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Sustainability plan 2025-2030 for EBCP Knowledge management

Results of a foresight study

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Table of Contents

1. Executive Summary

This report presents the results of a foresight study conducted within the OriON Joint Action to support the long-term sustainability of knowledge management for outputs generated under the European Beating Cancer Plan (EBCP). As EU-funded cancer initiatives continue to expand, ensuring that their evidence remains accessible, reusable, and equitable across Member States is critical for effective cancer control and reduction of inequalities.

The study explored how artificial intelligence (AI), particularly generative artificial intelligence (GenAI) can be utilised to support knowledge management of EBCP evidence and outputs. Using a foresight methodology, the study included a scoping literature review, a ranking survey, scenario development, and stakeholder workshops at EU and national levels. Thirty drivers influencing AI-enabled knowledge management were identified across demographic, ecological, socio-cultural, technological, economic, and political/legal dimensions.

Two critical uncertainties were found as the ones who will have highest impact on future AI-enabled tools for knowledge management. These include the demographic uncertainty: whether AI systems will be inclusive of linguistic, cultural, and generational diversity; and the governance uncertainty: whether equity, justice, and inclusive governance will be effectively embedded in AI governance frameworks and regulations. These critical uncertainties formed the basis for four plausible future scenarios, ranging from a highly inclusive and well-governed AI environment to fragmented or poorly governed systems that lack trust and risk reinforcing inequal access to EBCP outputs and evidence.

Stakeholders recognised strong potential for AI-enabled tools to improve efficiency, accessibility, and use of EBCP evidence, particularly in policy and healthcare settings. However, concerns were consistent across stakeholders and scenarios regarding reliability, transparency, accountability, skills gaps, over-reliance on automation, and trust. Across all scenarios, trust, human oversight, interoperability, and continuous capacity-building emerged as essential conditions for sustainable and equitable uptake.

The report concludes that AI-enabled tools for knowledge management can significantly enhance the long-term impact and maximise equal benefit of EBCP outputs, provided they are implemented within robust governance frameworks, aligned with EU regulation, and designed around real user needs. For the next 20 years, priority actions include investing in multilingual and context-aware core functions within the tool, enforcing shared quality and interoperability standards, strengthening stakeholder engagement, and building AI literacy and capacity building across sectors to ensure equitable and sustainable access to EBCP evidence.

2. Introduction

The European Beating Cancer Plan (EBCP), launched in 2021 is a major EU initiative aimed at reducing the burden of cancer throughout the full continuum of care. The EBCP consists of ten flagship initiatives, each also supported by EU-funded projects. Many of these projects are ongoing or already concluded, and generate essential evidence and outputs intended to support patients, clinicians, researchers, policymakers, and healthcare providers.

It is important that these outputs are easily findable and re-usable by different stakeholders across member states (MS), regardless of their level of participation in the EU projects. Therefore, as Europe moves further into its digital transformation, it is critical to understand how stakeholders will want to access, interpret, and apply cancer-related evidence in the future.

This document presents the results of a foresight study implemented within the Joint Action (JA) on Contribution to the Cancer Inequalities Registry to Monitor National Cancer Control Policies (OriON). The foresight study investigated the potential tools and systems to make EBCP-generated evidence findable, interoperable, accessible and reusable over the next 20 years. Specifically, it explores how knowledge management of EBCP-generated evidence can be enhanced through the use of artificial intelligence (AI) and generative artificial intelligence (GenAI) to support better cancer control and care outcomes across the EU (as seen in figure 1).

Figure 1: the envisioned AI-enabled tool to support knowledge management of EBCP evidence

As such, this task lays the foundation for greater and more sustainable EBCP impact over time. It develops four different scenarios of possible future interactions with AI or GenAI for knowledge management of EBCP-generated evidence.

The objectives of the foresight study were the following:

- To assess how the use of AI and GenAI may impact knowledge management for cancer control by conducting a scoping literature review.
- To explore how key stakeholders in the cancer field will engage with evidence from EBCP-related outputs over the next 20 years through scenario development.

- To identify the formats and landscape of potential AI-driven tools (particularly GenAI) that stakeholders expect or prefer for finding and using cancer-related evidence through stakeholder workshops.

Finally, the document will provide strategic recommendations to prepare for the different possible futures of using AI/GenAI for knowledge management in cancer care and research.

3. Methods

The foresight methodology helps identify how various stakeholders (e.g., patients, clinicians, researchers, policymakers) may engage with EBCP outputs in the future, and under what demographic, economic, social, technological, ecological, and political conditions.

Figure 2 presents the conceptual framework of the study. This framework is grounded in the DESTEP model used to systematically analyse the macro-environmental factors that can impact the development and use of the AI-tool. These factors are represented in the main themes: **D**emographic, **E**cological, **S**ocio-cultural, **T**echnological, **E**conomic, **P**olitical/legal. This model was used throughout all steps of the methodological foresight approach.

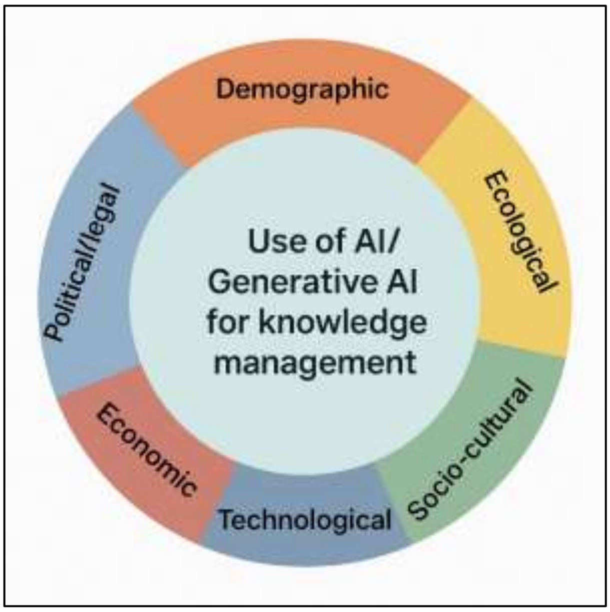

Figure 2: the conceptual framework

The foresight process included the following steps:

1. Scoping review and identification of drivers
2. Trends ranking and identification of uncertainties
3. Scenario development
4. Stakeholder workshops and strategic recommendations

3.1. Scoping literature review and identification of drivers

A comprehensive electronic literature search was conducted on reviews extracted from three databases (PubMed, Embase, Cochrane), limited to the timeframe of 2021 to 2025. The protocol adhered to PRISMA for Scoping Reviews guidelines. Covidence (www.covidence.org) was used to support and streamline the review process, including duplicate removal, title/abstract screening, full-text screening.

Furthermore, a scoping search was conducted using Google Scholar through advanced operators to target grey literature reports. The focus was on European outputs relevant to EBCP with a specific emphasis on digital tools that support knowledge management. The aim was to complement the academic literature review where insufficient literature was found to support the identification of drivers.

3.1.1. Eligibility criteria

The review included reviews of studies reporting perspectives from any stakeholder group involved in or affected by AI and evidence-use processes, such as patients, clinicians, healthcare professionals, researchers, policymakers, regulators and healthcare organisations. Eligible studies examined the use of artificial intelligence technologies, including machine learning, deep learning or GenAI, and/or processes related to evidence access, decision support or knowledge management in cancer care or public health. Only studies conducted in high income settings, were included, while those situated in low- or middle-income countries were excluded. Studies were required to address at least one DESTEP determinant, capturing trends or factors shaping the impact of AI on knowledge management and cancer control. Furthermore, only review articles (systematic, scoping, narrative or umbrella reviews) published in English between 2021 and 2025 were included. The review excluded randomized controlled trial (RCT) related reviews and all non-review publications.

The advanced operators used for the grey literature search were broader in scope. The inclusion criteria for the search focused on European reports related to cancer, cancer control, or evidences access; reports published between 2021-2025 mainly by EU institutions; reports that described the use or potential use of AI/GenAI-enabled tools for knowledge access, management or dissemination; public reports and reports published in English. The exclusion criteria for the grey literature search were clinical trials or treatment guidelines unrelated to knowledge access or management; national documents without EU-level relevance; reports that are not publicly accessible and reports published prior to 2021.

3.1.2. Search strategy

A comprehensive search strategy was designed to capture literature on AI, digital knowledge management for cancer-related evidence, stakeholder engagement with digital tools and outputs from the EBCP including trends, drivers, and conditions influencing future access to cancer knowledge, using the DESTEP framework. Searches were conducted in PubMed/MEDLINE, Embase, and Cochrane using controlled vocabulary and free-text terms related to AI, GenAI, knowledge management, data and digital innovations, trends and forecasting, drivers and barriers, decision support and cancer/public health.

The list of retrieved articles was imported into Covidence to clear out duplicates and proceed to the screening according to the PRISMA guideline. At this phase, all the literature gathered through the comprehensive search were included. The search strategy used for the different databases is included in appendix I.

For the grey literature, the following string was used:

site:europa.eu ("cancer" OR "European Beating Cancer Plan") AND ("AI" OR "artificial intelligence" OR "generative AI") AND ("knowledge access" OR "digital platform" OR "evidence dissemination").

3.1.3. Screening process

The articles were screened through the Covidence platform in accordance to the eligibility criteria. A two-stage process was applied consisting of title and abstract screening, followed by full-text screening. Prior to the first screening round, a calibration training was conducted to ensure the reviewers' shared understanding on the eligibility criteria.

During the first screening round, study titles and abstracts were reviewed by two reviewers, and all publications that initially met the criteria were included and assigned to specific DESTEP categories. If discrepancies required resolution, they were addressed through discussion among the reviewers and a third person.

The grey literature outputs were reviewed manually by one reviewer and screened based on their title/summary, followed by full-text review in accordance to the inclusion and exclusion criteria.

3.1.4. Data extraction and identification of drivers

After the full-text review, a set of 140 documents was downloaded from Covidence and organized into folders according to the DESTEP categories, noting that a single document could be assigned to more than one category. Data were extracted from the included records with a predefined form.

As part of the review process, AI/GenAI tools were intentionally used for data extraction to support clustering, and synthesis of determinants across a large and heterogeneous body of literature. This approach provided practical insights and hands-on experience into how AI-enabled tools can assist in structuring complex evidence, particularly by accelerating pattern recognition, supporting consistent categorisation, and facilitating comparative analysis across sources. For this, ChatGPT and Gemini were compared. ChatGPT (GPT-5.2 by OpenAI) was selected due to its relatively better ability to process uploaded files. The specific prompts used for data extraction are provided in appendix II. To validate the outputs of ChatGPT, a sample (n=29) of the papers were simultaneously subject manual extraction, and the results compared.

Next, the papers were categorised according to their corresponding DESTEP factor, and the following information was recorded in an Excel sheet: paper title, year of publication, DESTEP category, evidence, reference, and notes. Based on this process, the determinants influencing AI use and adoption were extracted. From the initial comprehensive list of determinants, each determinant was assessed, and similar or related items were merged, resulting in a final consolidated list.

The grey literature data extraction was performed manually to retrieve the following information: year of publication, source/institution, purpose of report, frameworks mentioned, and outcomes.

3.2. Identification of uncertainties and scenario development

The scoping review rendered a consolidated list of 30 drivers across all the DESTEP themes. This list was incorporated into a survey in which stakeholders were asked to assess each driver in terms of its level of impact and uncertainty.

Ranking the drivers in terms of current impact refers to the significant influence the driver may have on AI and knowledge management today. Ranking drivers in terms of uncertainty refers to the likelihood that this driver will continue to shape AI and knowledge management over the next 20 years. The impact scale ranged between high impact, medium impact, and low impact. The uncertainty scale ranged between uncertain, moderately certain, and very certain. All survey rankings were synthesised into numeric values. For each of the drivers individually, an average was calculated for both the impact and uncertainty.

To identify the most important uncertainties, all drivers were plotted on two axes, and the drivers with the highest impact and uncertainty were chosen as the critical uncertainties for further development of the scenarios.

Based on the critical uncertainties that were identified, four different scenarios were constructed representing a continuum from best-case to worst-case conditions. Each scenario was further elaborated with the contextual determinants identified as key drivers.

3.3. Stakeholder workshops

Three workshops were conducted to discuss the drivers and scenarios with different stakeholders. Two workshops were designed as consecutive two-hour online workshops with European stakeholders. A third workshop was conducted with Belgian stakeholders to provide a national perspective.

4. RESULTS

4.1. Scoping literature review and identification of trends

The scientific literature review initially identified 1,241 records. After 283 duplicates were removed, 958 titles and abstracts were screened, from which 205 full-texts were assessed for illegibility . The most common reason for exclusion was that the outcome did not address any DESTEP aspect, followed by studies that did not address AI or knowledge management, and those without full-text availability. A final set of 140 studies were included for extraction, as shown in Figure 3 below.

A total of 48 determinants were initially identified. However, many of these determinants overlapped conceptually and overlapped across themes. For example, the aspect of digital literacy was extracted as both a demographic factor as well as a social factor. Similarly, the concept of Equity was mentioned in multiple themes. To avoid duplication across themes, consensus was reach across to assign each factor to only one theme. Ultimately, a list of 30 determinants were classified according to the DESTEP framework (see definitions for each theme in Appendix II table 8):

- Demographic: 5 determinants (16.6%), referenced in 12 papers
- Ecological: 3 determinants (10%), referenced in 8 papers
- Socio-cultural: 6 determinants (20%), referenced in 56 papers
- Technological: 5 determinants (16.6%), referenced in 26 papers
- Economic: 5 determinants (16.6%), referenced in 18 papers
- Political/Ethical: 6 determinants (20%), referenced in 22 papers

The grey literature review started with an initial number of 109 reports. Through title and abstract/summary screening most reports were excluded due to lack of focus on AI tools and knowledge management, keeping 26 relevant reports that underwent full-text screening. A final list of 16 reports were found relevant, which included aspects of AI and digital tools utilisation, risks and possible future trends. Three additional papers were included to the compilation of grey literature through experts' suggestions. It is also important to note that the grey literature was used as complementary analysis for those DESTEP themes that did not render sufficient outputs from the scientific literature, and specifically to identify the Ecological drivers impacting the use of AI/GenAI for knowledge management.

A final list of 159 studies (140 from Covidence + 19 grey literature) were included for extraction.

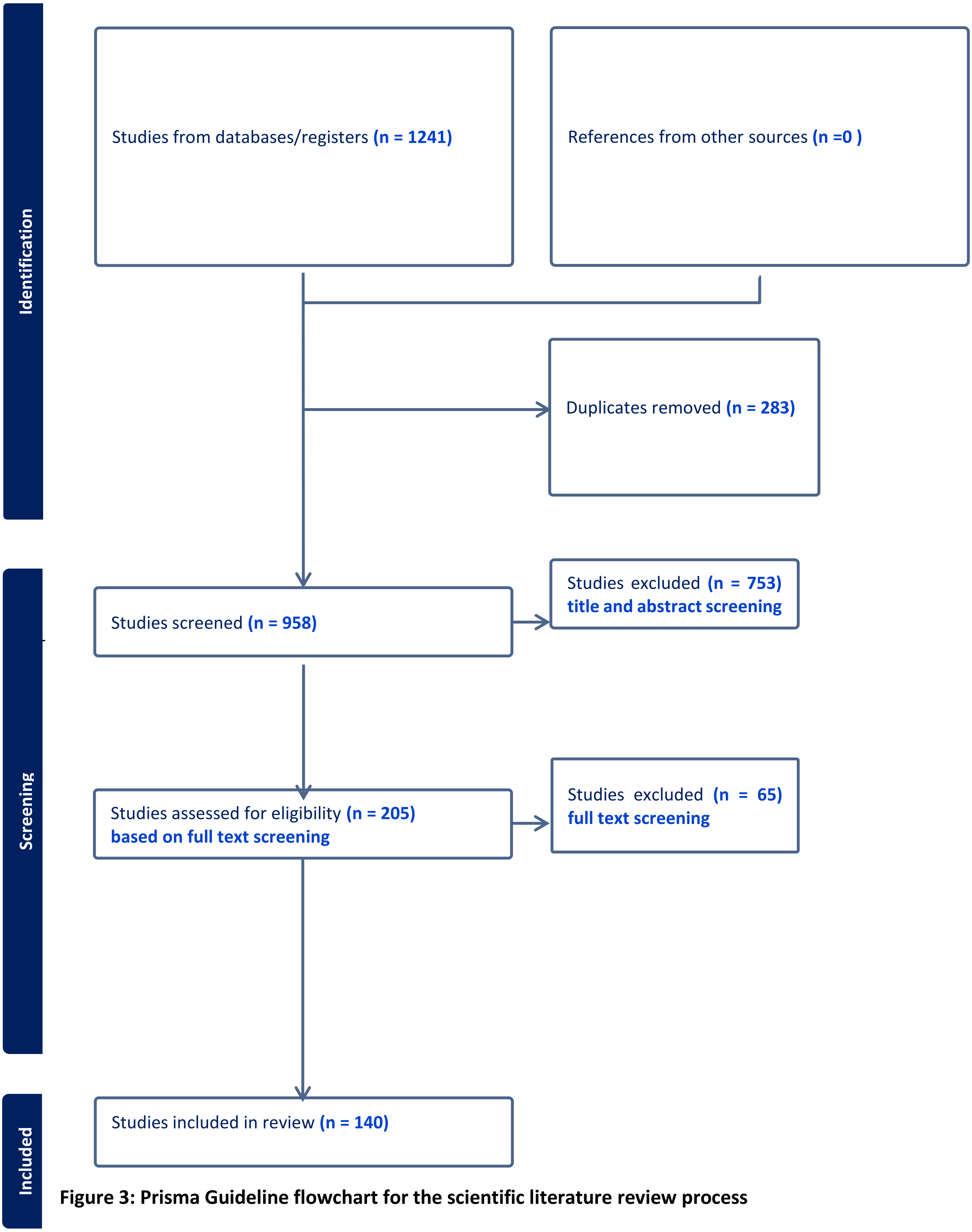

Figure 3: Prisma Guideline flowchart for the scientific literature review process

4.2. Validation of AI-assisted extraction

A random sample of 29 papers (out of the 140 final included studies, 21%) were selected for validation. Data extraction was performed manually through Covidence. Concordance between manual and AI-assisted extraction (using ChatGPT (GPT-5.2) by OpenAI) was assessed by identifying whether data extracted on the trends/determinants related to the use and uptake of digital tools were comparable.

Through this comparison it was found that 22 papers (76%) extracted the same information regarding possible determinants. For the remaining 7 papers (24%) it was noted that ChatGPT had excluded the papers from the analysis based on the given exclusion criteria. The reasons for exclusion were examined and only one paper had a valid reason for exclusion (an RCT that should have been excluded during the screening process).

4.3. Identification of uncertainties and scenario development

The survey was launched on October 14, 2025 and was circulated through multiple platforms. The survey remained active until November 10, 2025. A total of 36 responses were recorded and used for the analysis. The respondents represented 13 MS and two additional countries (see figure 4). Additionally, figure 5 provides an overview of the profiles of the respondents of the survey.

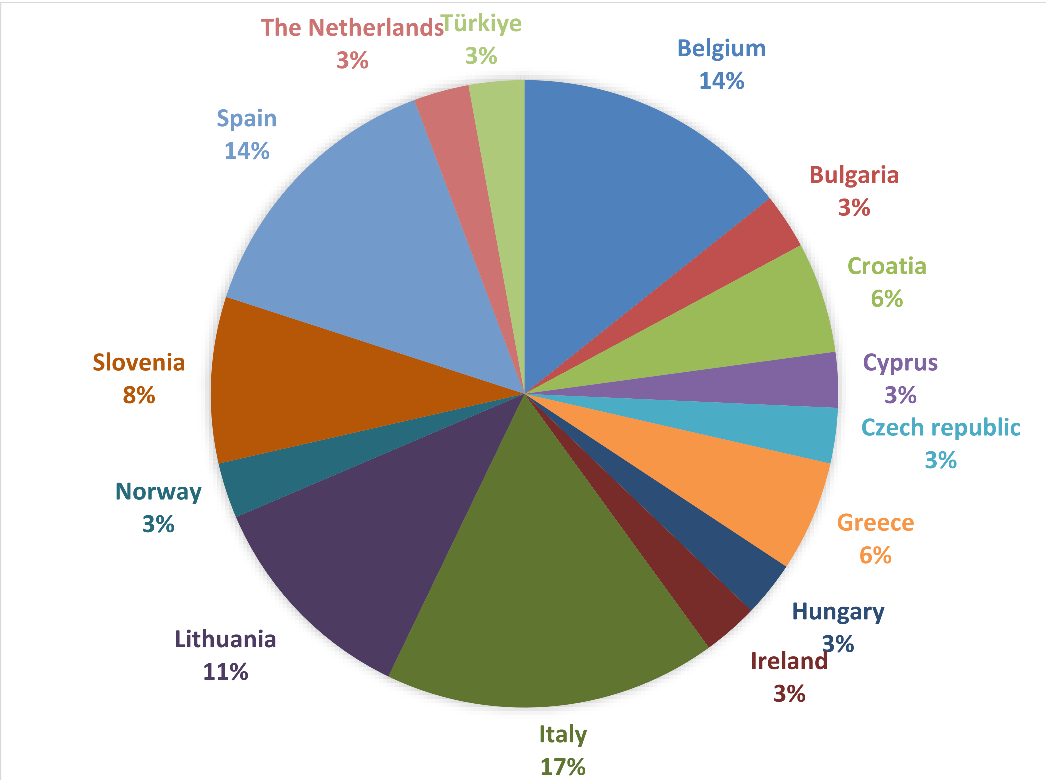

Figure 4: the participating countries

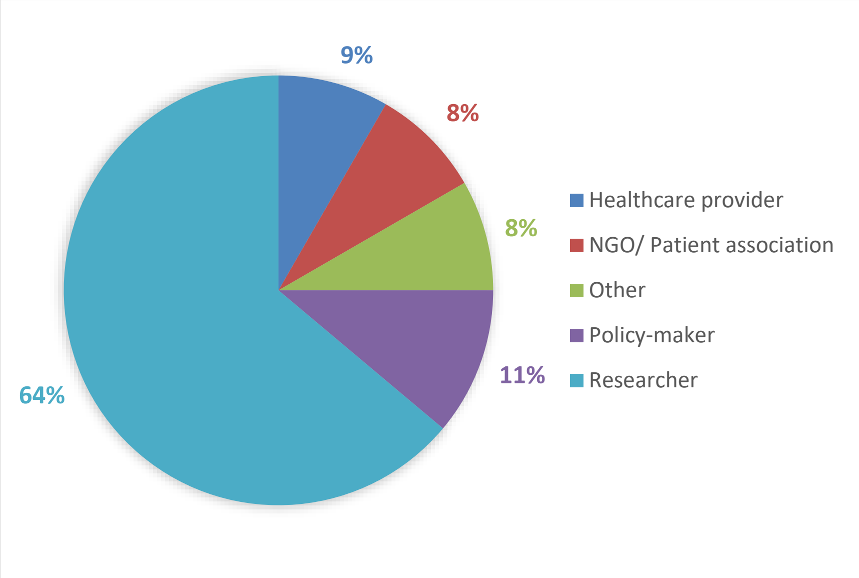

Figure 5: the profiles of the participants of the survey

To determine the average impact and uncertainty for each determinant, both scales were converted into numerical values. For the impact scale, high, medium, and low impacts were assigned values of 3, 2, and 1 respectively. Similarly, for the uncertainty scale, uncertain, moderately certain, and very certain were assigned values of 3, 2, and 1 respectively. Table 1 presents each determinant, its code and title, and the average impact and uncertainty averages.

Table 1: the final list of determinants synthetised through literature review including the impact and uncertainty averages from the survey

Code	Determinant Title	Determinant Statement	Impact	Uncertainty
D1	Gender Representation and Bias	Gender representation and bias influence how fairly and effectively AI systems serve and empower diverse users.	**2,0**	**2,2**
D2	Data Diversity	Biases stemming from uneven data representation affect the reliability and inclusivity of AI systems.	**2,6**	**1,7**
D3	Language and Cultural Context	Language and cultural alignment determine how well AI-generated knowledge is understood, accepted, and applied.	**2,5**	**2,0**
D4	Age and Generational Inclusion	Age-related differences in digital familiarity and trust shape patterns of AI adoption and engagement.	**2,6**	**2,1**

D5	Urbanisation and Infrastructure Access	Urbanisation and infrastructure disparities influence who can access, use, and benefit from AI-driven systems.	**2,5**	**1,9**
E1	Environmental Resources and Sustainability	Resource availability and environmental sustainability shape the scalability, design, and acceptance of AI technologies.	**2,5**	**1,5**
E2	Environmental Governance and Regulation	Environmental governance and regulatory frameworks influence how responsibly and transparently AI systems are developed and managed.	**2,0**	**1,8**
E3	Socio-Environmental Equity and Justice	Environmental inequality and social justice considerations affect who benefits from AI applications and how equitably environmental data and knowledge are represented and used.	**2,1**	**1,6**
S1	Trust and Transparency	Trust and transparency shape public and professional acceptance of AI systems and their outputs.	**2,4**	**1,6**
S2	Education, Literacy, and Socioeconomic Access	Education, digital and health literacy, and socioeconomic conditions determine the ability of individuals and organisations to engage with and benefit from AI.	**2,8**	**1,3**
S3	Cultural Norms and Acceptance	Cultural beliefs, values, and stigma influence societal openness to and engagement with AI technologies.	**2,4**	**1,7**
S4	Equity, Inclusion, and Social Fairness	Equity, inclusion, and fairness affect how AI systems distribute benefits and represent diverse populations.	**2,4**	**1,6**
S5	Communication and Stakeholder Engagement	Communication, education, and stakeholder participation influence understanding, trust, and collaboration in AI development and use.	**2,4**	**1,6**

S6	Personalised and Precision Medicine	The use of AI in personalised and precision medicine shapes how health systems generate, manage, and apply patient-specific insights.	**2,3**	**1,4**
T1	Data Interoperability and System Integration	Data interoperability and standardisation determine how effectively AI and knowledge systems share, connect, and reuse information.	**2,7**	**1,3**
T2	User-Centred Design and Usability	User-centred design and usability influence accessibility, engagement, and adoption of AI tools and platforms.	**2,4**	**1,3**
T3	Transparency, Explainability, and Algorithmic Fairness	Transparency, explainability, and fairness shape accountability, trust, and compliance in AI systems.	**2,4**	**1,6**
T4	Reliability, Accuracy, and Bias Mitigation	Reliability, accuracy, and bias mitigation affect the credibility, validity, and equity of AI-generated insights.	**2,6**	**1,4**
T5	System Efficiency and Responsiveness	System efficiency and responsiveness influence how quickly and effectively AI platforms process and apply information.	**2,3**	**1,6**
Ec1	Funding, Investment, and Incentive Models	Funding stability, investment models, and incentive structures determine the development, scaling, and sustainability of AI systems.	**2,6**	**1,7**
Ec2	Affordability and Cost Barriers	Affordability and cost constraints influence accessibility, inclusivity, and participation in AI-enabled knowledge systems.	**2,5**	**1,7**
Ec3	Cost-Effectiveness and Policy Alignment	Cost-effectiveness, economic evaluation, and policy alignment shape institutional adoption and long-term viability of AI solutions.	**2,3**	**1,8**

Ec4	Infrastructure and Resource Requirements	Infrastructure and resource demands affect the scalability, maintenance, and quality of AI and knowledge systems.	**2,6**	**1,6**
Ec5	Economic Equity and Access	Economic equity determines who can access, contribute to, and benefit from AI-driven innovation and decision-making.	**2,3**	**1,7**
P1	Data Protection, Privacy, and Consent	Data protection, privacy, and consent regulations govern how AI systems collect, process, and share information ethically and legally.	**2,5**	**1,5**
P2	Regulatory Oversight and Compliance Frameworks	Regulatory oversight, standards, and compliance mechanisms shape the safety, transparency, and accountability of AI development and deployment.	**2,5**	**1,5**
P3	Interoperability and Federated Governance	Interoperability policies and federated governance frameworks influence data harmonisation, portability, and cross-border collaboration.	**2,6**	**1,4**
P4	Accountability, Liability, and Professional Responsibility	Accountability and liability frameworks define how human and institutional actors share responsibility for AI-assisted decisions.	**2,3**	**1,7**
P5	Data Sovereignty and Geopolitical Governance	Data sovereignty and geopolitical governance determine how nations control, localise, and regulate AI infrastructure and data flows.	**2,3**	**1,9**
P6	Equity, Justice, and Inclusive Governance	Equity, justice, and inclusion principles guide the legitimacy, fairness, and public trust of AI policies and governance systems.	**2,3**	**2,0**

The following figure (6) presents all drivers plotted on a 2x2 matrix. The axes present the averages of the impact and uncertainty. Figure 6 presents the peripheral uncertainties (yellow), the background factors (blue), and the key drivers (green), and highlights the critical uncertainties (red). The critical uncertainties are those drivers found to be highly impacting the use of AI/GenAI for knowledge management of cancer, for which it is also highly uncertain how they will develop in the next 20 years. The key drivers are those constant determinants that are certain to continue having an impact on the use/uptake of AI for knowledge management in the future.

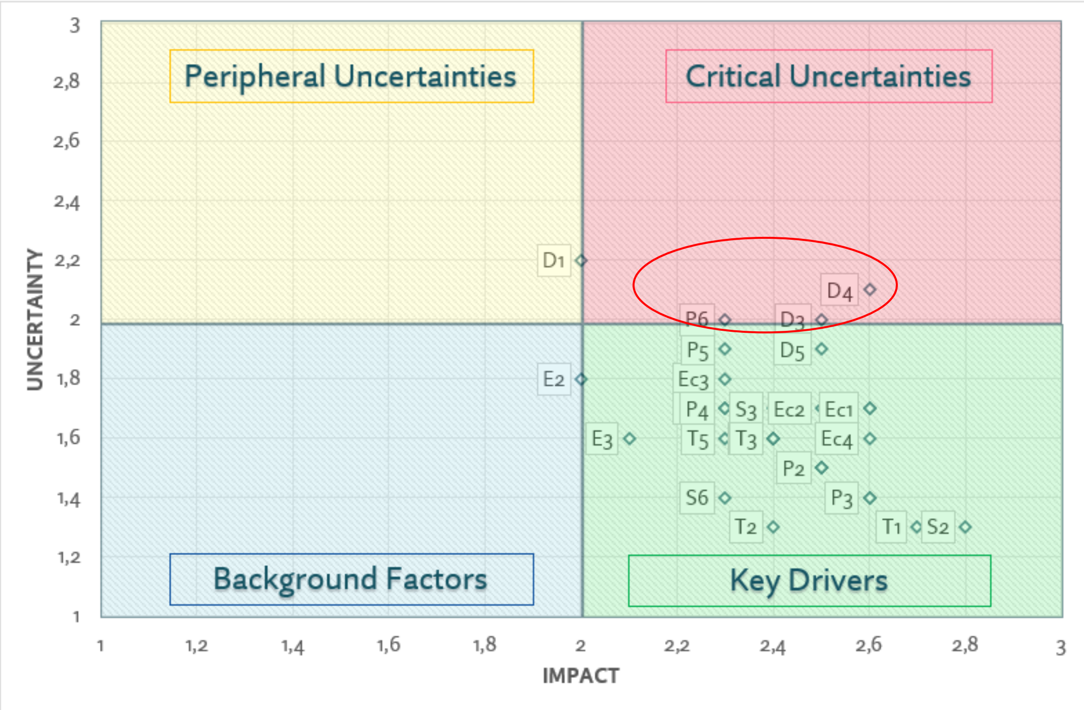

Figure 6: 2x2 matrix of impact versus uncertainty of all drivers, the critical uncertainties circled in red

Figure 6 highlights the three determinants that are considered within the limits of the critical uncertainty grid. These are the following:

- D4: Age and Generational inclusion
- D3: Language and Cultural context
- P6: Equity, Justice, and Inclusive Governance

Considering that both D3 and D4 are demographic determinants, it was decided to combine these two determinants, and together with the political determinants P6, they were taken as the basis for the scenario development.

4.3.1. <u>Critical uncertainties</u>

For the scenario development, each uncertainty is explained ranging from best to worst case.

For the **demographic uncertainty**; the uncertainty is based around the development of the technology and its inclusivity (both from the side of the AI being trained on varied data, as well as the user perspective where diverse populations do/do not feel represented). This uncertainty can develop in either of the following trends:

a. **AI-driven systems are tailored to individual contexts and populations, being representative, inclusive, and adaptive to linguistic, cultural, and generational diversity.** AI design, data, and interfaces reflect plural values, enabling equitable access and understanding across age groups and cultural settings. Systems evolve through participatory co-design, ensuring that differences enrich rather than fragment innovation.

b. **AI-driven systems are created generic to a majority of the population, overlooking linguistic, cultural, and generational differences.** Generic, one-size-fits-all designs dominate, privileging major languages, cultural norms, and digitally fluent populations. This results in biased outputs, exclusion of underrepresented groups, and widening generational and cultural divides in AI access and trust.

The **governance uncertainty;** the uncertainty is based on the environment in which the technology is implemented and embedded, and the following two trends are plausible:

a. **Ethical and political determinants of equity and justice are deeply/highly embedded within AI governance frameworks.** Governance structures are participatory, transparent, and representative. Diverse stakeholders and communities influence AI policy and oversight. Institutions address systemic inequities proactively, ensuring equal and just distribution of benefits.

b. **Ethical and political determinants of equity and justice are not sufficiently embedded within AI governance frameworks**. Governance remains dominated by elite, corporate, or political interests. Participation is superficial and lacks accountability. This reinforces inequalities rather than mitigating biases.

4.3.2. Scenarios

The scenarios were designed by matching all possible combinations of the trends for both critical uncertainties. Each scenario represents a plausible future state. Below are the four scenarios:

I.Scenario 1: AI Euphoria

This scenario describes a future in which an AI-enabled tool for cancer knowledge management is both advanced and inclusive. Outputs and evidence generated under the European Beating Cancer Plan (EBCP) are accessible, multilingual, and adapted to national and regional contexts. This enables coordinated policymaking, aligned clinical practice, efficient reuse of research outputs, and meaningful patient engagement. Robust regulatory and governance frameworks are in place, ensuring equitable access, transparency, and usability across stakeholder groups. The scenario is referred to as *AI Euphoria* as it represents a configuration in which the most favourable outcomes across the key uncertainties identified in Section 4.2.1 are realised simultaneously.

II.Scenario 2: Ghost Protocol

This scenario reflects a future characterised by strong regulatory frameworks and high levels of compliance, but limited practical usability and inclusivity of the AI-enabled tool. While the system fully adheres to EU requirements on ethics, data protection, and transparency, its outputs remain generic and insufficiently adapted to local, cultural, and linguistic contexts. As a result, stakeholders experience difficulties translating formally accessible evidence into actionable decisions or everyday practice. The scenario is labelled *Ghost Protocol* to capture the paradox at its core: a system that is formally present, compliant, and authoritative, yet largely intangible in daily use.

III.Scenario 3: Wild Wild Tech

This scenario captures a future in which weak coordination and governance undermine trust, coherence, and equity. A wide range of public and private AI-enabled tools are available, many of them technologically advanced and capable of addressing different contexts, languages, and user needs. However, the absence of shared governance frameworks, standards, and accountability mechanisms leads to fragmented and sometimes conflicting interpretations of EBCP evidence. This fragmentation generates uncertainty among policymakers, clinicians, and patients, and limits consistent access to, and effective use of, evidence-based knowledge.

IV.Scenario 4: Digital Doom

The final scenario describes a future characterised by weak coordination, limited accountability, and insufficient public oversight. AI-enabled tools for cancer knowledge management are largely generic, non-inclusive, and rigid, offering limited adaptation to diverse health system contexts. In the absence of clear governance structures, shared standards, and transparency mechanisms, inequalities persist and deepen, restricting meaningful access to evidence for less-resourced stakeholders and undermining trust in AI-enabled knowledge systems.

4.4. Stakeholder workshops

The first two, consecutive online workshops were conducted with international experts on November 3rd and November 17th 2025. The OriON partners were invited to join the workshops and were encouraged to invite national stakeholders that represent policy makers, researchers, healthcare providers, and patient organisations. The aim of the first workshop was to validate the drivers identified in the literature, and discuss stakeholders' perspectives regarding the potential use of an AI-enabled tool for knowledge management through a SWOT analysis. The second workshop focused on the developed scenarios and discussed strategic recommendations for each.

The third online workshop was organised on December 19th 2025 and included a variety of Belgian stakeholders. This workshop also focused on the scenarios and discussed strategic recommendations.

Sections 4.3.1 and 4.3.2 draw on EU-level expert workshops, while section 4.3.3 reflects a dedicated national-level (Belgian) expert workshop focused on strategic recommendations. Together, the analysis combines micro-level stakeholder conditions for engagement with macro-level strategic recommendations, generated in complementary expert workshops.

4.4.1. SWOT analysis

The first workshop was attended by 23 participants from across partner countries of the OriON JA. The participants presented their expectations and concerns regarding the potential of an AI-enabled tool for knowledge management of the EBCP knowledge and evidence.

Through a SWOT analysis, the following strengths, weaknesses, opportunities and threats were identified in table 2. The strengths and weaknesses represent the experts' general opinions and current experiences with different AI tools for knowledge management. The future threats and opportunities focused on the potential AI-tool to be created for knowledge management of EBCP outputs.

Table 2: the SWOT results from the first workshop with OriON partners

<table>
<tr><th>STRENGTHs</th><th>WEAKNESSES</th></tr>
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Improved efficiency and productivity
Streamlines workflows, time efficient, supports limited human resources, and accelerates routine tasks (e.g. drafting, proofreading texts, and summarising documents).
Process optimisation and pattern recognition
Helps identify trends, similarities, and recurring issues across large volumes of information and documents.
Decision-making support
Assists with structuring information, comparing options, and supporting evidence-informed decisions.
Support to health communication
Improves accessibility of knowledge by searching, summarising, and synthesising existing evidence and outputs.
Infrastructure and operational readiness
Most tools can currently be integrated into existing digital infrastructures for certain operational tasks.

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Reliability and accuracy issues
Risk of misinformation, and inconsistent quality of outputs, no built in verification processes.
Lack of transparency
Limited insight into how outputs are generated and which sources are used, the “black-box” effect.
Accountability gaps
Risk of unclear responsibility for decisions and outputs, lack of ownership by relevant stakeholders.
Skills and capacity gaps
Limited digital literacy and insufficient knowledge of prompt design and AI capabilities.
Speed and availability constraints
Performance may be inconsistent depending on task complexity and system availability.
Dehumanisation and cognitive risks
Risk of over-dependency, reduced human oversight, diminished creativity, and constrained “out-of-the-box” thinking.
Language limitations
Uneven performance across languages and contexts.

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<tr><th>OPPORTUNITIES</th><th>THREATS</th></tr>
<tr><td>

Improved evidence identification and monitoring
Searching for good practices and peer initiatives, tracking outputs and outcomes dynamically, checking availability and timeliness of relevant documents, providing

</td><td>

Over-reliance on GenAI
Risk of intellectual laziness, reduced strategic thinking, loss of diversity in problem-solving, and neglect of non-AI resources.

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an overview of EU projects and identifying overlaps with existing solutions. • **Faster translation of evidence into action** Converting outputs into policy-maker-friendly recommendations, supporting dashboards and visualisations for decision support. • **Capacity building and uptake of digital tools** Increased awareness and willingness to use digital tools, more interactive training formats, guidelines and training on effective prompt design. • **Targeted interventions and equity monitoring** Tracking inequalities, supporting more targeted and data-driven interventions.	• **Lack of trust and high uncertainty** Skepticism due to opacity, inconsistent quality, and limited explainability. • **Risk of false or unverifiable results** Difficulty checking outputs may lead to flawed decisions. • **Environmental impact** High energy and water consumption linked to data centres. • **Social and economic risks** Potential job displacement, widening inequalities, and uneven access to benefits. • **Bias, intellectual property, and security concerns** Embedded biases in models, IP risks, data security issues, and dependency on non-EU providers (e.g. US/China). • **Reduced collaboration** Risk of weakened networking and peer exchange if tools replace human interaction.

The SWOT results indicate that the experts perceive AI/GenAI as tools to improve efficiency, support the use of evidence, and make information easier to access, especially where resources are limited. However, their use could be limited by reliability, transparency, accountability, and digital skills. While there are clear opportunities to improve monitoring, visualisation, training, and the translation of evidence into practical outputs, these benefits must be balanced against risks such as over-reliance, lack of trust, ethical and environmental concerns, and external dependencies. A careful and well-governed use of these tools, with strong human oversight, is therefore needed.

4.4.2. Stakeholder engagement under contrasting futures

In the second workshop, 21 participants joined from the partner countries of the OriON JA. This workshop examined conditions for stakeholder engagement with an AI-enabled tool for EBCP under two contrasting future scenarios: Scenario 1 *AI Euphoria* and Scenario 4 *Digital Doom*. These two scenarios represent opposite contexts of high advancement and trust with regards to AI use, versus high caution towards digital technologies. The workshop asked the experts to envision the use by four stakeholder groups: policy-makers, researchers, healthcare providers, and the general public.

The results show that stakeholders' willingness to use the tool depends strongly on the broader context, but also that some needs remain the same in both situations.

Table 3 summarises the contrasting requirements and conditions under which different stakeholder groups would engage with the AI tool, in the two extreme future scenarios. It highlights the conditions focused on usability in *AI Euphoria,* and the conditions focused on control, caution, and risk mitigation in *Digital Doom*.

Table 3: requirements for engagement per stakeholder group across the two extreme scenarios

Stakeholder	Scenario 1: AI Euphoria	Scenario 4: Digital Doom
Policy-makers	• High willingness to use the tool • User friendly interface • Short, clear summaries • Results can be trusted • Transparency and reproducibility required, but not restrictive • The tool fits with policy priorities • Data are up to date • Training focused on critical interpretation	• Strong caution and reluctance • Clear explanation of tool limitations • Strict oversight and governance • Concern about societal and political impacts • Risk of misuse (e.g. propaganda) must be addressed • Preference for simple and clearly bounded outputs
Researchers	• Outputs are clearly evidence-based • Transparent data sources and selection criteria • Interoperability with other research systems • Training and strategic development plan expected • Supports hypothesis-driven research	• High level of skepticism • Uncertainty about added value • Strong focus on data source and transparency • Use often driven by obligations rather than interest • Desire for a future scale-up or exit plan
Healthcare providers	• Generally positive attitude • User-friendly and simple design • Reliable and reproducible outputs • Comparable data across regions or countries • Fits into existing workflows and IT systems • Training and time to use the tool	• Cautious and pragmatic approach • Need to know how useful and up to date the tool is • Strong emphasis on reliability • Critical validation of outputs required • AI seen strictly as a support tool, not a decision-maker
General public	• High interest and openness • Simple, clear, non-technical language • Easy access and intuitive use • Transparency about data used • Information relevant to different types of stakeholders • Ongoing education and explanation	• Guarded engagement • Strong concerns about data privacy • Need for simplicity combined with critical awareness • Clear explanation of risks and limitations of AI • Tool must work across different platforms • Tool should be widely accessible

From the results above, expert inputs indicate that willingness to engage with the AI tool varies substantially by the two extreme scenarios. In scenario 1 *AI Euphoria*, engagement is facilitated by perceptions of usefulness, efficiency, and user friendliness. In contrast, under Scenario 4 *Digital Doom*, engagement becomes conditional on risk mitigation, governance frameworks and structures, and transparency of system limitations. However, in both situations, trust, transparency, and training remain essential. These findings help define the minimum and maximum engagement conditions under which the AI tool for EBCP could be used, and they provide an important reference for the strategic recommendations developed in the third workshop.

4.4.3. Strategic recommendations across scenarios

The third workshop was attended by 55 Belgian stakeholders. This workshop was designed as a dedicated national-level expert workshop, focused on strategic recommendations. The four scenarios were presented to the stakeholders. Thereafter, the stakeholders were divided into four groups which separately discussed one scenario each to agree on three main strategic recommendations for an AI-enabled tool for knowledge management, that ensures equitable access to EBCP evidence in Belgium under the specific scenario.

The following recommendations were suggested during the discussions:

1. **AI Euphoria:**
    I. Multilingual and regional contextualisation should be a core performance requirement, with the tool natively embedding language capabilities and system-level knowledge to ensure outputs are accurate, relevant, and meaningful across different local contexts.

    II. Robust quality control should govern all data inputs by limiting initial data entry and validation to designated domain experts and applying layered governance mechanisms to ensure accuracy, reliability, and trust before wider access is granted.

    III. The tool should prioritise broad user adoption while incorporating a transparent, continuous feedback loop that enables users to directly support rapid and efficient optimisation.

2. **Ghost Protocol:**
    I. Structured education and training should be provided to all stakeholder groups to ensure they understand how to use the tool, what value it offers, and how it can support their specific roles and decision-making processes.

    II. Key stakeholders should be systematically involved in the continuous improvement of the tool, with their needs translated into clear, actionable configurations and functionalities.

    III. Outputs should be presented in clear, inclusive, and understandable language, translating complex technical and policy information into formats accessible to all users, including patient organisations and stakeholders across governance levels.

3. **Wild Wild Tech:**
    I. The tool should clearly reference the sources of its knowledge, including the underlying evidence base and the number and type of projects contributing to it, to ensure transparency and credibility.

    II. Oversight should be ensured through a European-level reference group, supported by trusted governance frameworks at national level and harmonised international standards to enable reliable data exchange and consistency.

III. A structured training system should be implemented to enable stakeholders to critically assess and distinguish between high-quality and lower-quality tools and outputs.

4. **Digital Doom:**

I. Capacity-building and structured stakeholder consultation should be strengthened through existing regulatory frameworks, such as EHDS and the AI Act, to build trust, improve equity, and ensure meaningful input from patient organisations and other key actors across European, national, and commercial levels.

II. A clear evidence category should be defined within the EHDS framework to establish harmonised standards for EBCP evidence, addressing data quality, interpretation, transparency, and interoperability across systems.

III. Clear distinctions between non-public and publicly available outputs, with upfront definitions agreed at project level to balance transparency, data protection, competitiveness, and the practical usefulness of AI-supported tools.

In addition, the groups were asked to formulate an actionable recommendation for the next 2-3 years to prepare for and facilitate or avoid their different scenarios (table 4).

Table 4: actionable recommendations for preparedness across all scenarios

Scenario	Action
1) AI Euphoria	• Develop an in-house AI tool that is grounded in national system knowledge, uses validated and appropriate data, and is accompanied by broad AI literacy and training programmes to support safe, responsible, and effective use across all stakeholder groups.
2) Ghost Protocol	• Establish a structured process to bring all relevant stakeholders together to identify, prioritise, and document their needs, ensuring the tool is designed and implemented in line with real user requirements.
3) Wild Wild Tech	• Mandate user-focused AI literacy and training for decision-makers and future users to ensure the ability to assess evidence quality, and require interoperability as a binding condition for EU-funded digital and AI tools.
4) Digital Doom	• Formally define what constitutes “knowledge” and “evidence,” and require structured engagement with a broad range of stakeholders, including patient organisations and representatives from different countries, to ensure shared understanding, legitimacy, and trust.

Overall, the workshops highlighted the following recommendations to support equitable access to EBCP evidence across scenarios:

1. **Trust and transparency through quality and governance:** AI-enabled knowledge management tools should be grounded in validated, high-quality evidence, with transparent source referencing and robust governance aligned with frameworks such as the EHDS and the AI Act.
2. **Design for inclusiveness and real user needs:** Tools should be user-centred, multilingual, and context-aware, ensuring accessible and equitable use by policymakers, clinicians, patient organisations, and other stakeholders.
3. **Invest in capacity-building, training, and continuous engagement**: Structured AI literacy programmes and formal mechanisms for ongoing stakeholder consultation should be established to support informed use and continuous improvement.
4. **Ensure interoperability and long-term sustainability:** Interoperability with existing systems and harmonised standards should be mandatory, supported by national system knowledge and coordinated European oversight to ensure durability and scalability.

5. CONCLUSION

This study applied a structured foresight and stakeholder engagement approach to explore the future use of artificial intelligence (AI) and generative AI (GenAI) for cancer knowledge management in the context of the European Beating Cancer Plan (EBCP). The analysis combined a scoping literature review, an expert survey, scenario development, and multi-level stakeholder workshops conducted at EU and national level. In doing so, the study examined both the prospective role of AI-enabled tools for structuring and disseminating cancer-related EBCP outputs and evidence, and the practical implications of using GenAI within evidence synthesis processes themselves.

From the scoping review, a consolidated list of 30 drivers influencing the use of AI for knowledge management, was mapped across the DESTEP framework. As part of the review process, ChatGPT was intentionally used to support data extraction, clustering, and synthesis of determinants across a large and heterogeneous body of literature. This approach provided practical insights into how AI-enabled tools can assist in structuring complex evidence, particularly by accelerating pattern recognition, supporting consistent categorisation, and facilitating comparative analysis across sources. However, the study also demonstrated the continued need for expert oversight is crucial, as regular human checks were required to validate outputs and interpretation and resolve conceptual overlaps.

Furthermore, the survey validated the list of literature-extracted drivers, and enabled their prioritisation according to perceived impact and uncertainty by experts. This process led to the identification of two critical uncertainties expected to shape the future use of AI-enabled tools for EBCP knowledge management. These are: (1) the extent to which AI systems evolve to be inclusive of linguistic, cultural, and generational diversity, and (2) the degree to which equity, justice, and inclusive governance are embedded within AI governance frameworks and regulations. The scale of the two uncertainties formed the basis for four plausible future scenarios: *AI Euphoria, Ghost Protocol, Wild Wild Tech*, and *Digital Doom*. The four scenarios illustrate potential trend developments of the critical uncertainties from trusted and inclusive systems to fragmented, generic, and weakly governed systems.

The stakeholder workshops validated the relevance of the identified drivers, and explored the engagement conditions across contrasting futures. Participants consistently recognised the potential of AI/GenAI to improve efficiency, accessibility, and evidence use, particularly in resource-constrained policy and healthcare environments. However, the discussions also highlighted persistent concerns related to reliability, interpretation and accountability, skills gaps, and the risk of over-reliance on automated outputs. These concerns mirror the lessons learned from the study's own use of GenAI for evidence structuring, reinforcing the importance of transparency, traceability of sources, and clearly defined roles for human oversight. Across all scenarios, trust, transparency, and continuous training emerged as necessary requirements for meaningful engagement. The strategic recommendations developed across scenarios show a consistent set of priorities, including multilingual and contextualised outputs, layered quality control and accountability mechanisms, interoperability and shared EU/national standards, structured stakeholder engagement, and sustained investment in AI literacy and training.

To conclude, the study demonstrated that use of AI/GenAI to support knowledge management of the vast amount of evidence and outputs from EBCP has clear added value for the different types of stakeholders. Most importantly, to ensure trust and equitable access, experts and stakeholders stress that any AI-enabled tool must be deployed within clear governance arrangements, with sustained human oversight, and a minimum requirements of safeguards.

Limitations

The study has several limitations. First, while the use of ChatGPT for data extraction and synthesis was an intentional component of the study design, its performance is influenced by prompt formulation. Although the extracted determinants were reviewed and validated by the research team during ChatGPT-assisted extraction, the potential for under-sampling, partial omissions, framing effects, or interpretative bias cannot be fully excluded. This was evident during validation (Section 4.2), where ChatGPT excluded 24% (n = 29) of the sampled studies. However, given that two thirds of the papers were concordant during validation, and that experts were invited to comment on or add trends through the survey and workshop, the extracted information was considered sufficiently exhaustive.

Second, the survey involved 13 MS and a total of 36 participants. While the study captured a broad range of informed perspectives, it does not provide statistically representative coverage of all MS or stakeholder groups.

Third, the scenario development is inherently exploratory and qualitative in nature. The scenarios presented are not predictions, but are structured representations of plausible futures intended to support strategic reflection and preparedness actions.

Finally, the rapid evolution of AI technologies and regulatory frameworks means that some assumptions and findings may change over time. Continued monitoring, iterative assessment, and repeated stakeholder engagement will therefore be necessary to ensure the relevance of conclusions and recommendations.

APPENDIX I

The following tables present the terms used for the scientific literature review. To cover all the DESTEP dimensions, the search strategy consisted of a core block and a separate search for each dimension. Thus, the search was conducted six times to cover each DESTEP dimension. The combination of both was used across the databases.

Table 5: Core block for search strategy

Concept	MeSH Terms	Free-Text Keywords Title/abstract
Health	"public health" [Mesh], "population health" [Mesh], "Neoplasms"[Mesh], "Oncology Service, Hospital"[Mesh],	cancer, "cancer care", "cancer prevention", "cancer control", "European Beating Cancer Plan", EBCP, oncology
Knowledge Management	"Information Services"[Mesh], "Evidence-Based Practice"[MeSH], "Implementation Science"[MeSH], "Health Information Exchange"[MeSH],	"knowledge*", "evidence*", "data*", "disseminat*", "access", usability, "user experience", accessibility, human-centered design, decision*, use, "scaling", "adoption", information, "health information"
Data and digital innovations	"Artificial Intelligence"[Mesh], "Generative Artificial Intelligence"[Mesh]	"natural language processing", "AI", "generative AI", "machine learning"
Trends & Forecasting	"Forecasting"[Mesh], "Trends"[Subheading], "Diffusion of Innovation"[MeSH],	"trend*", "future", "pattern*", "forecast*", "foresight*", "emerging*"
Drivers & Barriers	"Implementation Science"[Mesh]	"impact", "driver*", "factor*", "barrier*", "facilitat*", "determin*"

Table 6: DESTEP dimensions separated search strategy

DESTEP Dimension	MeSH Terms	Free-Text Keywords
Demographic	"Demography"[MeSH], "Age Factors"[MeSH], "Educational Status"[MeSH], "Socioeconomic Factors"[MeSH], "Population Dynamics"[Mesh], "Epidemiologic Factors"[MeSH]	"ineq*"
Economic	"Health Care Costs"[MeSH], "Health Expenditures"[MeSH], "Cost-Benefit Analysis"[MeSH], "Economics"[MeSH],	"health economics", 0"resource allocation", "digital inequality", "reimbursement",

	"Health Care Economics and Organizations"[MeSH]	"digital investment", "ROI", “return on investment”
Social	"Trust"[MeSH], "Social Determinants of Health"[MeSH], "Social Values"[MeSH], "Social Norms"[MeSH], "Physician-Patient Relations"[MeSH], "Behaviour*"[MeSH], "Information Seeking Behavior"[Mesh]	“digital literacy”, “health literacy”, “public trust”, "patient perception*", "clinician attitudes", "trust in technology", "values", "data sharing perception*”, “mis-information”, “fake news”, “social media”, “ethic*”, “ineq*”
Technological	"Technology"[Mesh], "Medical Informatics Applications"[Mesh], “Telemedicine” [Mesh]	eHealth, “digital health”, “mHealth”, interoperability, visualisation*, “GIS”
Ecological	"Ecology"[Mesh], “Ecological and Environmental Phenomena” [Mesh]	
Political / Legal	"Data Protection"[Mesh], "Legislation, Health"[Mesh], "Legislation as Topic"[MeSH], "Health Policy"[MeSH], “public policy” [Mesh], "Policy Making"[Mesh],	GDPR, “data governance”, “AI Act”, “EU health policy”, "EHDS", "General Data Protection Regulation", "cross-border health data", "digital governance", "eHealth strategy", “primary use of data”, “Secondary use of data”

APPENDIX II

The following paragraph includes the prompts that were used for data extraction in ChatGPT:

Table 7: The prompts used during the data extracting by ChatGPT

	Sentence	Action
1	Please execute the data extraction using the content from the provided source files, focusing ONLY on the (DESTEP category).	Restricted the analytical scope strictly to the specified DESTEP category and excluded all others.
2	Extraction Criteria:	Switched to a DESTEP category definition extraction mode and treated all following instructions as mandatory constraints.
3	DESTEP Category Focus: The extraction must align with the definition of the (DESTEP category definition).	Anchored interpretation strictly to the annex definition and excluded ambiguous determinants unless clearly justified.
4	Table Structure: Use the following column structure precisely.	Locked the table schema and ensured one determinant per row without altering column names or order.
5	Name of Paper (and authors)	Extracted full paper titles and author names to ensure traceability.
6	Year of Publication	Recorded the final publication year only.
7	DESTEP Category	Explicitly labelled the determinant under the specified DESTEP category. for traceability and interpretability.
8	(DESTEP categorie) Factors Influencing AI Use and KM impact	Extracted only determinants directly influencing AI use or adoption and KM impact.
9	Evidence (with numbers)	Captured all quantitative data verbatim and excluded non-relevant figures.
10	Reference (Pages)	Recorded exact page numbers or ranges where the determinant appeared.
11	Notes	Documented qualitative discussion without interpretation.

12	Extract any quantitative data and place it in the Evidence column.	Separated numeric evidence strictly from qualitative notes.
13	If no numeric evidence is present, write ‘No quantitative data’.	Explicitly filled the evidence field with ‘No quantitative data’ when applicable.
14	Record qualitative discussion in the Notes column.	Summarized the type of qualitative mention present (e.g. barriers, perceptions).

Table 8: Definitions provided to ChatGPT regarding the DESTEP categories

Dimension	Purpose in Foresight	Example Drivers	Example Uncertainties
Demographic	Assess population-related factors shaping engagement with AI-driven knowledge tools	Aging population, increasing digital literacy, urbanization	Unequal AI adoption by age, education, or region; unknown future digital skill disparities
Economic	Examine funding, affordability, and system-wide investment in digital tools	Investment in AI, funding for cancer data platforms, cost-effectiveness of LLMs	Variability in national budgets; sustainability of digital infrastructure
Social	Explore societal trust, literacy, and behavioural trends related to digital health tools	Growing reliance on online info, rising health literacy, normalization of AI	Clinician resistance to AI, misinformation spread, data-sharing concerns
Technological	Track the evolution and integration of AI and generative AI tools into cancer knowledge	Advances in LLMs, usability of portals, platform integration	Reliability of AI in healthcare, standardization gaps, pace of generative AI adoption
Ecological	Assess the environmental impact and sustainability of digital transformation	Interest in carbon-aware computing, EU green digital policy	Regulatory lag on sustainability; high energy use of LLMs and data centers
Political / Legal	Evaluate the enabling or restrictive effects of regulation and governance structures	GDPR, EHDS, EU AI Act, digital governance frameworks	Interpretation of AI laws, cross-border data access restrictions, secondary data regulation