological factors: TANGO's blockchain-based approach and integration with cutting-edge components has an important impact in technological power. Emphasizing seamless AI analytics aligns with the growing importance of advanced technologies in business operations. Technological innovations possess challenges in the implementation of the project and the application of the project could be easily influenced.

Legal factors: It is essential the Compliance with regulations and data protection laws. TANGO's Platform gives strong attention to privacy but stays up to date with evolving legal requirements due to the possibility to avoid possible challenges. The regulations and new laws implemented that are introduced could influence the project since TANGO is aligned with many regulations form, both from the development of the project and from the use of it. Changes in patents laws affect the licensing and the development of technological innovations.

Environmental factors: Strength is that the platform is committed to environmentally friendly practices. TANGO's Platform approach could be an important selling point in a world where the concern of sustainability has been increased. The new market environmentally technologies create new aspects on the use of TAGNO project and influence the efficient way that the project is being used.

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Annex D - Exploitable Results Standardisation Mapping

Number	Exploitable Result	Relevant Standardisation Bodies
1	Blockchain-based data storage and sharing	<ul style="list-style-type: none"> ISO/TC 307 (Blockchain and Distributed Ledger Technologies) European Union Blockchain Observatory and Forum ITU-T Focus Group on Application of Distributed Ledger Technology
2a	UCON	<ul style="list-style-type: none"> ISO/IEC 29100 (Privacy Framework) NIST Privacy Framework ENISA Guidelines on Data Protection
2b	Trustworthiness Scoring Module	<ul style="list-style-type: none"> ISO/IEC 25010 (System and Software Quality Models) IEEE Standards Association (Trust and Reputation Systems) ITU-T X.1255 (Framework for Discovery of Identity Management Information)
2c	User Behaviour Exchange Module (UBEM)	<ul style="list-style-type: none"> GDPR (General Data Protection Regulation) ISO/IEC 27001 (Information Security Management) NIST Special Publication 800-53 (Security and Privacy Controls)
3	Confidentiality and Privacy by Design	<ul style="list-style-type: none"> ISO/IEC 27018 (Code of Practice for Protection of Personal Data in Cloud) ISO/IEC 27701 (Privacy Information Management) GDPR
4	Self-encryption and Decryption Techniques with Multi-Factor Information Recovery Mechanisms	<ul style="list-style-type: none"> ISO/IEC 29192 (Lightweight Cryptography) NIST Special Publication 800-57 (Recommendation for Key Management) ENISA Guidelines on Cryptography
5	ePrivacy Mechanisms, Protocols and Processes	<ul style="list-style-type: none"> ePrivacy Directive ISO/IEC 29184 (Online Privacy Notices and Consent) GDPR
6a	Personal Credential Manager	<ul style="list-style-type: none"> FIDO Alliance (Fast Identity Online) ISO/IEC 24760 (A Framework for Identity Management) NIST Special Publication 800-63 (Digital Identity Guidelines)

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6b	Privacy-preserving distributed ABC scheme	<ul style="list-style-type: none"> • ISO/IEC 29101 (Privacy Architecture Framework) • NIST Privacy Framework • W3C Verifiable Credentials Data Model
6c	Issuer and Verifier for SSI Mgmt	<ul style="list-style-type: none"> • Decentralized Identity Foundation (DIF) • W3C DID (Decentralized Identifiers) • ISO/IEC 18013 (Personal Identification)
7a	Seamless onboarding for users	<ul style="list-style-type: none"> • ISO/IEC 29115 (Entity Authentication Assurance Framework) • FIDO Alliance • NIST Special Publication 800-63
7b	Seamless onboarding for devices	<ul style="list-style-type: none"> • ISO/IEC 27033 (IT Network Security) • IEEE 802.1X (Port-Based Network Access Control) • IETF (Internet Engineering Task Force) Standards
8	User continuous behavioural authentication	<ul style="list-style-type: none"> • ISO/IEC 30107 (Biometric Authentication) • FIDO Alliance • ENISA Guidelines on Authentication
9	Device continuous behavioural authentication	<ul style="list-style-type: none"> • ISO/IEC 30107 (Biometric Authentication) • NIST Special Publication 800-63 • ENISA Guidelines on Authentication
10	Hardening against Sidechannel Attacks	<ul style="list-style-type: none"> • ISO/IEC 19792 (Security Evaluation of Biometrics) • NIST Special Publication 800-57 • ENISA Guidelines on Cryptography
11	Exploratory Data Analysis engine (EDAE)	<ul style="list-style-type: none"> • ISO/IEC 27045 (Information Security Incident Management) • NIST Big Data Interoperability Framework • IEEE Big Data Standards
12a	Energy efficient AI model training Support for MLOps	<ul style="list-style-type: none"> • ISO/IEC JTC 1/SC 42 (Artificial Intelligence) • IEEE Standards Association (AI Standards) • European Commission AI HLEG (High-Level Expert Group on AI)
12b	Energy efficient AI model training Support for Federated Learning	<ul style="list-style-type: none"> • ISO/IEC JTC 1/SC 42 (Artificial Intelligence) • IEEE Standards Association (AI Standards) • European Commission AI HLEG
12c	Energy efficient AI model training Support for AutoML	<ul style="list-style-type: none"> • ISO/IEC JTC 1/SC 42 (Artificial Intelligence) • IEEE Standards Association (AI Standards) • European Commission AI HLEG

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13	Dynamic Intelligent Execution	<ul style="list-style-type: none"> • ISO/IEC 2382 (Information Technology Vocabulary) • IEEE Standards Association (AI Standards) • ITU-T Focus Group on AI for Autonomous and Assisted Driving
14a	Privacy Threat Modelling and Identification for Trustworthy AI Privacy Enhancing Component (PEC)	<ul style="list-style-type: none"> • ISO/IEC JTC 1/SC 42 (Artificial Intelligence) • IEEE Standards Association (AI Standards) • GDPR
14b	Privacy Threat Modelling and Identification for Trustworthy AI Privacy Assurance Tool (PAT)	<ul style="list-style-type: none"> • ISO/IEC JTC 1/SC 42 (Artificial Intelligence) • IEEE Standards Association (AI Standards) • GDPR
15	X-AI for Privacy and Trust Enhancement	<ul style="list-style-type: none"> • ISO/IEC JTC 1/SC 42 (Artificial Intelligence) • IEEE Standards Association (AI Standards) • GDPR
16	Infrastructure Management based on AI	<ul style="list-style-type: none"> • ISO/IEC JTC 1/SC 42 (Artificial Intelligence) • IEEE Standards Association (AI Standards) • ITU-T Focus Group on AI for Autonomous and Assisted Driving
17	TANGO Platform	<ul style="list-style-type: none"> • ISO/IEC JTC 1/SC 42 (Artificial Intelligence) • IEEE Standards Association (AI Standards) • European Commission AI HLEG
18	TANGO Connectors	<ul style="list-style-type: none"> • ISO/IEC JTC 1/SC 42 (Artificial Intelligence) • IEEE Standards Association (AI Standards) • European Commission AI HLEG

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