TECH GROW
VET training on technological watch

Implementation Guide for a Technology Watch System

Empowering Innovation: Mastering the Essentials of Technological Watch for Organisational Competitiveness

Co-funded by the European Union

Guide for the implementation of a technology watch system

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Objective

This comprehensive guide aims to equip learners with the essential knowledge, skills, and competences for effectively implementing a technology watch system. Participants will gain a deep understanding of the concept, purpose, and importance of technology watch, along with practical insights into the processes involved.

By the end of this training guide, participants will be able to identify relevant sources of information, utilise appropriate tools and techniques for data analysis and define roles within a technology watch team. Furthermore, they will develop the capability to compile insightful technology watch products and present findings in a clear and concise manner.

This training module empowers participants to play a key role in driving innovation and competitiveness within their organisations.

Content

1. Introduction

At the end of the year 2000, the threat posed by the overload of information to personal productivity and, by extension, to the productivity of organisations began to be observed. Technology Watch is one of the available solutions for organisations to analyse and comprehend the strategic information.

The objective of Technology Watch is the periodical and continuous collection of information related to the strategic aspects of each organisation and its transformation into added value in form of knowledge. To achieve such a goal, it is necessary to rely on a set methodology to ensure that the collection, processing and putting into value of such information is carried out efficiently and effectively.

The main questions that Technology Watch seeks to answer include:

- What are the main lines of research?
- What emerging technologies are appearing?
- What do competitors do?
- Who are the leaders? (Research centres, teams, people...)

For an organisation to innovate in its processes or products, it must be updated on all the developments within its sector or industrial activity. With this knowledge in hand, an analysis of opportunities and threats can be developed and decisions made.

The main objective of watching all the aspects involved in an organisation is to enable it to exploit the information and, in doing so, achieve improvements making the right decisions. A proper Watch and Strategic Intelligence implementation in an organisation makes it possible to retrieve relevant information and reveals opportunities or threats to act upon them according to their goals.

The strategic management of information is essential in an organisation, and that is why a collaborative use of a Technology Watch System is a great benefit

2. Technology Watch Process

The process of technology watch encompasses several phases: Identification of information needs, sources of information and means of access, planning of its execution, search and information processing, valorisation of the information, dissemination and storage, and results and decision making (Figure 1).

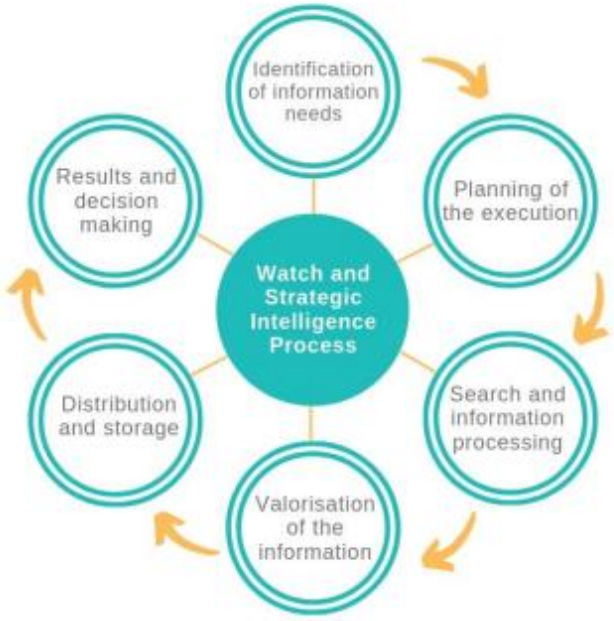

Figure 1 Technology Watch Process

2.1 Identification of information needs, sources of information and means of access

When an organisation considers carrying out a Technological Watch system, the first step is to identify their information needs.

As stipulated in the standard UNE 166000:2018, the identification of information needs can be performed starting from one or more factors, such as:

- The analysis, evolution or new applications of the products, processes, materials and basic technologies of the organisation
- Claims expected or manifested by internal or external stakeholders
- Socioeconomic, legislative or normative evolution
- Projects or actions of the competition

Within this phase, the organisation must identify the Watch and Intelligence areas., Progress should be made on the available sources of information for the identified areas and the keywords that will be used.

For each one of the information sources that are identified, a **frequency** (daily, weekly, monthly, etc) should be defined for its consultation., depending on the update of the information in each of them.

There may be some common areas when it comes to monitoring and, generally, it is important to monitor them for a long period of time (Watch Factors). There are other aspects that are aligned with the organisation's strategies which are better reviewed in the short term (Critical Watch Factors).

In turn, the organisation must also provide information on the type of product that will be manufactured based on the Watch and intelligence system and its content.

2.2 Planning of the execution of the Technology Watch

During the **planning phase,** the needs of each organisation must be assessed, which is usually followed by two planned actions:

- Research on unknown areas
- Monitor news on known areas

Watch and Strategic Intelligence is a continuous process. Therefore, the organisation must establish a structure, a frequency and ensure the updating of the systematic monitoring of developments in the identified areas.

The involvement of all the departments of the organisations in the Watch and Strategic Intelligence system will ensure that their needs will be fully covered and, additionally, is likely to be better accepted by the organisation as a whole.

Employees will also learn how to act, why their contribution is necessary, and what they can expect in return.

2.3 Search and Information processing

Once the **sources of information** are already selected, the search and selection of the information takes place. Search strategies, such as descriptors, keywords, terminology, etc., must be applied in this case.

The search performed by each technician, according to the criteria established in the previous stages, shows a series of results that must be analysed to be able to assess whether they are of interest for the organisation. The **search strategies** used during this phase can be very useful in the later stages of processing and valuing the information.

The treatment of the information is conditioned by the quality of the sources that have been previously selected.

In this phase, validating the information is required: verifying the suitability and veracity or reliability of the information.

The information will become quality information when it matches the information needs initially raised.

Information must be validated while it is processed in order to finally transform it into knowledge.

If the information retrieved is simple, or is not a large amount of information, a manual treatment may be applied.

However, if the volume of information is huge or the information retrieved is complex, the treatment is more advanced. Once the preparation is completed, the initial treatment (exploratory analysis) is carried out, differentiating as a rule of thumb between structured information (data series) and unstructured information (texts, images, graphics).

After obtaining the results of these initial analyses, the mathematical or statistical analysis phase follows. In this phase, different techniques may be used depending on the problem to be solved. Some examples of the applied techniques are:

- Statistical inference
- Regression models
- Machine Learning

2.4. Valorisation of the information

Assessing the quality and reliability of the information and determining its usefulness for the company is one of the most important parts of the Watch and Strategic Intelligence process. That is why the organisation must have the necessary capabilities and resources (human and technological) to analyse the flow of raw information from a wide variety of information sources.

The information gathered should be used with the objective of facilitating the process of taking decisions. Raw information will be treated to transform it into knowledge. To take the best possible decisions based on the results of the analysis, information should be contextualised.

Generally, this phase is carried out by an analyst with both technical knowledge and analytical skills.

The analysis of the information will depend on the volume of information to be processed, the content or nature of the information, and the format or structure in which it is found.

The value setting of the information includes the following aspects:

- Integrating data from different sources to achieve a correlation
- Interpreting information to determine what is accurate and what is relevant to make decisions
- Representing information graphically or with infographics to facilitate their understanding
- Understanding the analysis and its possible implications and consequences for the organisation
- Recommendations for action for the consumer.

The main types of competitive analysis are displayed in the table below:

Type of analysis	Description
Comparative analysis	Characteristics of products and services with respect to those of the competition.
SWOT Analysis	Situation of the company, threats and environmental opportunities, strengths and weaknesses of the organisation
Benchmarking	Gaps in products and services with respect to the best practices in relation to the company.
Porter forces	It allows to interpret the interrelations, forces and environmental actions that determine the level of company competitiveness.
Competitors profile	Business profile, target and capabilities competitive of other companies.
Market segmentation	Market analysis by type of client and turnover.
Competitive positioning	It evaluates factors that impact the performance of each company in terms of the market and the benefits to improve the competitive position.

PEST analysis	Identifies the environmental factors that impact the company: political, economic, social and technological factors.

2.5 Distribution and storage

The dissemination of information within the organisation is one of the objectives of Technology Watch: adequate information must be provided to the right person for decision making. The communication policy of the organisation must be known and used by all team members.

A Technology Watch System is useless if the recovered information is not received by the appropriate person. The already processed information should be conveniently stored as defined and should be retrievable and accessible. The Watch and Intelligence product should be distributed to the interested parties of the organisation according to their needs.

Innovation management in an organisation should promote a collaborative learning environment that encourages the spontaneous exchange of information.

Therefore, the information needs should be well known in order to distribute the information to the interested parties of the entity according to their needs.

Sometimes, the existence of a common and collaborative repository is enough to store the results of the monitoring process. All the members of the organisation have easy access to such repository and, therefore, to the results.

However, sometimes the information needs are individual and must be communicated to the person in a personal way.

The alternatives for disseminating the results are almost limitless: in a formal way (written communications) or an informal way (meetings, emails, telephone calls, etc.)

The dissemination of information should follow very important confidentiality guidelines. It is important to spread the information, but it is also important to protect high-value information for the company.

Some examples to improve the security in the Technological Watch System in an organisation are:

- Train the personnel involved in the Technological Watch System for the possible risks.
- Use intellectual property to protect inventions, trademarks or designs.
- Control of the use of computer tools

- Use of security systems such as passwords or document protection.

2.6 Results and decision-making

The information has no value unless it is distributed in the organisation and helps the decision-making. Therefore, it would be more appropriate to establish a procedure that ensures that decision-making is systematically carried out.

The results of the Technology Watch process will allow the organisation to make the appropriate decisions and minimise the risks by having sufficient and valuable information.

The main result obtained in the Technology Watch Process is the knowledge acquired by the organisation to reduce the uncertainty in the decision-making process.

This knowledge can be classified into two types:

- Derived actions of Watch and Intelligence Process.

The actions that derive from the Watch can be conditioned by external factors of the system. These actions may contain categories such as:

- Anticipation: Actions depending on the situation detected
- Exploitation of opportunities: Actions to exploit identified advantages
- Risk reduction: Actions to reduce threats or overcome barriers
- Line of improvements: Actions to overcome lags and minimise weaknesses
- Innovation: New ideas and R&D&i projects
- Cooperation: Identification of potential collaborators
- Environments of interest

The knowledge about environments is key to either constitute opportunities in new technological environments and/or markets related to the organisation, or leave an environment currently considered uninteresting.

- The information on environments of interest may contain aspects such as:
- Assessment of technological and/or market options
- Impact and interaction between technologies, products and processes
- Evolution of technologies.

3. Roles and responsibilities in a technology watch and competitive intelligence system

Technology watch and competitive intelligence within an organisation is everyone's job, and any employee can provide valuable information.

Participation in the TW/CI process is achieved with clear "incentives" that reward the quantity and quality of information provided. This is related to the fact that from the moment a TW system is implemented in an organisation, all users are able to collaborate and participate in the system. Once the information needs have been defined, the information management team should be defined, that is, the one that will carry out the TW process.

First, , the number of people involved in the TW process may vary and one person can perform various roles, depending on the size of the organisation. Furthermore, for an intelligence system to perform correctly, users must be motivated both to demand and use the intelligence produced, and to contribute information and knowledge to the intelligence production process.

UNE 166006: 2018, standard oriented to a TW/CI system, identifies a series of roles, which are defined below:

- A manager should show leadership and commitment to the system. The manager should make sure that the responsibilities for the roles are assigned. In addition, they should communicate the importance of the system throughout the organisation.
- Coordinator or dynamiser: The person responsible for the proper functioning of the TW/CI system, who monitor the process and organizes the tasks for the different participants.
- Source manager (documentalist): The person who knows and manages the different sources of information, giving support to analysts to get the most out of it.
- Analyst (data scientist): The person responsible for reviewing, validating and sharing the information received, adding value to it with their experience in the sector.
- Administrator: The person who manages information technologies to support the process. This role is not exclusive to the TW/CI system.
- Reader or consumer: The recipient of the information distributed by the analysts, who uses it to make decisions at the operational or strategic level, and also provides the analysis with comments. In this case, consumers are the members of the organisation.

The personnel making up the watch and strategic intelligence team should comply with the following profile:

- Advanced level in languages, especially in English, as most of the information is provided in this language
- Experience in the field of research
- Analytical and synthesis skills
- Communication skills and teamwork
- Tech-savvy and database-specalised

4. Technology Watch Product

The monitoring process within an organisation can be the **first step** both to implement a Watch and Strategic Intelligence system and to carry out a specific Watch Study around a specific topic.

Depending on each organisation and the information needs identified, a support or format will be determined in which to elaborate and **distribute the TW product**.

The three main products that are usually obtained from the monitoring process are:

- Products that include a **low level of analysis**, for example, validated news listings. They are usually disseminated in RSS format or through thematic newsletters. They are usually daily or weekly newsletters.
- Products that include a **medium level of analysis**, for example, Technology Watch reports, state-of-the-art, patentability studies, etc. In the case of state-of-the-art or patentability studies, they are carried out on request and do not have an exact periodicity.
- Products that include a **deep level of analysis**, for example, exhaustive studies, analysis of trends...

From this perspective, the potential analyses to be carried out by the organisation are classified from the most general to the most specific topics. Some issues that may be tackled are defensive or offensive protection strategies, technology trends, state of a specific technology or new investment spaces.

It is paramount to be aware that all professionals can generate this type of products and analysis. Each organisation according to its capabilities, regardless of its size, sector, product or service, can carry them out. However, the organisation should be able to adapt to its objectives in the market and learn to draw conclusions from the information gathered to improve strategic decision making.

5. Updating the Technology Watch System

After the entire Technology Watch process in an organisation is completed, the system shall be evaluated in order to observe which aspects worked and which may be improved.

The Technology Watch process is continuous and constantly evolving due to **changes in the organisational environment**, making regular updates essential.

The organisation will determine which aspects of the Watch and Strategic Intelligence process shall be evaluated and how often these **evaluations** should be carried out.

The organisation shall maintain **adequate documented information** as evidence of the results, and evaluate the performance and effectiveness of the Watch and Intelligence in the organisation.

Technological Watch management system will be established to ensure its effectiveness and periodically evaluate the performance of the system. Finally, depending on the results obtained, the **appropriate changes shall be carried out**.

Some of the methods or indicators that allow evaluating the effectiveness of a Technology Watch System are:

- Monitoring the performing of the tools used
- Quantification of the openings of the newsletterssent
- Monitoring the number of R&D+i actions initiated as a result of the Technology Watch.
- Requesting opposition to the users and readers of the Technology Watch System
- Check if the information needs of the company have been modified

In addition, the organisation director review should **include decisions related to opportunities for continuous improvement**. The organisation should retain all documented information demonstrating the results of management reviews of the Technology Watch system.

Depending on the state of the organisation, the review of the aspects in the Watch and Strategic Intelligence System will be carried out with a different frequency. The following table shows an approximate example of the review times:

Review	Frequency
Inclusion of new sources of information	Every three months
Review of current information sources	Twice a year

Review of the Watch Factors	Once a year
Review of the objectives	Every two years
Review of group members and roles	Once a year

The company shall always improve the suitability, adequacy and effectiveness of the Technology Watch and Strategic Intelligence management system.

When a non-conformity occurs within the organisation, the organisation shall:

a) React to non-compliance with actions such as:

- Taking actions to control and correct it.
- Facing the consequences.

b) Evaluate the needs of actions to eliminate the causes of non-conformity, with the aim avoiding the same situation again elsewhere in the future, through:

- Reviewing of non-conformity
- Determining the causes of non-compliance
- Determining whether there are similar non-conformities

c) Implement any necessary action

d) Review the effectiveness of the corrective action used

e) If necessary, make changes in the Technology Watch management system

6. SpecificTechnology Watch Methodology

The objective of the **Specific Technology Watch** is to solve a need for **specific information**, for example, to know the state of the art of a certain technology or address a new R&D+i project. Although the objective of the Specific Technology Watch is different from the Systematic Watch Process, the applicable methodologies share several aspects.

The person carrying out the search and the report shall know **precisely the problem to be solved** and shall determine the relevant fields for the search.

6.1 Search methodology

This stage handles the **definition of the need for accurate information**. The most important aspect lies in determining the scope in which the search will be carried out and the type of report that is required. The scope can be scientific, technological, legislative, about competitors. (Figure 2)

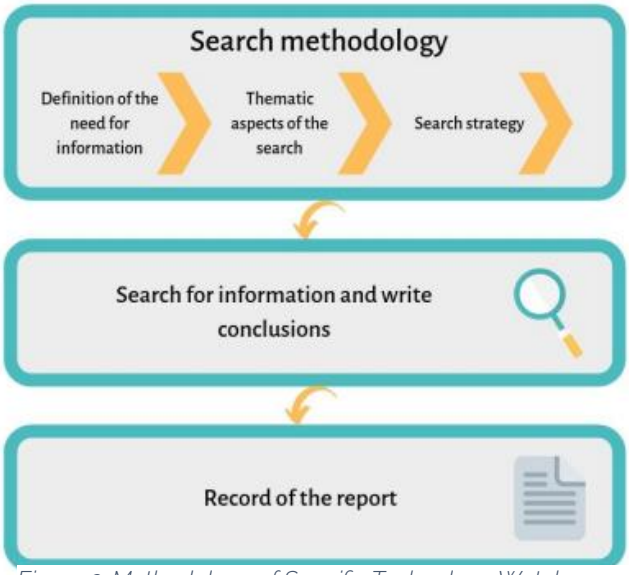

Figure 2. Methodology of Specific Technology Watch

In this phase, the periodicity of the search and the geographic scope must be determined.

Before starting any search, the team shall ensure that the information required does not yet exist.

6.2 Thematic aspect of the search

During this phase, the main aspects on which the search will be based and therefore the report are established.

For example, the state of the art of a product may be divided into:

- Commercial Solutions
- Patents
- Research Projects
- Scientific articles

6.3 Search strategy

During the "search strategy" phase, the sources of information that will be used when performing the search must be determined, such as patents databases, databases of scientific articles, or databases of R&D projects.

Defining the keywords will also be carried out. If the search is carried out in an international way, these keywords should be identified in different languages.

6.4 Search for information and write conclusions

In this phase, the assigned person will perform searches using the keywords defined above in the different databases chosen.

These results shall be analysed and those of quality that correspond to the objective of the search must be included in the report.

To keep a record of the searches performed and the results obtained is crucial and should be carried out by the search technician, including terms such as the source used, the search operators employed and the relevant results obtained, in order to be able to retrieve this information later if needed.

In the event that the desired results are not obtained, the technician will go back to the previous phase, incorporating new sources of information or modifying the keywords.

Drawing conclusions will help the responsible person meeting the objective of the search and the need for initial information.

6.5 Record of the report

Finally, the report is drafted including the information that has been recovered throughout the process specifying the methodology, the sources of information used and, finally, the results.

The report **will be valued and communicated**, either to a member of the organisation that needs the state of the art of a technology or to elaborate an R&D+i project, as a specific aspect that may be of interest to the director in the organisation.

In some cases, we can find that our specific monitoring process does not end in this final stage of value enhancement. Such is the case of a search aimed at establishing the **state of the art prior to undertaking an R&D project.**

Therefore, it is essential to record the report and store it so that, at any time, it can be recovered to update it.

7. International Standards for Innovation Management

In the context of the knowledge economy, where information is fundamental for business decision-making, international standards play a crucial role in facilitating the management of innovation processes. These standards provide structured guidelines and frameworks that help organisations effectively manage strategic intelligence, optimise innovation investments, and enhance their competitive advantage.

7.1 The role of strategic intelligence in innovation management

Technological innovation processes require robust information management to efficiently retrieve, select, generate, and process vast amounts of data from an ever-expanding environment. This task, as a fundamental component of strategic intelligence, involves analysing relevant information to provide critical guidance for optimising investments in innovation and determining the most effective strategic direction.

Strategic intelligence encompasses the vital knowledge an organisation needs of its environment to foresee trends and develop effective strategies. This capability is crucial for creating value for customers and ensuring profitability in emerging markets and sectors. Indeed, strategic intelligence has evolved into a core systematic learning process within the business value chain, rather than functioning merely as a separate department.

Strategic intelligence arises from the thorough analysis of strategic information, which is used to inform and organise an organisation's strategy. This information is gathered through the process of Technology Watch and Competitive Intelligence, which involves continuous and primarily iterative activities designed to actively monitor technological, commercial, regulatory, legal, standard, socio-economic, and competitive environments. The ultimate goal is to anticipate changes and risks while identifying opportunities, enabling organisations to stay ahead in a dynamic market landscape. This systematic approach ensures that organisations can navigate complexities, leverage emerging opportunities, and sustain long-term growth and competitiveness.

Benefits in innovation management

Strategic intelligence plays a pivotal role in fostering innovation by identifying gaps in the market and uncovering unmet customer needs. By integrating insights from various domains, organisations can better align their innovation efforts with market demands, thus enhancing their ability to develop breakthrough products and services. This alignment not only boosts the chances of successful innovation,

but also maximises the return on investment by focusing resources on high-impact areas.

In addition, strategic intelligence facilitates **informed decision-making** by providing a comprehensive understanding of the competitive landscape. By continuously monitoring competitors' activities, technological advancements, and market trends, organisations can make proactive decisions that enhance their competitive positioning. Monitoring allows for timely adjustments to strategies and tactics, ensuring that organisations remain agile and responsive to external changes.

Moreover, strategic intelligence supports **risk management** by identifying potential threats and vulnerabilities within the innovation process. By analysing data from a wide range of sources, organisations can foresee potential disruptions and develop contingency plans to mitigate risks. This proactive approach to risk management helps maintain the stability and resilience of innovation initiatives, even in the face of unforeseen challenges.

Lastly, the integration of strategic intelligence into the innovation management process fosters a **culture of continuous learning and improvement**. By systematically gathering and analysing information, organisations can draw valuable lessons from past experiences and apply them to future projects. This continuous feedback loop enhances the overall efficiency and effectiveness of innovation efforts, driving sustained success in a highly competitive environment.

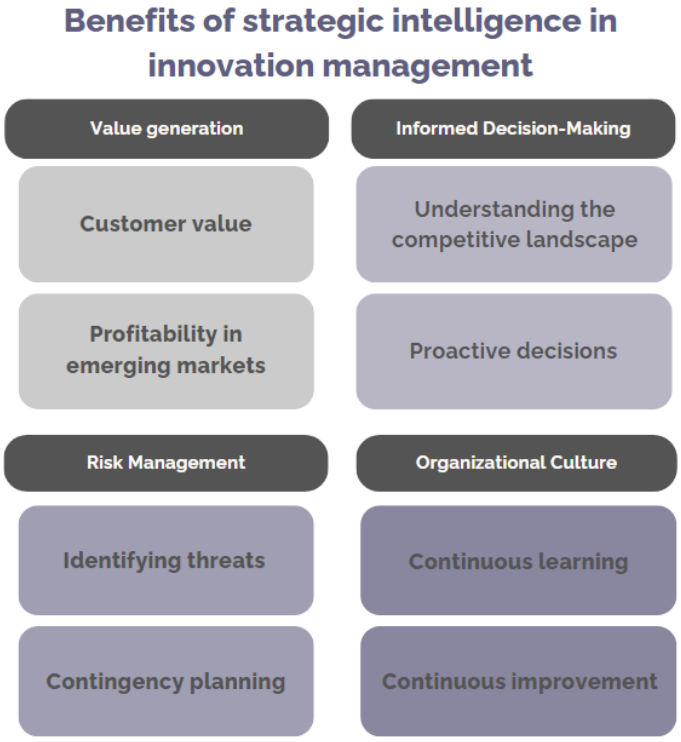

Figure 3. Benefits of strategic intelligence in innovation management

In conclusion, as showed in Figure 3, strategic intelligence is indispensable for innovation management, providing the necessary insights and guidance to navigate the complexities of technological advancements and market dynamics. By leveraging strategic intelligence, organisations can make informed decisions, optimise their innovation investments, and maintain a competitive edge in an ever-changing landscape.

7.2 Different international standards on strategic intelligence

Nowadays, the world operates within a constantly evolving knowledge economy, where information plays a pivotal role in business decision-making. In this context, standards and regulations aimed at facilitating the management of innovation processes and strategic intelligence within organisations have emerged.

There are two specific international standards for managing strategic intelligence. Both standards share considerable similarities in their content.

- CEN/TS 16555-2:2014 Innovation management - Part 2: Strategic intelligence management. Published in 2914, this technical specification, relates to structuring and managing a strategic intelligence system intended to guide decisions in innovation planning and deployment.
- ISO 56006 Innovation management. Tools and methods for strategic intelligence management. This guidance document, building upon the previous technical specification and published in 2021, aids organisations in effectively implementing processes to use information. ISO 56006 also serves to communicate procurement specifications when outsourcing strategic intelligence services. The standard was developed by the ISO technical committee ISO/TC 279 Innovation management, under the secretariat of AFNOR, France's ISO member.

Both standards concur that a strategic intelligence system is founded on processes and frameworks designed to generate strategic insights. Such insights are derived from analysing strategic information, crucial for informing and guiding an organisation's strategy, encompassing forward planning, positioning, leveraging, and safeguarding, among other aspects.

Key elements and structure

The standards comprehensively cover the management of strategic intelligence within organisations, encompassing processes from identifying needs to analysing outcomes and disseminating strategic insights.

- Identifying strategic intelligence needs underscores the importance of identifying relevant information internally and externally, including business sectors, competitors, markets, intellectual property, and trends.
- Identifying sources of information involves categorising information into types such as classified, internal, sensitive, and critical, and allocating resources accordingly.
- Interpreting and assessing information emphasizes thorough data analysis using tools such as SWOT and PESTEL analysis.
- Results and dissemination involve pivotal actions like future planning, risk mitigation, and fostering innovation.

In terms of leadership and responsibilities, the regulations highlight the role of management and supervisory staff in promoting strategic intelligence and assigning responsibilities, as well as the role of the coordinator in collecting and analysing data to assess the effectiveness of the system and the importance of continuous improvement of the strategic management system.

Steps for an integrated implementation in an organisation

Organisations have the option to adopt either one or both standards based on their geographical location or specific requirements. Furthermore, ensuring access to the latest versions of these standards is crucial, as updates may incorporate evolving best practices in innovation and strategic intelligence management.

Figure 4 set the five steps to implement international strategic intelligence standards.

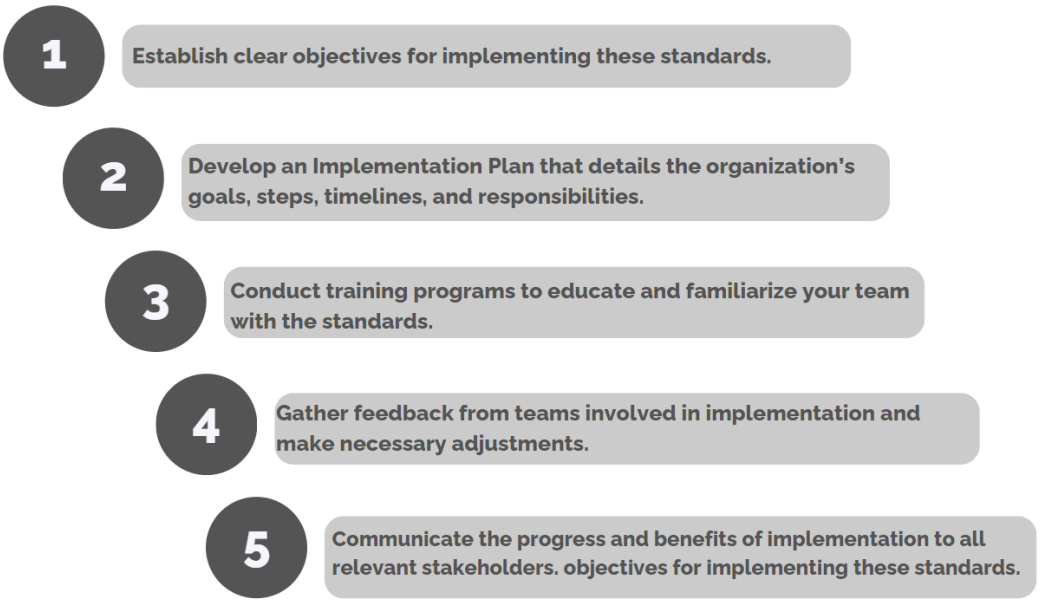

Figure 4. Steps to implement international strategic intelligence standards

Other standards

Other standards related to innovation management include:

Standard	Objective
ISO 56000:2020 - Innovation management — Fundamentals and vocabulary.	Outlines the foundational principles and terminology of innovation management.
ISO 56002:2019 - Innovation management — Innovation management system — Guidance.	Offers guidelines for establishing, implementing, maintaining, and continually improving an innovation management system in organisations of all sizes and types.
ISO 56003:2019 - Innovation management — Tools and methods for innovation partnership — Guidance	Provides direction on tools and methodologies for establishing and managing innovation partnerships.
ISO 56004:2019 - Innovation management assessment — Guidance	Assists organisations in self-assessing and evaluating their innovation management systems.
ISO/TR 56005:2020 - Innovation management — Innovation management taxonomy — Guidance	Offers principles for taxonomy in innovation management.
ISO/TR 56007:2019 - Innovation management — Innovation management navigator — Guidance	Provides insight into selecting appropriate standards in the field of innovation management and their combined use

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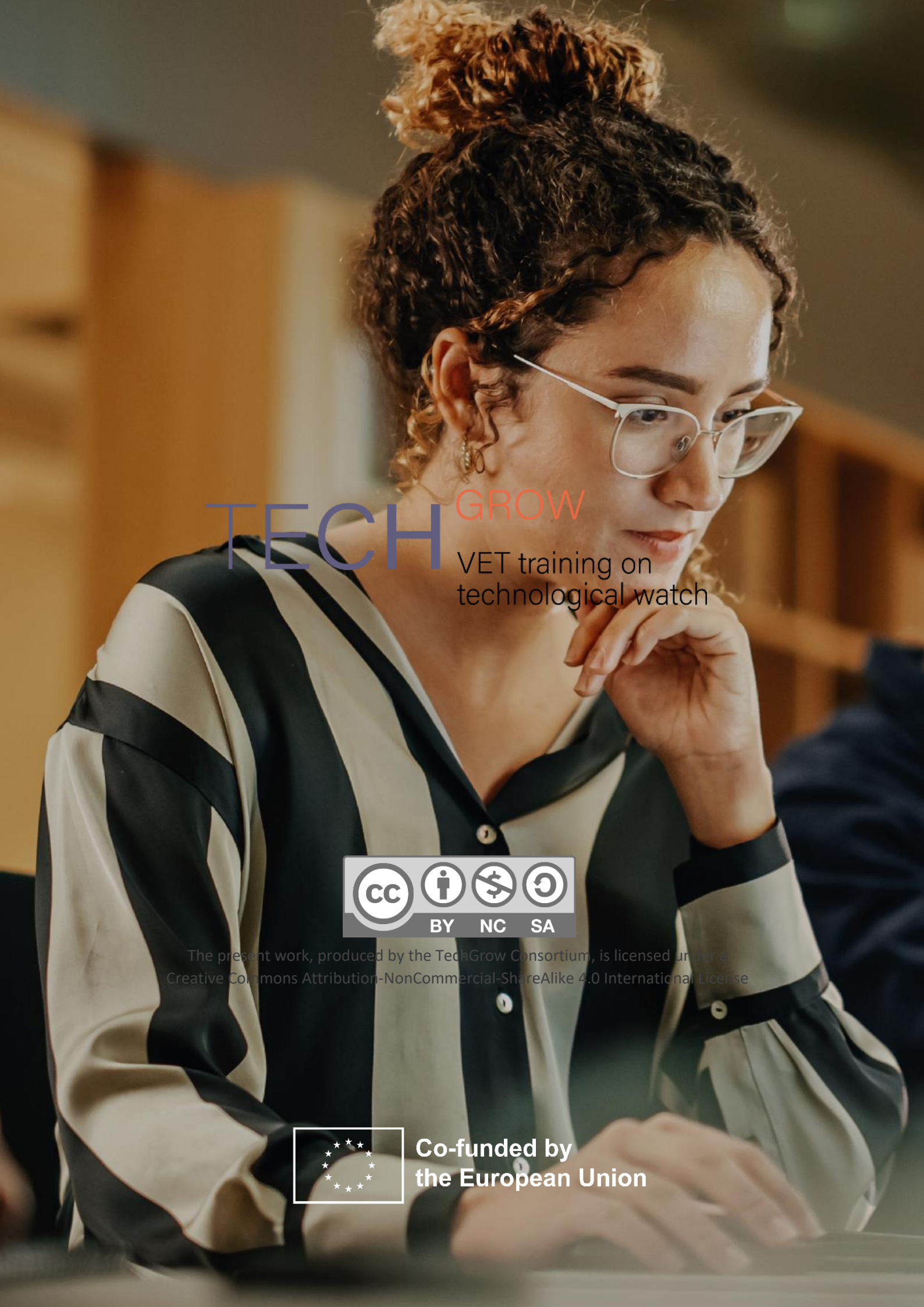

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