CSI-COP

Citizen Scientists Investigating Cookies and App GDPR compliance

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Deliverable D6.6 | D25

Synthesis Report on CSI-COP Project Results

Delivery date: 31 August 2023

LEAD Partner for deliverable: NaTE; Delivered by CU & NaTE

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Version: 5.4

Project funded from the European Union's Horizon 2020 SwafS research and innovation programme under grant agreement N°873169

44 months January 2020-August 2023 (with Amendments)

Dissemination Level		
PU	Public	X
R	Report, **DEM**: Demonstrator, pilot, prototype, plan designs, **DEC**: Websites, patents filing, press & media actions, videos, etc., **OTHER**: Other **(**Database, online tools, questionnaires, etc)	
CO	Confidential, only for members of the Consortium (including the Commission Services)	
CI	Classified, information as referred to in Commission Decision 2001/844/EC.	

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European Union's Horizon 2020 research and innovation programme under grant agreement N°873169

Version control table

Version Control				
Version	Date	Author(s)	Institution	Change and where applicable reason for change
1	28.06.23	Huma Shah	CU	Draft structure in meeting with NaTE and follow up email correspondence
2	01.08.23	Dorottya Rigler	NaTE	Initial Draft from CU/ Huma's document structure
3	09.08.23	Huma Shah	CU	Correction to template and revised structure to incorporate Realised Impacts, Limitations and Legacy
4	12.08.23	Dorottya Rigler	NaTE	Content added on Specific Objectives, Expected Impacts, and Other Impacts. Content on Limitations and Legacy. Executive Summary, List of Abbreviations, Definition of Terms, List of References.
4.1	14.08.23	Various	NaTE; BIU; UAB; IB; UOULU	Partners' content added on Other Impact 4, and partner specific Recommendations (BIU, UAB, IB, UOULU, NaTE). Screenshots added
5	20.08.23-21.08.23	Huma Shah	CU	Redrafted report for conciseness to reduce repeated text from previous deliverables. Moved partner country-specific recommendations to Appendix. Added Appendix documents: Full List of CSI-COP deliverables, Participant Information, Informed Consent
5.1	22.08.23	Huma Shah	CU	Added introductory content in Impact section
5.2	23.08.23	Huma Shah	CU	Finalised first draft for partners with new Executive Summary, Introduction and Legacy/Recommendations.
5.3	30.08.23	Huma Shah	CU	Added milestones.
5.4	31.08.23	Huma Shah & Ian Marshall	CU	Final edits

Acknowledgements: Maayan Zhitomirsky-Geffet; Tiberius Ignat; Jordi Vallverdú, Ulrico Celentano and Olga Stepankova.

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Table of Contents

This communication is part of a project that has received funding from the
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Executive Summary

CSI-COP, a citizen science project responding to the Horizon2020 research and innovation (RIA) grant call in the theme *science with and for society* (SwafS) under the topic 'Exploring and Supporting Citizen Science', is the first of its kind investigating websites and apps for compliance with a new EU regulation: the general data protection regulations (GDPR). With six specific objectives, six milestones and six expected impacts, the project realised its research and innovation goals through its outputs. These included production of a classification of the different types of website and app cookies and other online tracking tools (CSI-COP Taxonomy), and the innovation of a searchable open-access web knowledge base of websites and apps investigated by the project's citizen scientists and researchers (CSI-COP Repository). This document presents a synthesis of CSI-COP project activities and results to raise awareness of rights accorded in the GDPR, and the investigations of GDPR compliance in websites and apps by citizen scientists and the project researchers. CSI-COP legacy includes forming a post-project forum with the project's Privacy Champions who emerged from the project's citizen scientists. The long-term legacy aims to continue raising the project's message. Additionally, CSI-COP's post-project activity will raise awareness of the EU's Digital Services Act, and the risks to personal data from artificial intelligence (AI) tools such as large language models (LLMs), for example OpenAI-Microsoft's ChatGPT, and Google's BARD now applied as answer-summarisers in evolved browser-search. The long-term aim is contributing to the creation of effective standards for website and app cookie notices and privacy policies, and beyond that, in Internet-connected devices in the home and transportation.

Keywords: app, app permissions, citizen science, cookie, data protection, EU, GDPR, GDPR compliance, gender, informal education, informed consent, investigation, MOOC, online tracking, participant information sheet, personal data, repository, societal impact, taxonomy, transparency, your right to privacy online, website

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1 Introduction

CSI-COP coordinated by Coventry University, UK, is a citizen science project that answered the Horizon2020 research and innovation (RIA) funding call in the theme of science with and for society (SwafS) under the topic of 'Exploring and Supporting Citizen Science'. CSI-COP chose to engage the general public in monitoring compliance of a new EU regulation applicable in law in EU countries from May 2018: the general data protection regulation (GDPR). This final deliverable report, D6.6 |D25 synthesises the many activities that CSI-COP partner institutions carried out to achieve the project's specific objectives, reach the milestones, and realise the expected impacts. This work included raising awareness among the public in Europe and beyond about the rights to personal data protection accorded in the GDPR.

1.1 Milestones & Deliverables

CSI-COP structured its project around six milestones:

- **Milestone 1**: Create framework to engage citizen scientists. This was **reached** on completion of work package 2 (WP2) and the production of three deliverable reports: by **30 September 2020:** D2.1; D2.2 & D2.3
- **Milestone 2**: Complete recruitment and informal education of the general public in a series of workshops. This was reached with the conclusion of WP3 on **30 June 2022** and its two deliverables: D3.1; D3.2
- **Milestone 3**: Production of two databases produced from trained citizen scientists' website and app investigations. This was **reached** on completion of two WP4 tasks T4.1 (citizen scientists' website investigations database), and T4.2 (citizen scientists' app investigations database) by **31 December 2022**
- **Milestone 4**: Production of a taxonomy of cookies. This was **reached** during WP5 with the production of a report classifying cookies by **31 March 2023** presented in the deliverable report D5.1
- **Milestone 5**: Develop a knowledge resource of trackers. This was **reached** in WP5 with the production of CSI-COP's web-based, open-access searchable Repository of citizen scientists and project team members' website and app investigations as deliverable D5.2 by **31 May 2023**.
- **Milestone 6**: Conclusion of a series of stakeholder cafés and parent-teacher round tables. The final milestone was **reached** by the end of the project with the conclusion of CSI-COP's stakeholder engagement activities (stakeholder cafés and parent-teacher roundtables) in WP6 by **31 August 2023** through two deliverables: D6.4 and D6.5.

It is to be noted that CSI-COP's three data management plans (deliverables D1.8; D1.9 & D1.10) entailed revising milestone 3. The aim was to follow the GDPR's **purpose limitation**

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principle (Article 5 (1) (b)), to safely secure the personal data of CSI-COP's citizen scientists. A decentralised approach was followed to securely store the minimal personal data collected from the project's citizen scientists: "Each [CSI-COP] partner is responsible for the secure and safe data storage of the limited personal data (two data points: name and email) collected in the recruitment and informal education phase of the project" (deliverable D1.9: Shah et al., 2022). Hence for milestone 3, each partner produced a confidential database of their own trained citizen scientists that only they had access to, to mentor and motivate. However, the website and app investigations by the combined citizen scientists generated two open-access databases in deliverables D4.1 and D4.2. These two databases do not hold any personal information on the citizen scientists. Deliverable D4.3 presents anonymised information on the age-range, geographical location and socio-economic status of CSI-COP's citizen scientists (see Rigler et al., 2023). The D4.1 (websites) and D4.2 (apps) investigations' databases are available as Excel datasheets to search and download from CSI-COP website project results page: https://csi-cop.eu/projectresults/

The full list of CSI-COP deliverables can be found in Appendix 1.

1.2 GDPR

The GDPR was designed with "stronger rules to protect personal data" and provide "one set of rules for all companies operating in the EU, wherever they are based", thereby helping "businesses through a level playing field" (EC, nd). CSI-COP project actions included engaging the public to join the CSI-COP researchers in investigating compliance of the GDPR in websites and in apps. The results of CSI-COP activities, and the short-term and medium-term impacts they have on citizens, the trust in science, willingness to devote time for informal education, and managing personal data in everyday life accessing the Internet, are presented in this final CSI-COP deliverable.

The germ of the project arose from the lead author (HS) teaching technology and AI ethics from 2016. Second year computer science students in Coventry University cleaning up their digital presence (since it became known recruiters would look through social media profiles), in preparation for their third-year industry placement, found that while they and their contacts no longer had access to deleted posts and images on a social media platform, deleted items were in fact found in the packages of information following a subject access request (SAR) allowed under the GDPR. Enhanced data subject rights in the GDPR entail the right of a person to request what personal data is held on them by an organisation (GDPR Article 13).

This final CSI-COP deliverable report, D6.6|D25synthesises the results disseminated in numerous public reports produced from the project. The D6.6 | D25 'Synthesis Report on CSI-COP Project Results' is structured as follows: Section 2 presents the project's six specific objectives and how they were achieved referencing previous deliverables for further information. In Section 3 the impacts realised in CSI-COP are detailed. Limitations in CSI-

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COP's implementation are discussed in Section 4. Section 5 presents the Legacy and policy recommendations of CSI-COP with an eye to the future contributing to creating standards for website and app cookie notice and privacy policies.

1.3 COVID-19 and other Challenges

The once-in-a-hundred years' pandemic, COVID-19 severely affected delivery of informal education in the first year of the project, in 2020. Project partners suffered 'life problems' along the way (passing away of a parent, immediate family illness), and two CSI-COP university partners suffered major cyberattacks. The project was also affected by the termination of two CSI-COP partners during the lifetime of the project, necessitating two Amendments to the project's grant agreement (GA 863169). The Amendments involved requesting extensions to task deadlines, and extensions to the project-end. CSI-COP project was extended by fourteen months from June 2022 to August 2023. Despite the many challenges during CSI-COP's 44-months, the efforts by the nine remaining partners and the engaged citizen scientists accomplished the project's objectives, milestones, and impacts.

1.4 Future work

CSI-COP project's main mission, of involving citizen scientists to investigate the extent of online tracking, is ongoing. New risks to protecting personal data are posed in artificial intelligence (AI) through the machine learning-powered algorithms underpinning these tools. For example, the data gathered for large language models (LLMs), such as in evolved browser-search used by OpenAI-Microsoft in ChatGPT applied in BING, and Google's BARD could include personal data extracted from the web during model training. CSI-COP consortium will seek appropriate funding sources to join the general public continuing to monitor the GDPR, explore compliance of the EU's Digital Services Act (DSA, 2022) and follow the impact on personal data protection from advances in AI tools and techniques.

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2 CSI-COP Specific Objectives (SOs)

CSI-COP project was shaped around six specific objectives designed to undertake an exploration of citizen science and support volunteers:

1. Specific objective 1 (**SO1**): Setting up CSI-COP citizen science initiative
2. Specific objective 2 (**SO2**): Investigate GDPR compliance
3. Specific objective 3 (**SO3**): Create Taxonomy of Digital Trackers
4. Specific objective 4 (**SO4**): Create open access web-based repository of digital trackers
5. Specific objective 5 (**SO5**): Co-designing and implementing science-related policies: pro-privacy policies
6. Specific objective 6 (**SO6**): Influencing Stakeholders

These objectives, presented in CSI-COP's 2019 proposal document (EU Cordis, 2019), were founded in the ten principles of citizen science from the European Association of Citizen Science (ECSA). Additionally, CSI-COP's specific methodology to investigate compliance of the GDPR in website and app cookies was set-out in the project's implementation through six work packages (WPs):

- Work package 1 (WP1): project management led by Coventry University, UK
- Work package 2 (WP2): researching best practices in citizen science
- Work package 3 (WP3): informally education and practical training for citizen scientists and researchers to investigate GDPR compliance in websites and apps
- Work package 4 (WP4): a) create databases from citizen scientists' website and app investigations; b) report on who CSI-COP citizen scientists are (anonymised data)
- Work package 5 (WP5): a) Taxonomy (classification) of cookies and online trackers; b) Repository: free searchable online tool of cookies and online trackers found in CSI-COP website and app investigations
- Work package 6 (WP6): CSI-COP communication, dissemination and project results exploitation strategy.

The next sub-sections present how CSI-COP met the six objectives with reference to the project's associated deliverable reports for detailed information. Each of the outputs from the work done in CSI-COP to meet the specific objectives can be accessed through public reports or open-access tools accessible from CSI-COP project website results page, from EU Cordis page, and from Zenodo open-access platform.

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2.1 SO1

In setting up a citizen science project, initially CSI-COP consortium, especially the university partners, utilised their experience of outreach with schools, members of the public and wider stakeholders. From desk-top research conducted in WP2, the consortium learnt the best practices in engaging members of the public as volunteers, and also became aware of challenges to recruiting diverse communities of citizen scientists. In meeting specific objective 1 (SO1), CSI-COP produced three open-access deliverables as reports from the work in WP2 enabling the consortium to build on the successes of previous citizen science projects and innovate a new framework for the general public's original investigation of the EU's new data protection regulation, the GDPR:

- Deliverable D2.1: CS Research report. Public report on current methods in CS Engagement
- Deliverable D2.2: Guidelines for CS recruitment. Guidelines for balanced recruitment and selection of Citizen Scientists
- Deliverable D2.3: CSI-COP Framework.

In addition to the above deliverables, accompanying D2.3 is a dataset listing diverse organisations across Europe and beyond that WP2-involved partners identified to engage with and recruit citizen scientists. This CSI-COP dataset can be accessed from Zenodo open-access platform here: https://zenodo.org/record/6780048

The three WP2 deliverable reports are listed in Appendix 1, and can be accessed from here:

- CSI-COP project website results page
- EU Cordis page, and
- Zenodo platform.

The outcome from the research findings in WP2 were designed to lead straight into recruitment of the general public. However, due to the restrictions placed on mobility and meetings from the COVID-19 pandemic in March 2020, it became necessary to adapt the implementation of CSI-COP's WP3 after the conclusion of WP2 in September 2020 to meet the project's second specific objective. This is explained next.

2.2 SO2

To investigate GDPR compliance in websites and apps, as part of specific objective 2, CSI-COP needed to recruit and informally educate members of the public, then provide training in the scientific method. Involving participants as volunteers required provision of clear and simple to understand GDPR-compliant information. CSI-COP's Coordinating partner prepared a research ethics application in months 7-9 (July – September 2020) to Coventry University's Research Ethics Panel creating participant information and informed consent sheets. These

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sheets were reviewed by CSI-COP data protection and online privacy expert partner: Matthias Pocs of STELAR. CSI-COP's approved Participant Information, and Informed Consent sheets can be found in Appendix 2a and 2b in this document. With ethics approval from month 9 (September 2020) partners could continue with project tasks involving external people: members of the public.

As reported in CSI-COP project outputs, in publicly accessible deliverable reports, it became necessary to rearrange the next set of tasks, after the conclusion of WP2 in WP3, due to COVID-19 restrictions on public gatherings outside own households, and mobility. It was decided to create CSI-COP's free informal education resource about data protection rights (MOOC) accessible as self-learning in a person's own time, alongside raising awareness of the project. Coventry University and its WP3 sub-contractor, Privacy Matters, created the five step MOOC '[Your Right to Privacy Online](https://csi-cop.eu/informal-education-mooc/)' in English and launched it on the project website in month 16-April 2021: https://csi-cop.eu/informal-education-mooc/ (see Figure 1). Partners then set about translating the MOOC into their country language (and where it was possible, in an additional language). The translated documents were uploaded to the same website page as the English MOOC (Figure 1). Taking partner UAB's advice, thumbnails of country flags were placed next to their associated translated document. This enabled interested individuals to easily recognise a translation. This also provided an activity to engage informal learners by downloading the MOOC translation in their language of choice.

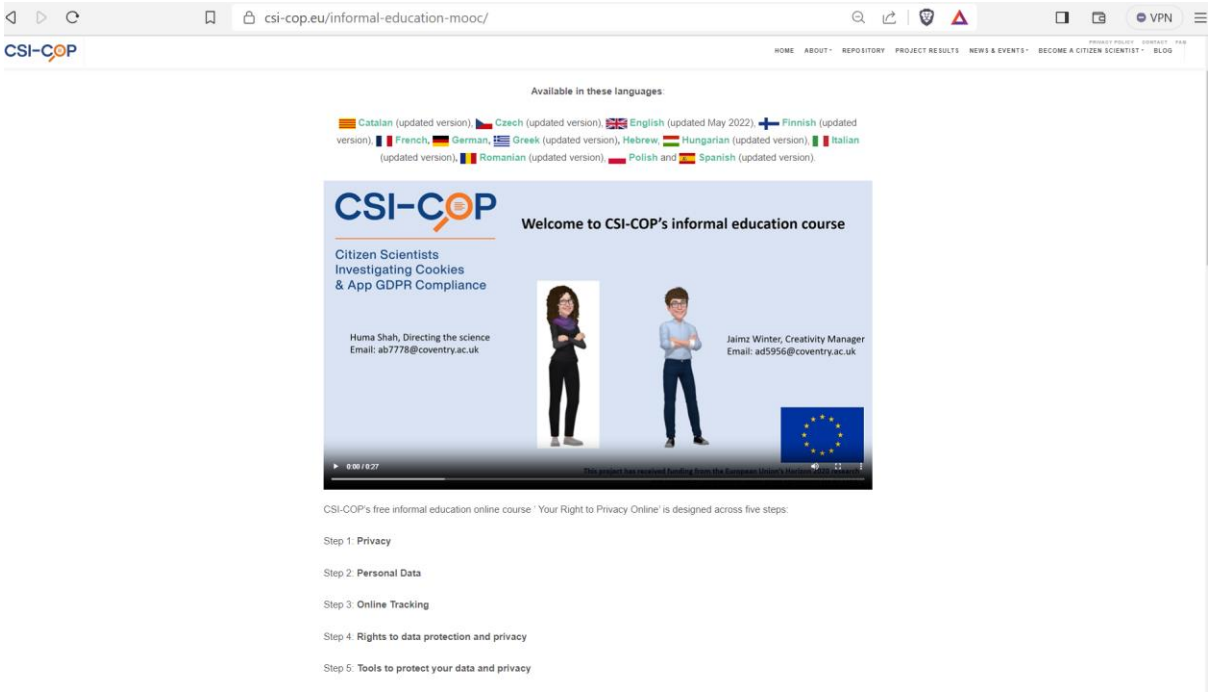

Figure 1: CSI-COP MOOC translations available from website: https://csi-cop.eu/informal-education-mooc/

During continuing COVID-19 restrictions in 2021, the MOOC was first delivered online by Coventry University in October 2021. Partners followed this first webinar by organising their

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own online events using a translation of the MOOC until COVID-19 restrictions were lifted. In person events were held across Europe and in Israel from November 2021 and continued until the end of June 2022. Following completion, either in person or online, of the free informal education resource and its short multiple-choice test (to glean understanding of how we are tracked online and the rights to data protection), CSI-COP MOOC learners could request a certificate and indicate if they wished to continue learning more by becoming a CSI-COP citizen scientist. A blank CSI-COP certificate can be found in Appendix 3. This interest to progress from learner to citizen scientist was indicated on signed informed consent sheets collected electronically in accordance with CSI-COP's data management plans (DMP1- Shah, Ignat & Pocs, 2020; DMP2- Shah et al., 2022; DMP3- Shah & Pocs, 2023). Completing the MOOC and its test was enabled through a choice of three pathways:

i. Self-learning: by downloading the MOOC document in an available language from CSI-COP project website
ii. Attending an online webinar and completing the course guided by a CSI-COP partner
iii. Attending an in-person workshop once COVID-19 restrictions were lifted.

Individual practical training followed completion of the MOOC for engaged members of the public who had given informed consent to join CSI-COP as a citizen scientist. Coventry University created a bespoke cookies recording tool in Microsoft Excel (Figure 2). The training involved informally educating CSI-COP's citizen scientists about the scientific method and the importance of data validation through use of CSI-COP's cookie investigation tool.

Website name	Type of website	Date of website visit	Language of website	Website link	Cookie policy present	Cookie policy: additional information	Privacy policy present
The Mouse (To Pontiki)	News site	01/12/2022	Greek	https://www.topontiki.gr/	Yes	Yes (when clicked more information - available only in Greek)	Yes, embedded into cookie policy

Figure 2: CSI-COP Investigation tool – headers in Excel spreadsheet

MOOC completions concluded WP3 and began WP4 delivery of practical training. CSI-COP's delivery of practical skills ensured the recording of quality data as part of investigating websites and apps by the project's engaged citizen scientists in WP4 (see D4.1 website investigations: Shah & Winter, 2022ab; D4.2 app investigations: Shah & Winter, 2022cd). Citizen scientists' website and app investigations were captured in two separate and freely accessible databases as deliverables D4.1 and D4.2 in WP4. Table 1 overleaf summarises the results of CSI-COP's efforts in WP3 and WP4 in numbers. By the end of the project, 631 individuals had completed the MOOC, CSI-COP's informal education course '[Your Right to Privacy Online]' in ten of the thirteen available languages. The Greek translation of the MOOC gained the most learners (315). The English language translation gained 88 learners, followed by 74 Czech language

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learners, and 71 learners of the Hebrew translation. Not all these individuals expressed interest to continue as CSI-COP citizen scientists for various reasons (see D3.1 & D3.2: Shah et al., 2022ab). Seventy-one (71) Greek language speakers became citizen scientists; 34 English language speakers, 34 Czech speakers and 23 speakers of Hebrew also became CSI-COP citizen scientists. Other citizen scientists who completed the MOOC and received practical training spoke Spanish, Romanian, Hungarian, Finnish, Catalan and French. A total of 191 citizen scientists were engaged in CSI-COP. Between them, they conducted over 1360 website and app investigations (>1000 websites; >350 apps). The total number of website and app investigations is greater, because the final number includes the CSI-COP partner's team member investigations (see SO4).

Table 1: Number of MOOC learners, citizen scientists, and website and app investigations

Number of MOOC completions	Number of Citizen Scientists (CS)	Number of websites investigated by CSs	Number of apps investigated by CSs	Total number of website and app investigations by CSs
631	191	1006	359	1365

With CSI-COP researchers' additional investigations of websites visited and apps used, this completed WP4 and met specific objective 2 (SO2): investigate GDPR compliance. The project's results produced to meet SO2 are:

- WP3 Deliverable D3.1: Recruited community of CSI-COP Citizen Scientists
- WP3 Deliverable D3.2: Trained Citizen Scientists. GDPR Trained CSI-COP Citizen Scientists
- WP4: Deliverable D4.1: Database of Website Cookie Trackers.
- WP4 Accompanying Account to D4.1 Database of website cookies
- WP4 Deliverable D4.2: Database of CSI-COP Android App Trackers
- WP4 Accompanying Account to D4.2 Database of App cookies

As before, WP3 and WP4 public resources listed above are accessible from three platforms:

- CSI-COP project website results page
- EU Cordis page, and
- Zenodo platform.

The output from WP3 and WP4 in achieving SO2 led to meeting SO3 and SO4.

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2.3 SO3

The third specific objective related to creating a Taxonomy of Digital Trackers. The output from WP4, the citizen scientists' website and app investigations, provided invaluable insight concerning the various methods that website and app users are tracked. Advertising, behavioural, marketing and other tracking tools embedded in websites and apps were classified in CSI-COP's WP5 public report (D5.1: Shah et al., 2023). This taxonomy of online trackers met SO3:

- WP5 Deliverable D5.1: Taxonomy of Cookies and Online Trackers.

This project result is available from:

- CSI-COP project website results page: https://csi-cop.eu/project-results/taxonomy-of-cookies-and-online-trackers/
- Zenodo platform: https://zenodo.org/record/7801846

2.4 SO4

Specific objective 4 (SO4), to create an open-access web-based repository of digital trackers, began with combining the two databases from citizen scientists' investigations in WP4 (see SO2: D4.1 websites; D4.2 apps). This objective entailed the innovation of an easy-to-use searchable repository of CSI-COP website and app investigation. The first iteration of CSI-COP's main innovation entailed bringing together the over-1300 website and app investigations in one resource: the Repository. The Coordinating partner's technical sub-contractor, Xcel Resources Ltd., designed the Repository's infrastructure around 'searchable cards' – one card for each investigation. The searchable cards would retrieve the information recorded by the citizen scientists in their investigations, including name of the website or app with screenshots (Figure 3). To ensure the correct screenshot was retrieved alongside the corresponding investigated website or app, CSI-COP researchers in WP5 followed a labelling convention: for consistency this included the name of website/app and date of the investigation.

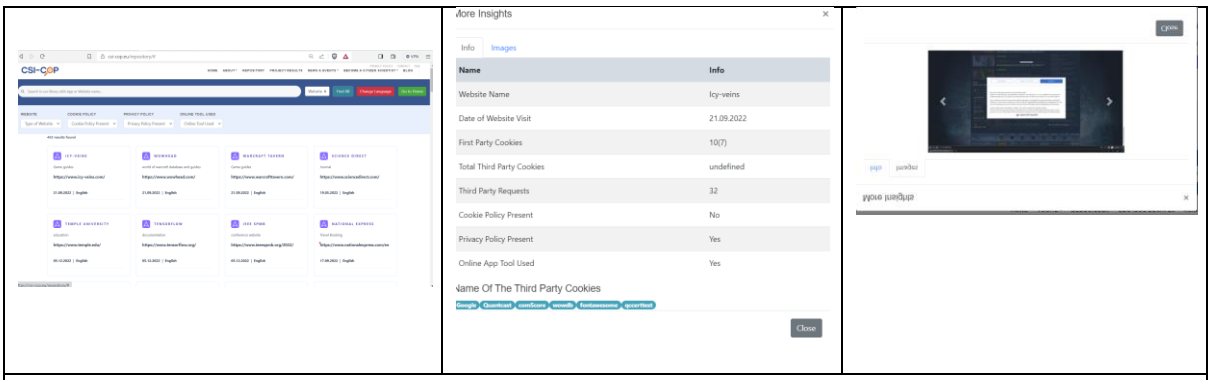

Figure 3: Repository retrieval on 'English' language website search (left), selecting card for investigation (centre); screenshot (right)

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A short manual accompanies the innovation of WP5 repository to explain its use. The Repository itself contains a 'Help' function on the tool's home page (Figure 4: blue button). Visuals on the Repository's home page host word-clouds from the website and app investigations (Figure 4):

- Apps: Categories, Permissions, Trackers
- Websites: Trackers, Categories

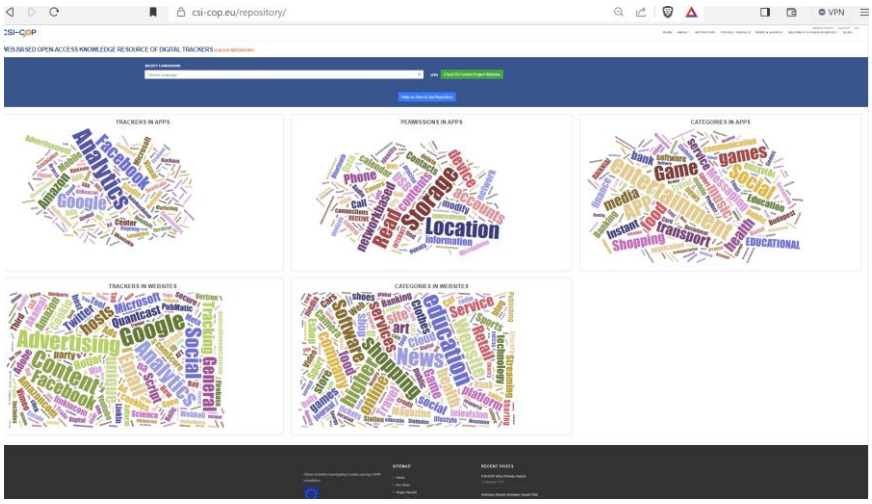

Figure 4 Repository home page

CSI-COP's Repository searchable online tool demonstrates the effectiveness of citizen scientists' and researchers' collaboration in exploring an area of science to better understand compliance of regulations. SO4 was met through these CSI-COP results:

- WP5 Deliverable D5.2: Web-based, Open-access Knowledge Resource of Digital Trackers
- WP5 Accompanying manual to Repository.

The Repository is searchable from CSI-COP project website here: https://csi-cop.eu/repository/

The accompanying manual is accessible from these two sources:

- CSI-COP project website results page: https://csi-cop.eu/projectresults/
- Zenodo: https://zenodo.org/record/8005663

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2.5 SO5

CSI-COP's fifth specific objective (SO5) aimed at including stakeholders and citizen scientists in co-designing and implementing science-related policies. This objective required clear communication and coherent dissemination of CSI-COP's overall goals:

- Increase public awareness around the science of personal data protection and privacy-by-design
- Encourage citizens to participate in the scientific process and learn data validation
- Improve trust between the general public and scientists through mutual understanding
- Monitor implementation and compliance of the GDPR

CSI-COP's work package 6 (WP6) dedicated to communication, dissemination and exploitation of project results. SO5 was met through these deliverables and activities:

- WP6 Deliverable D6.1: Privacy-by-design, no tracking project website
- WP6 Deliverable D6.1.1: Newsletters
- WP6 Deliverable D6.2: Scientific publications submitted to peer-review journals
- WP1 Deliverable D1.12: Final List of Activities includes other communication and dissemination actions relating to SO5:
    - Press releases
    - Articles in magazines
    - Invited talks

CSI-COP project website is accessible here: https://csi-cop.eu/

CSI-COP Newsletters distributed widely to stakeholders are also accessible from a page on the website: https://csi-cop.eu/news-letters/

Scientific publications arising from the work in CSI-COP will be available in open-access journals after publication.

CSI-COP press release/research news are on Coordinating partner's website:

- Launch of website:
    - https://www.coventry.ac.uk/news/2020/innovative-tracking-free-website/
- Launch of free MOOC:
    - https://www.coventry.ac.uk/news/2021/freecoventry-universitycourse-tohelp-people-protecttheironline-privacy/
- Recruiting citizen scientists:
    - https://www.coventry.ac.uk/research/about-us/research-news/2022/csi-cop-helping-track-internet-data/
- PICCASO award:

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European Union's Horizon 2020 research and innovation programme under grant agreement N°873169

  - https://www.coventry.ac.uk/research/about-us/research-news/2022/university-led-digital-data-tracking-research-project-wins-innovation-award-from-national-privacy-organisation---piccaso/
- Repository news:
  - https://www.coventry.ac.uk/news/2023/coventry-university-researchers-shocked-by-excessive-data-harvesting-by-apps/

Magazine articles authored by the CSI-COP team can be found here:

- International Teacher Magazine (ITM) 'The Cookie Jar: Protecting Children's Data online'
  - https://consiliumeducation.com/itm/2021/11/15/the-cookie-jar/
- Article 'Chraňme si své soukromí!' (Be aware of your privacy!) in CTU partner's internal magazine: TecniCall:
  - https://media.cvut.cz/cs/publikace/20221017-tecnicall-podzim-2022#page/31
- CS Track, EU funded project e-magazine about online privacy:
  - https://cstrack.eu/format/opinion/why-is-the-protection-of-online-privacy-important-to-the-citizen-science-community-an-interview-with-huma-shah-from-the-csi-cop/

SO5's objective of including stakeholders and citizen scientists is closely linked with influencing stakeholders, specific objective 6 (SO6). The results of SO6 are presented next.

2.6 SO6

Specific objective 6 (SO6) produced a variety of actions and organised events designed to interact with, and so influence CSI-COP stakeholders. The objective concerned effectively anyone who uses the Internet for work or pleasure, to learn how to protect personal data online. These actions and events, part of work package 6 (WP6), are CSI-COP's sixth and final objective (SO6). This objective aimed to promote pro-privacy policies and was met through the production of four public reports (in WP1) and the dissemination and project results' exploitation events (WP6). The results from SO6 are:

- WP1: Two CSI-COP Policy Briefs – Deliverable reports D1.13 (Shah & Pocs, 2021) & D1.14 (Shah, 2023)
- WP1: Two Societal Impact reports - Deliverable reports Societal Impact 1: D1.6 (Shah, 2022) & Societal Impact 2: D1.7 (Shah & Winter, 2023b)
- WP6 Deliverable D6.3: CSI-COP main event (Shah & Winter, 2023a)
- WP6 Deliverable D6.4: Stakeholder cafés (Gialelis, et al., 2023)
- WP6 Deliverable D6.5: Parent-Teacher Roundtables (Shah et al., 2023)

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Interaction and engagement with stakeholders provided positive influence to better manage personal data online. For example, frequent sceptical questions included:

- 'What is the problem with cookies?' and
- 'Why shouldn't we give our data for better services?'.

These *are* reasonable questions. However, stakeholders were asked during engagement: *how much personal data where they prepared to give and for what service*?

Sceptical stakeholders were also asked if they thought it was necessary for civil engineers to follow standards to build bridges, to ensure the bridges did not collapse with the first walk-across or vehicle. People agreed. This was followed with CSI-COP related interactions: *shouldn't websites, apps and devices connected to the Internet follow standards when collecting personal data?*

CSI-COP citizen scientists responding to a survey following their participation in the project investigating websites and apps were positively influenced. A flavour of actual comments from citizen scientists featured in WP1 Societal Impact 2 (deliverable D1.7: Shah & Winter, 2023b) are provided below demonstrating some of CSI-COP's positive influence:

> "I am much more careful and try not to accept cookies if possible. I was very impressed by the arguments that pointed to the risks associated with accepting cookies."
>
> "I am trying to inform those around me about the dangers of cookies. I am attracted by the idea that we can contribute to the "improvement of the world" if we ourselves behave more responsibly".
>
> "I was already accustomed to data privacy, CSI-COP helped me to enhance my view about the matter."
>
> "I am much more cautious and now, I am now carefully considering whether or not to provide my personal data to any data processing entity."
>
> "I was surprised how easily cookies can be misused. I certainly try to limit the collection of data about me and my child."
>
> "I am much more cautious and will always carefully consider whether or not to provide my personal data to a data controller/processor."

The above feedback from some stakeholders, as citizen scientists who investigated the websites they visited and the apps they used for CSI-COP, demonstrates the project meeting its sixth specific objective: SO6. Individuals were geared-up making changes to reject cookies to protect themselves, their children and other people for the "improvement of the world".

However, other comments show CSI-COP's work is far from over in informally educating people to better protect their personal data online.

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> "I find it annoying that although one day they clearly specify their preferences, the website does not remember the choice: the very next day they ask about cookies again. There is not much choice between browsers anymore (no true alternatives). There are many brands, but most are based on Chromium (G chrome base)."

> "I am trying to be more cautious. I would welcome a continuously updated webpage with concrete, simple instructions for safe behavior, especially on mobile phones."

CSI-COP's legacy work will include contributing to work making it simpler for website visitors and app users to understand if their personal data is being adequately protected according to regulations. The specific objectives in CSI-COP were aimed at producing project results, and also impact. Expected and other impacts realised from the project are presented in the next section.

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3 Project Impacts

Specific objectives in CSI-COP project aimed at realising impact in the area of GDPR compliance. The outputs from the work done to achieve the project's six specific objectives, detailed in section 2, are shown against key performance indicators (KPIs) in Table 2.

Table 2: Output from CSI-COP specific objectives

Specific Objective	Key Performance Indicators (KPI)	Work Package	Result: public reports
SO1	Framework for CSI-COP project: production of a methodology for CSI-COP to follow best practices engaging citizen scientists regardless of background	WP2	Deliverable D2.3
SO2	Community of citizen scientists from a diverse background recruited, informally educated and supported through training; and investigation of GDPR compliance by citizen scientists	WP3, WP4	Deliverables D3.1; D3.2; D4.1; D4.2
SO3	Creation of a taxonomy of trackers based on the databases of new knowledge on trackers in a) websites and b) apps	WP5	Deliverable D5.1
SO4	Innovation of an open-access web-based repository systematically mapping trackers by type	WP5	Deliverable D5.2
SO5	Scientific papers, presentations and publications on CSI-COP's research results	WP1 WP6	Deliverables D6.1; D6.1.1; D6.2 & D1.12
SO6	Completion of a series of project events involving stakeholders, such as citizen science cafés and parent-teacher roundtables; organisation of the main stakeholder event in Brussels	WP6	Deliverables D6.3; D6.4 & D6.5

A basket of indicators to achieve the KPIs were designed to measure CSI-COP's impact. These are detailed in this section against actual impacts. One unexpected impact from the work in CSI-COP was the recognition of the project's work by the 'Privacy, InfoSec, Culture, Change, Awareness, Societal, Organisation' (**PICCASO Privacy**). Dr Huma Shah from coordinating partner Coventry University nominated CSI-COP in PICCASO Privacy's category 'Best Innovative Privacy Project' in the summer of 2022. In the awards ceremony held in London in December 2022, CSI-COP project, shortlisted from the nominations, won the '**Best Innovative Privacy Project**' award ahead of strong competitors, including the UK data protection

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authority (the Information Commissioner's Office -ICO), Nokia, PricewaterhouseCoopers (PwC), and the UK Cabinet Office (Figure 5).

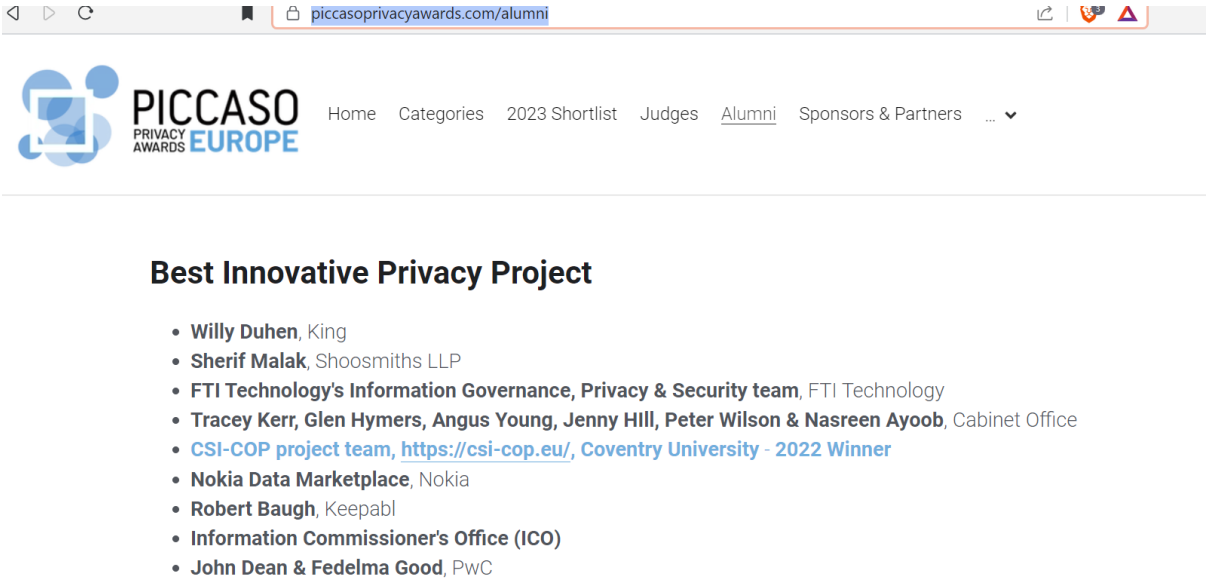

Figure 5: CSI-COP Winner of 2022 PICCASO award in category 'Best Innovative Privacy Project'

In the following subsections an overview is provided of how the CSI-COP consortium realised the project's expected impacts and other impacts through project activities.

3.1 Expected Impacts

CSI-COP's ambition raised six expected impacts (EI) and seven other impacts (OI) for the project's influence. To monitor and evaluate the expected and other impacts, thirteen indicators were selected: ten from 'Monitoring the evolution and benefits of responsible research and innovation' (MoRRI) and three from the UN's Sustainable Development Goals (UN SDG). The indicators to assess impact included gender equality; science literacy and quality education; ethics; public engagement; open access, and partnerships for goals.

The project's expected impacts were:

1. Development of New Knowledge and Innovations by Citizen Scientists
2. Availability of Evaluation Data concerning the societal, democratic and economic costs and benefits of citizen science
3. Impact on the Citizen Scientists
4. Impact on Responsible Research and Innovation
5. Impact on the science: GDPR compliance
6. Impact on Society

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Other impacts CSI-COP aimed to realise were:

i) Screen time
ii) Staying safer online
iii) Upskilling the Public and Educators
iv) Improving pro-privacy development in higher education courses
v) Consortium Partner's website privacy compliance
vi) Reducing Barriers
vii) Gender, socio-economic and geographical factors

The thirteen indicators from MoRRI and UN SDG to monitor impact with the associated dimensions relating to the Horizon2020 SwafS15-2018-2019 call to explore and support citizen science, are shown in the Table 3.

Table 3: CSI-COP Indicators to monitor and evaluate project impact

Dimension	MoRRI Indicator	UN SDG Indicator	CSI-COP Indicators for impact
Gender equality	**GE2**	**Goal 5**	Balanced recruitment of male, female and other gender citizen scientists
Science Literacy and education (SLSE)	**SLSE2** **SLSE3** **SLSE4**		SLSE2: Responsible Research and Innovation (RRI) Training SLSE3: Science communication through informal education into GDPR SLSE4: Citizen science engagement
Ethics (E)	**E1**		Ethics approval for CSI-COP consortium at the level of the Coordinating University
Public Engagement (PE)	**PE2** **PE3** **PE4** **PE5**		PE2: Policy-oriented engagement with science (secondary data) PE3: Citizen preferences for active participation in S&T decision making (secondary data) PE4: Active information search about controversial technology (secondary data) PE5: Public engagement performance mechanisms at the level of research institutions
Open Access (OA)	**OA1**		Open Access Literature and to CSI-COP's Innovation
Quality Education		**Goal 4.4**	Contribute to goal "By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and

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			vocational skills, for employment, decent jobs and entrepreneurship"
Partnership for Goals		**Goal 17.7**	Encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships

The next sub-sections show how each of CSI-COP's expected and other impacts were realised.

3.1.1 Expected Impact 1

Expected Impact 1- '**Development of New Knowledge and Innovations by Citizen Scientists**' was monitored through indicators for public engagement (PE):

- PE3: Citizen preferences for active participation in S&T decision making (secondary data)
- PE4: Active information search about controversial technology (secondary data)

CSI-COP Citizen scientists actively collaborated in the development of new knowledge around personal data protection, third-party cookies and other tracking technologies. This work executed in WP5 produced deliverable report D5.1: Taxonomy of cookies and online trackers (see SO3: Shah et al., 2023). Additionally, citizen scientists' participation in the project produced the project's main innovation: the searchable web-based open-access Repository of cookies and trackers (see SO4).

3.1.2 Expected Impact 2

Availability of CSI-COP evaluation data on the project's engagement of its community of citizen scientists, and long-term interest in pro-privacy software development, were made available through the project's many outputs, including its two societal impact reports: *Deliverable D1.6 | D5 Societal Impact 1* (Shah, 2022) and Deliverable *D1.7 | D6 Societal Impact 2* (Shah & Winter, 2023b).

3.1.3 Expected Impact 3

Impact on the citizen scientists is also evident in CSI-COP's two societal impact reports. It is also evident from the informal education and practical training received to understand ethical methods to conduct responsible research. In addition innovating with safeguards was evident to the citizen scientists since no personal data was made available in CSI-COP's produced public resources. The indicators to assess CSI-COP's impact on the citizen scientists were:

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- GE2: Gender equality in recruitment and training of citizen scientists
- SLSE 2-4: Scientific literacy and science education through informal education, and citizen science engagement in responsible research and innovation (RRI) Training, and science communication;
- E1: Ethical practice impacting citizen
- PE3: Citizen preferences for active participation
- SDG 4.4: Contribute to goal to increase the number of youth and adults with relevant skills for employment, decent jobs and entrepreneurship (SDG 4.4).

3.1.4 Expected Impact 4

As a citizen science project concerned with personal data protection, CSI-COP placed special emphasis on **responsible research and innovation** for expected impact 4. The consortium planned ethical task execution, chose secure data management processes and limited the reliance on social media.

In accordance with the principles of the EU's GDPR, throughout the recruitment and engagement process across the project, CSI-COP implemented **transparency**, practiced **informed consent** and attended to the **purpose of personal data collection**. As detailed in CSI-COP's three Data Management Plans (Shah et al., 2020; Shah et al., 2022; Shah & Pocs, 2023), CSI-COP operated on **purpose limitation**: limiting collection of personal data to the necessary and minimum from members of the general public (name and email only). This is evident also from CSI-COP project website which does not perform any tracking to obtain personally identifiable information such as device, IP, etc. The limited personal data (name and email) was provided by citizen scientists through project participation information and full informed consent (Appendix 2ab).

The indicators used to assess CSI-COP's impact on Responsible Research and Innovation were:

- GE2, SDG 5: Balanced recruitment of male, female and other gender citizen scientists
- SLSE2: Responsible Research and Innovation
- EI: Ethical practice
- PE2: Policy-oriented engagement with science.

CSI-COP consortium make-up itself includes established female researchers who are role-models in their respected fields. This benefitted the project in approaching organisations dedicated to women, such as the Women branch of the UK's British Computer Society (BCS), in recruiting women and men to collaborate in CSI-COP. In addition to setting up GDPR-compliant personal data management processes, responsible research and innovation in CSI-COP involved submitting ethics applications to the Coordinating partner, Coventry

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University's research ethics panel. Three ethics applications were completed: the first in 2020 to gain permission to engage volunteer participants in the project; the second due to an Amendment in the grant agreement (one beneficiary termination) in 2021; and a third to raise awareness of personal data protection to under-18s. Each comprehensive ethics application was approved with the GDPR-compliant documentation (new participant information and informed consent sheets for under 18s).

The creation of material for the informal scientific education (the MOOC) was also put together in a responsible way by involving a data protection and privacy expert as sub-contractor (Privacy Matters). Additionally, the content was reviewed internally by CSI-COP's data protection and privacy legal partner (STELAR). The MOOC was also reviewed by members of the public, and also by personnel in the EU-Citizen.Science project before its launch in April 2021 on CSI-COP website and the EU-Citizen.Science Moodle platform. Similarly, the innovation of the Repository from the project's investigations went through iterations following feedback from CSI-COP's citizen scientists and a variety of stakeholders to improve its use and data retrieval.

Policy orientation in CSI-COP's work derived from the findings of the project's citizen scientists' and the partners' investigations of websites and apps. Transparency and informed consent were not being followed completely according to the requirements in the GDPR. Policy recommendations were encapsulated in two CSI-COP policy briefs (Deliverable documents D1.13 - Shah 2021; Deliverable D1.14 -Shah 2023).

The above actions realised the project's expected impact 4, CSI-COP fulfilling responsible research and innovation.

3.1.5 Expected Impact 5

Impact on the science of GDPR was evident from the findings on compliance issues in websites and apps. Citizen scientists' investigations of website cookies and permissions in apps showed that while the GDPR provides a strong mechanism to protect fundamental rights and freedoms of living people with respect to processing of personal data, it is clear that it is not being complied with fully in its early years. The reasons for this are many, including software development environments for websites and apps could have embedded third-party trackers. Hence, unless a software developer has knowledge of this, or been trained with a privacy-by-design approach, they might not be aware that their product is collecting personal data without being clear why and without gaining informed consent. While this process takes place, the EU can make the GDPR simpler to understand for individuals and businesses. CSI-COP contributed to this by creating simple Guidelines to help the EU implement GDPR compliance in its funded projects. These Guidelines have been submitted to the EU and will be made available from the CSI-COP project website. CSI-COP Guidelines are an additional output to project deliverables.

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The indicators to monitor progress in expected impact 5 on the science of GDPR were similar to measure other expected impacts: gender equality in recruitment and training of citizen scientists (GE2); ethical practice (E1); Policy-oriented engagement with science (PE2); Citizen preferences for active participation in S&T decision making (PE3); Active information search about controversial technology (PE4); Public engagement performance mechanisms (PE5).

3.1.6 Expected Impact 6

The reach of CSI-COP project through its activities in Europe and beyond, to raise awareness of personal data protection rights accorded in the GDPR, demonstrated the **impact of CSI-COP on society**. Members of the public with little, some or no knowledge of algorithms underpinning cookies were keen to learn how to reject third-party tracking, and unnecessary cookies and permissions in websites and apps. Organising free, accessible online and in-person events in partners' available venues (e.g. a university classroom), in cafes, in libraries and museums (Figure 6), and participation in other organisation's events, helped to spread the EU's GDPR to members of the public across Europe and in Israel. Two societal impact reports realised from the project show the change in online behaviour within the project partners, and the general public who became citizen scientists and their efforts to share CSI-COP learning within their networks: deliverables D1.6 (Shah, 2022) & D1.7 (Shah & Winter, 2023b).

Figure 6: CSI-COP interactions with society: Researchers' Night (eft); museum (centre); festival (right).

The same indicators to assess and monitor progress on CSI-COP's impact on society were: gender equality in recruitment and training of citizen scientists (GE2); ethical practice (E1); Science communication through informal education into GDPR (SLSE3)**;** Contribute towards meeting goal: to substantially increase the number of youth and adults who have relevant skills, including technical and vocational by 2030 (SDG 4.4); Encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships (SDG 17.7).

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3.2 Other Impacts

3.2.1 Other Impact 1

Reducing screen time during COVID-19, affecting the first two years of CSI-COP project was evident from the general public's desire to enjoy the outdoors where restrictions allowed this. The expected number of citizen scientists was not realised in CSI-COP, and this could be due to compulsory home-working and home-schooling during the pandemic. Hence spending precious spare time on a screen participating in an Internet investigation topic could be perceived as unappealing, When designing the project, the CSI-COP consortium's hope was that learning about that extent of online activity might lead to high number of engagement (hundreds of thousands of MOOC completions; thousands of citizen scientists). Nonetheless, CSI-COP gained 191 citizen scientists across Europe and in Israel in a difficult time in the 21st century due to the pandemic.

3.2.2 Other Impact 2

Staying safer online underpinned the informal education and practical training delivered in CSI-COP. Third-party tracking in websites and apps, through unnecessary cookies and requests for personal data under the ambiguous term 'legitimate interest', is not the only issue plaguing the Internet. Lack of safe-guarding in one app (Yubo) was uncovered by Sunday Times' journalists **Sian Griffiths** and **Katie Tarrant** in their February 2022 article *Sex abuse and racism rife on 'Tinder for teens'* (Figure 7). Yubo app designed for children aged 13-17, to make friends with others online, appeared to lack robust moderation and realistic age verification processes. Safety online is especially crucial for children who might not know how to protect themselves from harm while using the Internet. CSI-COP engagement with the public explained the necessity for ethical technology and tools development to keep people safe online.

Abuse rife on 'Tinder for teens'

Sian Griffiths and Katie Tarrant

Schools have warned parents about a "Tinder for teens" social media app that an investigation found to be exposing children to sexual harassment, racism and bullying.

The platform, Yubo, allows children aged 13 to 17 to match with potential dates, as well as to join "lives" where they are encouraged to interact with about 100 other teenagers in group video calls. In Britain, it has 3.6 million users.

Head teachers at primary and secondary schools have become so concerned that they have shared a safety newsletter which says that "due to the nature of this app, your child may come across content that is not appropriate to them".

James Loten, deputy head at Harwich and Dovercourt High School, Essex, told parents he was concerned that Yubo "could be "exploited by adults for nefarious purposes". Kingsley primary school, in Co Durham, said children should be stopped from downloading it.

A Sunday Times reporter spent ten days on Yubo, posing as a 15-year-old girl called Anne. No age verification was required, with the journalist able to use profile pictures of her 20-year-old self.

She was propositioned for sex and frequently asked to send nude pictures. A message from a 17-year-old boy said: "Let me rail [have sex with] you", while others told girls on a livestream they would "strip you naked and rape you" and "choke you". A black 16-year-old was told by another user: "I'd le you pick my cotton any day." In

Continued on page 4 →

NEWMAN'S VIEW

All the single men...

Tom Calver
Data Projects Editor

Perhaps then, it is no surpr that the area won cult status in 2003 film *Love Actually* when Hu

RELAX, WE'RE ALMOST HOME

Figure 7: Article from Sunday Times, 20 February 2022.

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3.2.3 Other Impact 3

Given the pivotal role of schools in teaching digital literacy, and equipping young people with the awareness to identify and avoid the dangers online, it is particularly important that educators possess the appropriate, up-to-date knowledge to accomplish this role. CSI-COP researchers are cognisant of this, as many of them are teachers in higher education.

CSI-COP communication and project dissemination activities engaging stakeholders, parents, teachers, receiving the project's new knowledge (MOOC), learning about the innovation (privacy-by design website; Repository) and seeing the results (e.g. the Taxonomy), were an excellent way of **upgrading the knowledge and skills of educators** and other members of the public.

3.2.4 Other Impact 4

Improving on **pro-privacy development in higher education** was another impact that was realised from the CSI-COP consortium by the university partners (BIU, CU, CTU, UAB, UPAT, UOULU) and by two other partners who engaged regularly with universities (NaTE; IB). CU, BIU, UAB and UOULU have already integrated CSI-COP's new knowledge and skills generated in the project in their higher education teaching activities.

Coventry University's Dr. Huma Shah (HS) incorporated the new knowledge in CSI-COP's MOOC in her undergraduate and masters lectures, tutorials and student project supervision in ethics of artificial intelligence (AI). HS embedded 'human right to privacy online' in her 'AI, Creativity and Ethics' first year undergraduate class. HS created a '*Who is responsible when it goes wrong, and what does go wrong look like?*' for her 'AI Ethics for Business' masters classes. HS's classes contain interactive exercises using online tools such as Mentimeter to gauge students' understanding. Her supervision of students' undergraduate and postgraduate projects include teaching about innovating safeguarding methods in website and app development. She also supervises a doctoral student undertaking original research on 'privacy in serious games' following the researcher's employment in CSI-COP. CSI-COP's Taxonomy and the Repository are innovations that HS aims to utilise in her future classes for undergraduate, postgraduate and doctoral level study in higher education.

Dr Maayan Zhitomirsky-Geffet, from partner Bar Ilan University (BIU) incorporated the information from the CSI-COP's MOOC in her seminar on semantic technologies on the web for M.A. in the Information Technologies track. She added two lessons on ethics and AI emphasising the aspects of privacy threats, first-party and third-party cookies, Google and Facebook data privacy violations and tracking, GDPR and tools for privacy protection on the web.

CSI-COP partner, University of Oulu (UOULU) introduced a section on personal data protection in its 'Special Course in Information Technology 8 - AI Ethics, Privacy and

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Legislation' covering topics such as personal data collection and protection, the history of privacy protection, General Data Protection Regulation and its principles, and the practice of data protection. The section, which is lectured by *Dr Ulrico Celentano*, features examples from CSI-COP and includes interactive parts with discussions on the following questions: Are personal data something we still need to protect? Do the current protection methods work? Is it ethical to require non-monetary payment for services, in this case in the form of personal data? How is anonymity better guaranteed?

Dr Jordi Vallverdú from the Autonomous University of Barcelona (UAB) introduced debates about public understanding of scientific and ethical issues close to CSI-COP into his International Summer Course on Critical Thinking.

Professor Olga Stepankova enriched three of her taught Artificial Intelligence (AI) and robotics at two institutions of CTU, namely Faculty of Biomedical Engineering and Masaryk´s Institute of Higher Studies. Her revised lectures were dedicated to ethics, privacy on-line and potential misuse of AI tools This will remain so even in the coming years.

CSI-COP's university partners updated their taught courses to incorporate the new knowledge that emerged from the project's research and innovation activities. In this way CSI-COP has contributed to nurturing a privacy-by-design responsible approach to the development of web technologies and AI tools.

3.2.5 Other Impact 5

Other Impact 5 entailed **updating CSI-COP partners own websites** to better comply with the GDPR. A consequence of a CSI-COP was the consortium partners revisiting their own organisational websites to review transparency of cookie banners and notices, and whether privacy policies disclosed embedded trackers more obviously. Coventry University's website was updated during the course of the project through interaction with the university's Data Protection Officer and web team. The website shows three clearly labelled buttons presented in the same colour and size font inside the same sized button. CSI-COP partners continuously look to reduce the number of cookies in their websites, thus leading the way to better informing visitors to their websites to build trust and engender loyalty through pro-privacy platforms.

3.2.6 Other Impact 6

CSI-COP project was all about **reducing barriers**, especially barriers in to science. Humans *do* science from a very early age in life exploring our environment, and when language develops, questioning everything led by curiosity and the desire to learn about the world around us. The concept of citizen science is based on the recognition that science is for everyone; therefore, citizen science is democratic and participatory at its core. As a citizen science project, CSI-COP committed to making a contribution in a field that has unseen barriers: fewer women

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in computer science and technology innovation. Through the project's activities organised by female and male team members in CSI-COP partners, the general public could 'see' people *like them*, all ages with different backgrounds involved in exploring compliance of a regulation associated with online technologies. Accordingly, as well as organising project events in partners' venues, including university campuses, partners organised events in places where people go: in libraries, museums, in other organisation's events to attract potential learners from all walks of life and introduce them to invaluable experiences as citizen scientists.

3.2.7 Other Impact 7

The SwafS-15-2018/2019 Horizon2020 grant called for explicit cross-cutting priorities, including gender, and balanced participation regardless of background, gender and age. Supporting the consortium to meet the **gender balance** was the Association of Hungarian Women in Science (NaTE) partner in Hungary. NaTE were also responsible for the task assessing the socio-economic and geographical make-up of CSI-COP's citizen scientists. This was reported in deliverable D4.3 (Rigler et al., 2023).

The Coordinating partner, CU's revised **ethics application** in late 2022 enabled the consortium to engage under-18s through revised GDPR-compliant participation information and informed consent sheets. CSI-COP's success included a higher proportion of females and young people engaged in the project compared to other citizen science projects (Rigler et al., 2023).

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4 Limitations

Limitations in CSI-COP project implementation stemmed from two main factors:

a) Limit on using a wide range of social media platforms and tools, and

b) The effect of COVID-19 restrictions on the project's planned events in work package 3 (recruitment of citizen scientists), and work package 6 (dissemination and exploitation events).

Other limitations on the project, possibly reducing the number of potential citizen scientists than were envisaged in the proposal preparation phase, were:

c) The deployment of Microsoft products for learning, informal education and practical training: WORD and Excel .Not all members of the public had access to Microsoft tools. The MOOC was made available as an open-text document, and it was translated into an online course, in EU-Citizen.Science project's Moodle platform to mitigate this limitation.

d) The length of the MOOC was overwhelming for some in asynchronous learning (learning in own time on your own). Although the MOOC contained five short steps, as a downloadable informal education resource, the MOOC is 37-pages in length. This length in the English version includes a welcome/introduction (page 2), course details (page 3), the five steps (page 4-29), course feedback (page 30), the MOOC multiple choice ten-questions test (page 31), information on becoming a citizen scientist (page 32), and a pre-citizen science engagement anonymous survey (pages 33-37). A shorter version of the MOOC with simple questions might have encouraged more people to progress to the fuller version and join the project as citizen scientists.

e) Cyberattacks on CSI-COP partner systems. This prevented the two university partners from completing some project activities by deadline, as well as delayed recruitment of supporting research staff.

f) Termination of two partners (in the summer of 2021, and in early 2023) required a lot of project management time by the Coordinating partner. The time and effort in processing these two separate grant agreement amendments reduced the overall number of website and app investigations.

g) Shortage of staff: it was difficult to recruit post-doctoral research assistants in the UK qualified for contributing to peer-reviewed scientific articles to disseminate the wealth of new information and results realised from the project. Promotions and long-term sickness also affected the project by reduced admin support hours, resulting in this work added to scientific tasks.

h) Capacity to begin general public engagement activities in one partner country (UOULU), who did not organise any online webinars during COVID-19 restrictions after the MOOC had been launched and translated in WP3 by the end of June 2022.

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i) Communication strategy lacked skills in engaging journalists reporting on science and tech issues to carry CSI-COP's message further.

j) Zero MOOC learners in some translations: German, Italian, and Polish. Limited staff and time prevented reaching German, Italian and Polish speakers to learn about the GDPR and how to better manage personal data online.

The discovery from the project's limitations will contribute to improving CSI-COP legacy activities, and task design in future research and innovation grant proposals. This is especially important in raising awareness among the general public about the EU's new regulations, including the Digital Services Act (DSA, 2022) and the EU's strategy for AI (EC, 2018).

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5 Legacy and Recommendations

5.1 Legacy

The main legacy of CSI-COP is the cohort of enthusiastic and engaged Privacy Champions who emerged from the project's citizen scientists. This is a result of the project that the consortium feel most impactful. These citizen scientists-turned Privacy Champions have diverse backgrounds. This cohort includes parents with young children, so share a keen interest in online data protection. CSI-COP's Privacy Champions are eager to continue with a bottom-up movement for change in the way websites and apps track us as we use the Internet. Some CSI-COP Privacy Champions who were available on 23 August 2023 attended Coventry University's organised online informal meeting with stakeholders and partners. Attendees were from across Europe and in the US. Stakeholders included a data protection/GDPR lawyer from BSMP Romania, and a teacher of 5-14 year-olds in Colorado, US. The outcome of this Privacy Champions' meeting is a desire to continue with efforts to change personal behaviour, while raising awareness that the current model of the Internet needs to reduce personal data collection. The realisation is also that companies need to take cybersecurity more seriously.

Post-project, a working group will be formed from CSI-COP's partners and the Privacy Champions for continuity of the activities and promoting GDPR compliance training. In collaboration with privacy professionals in the consortium's network of networks CSI-COP material will be updated as privacy research and regulations are changed and revised. CSI-COP partners will encourage their own community of citizen scientists and the engaged Privacy Champions to apply their enthusiasm and, where possible, progress from informal learning about personal data protection to formal education bridging skills' gaps. Beyond the project, another objective is to influence educators to use the privacy and data protection findings to update curriculum development across a range of disciplines from the STEM and arts fields, including software engineering, business and law, and AI ethics.

5.2 Recommendations

CSI-COP's two policy briefs (D1.13 & D1.14) recommended policy changes for the EU to improve GDPR compliance in websites and apps funded through EU grants. Wider than EU funded projects, CSI-COP partners completely understand that businesses need data. Much of that data is personal data, and technology usage helps improve business intelligence allowing companies to thrive in very competitive markets, including higher education and its recruitment of students – fee payers. Nonetheless, the EU's GDPR makes it clear that personal data collection should be compliant with its principles, including transparency, gaining informed consent for collecting personal data, and providing unambiguous purpose with limits on allowing third-party access. Though the GDPR is very strong on transparency and informed consent with respect to the collection of personal data (European Union, 2018), CSI-COP found that it is not being complied with fully across the Internet and in websites and apps. These are

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not the only tools that collect personal data. Home devices connected to the Internet, such as smart TVs and children's 'emotional toys' can also lead to users giving up lots of personal data without knowing, let alone give real consent. The CSI-COP project has raised more research questions, which emphasises the pressing need for ongoing initiatives, including bottom-up campaigns to address the public's increasing concern about online personal data collection and data breaches from weak cybersecurity.

A start to the future beyond CSI-COP is Coventry University's successful application for a HS.booster standardisation support service. Coventry University has been awarded a standardisation consultant with the first meeting in early September 2023. The purpose is to create standards for website cookie notices and privacy polices so that they comply with the GDPR's transparency, informed consent, and purpose limitation principles. CSI-COP new standardisation could provide a platform to build CSI-COP's legacy with the Privacy Champions and Stakeholders.

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European Union's Horizon 2020 research and innovation programme under grant agreement N°873169

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Appendices

Appendix 1: List of CSI-COP Deliverables

The full list of all CSI-COP output, deliverable results from the project activities are listed in the table overleaf. The deliverables as resources include:

- Data management (D1.8, D1.9 & D1.10): CSI-COP's method of complying with the GDPR and protecting collected personal data (name and email of citizen scientists)
- Policy Briefs (D1.13 & D1.14): recommendations for policy change to improve GDPR compliance in websites and apps
- Societal Impact Reports (D1.6 & D1.7): impact on society from collaboration in CSI-COP
- Guidance on Inclusive Citizen Science engagement (D2.2)
- Reports on informally educating the public (D3.1 & D3.2)
- Databases of website and app investigations (D4.1 and D4.2)
- Citizen science demographics report -anonymised age, gender, location & socio-economic status (D4.3)
- Taxonomy of Digital Cookies and Online Trackers (D5.1)
- Repository, searchable web-based, open-access knowledge resource of digital trackers (D5.2)
- CSI-COP Communications, Dissemination and Exploitation strategy – CDE (D6.1.1)
- CSI-COP main project dissemination and exploitation event (D6.3)

The above and other deliverables listed in the table overleaf can be accessed from:

- CSI-COP website: https://csi-cop.eu/
  - Results page: https://csi-cop.eu/projectresults/
  - Searchable Repository page: https://csi-cop.eu/repository/
- EU Cordis results page: https://cordis.europa.eu/project/id/873169/results
- Zenodo open-access platform: https://zenodo.org/search?page=1&size=20&q=CSI-COP

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Full List of CSI-COP Deliverables (Project Output and Results)

Deliverables listed in Work Package (WP) Order

WP No	Task Number	Deliverable No	Title	Description	Lead Beneficiary	Nature	Dissemination Level	Submission Date
WP1	D1.1	D1	Project meeting 1	Project meeting 1 (M1)	CU	Other	Confidential, only fo	28 Jan 2020
WP1	D1.2	D2	Project meeting 2	Project meeting 2 (M12)	CU	Other	Confidential, only fo	28 Jan 2021
WP1	D1.3	D3	Project Meeting 3	Project meeting 3 (M30)	CU	Other	Confidential, only fo	01 Jul 2022
WP1	D1.4	D4	Project Meeting 4	Project meeting 4 (M42)	CU	Other	Confidential, only fo	29 Jun 2023
WP1	D1.5	D26	List of all CSI-COP events	A list of each and every CSI-COP event providing detailed info	CU	Report	Public	10 Mar 2020
WP1	D1.6	D5	Societal impact assessment report1	Societal impact assessment report [M28)	CU	Report	Public	11 Oct 2022
WP1	D1.7	D6	Societal Impact Assessment Report 2	Societal impact assessment report 2 [M42]	CU	Report	Public	31 Aug 2023
WP1	D1.8	D7	Data Management Plan (DMP)V1	Data Management Plan (DMP)	CU	ORDP: Open Research Data Pilot	Public	18 Jun 2020
WP1	D1.9	D8	Data Management Plan (DMP)V2	Updated V2	CU	ORDP: Open Research Data Pilot	Public	11 Oct 2022
WP1	D1.10	D9	Data Management Plan (DMP) Final	Final plan	CU	ORDP: Open Research Data Pilot	Public	28 Apr 2023
WP1	D1.11	D27	List of all CSI-COP events - updated	A list of each and every CSI-COP event providing detailed info	CU	Report	Public	28 Jan 2021
WP1	D1.12	D28	List of all CSI-COP events - final	Final list of each and every CSI-COP event providing detailed	CU	Report	Public	21 Jul 2023
WP1	D1.13	D29	Policy Brief v1	Policy brief version 1	CU	Report	Public	08 Dec 2021
WP1	D1.14	D30	Policy Brief v2	Final policy brief: version 2 [M43].	CU	Report	Public	31 Jul 2023
WP1	D1.15	D31	CSI-COP Ethics	New deliverable for new WP1 task T1.6 for project ethics.	CU	Other	Confidential, only fo	06 Dec 2021
WP2	D2.1	D10	CS Research Report	CS Research report. Public report on current methods in CS Engagement (M03)	IB	Report	Public	30 Apr 2020
WP2	D2.2	D11	Guidelines for CS recruitment	Guidelines for CS recruitment. Guidelines for balanced recruitment and selection of Citizen Scientists (M05)	NaTE	Report	Public	30 Jun 2020
WP2	D2.3	D12	CSI-COP Framework	CSI-COP Framework. Public report for CSI-COP Framework (M09).	CTU	Report	Public	30 Sep 2020
WP3	D3.1	D13	Recruited CS Community	Recruited community of CSI-COP Citizen Scientists (M29)	UAB	Other	Public	30 Jun 2022
WP3	D3.2	D14	Trained Citizen Scientists	Trained Citizen Scientists. GDPR Trained CSI-COP Citizen Scientists (M30)	UPAT	Other	Confidential, only fo	01 Jul 2022
WP4	D4.1	D15	Website cookie trackers	Website Cookie Trackers Database. Database of CSI-COP Cookie Trackers (M34)	UOULU	Other	Public	24 Dec 2022
WP4	D4.2	D16	Android App Trackers	Android App Trackers Database. Database of CSI-COP Android App Trackers (M34)	CU	Other	Public	23 Dec 2022
WP4	D4.3	D17	Internal AGSEG report	AGSEG report. CSI-COP citizen scientists' age, socio-econor	NaTE	Report	Public	30 Jan 2023
WP5	D5.1	D18	Taxonomy of Trackers	Taxonomy of Trackers. Systematic classification mapping website cookies and app trackers (M39)	UPAT	Report	Public	29 Mar 2023
WP5	D5.2	D19	Web-based Knowledge resource	Web-based Knowledge resource. TRL 5+ Searchable Public Web-based Knowledge Resource on Cookie and App Trackers (M41)	CU	Websites, patents filing, etc.	Public	31 May 2023
WP6	D6.1	D20	Project website	Project website. CSI-COP project website and citizen science forum (M3)	CU	Websites, patents filing, etc.	Public	30 Apr 2020
WP6	D6.2	D21	Scientific Communications	Scientific Communication. Communication: conferences and peer-reviewed journal papers (M42)	UOULU	Other	Public	31 Aug 2023
WP6	D6.3	D22	CSI-COP main event	CSI-COP main event. Main CSI-COP project dissemination event (M41)	CU	Other	Public	31 May 2023
WP6	D6.4	D23	Citizen Science cafes	Citizen Science cafes. CSI-COP Cafés and Stakeholder Engagement (M42)	UPAT	Other	Public	14 Jul 2023
WP6	D6.5	D24	Parent-Teacher Round tables	Parent-Teacher Roundtables. Parent-Teacher-Citizen Science Round Tables (M42)	UAB	Other	Public	07 Jul 2023
WP6	D6.6	D25	GDPR Tracker compliance	GDPR Tracker compliance. Synthesis of CSI-COP GDPR Tracker compliance (M44)	NaTE	Report	Public	31 Aug 2023
WP6	D6.7	D32	CDE Strategy	New deliverable for CSI-COP communication, dissemination and exploitation (CDE) strategy in WP6 under sub-task T6.1.1.	CU	Report	Public	06 Dec 2021

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Appendix 2: GDPR compliant volunteer information

Appendix 2a: Participant Information Sheet

PARTICIPANT INFORMATION SHEET

Dear Citizen Scientist

Thank you for your interest in the CSI-COP project and for completing the free informal education course/MOOC 'Your Right to Privacy Online'. We now invite you to take part in research investigating online privacy by exploring cookies in websites you visit, and in apps you use on your smart phone. The official title of this project is '**Citizen scientists investigating cookies and app GDPR compliance' (CSI-COP)**. Dr. Huma Shah, Director of Science of the CSI-COP project is at Coventry University, the lead partner of this international research and innovation project. Before you decide to take part as a citizen scientist it is important that you understand why the research is being conducted and what it will involve. Please kindly take the time to read the following information carefully.

What is the purpose of the study?

The General Data Protection Regulation (GDPR) is an EU law that requires organisations to safeguard personal data and uphold the privacy rights of anyone in the EU territory. Citizen scientists can play a valuable role in ensuring privacy and providing a better understanding of what information is tracked online. The CSI-COP project aims at a co-investigation between the professional researchers and citizen scientists interested in human rights in the digital age. CSI-COP is funded under the EU Horizon2020 scheme: https://cordis.europa.eu/project/id/873169

CSI-COP project will mobilise citizen scientists from across Europe and beyond to investigate the different types of trackers in cookies and smart phone apps. The project offers free training material to informally instruct citizen scientists on 'Your Right to Privacy Online'. With the CSI-COP partners citizen scientists will be engaged in co-producing a classification of the types of trackers found in web and app investigations. This will lead to the co-creation of an open-access knowledge resource, a repository of digital trackers that can be searched by parents, teachers and more.

Why have I been chosen to take part?

You expressed interest to join the CSI-COP project following completion of the MOOC. CSI-COP aims to recruit a wide cohort of citizen scientists through a variety of online platforms, groups and interests. You are invited to participate in this study because you are interested in finding out the purpose of different cookies in websites and in smart phone apps.

What are the benefits of taking part?

Through participation in this project you will become aware of your human rights in the digital age. By sharing findings with us of cookies you find in the websites you visit and in the apps you use on your smart phone, you will be helping CSI-COP and Coventry University to better understand the extent of online tracking. You will also be involved in designing a free to access online knowledge-base of cookies.

Are there any risks associated with taking part?

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This study has been reviewed and approved through Coventry University's formal research ethics procedure. There are no significant risks associated with participation.

Do I have to take part?

No – it is entirely up to you. If you do decide to take part, please keep this Information Sheet and complete the accompanying Informed Consent Form to show that you understand your rights in relation to the research, and that you are happy to participate. Please note down your participant number (which is in the Consent Form) and email this to Dr. Huma Shah on ab7778@coventry.ac.uk if you seek to withdraw from the study at a later date.

You are free to withdraw your information from the project data set at any time until the data are destroyed ten years after the conclusion of the project (30 December 2032). Please note, you will have the opportunity to co-author publications, including scientific articles. Hence please note that your data may be used in the production of these formal research outputs (e.g. journal articles, conference papers, theses and reports) prior to this date. Please be advised to contact Huma at your earliest convenience should you wish to withdraw from the study. To withdraw, please contact Huma on ab7778@coventry.ac.uk. Please also contact the Research Support Office [research.eec@coventry.ac.uk; telephone 44(0)24 7765 7688 so that your request can be dealt with promptly in the event of the lead researcher's absence. You do not need to give a reason. A decision to withdraw, or not to take part, will not affect you in any way.

What will happen if I decide to take part?

You will be asked a few questions in a survey before you take part. The survey is included in the informal education course 'Your Right to Privacy Online'. It will also be available to complete in a clean, health-safe environment CSI-COP before the start of any face-to-face workshop once the risk from the corona virus pandemic risk is greatly reduced. The survey should take 5-10 minutes to complete.

Data Protection and Confidentiality

Your data will be processed in accordance with the General Data Protection Regulation 2016 (GDPR) and for citizen scientists in the UK, the Data Protection Act 2018. All information collected about you will be kept strictly confidential. No sensitive data will be collected. Unless they are fully anonymised in our records, your data will be referred to by a unique participant number rather than by name. Your data will only be viewed by CSI-COP research team in Coventry University. All electronic data will be stored on a password-protected computer file in Coventry University's servers. Any paper records will scanned-in to a digital document then stored securely. The paper files will be destroyed securely after the scanning process. Your consent information will be kept separately from the data you provide about your investigations. This in order to minimise risk in the event of a data breach. The lead researcher will take responsibility for data destruction and all collected data will be destroyed on or before 30 December 2032 [10 years after conclusion of CSI-COP].

International Data Transfers

Your data will not be stored or processed in any CSI-COP partner's venue outside the UK. [Please be aware for yourself, that countries outside of the European Economic Area may not offer the same level of data privacy protection as in the UK].

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Data Protection Rights

Coventry University is a Data Controller for the information you provide. You have the right to access information held about you. Your right of access can be exercised in accordance with the General Data Protection Regulation (GDPR) and the Data Protection Act 2018. You also have other rights including rights of correction, erasure, objection, and data portability. For more details, including the right to lodge a complaint with the Information Commissioner's Office (ICO), please visit www.ico.org.uk. Questions, comments and requests about your personal data can also be sent to the University Data Protection Officer: dpo@coventry.ac.uk

What will happen with the results of this study?

The results of this study may be summarised in published articles, reports and presentations. Quotes or key findings will always be made anonymous in any formal outputs unless we have your prior and explicit written permission to attribute them to you by name.

Making a Complaint

If you are unhappy with any aspect of this research, please first contact CSI-COP's Director of Science, Dr. Huma Shah, on email: ab7778@coventry.ac.uk. If you still have concerns and wish to make a formal complaint, please write to Professor xxxx [Huma's Line Manager] at this email: xxxxxx@coventry.ac.uk . In your complaint please provide information about the research project, specify the name of the researcher and detail the nature of your complaint.

CSI-COP invite you to join the team and help to stop tracking by default across the Internet.

Dr. Huma Shah
Assistant Professor, School of Computing, Electronics and Mathematics
Associate Member, Centre for Data Science research
Coventry University
Coventry CV1 5FB
Email: ab7778@coventry.ac.uk

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Appendix 2b: Informed Consent Sheet

Participant No. e.g. CU1, CTU3, BIU9,

INFORMED CONSENT FORM:

Citizen Scientists Investigating Cookies and App GDPR compliance (CSI-COP)

Thank you for completing CSI-COP's free informal education course/MOOC 'Your Right to Privacy Online' and for expressing interest in joining this research study for the purpose of investigating cookies in websites and apps.

Before you decide to take part, you must **read the accompanying Participant Information Sheet.**

Please do not hesitate to ask questions if anything is unclear or if you would like more information about any aspect of this research. It is important that you feel able to take the necessary time to decide whether or not you wish to take part.

If you are happy to participate, please confirm your consent by circling YES against each of the statements below and then signing and dating the form as a CSI-COP project participant.

1	**I confirm that I have read and understood the Participant Information Sheet for the above study and have had the opportunity to ask questions**	**YES**	**NO**
2	**I understand my participation is voluntary and that I am free to withdraw my data, without giving a reason, by contacting Dr. Huma Shah, director of science in CSI-COP at email ab7778@coventry.ac.uk at any time until the date specified in the Participant Information Sheet**	**YES**	**NO**
3	**I have noted down my participant number (top left of this Consent Form) which may be required by Huma if I wish to withdraw from the study**	**YES**	**NO**
4	**I understand that all the information I provide will be held securely and treated confidentially**	**YES**	**NO**
5	**I am happy for the information I provide to be used anonymously in academic papers and other formal research outputs**	**YES**	**NO**
6	**I agree to take part in the above study**	**YES**	**NO**

Thank you for your participation in this study. Your help is very much appreciated.

Participant's Name	Date	Signature

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CSI-COP Researcher	**Date**	**Signature**

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Appendix 3: CSI-COP MOOC Certificate

Citizen Scientists Investigating Cookies and App GDPR Compliance

In recognition

_{insert name of citizen scientist}_____

On successful completion of CSI-COP's free informal education course

'Your Right to Privacy Online'

CSI-COP Partner Logo Here

Date: 00/00/00

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Appendix 4 Country-specific Data Protection and Online Privacy Recommendations

Partner-specific recommendations following collaboration in CSI-COP by Immer Besser (IB) -Germany, and Universitat Autonoma de Barcelona (UAB), Spain can be found below

Germany

The globalisation of the Internet makes itfor countries like Germany to act in singularity.

Plus, the policy recommendation I suggest here is addressing two specific niches, that are urgent in my opinion. Additional matters could be subject to other policy recommendations.

Policy Recommendation to Combat Dark Patterns in GDPR-Compliance and Disguised Cookies at Both German and European Levels

1. Equal Weightage: "Accept All" and "Manage Cookies" options should be presented with equal prominence and size across all EU member states, ensuring no undue pressure on users to accept non-essential cookies.
2. Simplified Management: Websites operating within the EU must offer a straightforward and intuitive interface for users to manage their cookie preferences, facilitating informed decisions without feeling overwhelmed.
3. Regular Audits: The EU should mandate periodic third-party audits of websites across member states to verify adherence to these guidelines. Websites employing dark patterns or disguising cookies should face penalties or fines at an EU-wide level.
4. Public Awareness: The EU, in collaboration with member states, should initiate public awareness campaigns about the importance of digital privacy and the risks of dark patterns. A well-informed European populace is essential to prevent deception.
5. Limit Legitimate Interest Claims: Websites claiming cookies under "legitimate interests" operating within the EU should provide clear evidence and justification. Such claims should be subject to EU-wide stricter scrutiny to prevent misuse.
6. Feedback Mechanism: Establish a Europe-wide platform where users from any member state can report instances of dark patterns or misleading cookies. This centralized system would aid regulators in swiftly identifying and addressing non-compliant entities across borders.
7. Consistent Updates: Regularly update the policy at the EU level to address the evolving challenges and tactics in digital privacy, ensuring a unified approach across all member states.
8. EU-Level Collaboration: Encourage member states, including Germany, to collaborate, share best practices, and pool resources for research and development on new strategies to combat dark patterns and ensure GDPR-compliance.

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Harmonising these recommendations at both the national (Germany) and European levels in addition to existing regulations, could increase providing all EU citizens with genuine control over their personal data and protecting them against manipulative online practices.

Spain

In light of the aftermath of the COVID-19 crisis and the prevailing global challenges we face, it is imperative that our national response takes on an ethical dimension. As we navigate these complex times, it becomes clear that our actions must not only address immediate concerns but also contribute to the enrichment of democracy itself.

The pandemic has exposed vulnerabilities in our societal systems and highlighted the need for a more resilient and inclusive approach to governance. Our national response should prioritize transparency, accountability, and the active engagement of citizens. Ethical considerations should guide the formulation of policies that ensure the well-being of all members of our society, leaving no one behind. Moreover, the crises we currently grapple with extend beyond public health to encompass environmental degradation, social inequality, and geopolitical tensions. These multifaceted challenges require solutions that are not only effective but also ethically sound.

In this context, enriching democracy means fostering a society where the voices of all citizens are heard, diverse perspectives are valued, and decisions are made collectively for the common good. Ethics should guide our leaders in maintaining the rule of law, upholding human rights, and promoting social justice. Our national response must prioritize the protection of vulnerable populations, the provision of equitable access to healthcare, education, and economic opportunities, and the preservation of our natural environment for future generations. Enriching democracy in the wake of these crises also entails fostering an environment where science, research, and evidence-based policymaking thrive. Embracing citizen participation, including through citizen science initiatives, strengthens the connection between the government and the governed, allowing for more informed and responsive decision-making.

Our national response must be ethically grounded in the pursuit of a more resilient, inclusive, and just society. By prioritising transparency, accountability, and the active involvement of citizens, we can not only address the pressing challenges before us but also contribute to the enrichment and revitalization of democracy itself. In doing so, we pave the way for a future that is not only more resilient, but also more equitable, sustainable, and harmonious for all.

Therefore, our set of policy recommendations is the following one:

1. Recognition and Support: We urge authorities to officially recognize and provide robust support for citizen science initiatives. Acknowledging their significant contributions to scientific research and community empowerment will foster a stronger culture of collaboration and discovery in our regions. Allocating resources and funding to these projects will amplify the positive impact on both local communities and the broader scientific landscape.

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2. Data Quality and Standards: We recommend the establishment of clear guidelines and standards for data collection, analysis, and reporting in citizen science projects, ensuring their relevance to the unique environmental and societal contexts of Catalonia, Spain, and beyond. By maintaining data accuracy and adhering to scientific norms, authorities can enhance the reliability and credibility of citizen-generated data that contributes to regional and national research efforts.
3. Education and Awareness: We propose the integration of citizen science into educational programs across our regions. By incorporating citizen science experiences into curricula, authorities can enhance scientific literacy among students, inspire future scientists, and promote active participation in scientific research that directly impacts local communities.
4. Open Data Access: We advocate for policies that promote open access to the data generated by citizen science initiatives. This transparency will encourage collaboration within regional and national scientific communities, enabling further research and facilitating innovation that benefits both the regions and the country as a whole.
5. Ethics and Privacy: We recommend the establishment of ethical guidelines and privacy safeguards for citizen science projects. Authorities should ensure that projects involving sensitive data or human participants adhere to rigorous ethical standards, building trust and protecting participants' rights within the unique legal and cultural frameworks.
6. Public Engagement: We call on authorities to actively promote diversity and inclusivity in citizen science projects. By facilitating the engagement of diverse communities and demographics within our regions, authorities can ensure that the projects truly represent the rich tapestry of perspectives and address the unique societal needs of Catalonia, Spain, and beyond.
7. Collaboration with Researchers: We emphasize the value of productive collaboration between citizen scientists and professional researchers. Authorities can play a pivotal role by facilitating platforms and spaces for meaningful interaction, fostering a dynamic exchange of knowledge and expertise that enhances both regional and national scientific progress.
8. Impact Assessment: We encourage authorities to develop frameworks for evaluating the impact of citizen science projects within their specific contexts. By assessing the outcomes in terms of scientific advancement and societal benefit, authorities can make informed decisions about resource allocation and policy integration that align with the priorities and needs of our regions.
9. Policy Integration: We urge authorities to consider integrating citizen science findings and recommendations into relevant policy domains, taking into account the unique environmental, cultural, and societal aspects of our regions. By aligning these insights with policies related to environmental management, public health, and urban planning,

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authorities can ensure that scientific discoveries from citizen science inform practical actions that resonate with local communities.

Supportive Infrastructure: We recommend the establishment of platforms or networks that facilitate communication and collaboration among citizen science projects. Such infrastructure will enhance the exchange of ideas, knowledge sharing, and collective problem-solving, bolstering the regional and national impact of citizen science endeavors

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