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Strategic Partnership for Industry 4.0 innovation advanced Training

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IO1: AUDIT METHODOLOGIES

Erasmus+ | AGENZIA NAZIONALE INDIRE

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Overview

Facing the challenges coming from the Fourth Industrial Revolution can open different levels of difficulties depending on the typology of company taken into consideration. On one hand big corporations seem to be much more ready to deal with the new paradigm, on the other hand SMEs often lack the awareness and the resources to join the revolution.

The present audit methodology helps companies to understand possible opportunities and threats coming from Industry 4.0. It supports companies during the first steps of identifying and implementing solutions based on Industry 4.0 concepts.

This manual aims at providing auditors with a guide to follow when performing the Industry 4.0 audit. It gives the auditor an overview on reference models at the basis of the audit and explains how to conduct the evaluation correctly by investigating each relevant aspects of companies' organization.

The methodologies were tested with 9 companies during the activity "IO1/A2: Execution of the audit pilot".

Method and reference models

The development of the proposed audit methodology grounds on the main approaches, standards and models already used by researchers and practitioners to analyze other dimensions of companies such as processes and management systems. In particular the audit methodology here proposed was inspired by management systems standards like ISO 9001 and ISO 19001, and Industry 4.0 reference model such as the DIN SPEC 91345:2016 standard. These reference models have been complemented by the acatech STUDY which focuses on providing an approach to investigate companies' Industry 4.0 maturity index.

ISO 19011:2011 Guidelines for auditing management systems

The standard UNI EN ISO 19011:2012 defines the guidelines to perform audits for environmental management systems, quality management systems and security systems. Such a standard describes what is an audit and identifies its main features, moreover it introduces the figure of

the auditor (the person which lead the audit) and the skills and knowledge she or he might possess to perform the audit.

ISO 9001:2015 Quality management systems - Requirements

UNI EN ISO 9001 defines the requirements for an effective quality management system to be implemented within an organization. The ISO 9001 standard is the reference model to perform a quality audit which take into consideration all the business activities and processes managed by an organization. The check list is a fundamental tool to be exploited for applying the ISO 9001 basics and to analyse how organizations satisfy the requirements settled by the standard itself.

DIN SPEC 91345:2016-04 Reference Architecture Model Industrie 4.0 (RAMI4.0)

The standard DIN SPEC 91345:2016 is the first attempt to frame and conceptualize the Industry 4.0 paradigm by identifying its constituent parts.

The standard is based on the concept of Asset intended as element which contributes to create value for the organization (both material and immaterial assets are taken into consideration). Starting from the Asset the digital transformation process can be completed by linking each Asset to its digital twin, so to represent the whole organization as a complex digital entity which encompasses all the aspects of the physical world. Figure 1 describes - from the bottom to the top – the path to be followed for translating a physical asset to its digital twin and the variables which allow the organization to completely represent and analyse the critical aspects for the digital transformation.

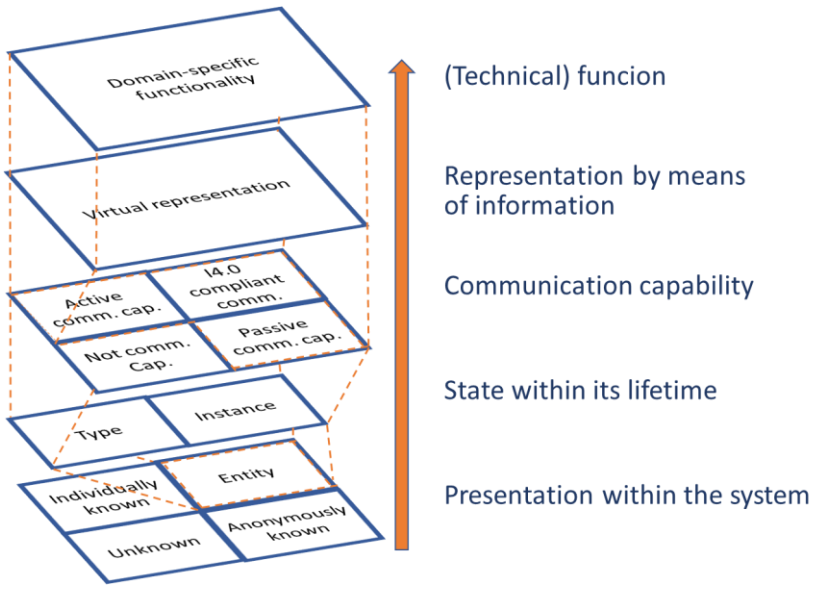

Figure 1. From physical asset to digital twin according to DIN SPEC 91345:2016

Industrie 4.0 Maturity Index. Managing the Digital Transformation of Companies (acatech STUDY)

The acatech STUDY proposes an approach to measure the current maturity level of manufacturing companies concerning digital transformation and the implementation of Industry 4.0 paradigm. Acatech STUDY evaluates each company according to 6 levels which allow to clearly understand the passage between Industry 3.0 and Industry 4.0 as shown in the following Figure 2.

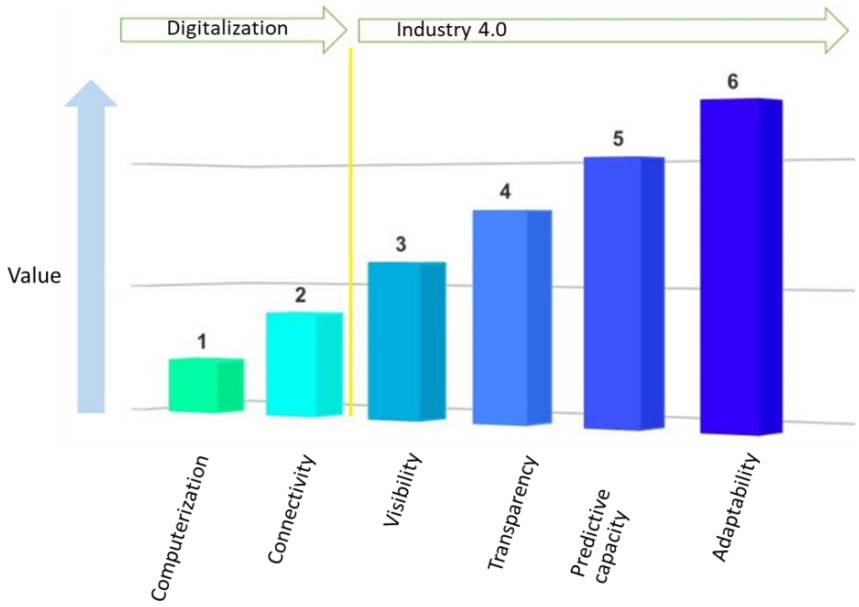

Figure 2. Maturity levels in the acatech model

The audit methodology assess the company by analysing 4 areas which allow to understand the maturity level of each business area.

- Resources
- Information systems
- Culture
- Organizational structure

Each of them has to be evaluated according to different principles and parameters.

The audit methodology

The audit methodology was designed by integrating the most convincing characteristics of the reference models in order to create a path that would raise the awareness of entrepreneurs regarding the level of digital maturity of their companies, and that would favour the implementation of the most suitable solutions according to the current situation of the company.

It consists in a **checklist** composed by more than 200 questions to be asked and/or observed into the company assessed.

The audit methodology provides the company with a detailed picture of its digitalization level by investigating all the different business areas.

The structure of the audit clearly reflects some of the sources taken as reference for the construction of the model. The execution approach is typical of management systems audits as described in ISO 19011. Moreover, the questionnaire combines the central elements of the DIN SPEC 91345 standard and the acatech study. In fact, the audit focuses on all the company assets by analysing the characteristics that an asset must possess to comply with the DIN standard. Finally, the structure of the survey to submit is a checklist inspired to the ISO 9001 standard.

During the pilot phase, Universities will test the audit methodologies with the National Target companies. The results of this first test will be used to fix possible shortcomings that will emerge from the test itself and to update the audit methodologies to be ready for the second testing phase (the second testing will be performed by involving two other companies belonging to the National Target company value chain, or to the same company group).

How to perform an audit

The audit is conducted by an external auditor (who has the basic skills to understand the Industry 4.0 technologies and to evaluate the organizational structure and the corporate culture) through a visit to the company lasting at least one day.

During the pilot phase Universities will perform the audit methodologies assessing the National Target companies through a visit and following the checklist provided by UNIPI and reviewed by all the partners.

The first part of the visit takes place through an interview with some managers of the company including the quality manager (who is the person who best knows the business processes). Instead, the second part of the visit takes place in the operational unit of the company (for example in the factory) so that the consultant conducting the audit can see with his own eyes the company's reality and can avoid any bias that may mitigate or exaggerate the perceptions of the company representatives involved in the evaluation. The visit has the purpose to fill out a check-list that represents the starting point for the preparation of the audit report.

As mentioned above, the audit methodology integrates the basics of the UNI EN ISO 19011 which explains how to conduct audits for analysing quality and environmental management systems.

According to the standard, the audit is defined as "Systematic, independent and documented process to obtain the evidences of the audit and to evaluate them with objectivity in order to investigate how the audit requirements are satisfied".

The evidences are the information obtained by the auditor during the execution of the audit, these might be compliant with the audit requirements which establish the rationale to evaluate what analysed through the audit itself. Then, the main output of the audit is given by the evaluation of the evidences in light of the audit requirements.

To perform the audit in the most effective way is crucial to design an audit plan which identifies the rules to follow to perform and iterate the audit over time.

The auditor is the key person for the execution of the audit, she or he is an expert concerning such kind of activities and has the responsibility to lead the audit. The auditor merges the knowledge on the topic of the audit to led with a deep understanding on the audit requirements which enable her/him to evaluate the compliance between the evidences and the audit requirements. Moreover, the auditor might possess some personal attitudes which can facilitate the execution of the audit among which independency, integrity, impartiality and confidentiality. The ideal profile to perform the Industry 4.0 maturity audit is that of consultants already executing audit for quality and environment management systems.

At the end of each pilot audit a final meeting will be scheduled to discuss the audit results and to prepare a report with feedback and possible improvements to the methodologies.

Summary of the process

Auditor

Knowledge:

- knowledge on Industry 4.0, the topics of the audit, the assessment methodology; understanding on the audit requirements and procedures; capacity of evaluating answers and feedback;

Personal attitudes:

- independency, integrity, impartiality and confidentiality

Ideal profile for the Industry 4.0 auditor:

- consultant/researcher already executing audit for quality and environment management systems.

Preparation

- Contact the company, present the audit and the benefit the company will have.
- Agree on a date for meeting at the company venue. The whole audit will take approximately 5/6 hours.
- Ask for information about the organization chart: which managing functions they have in the company? Identify the most relavant people to talk with. Usually the company functions involved are: Entrepreneur (in case of SMEs), CEO, Quality Manager, Product Manager, Innovation Manager.
- Make clear that you will need to access to private information and visit the workplace. All the information given during the audit will be strictly reserved and no use will be made by the auditor.
- Preparing the audit plan, starting from the check-list

Suggested Timetable

Duration	Activity	Target
15 min.	Presentation of the audit, explanation of the process	All the people who will be involved in the audit
10 min.	Verifying that the people identified are the correct one to talk to. In case they are not, try to identify the most suitable ones.	All the people who will be involved in the audit
120 min.	First round of questions on culture ad organization	Entrepreneur/CEO/Quality Manager. This part can be conducted in the

		office
120 min.	Second round of questions on resources and informative systems.	Responsible for the production/Quality Manager/whoever has a wide vision on the production process, not just an expert/responsible of a part of the process. This part should be performed where the core activities are carried out (e.g. factory).
30 min.	Wrap-up with the company	All the people who will be involved in the audit

Tips on how to conduct an audit

- During the audit take notes (on paper or on your pc), you will have than time for reporting the information in our excel file.
- Have the audit plan clear in mind: you don't need to ask all the questions in a row, you can jump from one question to another, skip some questions (if you think you will recover the needed information later on). Please avoid the interrogation-effect!
- Often it is better listening rather than asking. You can get more precious information this way.
- Ask for seeing how things are done, rather than just listening to it.

Questionnaire

ORGANIZATION:

General answer and marginal answer

1. *TYPE OF PRODUCTION*

This section of the questionnaire aims to start knowing the company, the functional areas that are present, and its way of producing goods

1.1. Production method:

- One-off production
- Batch production

1.2. Production works:

- make to order
- make to repetitive orders
- make to stock

1.3. Volume compared to the variety of products (for example, in manufacturing producing more than ten thousands pieces per years are high, while having hundreds of differents items (even if they are similar), means high variety):

- high volumes and low variety
- high volumes and high variety
- low volumes and high variety
- low volumes and low variety

1.4. The production cycle includes:

Phase	Internally or by subcontractor?			If subcontractor: necessary skills are present / not present?	
	Internally	Subcontractor	Not applicable	Present	Not present
inbound logistics	☐	☐	☐	☐	☐

raw material warehouse management	☐	☐	☐	☐	☐
assembly	☐	☐	☐	☐	☐
semi-finished product warehouse management	☐	☐	☐	☐	☐
finished goods warehouse management	☐	☐	☐	☐	☐
outbound logistics	☐	☐	☐	☐	☐
research and development / planning / design	☐	☐	☐	☐	☐
production	☐	☐	☐	☐	☐

2. LAYOUT TYPE

This section of the questionnaire aims to know the layout of the production and the structure of the organization

2.1. The production function works:

- for workshop
- for cells
- by product line

2.2. What type of decision-making system does the company have?

- centralized
- decentralized
- mixed

2.3. What kind of division of work is mostly present inside the company?

- teamwork
- individual work
- mixed

2.4. Which kind of structure does the company have? (multiple choice)

- hierarchical
- functional
- divisional
- matrix

3. MANAGEMENT SYSTEM

In this section are deepen all the topic regarding the management system and the methodologies that are applied within the company. Moreover the collaboration within the supply chain are treated in this section.

3.1. [ORG INT] Does the company use a management system according to ISO standards?

- Yes
- No

3.1.1. [ORG INT] If Yes, which one? (multiple choice)

- ISO 9000 for quality management systems
- ISO 14000 for environmental management systems
- UNI CEI EN ISO 50000 for energy management systems
- OHSAS 18000 for safety and health management systems
- SA 8000 impact on ethics and on social (issued by SAI)
- ISO 27000 for information security management systems

3.2. [ORG INT - BM] Which of the following Operations and Supply Chain planning methodologies are applied or are known in the company (maybe decided to apply, and/or people attended some courses but actually did not applied it)? (multiple choice)

Metodologies	Known	Applied
Demand Planning	□	□
Sales and Operations Planning	□	□
Master Production Scheduling	□	□
Rough Cut Capacity Planning	□	□
Material Requirement Planning	□	□
Capacity Requirement Planning	□	□

Scheduling	□	□
Collaborative Planning, Forecasting and Replenishment	□	□
Agile Project Management	□	□

3.2.1. [ORG INT - BMC-CI] If selected (applied) Demand Planning, which kind of forecasting techniques are applied?

- Quantitative extrinsic (linked to external factors)
- Quantitative intrinsic (from historical series)
- A mix of quantitative and qualitative
- Qualitative

3.2.2. [ORG INT - BM] If selected (applied) Sales and Operations Planning , which kind of characteristics does the process have? (multiple choice)

- Runs on a monthly basis
- Closed with an Executive Meeting
- Operations are responsible for the Resource Plan
- The vacation plan is defined on the basis of its outcome

3.2.3. [ORG INT - BMC-RC] If selected (applied) Master Scheduling and Rough Cut Capacity Planning, which characteristics does the process have? (multiple choice)

- Runs on a weekly basis
- Influences the shift
- Include a horizon of freezing

3.2.4. [ORG INT - BMC-RC] If selected (applied) Material Requirement Planning and Capacity Requirement Planning, which characteristics does the prices have? (multiple choice)

- Runs on a daily basis
- The Planner can confirm orders without releasing them
- Include a horizon of freezing
- The raw material are subject of scheduling

3.2.5. [ORG INT - BMC-RC] If selected (applied) Scheduling, which characteristics does the process have? (multiple choice)

- The schedule is built on finite capacity
- The Scheduler is powered by a MES system
- The Scheduler is powered by an MRP system

3.2.6. [DYN COL - BM - SC] If selected (applied) Collaborative Planning, Forecasting and Replenishment, which characteristics does the process have? (multiple choice)

- It involves customers
- It involves suppliers
- It takes charge of the promotions of a business partner
- It monitors and plans the inventory at each distribution centers

3.2.7. [ORG INT - BM] If selected (applied) Agile Project Management, how is it applied?

- through an information system ad hoc integrated into the management software
- through a special information system ad hoc isolated from the management software
- through a paper based recording system
- through a verbal based sharing method of methodology, know-how and objectives

3.3. **[DYN COL - SC]** Are any SCEM (Supply Chain Event Management) type applications used for monitoring and starting the activities within the Supply Chain? (multiple choice)

- Yes, and they include the main suppliers
- Yes, and they include the main customers
- Yes, and they provide adaptive algorithms to react to unexpected events
- Yes, and they have warning signals that report issues with the deadline for a scheduled task
- No, they are not used

3.4. [ORG INT - BM] Are any software that support Agile Project Management used to support a multi-plant planning process?

- Yes, they support the forecasting process of the group
- Yes, they optimize the distribution of productive activities on various plants
- Yes, they optimize allocation of new orders
- Yes, to perform finite capacity planning
- No

3.5. [ORG INT - BM] Does the company know the term Business Model?

- Yes, at all organizational levels
- Yes, but only at a management/managerial level
- No

3.5.1 [ORG INT - BM] If yes, the company applies methods of definition/management of Business Model?

- Yes
- No

3.5.2. [ORG INT - BM] If yes, how is applied ?

- through a structured instrument such as the Business Model Canvas
- in an unstructured way

3.5.3. [ORG INT - BM] If yes, how is it registered and shared?

- with the support of a software integrated with the management system
- with the support of software isolated from the management system
- through paper records

- through verbal sharing

3.6. [ORG INT] Does the company carry out budgeting activities?

- yes, in a structured way and with digital recordings
- yes, in a structured way but on paper
- yes, but unstructured
- No

3.7. [ORG INT] Which kinds of performance indicators are registered? (multiple choice)

- financial / economic KPIs (key-performance indicators)
- production KPIs
- accounting KPIs
- organizational KPIs
- individual KPIs
- process KPIs
- not registered

3.7.1. [ORG INT] If selected financial / economic, how performances are recorded?

- In real-time, digital, inside the information system
- In real-time, digital, outside the information system
- In digital, in programmed periods
- In paper format

3.7.2. [ORG INT] If selected production , how performances are recorded?

- In real-time, digital, inside the system
- In real-time, digital, outside the system
- In digital, in programmed periods
- In paper format

3.7.3 [ORG INT] If selected accounting , how performances are recorded?

- In real-time, digital, inside the system
- In real-time, digital, outside the system
- In digital, in programmed periods
- In paper format

3.7.4. [ORG INT] If selected organizational , how performances are recorded?

- In real-time, digital, inside the system
- In real-time, digital, outside the system
- In digital, in programmed periods
- In paper format

3.7.5. [ORG INT] If selected individual, how performances are recorded?

- In real-time, digital, inside the system
- In real-time, digital, outside the system

- In digital, in programmed periods
- In paper format in programmed periods

3.7.6. [ORG INT] If selected process , how performances are recorded?

- In real-time, digital, inside the system
- In real-time, digital, outside the system
- In digital, in programmed periods
- In paper format

3.8. [ORG INT] Who records the performances? *(multiple choice)*

- Machinery
- Manager of the process
- Operative profile

3.9. [ORG INT] Are the development strategies defined?

- Yes, digitally
- Yes, in paper format
- Yes, verbally
- No

3.10. [ORG INT] Are the objectives defined?

- Yes, digitally
- Yes, in paper format
- Yes, orally
- No

3.10.1. [ORG INT] If yes, what type of objectives? (multiple choice)

- economic / financial
- accounting
- organisational
- individual
- of the process

3.10.2. [ORG INT] What is their time frame? (multiple choice)

- long-term
- medium-term
- short-term

3.10.3. [DYN COL - SC] If yes, does the company carry out an analysis of stakeholders before defining objectives?

- Yes
- No

3.10.4. [DYN COL - SC] If yes, is an analysis of the clients' needs being done?

- Yes, in a structured way (well-known methodology or defined procedure) and registered (documentation of the analysis and the results)
- Yes, not in a structured way, but registered
- Yes, in a structured way, but not registered
- Yes, but neither in a structured way nor registered
- No

3.11. [DYN COL - SC] What kind of relations does the company have inside the supply chain?

- close cooperation between the various subjects of the supply chain
- close cooperation between only one subject of the supply chain
- None, just classic sale and supply

3.11.1. [DYN COL - SC] If there is collaboration inside the supply chain, since when?

- long-term
- medium-term
- short-term

3.11.2. [DYN COL - SC] If there is collaboration, between which subjects of the supply chain? *(multiple choice)*

- suppliers (suppliers of raw material, semi-finished products, technology, consultants, etc.)
- clients (distributors, sales, B2B clients, users, etc.)

3.11.3. [DYN COL - BMC- Pr - SC] If collaborating with suppliers, with what kind of partner? *(Indicate a maximum of 3 main types)*

- University / other research centre / laboratorium
- Parent company
- Supplier (technology)
- Supplier (raw material or components)
- Company in the same sector
- Company in another sector
- Subsidiary
- Distributor
- Other (specify _____)

-- repeat this group of questions for each selected type --

3.12. [DYN COL - SC] Location (city or foreign country):

_____ (drop-down menu)

3.13. [DYN COL - BMC- Pr - SC] Is the relation regulated through formal agreements?

- Yes
- No

3.14. [DYN COL - SC] Main motivation for the alliance *(only 1 choice)*

- Overcome market failures and/or gain market strength
- Gain new knowledge, learning
- Risk sharing
- Exploitation of complementary assets
- Enter in new markets and/or strategies
- Strengthen the innovativeness and development of new products
- Strengthen the start-up performance
- Other (specify _____)

--------- end of repetition ---------

3.15. [DYN COL - BMC- Cl - SC] If collaborating with the clients, in which type of market *(Indicate a maximum of 3 main types)*

- Mass market
- Niche market
- Segmented market
- Concentrated market
- Diversified market
- Multi-sided market

-- repeat this group of questions for each selected type --

3.16. [DYN COL - SC] Location (city or foreign country):

_____ (drop-down menu)

3.17. [DYN COL - BMC- Pr - SC] Type of partner *(Indicate a maximum of 3 main types)*

- University / other research centre / laboratorium
- Parent company
- Supplier (technology)
- Supplier (raw material or components)
- Business in the same sector
- Business in another sector
- Subsidiary
- Distributor
- Other (specify _____)

3.18. [DYN COL - BMC- Pr - SC] Is the relation regulated through formal agreements?

- Yes
- No

3.19. [DYN COL - SC] Main motivation for the alliance *(only 1 choice)*

- Overcome market failures and/or gain market strength
- Gain new knowledge, learning
- Risk sharing
- Exploitation of complementary assets
- Enter in new markets and/or strategies
- Strengthen the innovativeness and development of new products
- Strengthen the start-up performance
- Other (specify _____)

--------- end of repetition ---------

4. COMPETENCES

Competencies are the engine of industry 4.0. In this part of the questionnaire the management of competencies and skills is deepen

4.1. [ORG INT - BMC-RC] Which of the following professional profiles have been hired during the last three years? (multiple choice)

- IT system designers
- Mechanical engineers
- Management engineers
- Technical designer
- Energy engineers
- Responsible of database
- Responsible of IT system
- Data analysts
- Telecommunication officer
- IT system security officer
- Maintenance technician
- Machine conductors and industrial plant operators
- Automated assembly line operators
- Augmented reality officer
- Programmer
- 3D printing technicians
- Drone operators
- Experts for patenting
- Social network specialist
- Web marketing specialist
- Business Intelligence analysts
- None of the above

4.2. [ORG INT - BMC-RC] Does the company define training policies necessary for at least one of the profiles above?

- Yes, they are implemented
- Yes, they are defined but not implemented

- No, but they are about to be defined
- No, they are not defined

4.2.1. [ORG INT - BMC-RC] If yes, for which professional profile does the company define training policies?

- IT system designers
- Mechanical engineers
- Management engineers
- Technical designer
- Energy engineers
- Responsible of database
- Responsible of IT system
- Data analysts
- Telecommunication officer
- IT system security officer
- Maintenance technician
- Machine conductors and industrial plant operators
- Automated assembly line operators
- Augmented reality officer
- Programmer
- 3D printing technicians
- Drone operators
- Experts for patenting
- Social network specialist
- Web marketing specialist
- Business Intelligence analysts
- None of the above

4.3. [DYN COL - BMC-RC - SC] Does the process of recruitment and training of the staff take into consideration the needs of the stakeholders?

	Recruitment Process (Yes/No)	Training Courses (Yes/No)
Clients		
Suppliers		
Other stakeholder		

5. DATA MANAGEMENT

In this section the questionnaire deep how the company manage data and its security

5.1. [ORG INT] Does the company use a management software (ERP, Extended ERP...)?

- Yes, a complete standardized suite
- Yes, some standardized modules
- Yes, a customized software

- Yes, a designed and developed ad hoc software
- No

5.1.1. [ORG INT - BM] If yes, which modules have been acquired? (multiple choice)

- General accounting
- Analytical accounting
- Management control system
- Human resource management
- Purchases management
- Warehouse management
- Material Requirements Planning
- Production management
- Project management
- Sales management
- Distribution management
- Management of facility maintenance
- Enterprise asset management
- Financial management and analysis

5.1.2. [ORG INT - BM] If yes, which modules are actively used within the company? (multiple choice)

- General accounting
- Analytical accounting
- Management control system
- Human resource management
- Purchases management
- Warehouse management
- Material Requirements Planning
- Production management
- Project management
- Sales management
- Distribution management
- Management of facility maintenance
- Enterprise asset management
- Financial management and analysis

5.1.3. [ORG INT - BM] If yes, which business functions actively use the software? (multiple choice)

- Production
- Assembly line production
- Warehouse and logistics
- External logistics
- Maintenance
- Research and development
- Information Technology
- Quality
- Administration
- Management
- Human resource
- Accounting
- Purchasing
- Sales

5.2. [ORG INT] Does the company handle data security?

- Yes, internal
- Yes, in outsourcing
- Yes, both internally and in outsourcing
- No

5.2.1. [ORG INT] If yes, which types of action are done?

- Risk analysis and therefore definition of a data security director plan
- High-level strategy and some data management procedures are specified.
- creation of system access credentials
- Other
- No action

5.2.2. [ORG INT] If the company has a data security director plan, who has defined it?

- Internally, by director and main managers
- Internally, by directors, managers and other workers
- Outsourced

5.2.3. [ORG INT] If the company has a data security director plan, who has access to it?

- Only director and main managers
- Director and main managers and IT workers
- All workers
- All workers and some specific partners

5.3. [ORG INT] Does the company define different groups of roles to access the company data?

- Yes, but only dividing customers and internal staff
- Yes, in coarse-grained groups (e.g. dividing in customers, company managers and other workers)
- Yes, in specific fine-grained groups
- No

5.3.1. [ORG INT] If yes, which mechanisms are used to access the data of the company?

- System access credentials
- System access credentials and additional identity proofs or tools (smartcards, token, fingerprint scanner, etc.)

5.4. [ORG INT] Do you have a backup infrastructure to save all the data generated/collected by the company?

- Yes (financial, OT and IT records)
- Yes, but only partially (e.g. only financial records)
- No

5.4.1. [ORG INT] If yes, how often are these backups automatically built?

- Instantly
- Every hour

- Every day
- Every month
- Several times per year
- Once per year
- Never, they are manually built

5.5. [DYN COL - BM - SC] Does the business-management software (ERP) used by the company has a user-interface for customers?

- Yes
- No

5.5.1. [DYN COL - BM - SC] If yes, what is the purpose?

- Data sharing
- Data acquisition
- Data control

5.6. [DYN COL - BM - SC] Does the company use a digital platform shared with some of the partners involved in the supply chain?

- Yes
- No

5.6.1. [DYN COL - BM - SC] If yes, what is the purpose?

- Data sharing
- Marketing
- Information exchange

6. METHODOLOGIES

In this part the questionnaire discover the methodologies that are applied by the company

6.1. [ORG INT - BM - SC] Which of these following management methods are known in the company? (multiple choice)

- Risk management
- Material Flow Control Systems (e.g. Conwip, Kanban, Poka, cobacabana, DBR/TOC, ecc.)
- Overall equipment effectiveness (OEE) indicators
- Single Minute Exchange of Die (SMED)
- CONstant Work In Process (CONWIP)
- Life Cycle Assessment (LCA) or Product Data Management (PDM)
- Total Productive Maintenance (TPM)
- 5S
- Visual Planning
- Supply Chain Management (SCM)
- Vendor Managed Inventory (VMI) or Customer relationship management (CRM)
- Supplier Relationship Management (SRM)

6.2. [ORG INT - BM - SC] Which of these following management methods are actually applied in the company? (multiple choice)

- Risk management
- Material Flow Control Systems (e.g. Conwip, Kanban, Poka, cobacabana, DBR/TOC...)
- Overall equipment effectiveness (OEE) indicators
- Single Minute Exchange of Die (SMED)
- CONstant Work In Process (CONWIP)
- Life Cycle Assessment (LCA) or Product Data Management (PDM)
- Total Productive Maintenance (TPM)
- 5S
- Visual Planning
- Supply Chain Management (SCM)
- Vendor Managed Inventory (VMI) or Customer relationship management (CRM)
- Supplier Relationship Management (SRM)

6.2.1. [ORG INT - BM - SC] If you selected Risk Management, how is it carried out? (multiple choice)

- in a structured way (governance perspective)
- in a qualitative way (governance perspective)
- in a structured way (operational perspective)
- in a qualitative way (operational perspective)

6.2.2. [ORG INT - BMC-RC][DYN COL - BMC-RC - SC] If you selected Material Flow Control Systems (e.g. Conwip, Kanban, Poka, cobacabana, DBR/TOC...), how is it carried out?

- only inside the company
- inside the company and outside with suppliers
- inside the company and outside with customers
- inside the company and outside with suppliers and customers

6.2.2.1. [ORG INT - BMC-RC] If you selected "only inside the company", the kanban card is

- Electronic
- Printed

6.2.2.2. [DYN COL - BMC-RC - SC] If your selected one of the options for inside and outside the company, the kanban card is:

- Electronic
- Printed

6.2.2.3. [ORG INT - BMC-RC] By who and how often the Work In Process (WIP) is quantified?

- Digital, in real time, automatically
- hardcopy, in real time, by a dedicated operator
- hardcopy, at predefined times, programmed by a dedicated operator
- hardcopy, depending on the availability of the dedicated operator
- is not quantified
- none of the above

6.2.3.[ORG INT - BMC-RC]If your answer was Visual planning what type of tool is used?

- Digital touch screen
- Digital whiteboard
- Hardcopy whiteboard

6.2.4. [ORG INT - BMC-RC] If your answer was digital board, does it permit also simulations on production changes?

- Yes
- No

6.2.4.1. [ORG INT - BMC-RC] Are digital whiteboards integrated between departments?

- Yes
- No

6.2.4.2. [ORG INT - BMC-RC] Updates take place:

- Digital, in real time, automatically
- hardcopy, in real time, by a dedicated operator
- hardcopy, at predefined times, programmed by a dedicated operator
- hardcopy, depending on the availability of the dedicated operator

7. FINANCE

Finance management is another topic that shows the maturity of a company, and this is investigated in this section.

7.1. [ORG INT] Does the management of financial data provide structured reporting (product cost, profitability, investments, etc.) useful to take management decisions timely?

- Yes
- Not
- Partially

7.2. [ORG INT] Does the company has an industrial accounting structure integrated into company systems?

- Yes
- No
- Partially

7.3. [ORG INT] Is accounting managed:

- internally
- externally

7.4. [ORG INT] Is there a management accounting system in place in addition to a statutory accounting system?

- Yes
- Not

7.5. [ORG INT] Which is the calendar for the management/statutory book closure?

- Monthly
- Quarterly
- Yearly

7.6. [ORG INT] What are the financing sources for working capital?

- Invoice down payment
- Factoring
- Reverse factoring / Confirming
- Dynamic discounting
- Consignment stock
- Collaborative Planning, Forecasting and Replenishment (CPFR)
- Other

7.7. [ORG INT] Are there budget / forecasting cycles during the year?

- Yes
- Not

7.7.1. [ORG INT] If Yes, how often?

- Monthly
- Every 3 months
- Every 6 months
- Once per year

7.8. Are there any medium-term financial planning cycles?

- 3 years long Business Plan
- 5 years long Business Plan
- Other specify

OPERATING SIDE:

PHYSICAL ASSETS:

8. *Materials*

In the materials section we talk about: rough materials, semi-finished goods, finished goods, spare parts, and all the other materials that are manipulated within the company

Note down exceptions, which assets, in which department

8.1. [DIG CAP - BMC-RC] Are any applications like Warehouse Management System (WMS) used to support warehouses?

- Yes, to activate automatic warehouse
- Yes, to optimize the "put away" of materials
- Yes, to lead picking activities
- Yes, to support the inventories
- No

8.2. [DIG CAP] How are the assets identified?

- Single items
- In batches
- By product type
- They are not identified

8.2.1. [DIG CAP] If not, quantify the necessity of encoding

- Low, because the volume of materials is low
- Medium
- High

8.3. [DIG CAP] What kind of asset identification method is used?

- RFID
- Electronic device (microcontroller and others)
- Barcode/QR code/other paper-based mechanism
- Other paper-based mechanism

8.3.1. [DIG CAP] If chosen RFID, which is the typology?

- Read-only
- Writable

8.3.2. [DIG CAP] If chosen an electronic device, where is the information recorded?

- On the device
- In the central system

8.4. [DIG CAP] What is the purpose of recording the information?

- Monitor the security or track the history of interactions with the object
- Record the history of the object
- Manage the stock
- Monitor the progress of the production

8.5. [DIG CAP] Which information is associated with the encoding of the asset?

- Characteristics of the object and of the processing
- Characteristics of the object
- Progressive

8.6. [DIG CAP] In which moment does the code get assigned to the asset?

- Before entering in the company (when assigned by the supplier)
- When entering the company
- When entering the production
- At the end of the production
- When leaving the company

8.7. [STR COM] What type of communication ability do the identified assets have?

- Active with processing ability
- Active
- Passive

8.8. [STR COM] Who detects the assets?

- Recognition devices placed inside the company
- Infrared or bluetooth systems
- By an operator with a specialized device
- Recognition is not ensured

8.9. [STR COM] How is the traceability ensured?

- Digital recordings of the activities
- Paper-based recordings of the activities
- Upgrade of the spoken encoding
- The traceability is not ensured

8.10. [STR COM - SC] Does the encoding of the asset remain during the entire supply chain?

- Yes
- No

8.10.1. [STR COM - SC] If yes, how does the company interact with the encoding of the supply chain?

- It is able to read the encoding of the supply chain
- It adds an internal code to the encoding of the supply chain
- It has an own encoding that it imposes on the whole supply chain

9. *Tools*

In the materials section we talk about the tools that are necessary to realize the production

9.1. [DIG CAP - BMC-RC] Are any applications like Warehouse Management System (WMS) used to support warehouses? (multiple choice)

- Yes, to activate automatic warehouse
- Yes, to optimize the "put away" of materials

- Yes, to lead picking activities
- Yes, to support the inventories
- Yer, for other reasons
- No

9.2. [DIG CAP] How are the assets identified?

- Single items
- By product type
- In batches
- They are not identified

9.2.1. [DIG CAP] If not, quantify the necessity of encoding

- Low (e.g. because the volume of materials is low)
- Medium
- High

9.3. [DIG CAP] What kind of asset identification method is used?

- RFID
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- Characteristics of the object and of the processing
- Characteristics of the object
- Progressive

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- When entering the company

- When entering the production
- At the end of the production
- When leaving the company

9.7. [STR COM] What type of communication ability do the identified assets have?

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- By an operator with a specialized device
- Recognition is not ensured

9.9. [STR COM] How is the traceability ensured?

- Digital recordings of the activities
- Paper-based recordings of the activities
- Upgrade of the spoken encoding
- The traceability is not ensured

10. Containers

In the materials section we talk about all the objects that contain other objects that are important, for example boxes, shelves and pallets

10.1. [DIG CAP] What type of asset is tagged inside the company?

- Single objects
- Boxes
- Loading unit (e.g. pallet)

10.2. [DIG CAP] Is there an exchange of tagging during the production cycle?

- Yes
- No

10.3. [DIG CAP] Is the position of an item that is contained in a container identified?

- Yes, individually
- Yes, in batches
- No

10.4. [DIG CAP] Information on which item/batch is in a determined container are tracked?

- Yes, for every item

- Yes, for every batch
- No

10.5. [STR COM] Can the container recognize the position of the containing items?

- Yes, individually
- Yes, in batches
- No

10.6. [STR COM] Are the items or containers detectable by others?

- Yes, individually
- Yes, in batches
- No, only the container is detectable
- No, neither the container nor the item

10.6.1. [STR COM] If yes, the detection capability is:

- Completely centralized
- Mixed
- Completely decentralized

11. Machinery

In the materials section we talk about all the machines that work in production area (machines, plants, robot, etc)

Take note of exceptions and, if considerable, compile this part also for them

11.1. [BMC-RC] What is the machinery concerned? (multiple choice)

- Robot
- Machine tool
- Workshop Tools
- AGV
- Drones
- Measuring devices
- Assembly systems
- Other

-- repeat this group of questions for each selected typology (maximum 10) -

11.2. [DIG CAP - BMC-RC] The machine is equipped with: (multiple choice)

- PLC
- Microcontrollers

- Processors
- Sensors

11.3. [DIG CAP] What function does the machine perform on the asset? (multiple choice)

- Transformation
- Transport
- Quality control
- Safety
- Assembly

11.4. [DIG CAP] Are the operations that are carried out by the machinery recorded?

- Yes, Real-time digital
- Yes, Digital
- Yes, Paper-based
- Not registered

11.5. [DIG CAP] Which type of data is necessary to the funcioning of the machine?

- Digital data
- Paper-based data

11.6. [DIG CAP] Which data are more often necessary for the machines? (multiple choice)

- process data
- programming / planning data
- product data

11.7. [STR COM] Digital data needed for the machine are:

- Available and updated in real-time
- Available in real-time but not updated
- Automatically updated and made available on a regular schedule
- Available to the machine through the intervention of an operator

11.8. [STR COM] How often does the machine need digital data?

- In every moment
- Every hour
- Every turn
- Every day, less than 5 times a day
- Not every days
- Not all weeks

11.9. [STR COM] Paper data necessary for the machine are:

- Available real-time to the machine through an operator full time
- Available to the machine on a regular schedule
- Available to the machine during the periods of inactivity of the operator

11.10. [STR COM] How often does the machine need paper data?

- In every moment
- Every hour
- Every shift
- Every day, less than 5 times a day
- Not every days
- Not all weeks

11.11. [STR COM - BMC-RC] Which type of interaction does the machine allow?

- M2M communication automatically with other machinery
- Machine can interact and collaborate with other machines through an OT system
- Machine can interact and collaborate with other machines controllable through an IT system
- Machine can be controlled through an IT system

11.12. [STR COM] With which purpose does the machine interact with people? (multiple choice)

- Ergonomics
- Safety
- Control
- Actuate

--------- end of repetition ---------

12. *Material handlers*

In this section we talk about the material handlers that are used in order to move materials within the company

12.1. [DIG CAP - BMC-RC] Does the company use automatic handlers inside the warehouse?

- yes
- no

12.1.1. [DIG CAP - BMC-RC] If not, quantify the need for handlers?

- low because the warehouse is narrow
- medium
- high

12.1.2. [DIG CAP] If not, the management of stocks type is

- managed by the central system
- manual

12.1.3. [DIG CAP] If yes, material handling move on path:

- Variable
- Fixed

12.1.3.1. [DIG CAP] If the path is variable, how handlers intelligence is managed?

- Distributed
- Mixed
- Centralized

12.2. [DIG CAP - BMC-RC] Does the company use automatic handlers within the factory?

- yes
- no

12.2.1. [DIG CAP - BMC-RC] If not, quantify the necessity for automatic handlers

- Low since the warehouse has restricted dimensions
- media
- high

12.2.2. [DIG CAP] If yes, handlers moves on path:

- Variable
- Fixed

12.2.3. [DIG CAP] How is the intelligence of the handlers managed?

- Distributed
- Mixed
- Centralized

12.2.4. [STR COM] Handlers are tracked:

- continuously throughout all the company
- continuously only in some departments
- finite-state throughout the company
- finite-state only in some departments

12.2.5. [STR COM] Can the handler detect the items contained?

- Yes, individually
- Yes, in batch
- Yes, set of batches (container)
- No

12.3. [STR COM - BMC-RC - SC] Are applications like Transportation Management System (TMS) used to support logistics? (multiple choice)

- Yes, to locate the couriers
- Yes, to monitor the progress of the transport
- Yes, to manage the documentation for import
- Yes, to optimize routes
- No

12.4. [DIG CAP - BMC-RC] The company manages the transport internally:

- yes
- no

12.4.1. [DIG CAP - BMC-RC] If no, quantify the need:

- Low importance and/or low competencies
- media
- high

12.5. [STR COM - SC] The external handlers are located:

- Continuously over the whole path
- Continuously only in some sections of the path
- Finite-states defined along all the path (at fixed points)
- Finite-states defined along a section of the path (at fixed points)
- Location is not guaranteed

12.6. [STR COM - SC] If handlers position is tracked, localization is guaranteed by:

- Location sensor on the container/pieces
- Automatic devices for reading at each pick/load
- Devices used by the operator at each pick/load
- Location sensor on the handler

13. *People*

In this section we talk about people and the operations they perform (e.g. we do not talk here about competencies and skills)

13.1. [DIG CAP - BMC-RC] What kind of operational activities are done by people?

- Handicrafts
- Repetitive value added
- Give little added value
- Dedicated to added value
- Repetitive with little added value
- No activity is done by people (or only supervision)

13.2. [DIG CAP - BMC-RC] When operations are performed on objects by people (and not by machines or automatic tools), e.g. when people manipulate objects, which kind of objects do they manipulate?

- Fragile objects
- Microsize objects
- Personalized objects
- People manipulate all kinds of objects even if existing machines and tools should be used

13.3. [DIG CAP] When does the company perform stock counting?

- Every 2 or more years
- every year
- at most 2 times a year

- at most 6 times a year
- every month
- every week
- everyday

13.4. [DIG CAP] Who perform the inventory?

- machine
- a manager with the aid of a device
- a manager in manual mode
- an operative profile with the aid of a device
- an operator profile in manual mode

13.5. [DIG CAP] Are inventory results recorded?

- yes, in digital
- yes, on hardcopy
- no

13.6. [DIG CAP] Is the position of people registered?

- Yes, always
- Yes, in some departments
- Yes, in proximity of some of the machinery
- No

Indicate the minimum and maximum ratio of people assigned to machines:

13.7. minimum(n person/machinery)

13.8. maximum (n person/machinery)

13.9. Indicate the number of machines:

13.10. [STR COM] How does the communication between the staff inside the company take place?

- The exchanged information are tracked and transmitted through standardized procedures
- Information exchanged are tracked but are transmitted through not standardized procedures
- Information exchanged are not tracked but are transmitted through standardized procedures
- Information exchanged are not tracked, and are transmitted through not standardized procedures

INFORMATIONAL ASSETS

14. Monitoring

In this section we talk about the procedures that are present in order to monitor the process and measure performance

14.1. [INF PRO - BMC-AC] Are the procedures for performing the tasks defined?

- Yes, digital
- Yes, on hardcopy
- Yes, verbally
- No

14.2. [INF PRO - BMC-AC] Does the company have any process mapping?

- Yes, in digital
- Yes, on hardcopy
- Yes, know-how not written
- No
- Do not know what it is

14.3. INF PRO - BMC-AC] Are the process control points defined and programmed?

- Yes
- No

14.4. [INF PRO - BMC-AC] Are the activities of process control registered?

- Yes, in digital
- Yes, on hardcopy
- No

14.5. [INF PRO] Are the results recorded?

- Yes, in digital
- Yes, on hardcopy
- No

14.6. [INTEGR - SC] Are the results analyzed considering also the needs of stakeholders (clients, supplier, workers ecc.)?

- Yes
- No

14.7. [INTEGR - SC] Are the performances of the competitors monitored?

- Yes
- No

14.8. [INTEGR - SC] Are the results analyzed in benchmarking with competitors and other industries?

- Yes
- No

15. Purchasing

In this section we talk about how the purchasing office performs its activities and manage its data.

15.1. [INF PRO - BMC-RC] Is an historical archive of purchasing available?

- Yes, on digital media
- Yes, on hardcopy
- No

15.1.1. [INF PRO - BMC-RC] If yes, the archive contains recordings since:

- Over the last 5 years
- From 3 to 5 years
- From 1 to 3 years
- Less than 1 year

15.2. [INF PRO] How and how often are these data analyzed?

- in real-time, automatically
- in real-time, by a dedicated operator
- at specified timings by a computer
- at specified timings by a dedicated operator
- Not analysed

15.3. [INF PRO] Does a correlation analysis with other data is performed?

- Yes, in order to obtain more informations
- Yes, for validation purpose
- No

15.4. [INF PRO] Why are these data analyzed?

- To get forecasts
- For continuous monitoring
- For planning purpose

15.5. [INF PRO] Are the data integrated internally/inside the company (within all the appropriate business function)?

- Yes
- No

15.6. [INTEGR - SC] Are data integrated with at least one company in the supply chain?

- Yes
- No

15.7. [INTEGR - SC] Are data integrated with most of the companies in the supply chain?

- Yes
- No

16. Sales

In this section we talk about how the sales office performs its activities and manage its data.

16.1. [INF PRO - BMC-RC] Does an historical archive of sales exist?

- Yes, on digital media
- Yes, on hardcopy
- No

16.1.1. [INF PRO - BMC-RC] If yes, the archive contains recordings since:

- Over the last 5 years
- From 3 to 5 years
- From 1 to 3 years
- Less than 1 year

16.2. [INF PRO] How and how often are these data analyzed?

- in real-time, automatically
- in real-time, by a dedicated operator
- at specified timings by a computer
- at specified timings by a dedicated operator
- Not analysed

16.3. [INF PRO] Does a correlation analysis with other data is performed?

- Yes, in order to obtain more informations
- Yes, for validation purpose
- No

16.4. [INF PRO] Why are these data analyzed?

- To get forecasts
- For continuous monitoring
- For planning purpose

16.5. [INF PRO] Are the data integrated internally/inside the company (within all the appropriate business function)?

- Yes

- No

16.6. [INTEGR - SC] Are data integrated upstream or downstream in the supply chain?

- Yes, with only one/two subject of the supply chain
- Yes, with many subjects of the supply chain
- No

16.7. [INTEGR - SC] In the B2B case, do customers share forecast data?

- Yes
- No

16.8. [INTEGR - SC] Does the company analyze the historical data?

- Yes
- No

16.8.1. [INTEGR - SC] If yes, the forecast data

- Are correct, on average
- Oscillate between underestimation and overestimation
- Systematically underestimate
- Systematically overestimate

17. Post sales

In this section we talk about how the post-sales activities are done and how data related are managed.

17.1. [INF PRO - BMC-RC] Does an historical archive of complaints and/or post-sales activities exist?

- Yes, on digital media
- Yes, on hardcopy
- No

17.1.1. [INF PRO - BMC-RC] If not, are post-sales activities performed?

- No, or not relevant
- Yes

17.1.2. [INF PRO - BMC-RC] If yes, the archive contains recordings since:

- Over the last 5 years
- From 3 to 5 years
- From 1 to 3 years
- Less than 1 year

17.2. [INF PRO] How and how often are these data analyzed?

- in real-time, automatically

- in real-time, by a dedicated operator
- at specified timings by a computer
- at specified timings by a dedicated operator
- Not analysed

17.3. [INF PRO] Does a correlation analysis with other data is performed?

- Yes, in order to obtain more informations
- Yes, for validation purpose
- No

17.4. [INF PRO] Why are these data analyzed?

- To get forecasts
- For continuous monitoring
- For planning purpose

17.5. [INF PRO] Are the data integrated internally/inside the company (within all the appropriate business function)?

- Yes
- No

17.6. [INTEGR - SC] Are data integrated with at least one company in the supply chain?

- Yes
- No

17.7. [INTEGR - SC] Are data integrated with most of the companies in the supply chain?

- Yes, with only one/two subject of the supply chain
- Yes, with many subjects of the supply chain
- No

18. Marketing

In this section we talk about how the marketing office performs its activities and manage its data.

18.1. [INF PRO - BMC-RC] Does an historical archive of marketing activities exist?

- Yes, on digital media
- Yes, on hardcopy
- No

18.1.1. [INF PRO - BMC-RC - BMC-RI] If not, what about marketing needs of the company?

- Marketing exists and it is relevant
- Marketing does not exist, but it should be needed
- Marketing does not exist, however it has low relevance in the targeted market

18.1.2. [INF PRO] If yes, the archive contains recordings since:

- Over the last 5 years
- From 3 to 5 years
- From 1 to 3 years
- Less than 1 year

18.2. [INF PRO] How and how often are these data analyzed?

- in real-time, automatically
- in real-time, by a dedicated operator
- at specified timings by a computer
- at specified timings by a dedicated operator
- Not analysed

18.3. [INF PRO] Does a correlation analysis with other data is performed?

- Yes, in order to obtain more informations
- Yes, for validation purpose
- No

18.4.[INF PRO] Why are these data analyzed?

- To get forecasts
- For continuous monitoring
- For planning purpose

18.5. [INF PRO] Are the data integrated internally/inside the company (within all the appropriate business function)?

- Yes
- No

18.6. [INTEGR - SC] Are data integrated upstream or downstream in the supply chain?

- Yes, with only one/two subject of the supply chain
- Yes, with many subjects of the supply chain
- No

18.7. [INTEGR - BMC-Rl - SC] Is it possible for final users to find feedbacks about your products?

- Yes
- No

18.8. [INTEGR - SC] If yes, is this activity carried out?

- Yes
- No

18.9. [INTEGR - SC]If yes, is it carried out systematically?

- Yes
- No

18.10. [INTEGR - SC] Are the feedback stored?

- Yes, in electronic format
- Yes, on hardcopy
- No

19. *Design*

In this section we talk about how the company performs design activities and manage data related to that.

19.1. [INF PRO - BMC-AC] Does the company carry out internal product design activities?

- Yes
- No

19.1.1. [INF PRO - BMC-AC] If not, please choose one of the following reason:

- The design is not needed (e.g. it is carried out by upstream entities in the value creation chain or because we are dealing with standardized products)
- Outsourced activity

19.2. [INTEGR] In order to manage and track product design, does the company use:

- The whole process with Product Lifecycle Management PLM
- Product Data Management PDM
- Nothing

19.3. [INF PRO] How does prototypes realised by the technical department are encoded/identified?

- Individually
- Grouping them together (variants of the same prototype)
- They are not identified

19.3.1. [INF PRO] If not, why?

- Designing is a sporadic activity
- Designing is a non-core activity
- The number of prototypes is low or absent

19.4. [INF PRO] Are prototypes stored and preserved?

- Yes
- No

19.4.1. [INF PRO] If yes, how are they stored?

- In a dedicated prototypes' warehouse
- With other materials in a warehouse

19.5. [INF PRO] Documents are usually:

- Only in electronic format
- Both in electronic and in paper format
- Only in paper format

19.5.1. [INF PRO] If both, does it exist an internal process for digitalisation/dematerialisation of relevant paper documents?

- Yes, by data entry
- No, only scanning of paper documents

19.6. [INF PRO] How documents regarding design activities are encoded/identified?

- Individually
- By folder
- They are not identified

19.7. [INF PRO] What kind of digital documents coding does the company use?

- Structured and itemised
- Structured but not itemised
- Not structured

19.8. [INF PRO] What kind of information does the code contain? (multiple choice)

- Title
- Type of document
- Business function issuing the document
- The stage for which the document is issued
- Date of issuing
- Name or role of the person issuing the document
- Reviewing number
- Name or role of the person approving the document

19.9. [INF PRO] The designing activities are carried out mainly by:

- A multidisciplinary team
- A monodisciplinary team
- A single person

19.10. [INF PRO - BMC-RC] Does an historical archive exist about product designing?

- Yes, in electronic format
- Yes, in paper format
- No

19.10.1. [INF PRO - MBC-RC - BMC-AC] If yes, for which product design phases? (multiple choice)

- All
- Opportunities identification
- Feasibility analysis
- Conceptual design
- Detailed design
- Risk analysis
- Benchmarking
- Costing
- Simulation
- Testing

19.11. [INF PRO] Are documents analysed?

- Yes, automatically
- Yes, regularly by workers
- Yes, not regularly by workers
- No, they are not analysed

19.12. [INF PRO] Why is the document analysis carried out?

- For technological forecasting
- For design planning
- For continuously monitoring of the design phase

19.13. [INTEGR - SC] The documents and related data are:

- Integrated through the whole supply chain
- Upstream and/or downstream integrated
- Internally (to the company) integrated
- Not integrated

19.14. [INTEGR - SC] Does the company analyse data coming from the market?

- Yes, automatically
- Yes, regularly by workers
- Yes, not regularly by workers
- No

19.14.1. [INTEGR] If yes, are the results of the analysis recorded in the document specific?

- Yes
- No

19.14.2. [INTEGR - BMC-AC] Does the company use results as a lesson learned?

- Yes, when planning next design activities
- Yes, when controlling next design activities
- No

20. Research and Development

In this section we talk about how the Research and Development office performs its activities and manage its data.

20.1. [INF PRO - BMC-AC] Does the company perform internal R&D activities?

- Yes
- No

20.1.1. [INF PRO - BMC-AC] If not, what about the company R&D needs?

- There is no need for R&D (e.g. because it is carried out by players upstream in the supply chain)
- It is an activity carried out externally

20.2. [INF PRO] The R&D activity is carried out by:

- A multidisciplinary team
- A monodisciplinary team
- A single person

20.3. [INF PRO] Does an historical archive exist about R&D activities?

- Yes, in electronic format
- Yes, in paper format
- No

20.3.1. [INF PRO] If yes, the archive contains recordings since:

- Over the last 5 years
- From 3 to 5 years
- From 1 to 3 years
- Less than 1 year

20.4. [INF PRO] How and how often are these data analyzed?

- in real-time, automatically
- in real-time, by a dedicated operator
- at specified timings by a computer
- at specified timings by a dedicated operator
- Not analysed

20.5. [INF PRO] Do other departments form the company analyse the data?

- Yes
- No

20.6. [INTEGR - SC] Are data integrated with at least one company in the supply chain?

- Yes
- No

20.7. [INTEGR - SC] Are data integrated with most of the companies in the supply chain?

- Yes, with only one/two subject of the supply chain
- Yes, with many subjects of the supply chain
- No

21. Maintenance

In this section we talk about how the company performs design activities and manage data related to that.

21.1. [INF PRO - BMC-AC] Does the company maintain machineries?

- Yes
- No, we directly substitute when a breakdown occurs
- No, it is not needed

21.1.1. [INF PRO] If yes, when do you call the maintenance operator?

- When the machinery is working but it signals the possibility that a breakdown will occur soon
- When the machinery is working but the maintenance work has been programmed based on the breakdown history
- The machinery is out of work because of a breakdown

21.2. [INF PRO] Does the company record maintenance activities?

- Yes, in real-time, digitally and automatically
- Yes, in real-time, digitally by a worker
- Yes, later, digitally by a worker
- Yes, in real-time, in paper format
- Yes, later, in paper format
- No

21.3. [INTEGR] Does the machinery emit a warning when a breakdown occurs?

- Yes, automatically to the other machineries
- Yes, automatically to the management system
- Yes, but the worker must watch and manage the signal
- No

21.4. [INF PRO - BMC-RC] Does an historical archive of maintenance is available?

- Yes, on digital media
- Yes, on hardcopy
- No

21.4.1. [INF PRO - BMC-RC] If yes, the archive contains recordings since:

- Over the last 5 years
- From 3 to 5 years
- From 1 to 3 years
- Less than 1 year

21.5. [INF PRO] How and how often are these data analyzed?

- in real-time, automatically
- in real-time, by a dedicated operator
- at specified timings by a computer
- at specified timings by a dedicated operator
- Not analysed

21.6. [INF PRO] Does a correlation analysis with other data is performed?

- Yes, in order to obtain more information
- Yes, for validation purpose
- No

21.7. [INF PRO] Why are these data analyzed?

- To get forecasts
- For continuous monitoring
- For planning purpose

21.8.[INF PRO] Are the data integrated internally/inside the company (within all the appropriate business function)?

- Yes
- No

21.9. [INTEGR - SC] Are data integrated with at least one company in the supply chain?

- Yes
- No

21.9. [INTEGR - SC] Are data integrated with most of the companies in the supply chain?

- Yes
- No

22. Quality

In this section we talk about how the company performs quality activities and manage data related to that.

22.1. [INF PRO - BMC-AC] When does the company perform quality control?

- Continuously
- In more than two points of the chain
- In two points of the chain
- In one point of the chain
- Not in a structured way

22.2. [INF PRO] If the company performs quality control, how does the company do that? (multiple choice)

- By a vision system
- By a machinery
- By a worker or any other person responsible for quality assurance

22.3. [INF PRO] When does the company perform the control activity?

- During the whole time the piece stays in the machinery
- When the piece enters or exits the machinery

22.4. [INF PRO] Does the company record the quality control results (choose the most relevant/frequent answer)?

- Yes, in real-time, digitally and automatically
- Yes, in real-time, digitally by a worker
- Yes, later, digitally by a worker
- Yes, in real-time, in paper format
- Yes, later, in paper format
- Yes, both digitally and in paper format
- No

22.5 [INTEGR] Does the machinery emit a warning in case of a non-compliance finding of a piece?

- Yes, automatically to the other machineries
- Yes, automatically to the management system
- Yes, but the worker must watch and manage the signal
- No

22.6. [INTEGR] Does machineries exchange data coming from quality control?

- Yes
- No

22.7. [INF PRO - BMC-AC] Does the company perform quality control on the documents that are more important for the company (e.g. technical drawing, production orders. etc)?

- Yes
- No

22.8. [INF PRO - BMC-AC] When does the company check the quality of the documents that are more important for the company (e.g. technical drawing, production orders. etc)?

- Continuously
- In more than two points of the chain
- In two points of the chain
- In one point of the chain
- Never

22.8.1. [INF PRO] If yes, how does the company perform quality control on that documents?

- By a software
- By a worker with a dedicated device
- Visually by a worker

22.9. [INF PRO] When does the company perform control activities?

- During the whole process, from the opening of the document until the validation
- During any stage of document reviewing

22.10. [INF PRO] Does the company record control activity and results?

- Yes, in real-time, digitally and automatically
- Yes, in real-time, digitally by a worker
- Yes, later, digitally by a worker
- Yes, in real-time, in paper format
- Yes, later, in paper format
- No

22.11. [INTEGR] Does the management software emit a warning in case of a non-compliance finding of the document?

- Yes, automatically for the users allowed to access the document
- Yes, automatically for all the users of the enterprise resource planning
- Yes, but the worker must watch and manage the signal
- No

23. Scheduling

In this section we talk about how the company schedule the production and how much this process is flexible.

23.1. [INTEGR] Does machinery exchange data on production scheduling?

- Yes
- No

23.2. [INTEGR] How scheduling is communicated to blue collar?

- Scheduling is communicated directly to machines
- Scheduling is communicated through the information system or another electronic device (e.g. a monitor)
- Scheduling is communicated through sheets near the machines

23.3. [INTEGR] Does the machinery emit a warning in case of a production delay?

- Yes, automatically to the other machineries
- Yes, automatically to the management system
- Yes, but the worker must watch and manage the signal
- No

23.4. [INF PRO] How does the company manage the short-term production re-scheduling?

- Using an electronic notice board
- Using a tablet
- Using an on-board computer
- Using a paper board
- Using a paper sheet

23.5. [INF PRO] How does the company updates the scheduling?

- In real-time automatically
- In real-time by a dedicated worker
- In specific, planned, moments
- Depending on the workers availability

23.6. [INF PRO - BMC-AC] Does the company use production simulation systems?

- Yes, when programming and reprogramming using on-board devices
- Yes, when programming
- Yes, when monitoring production
- No

CULTURE:

24. Agile

This section investigate the culture of the organization for what concerns the way of manage workers and define strategies

24.1. [WIL CHA] Do you have job rotation policies?

- Yes
- A few
- No

24.1.1. [WIL CHA] If a few, would the workers be available?

- Yes, without any difficulty
- Yes, with a training period
- No

24.1.2. [WIL CHA] If not, how did the workers reacted in the past about the introduced technological innovations?

- They were open to learning
- With some initial difficulties
- With complaints and difficulties which were not overcome

24.2. [WIL CHA] In case workers had difficulties with technological innovations in the company: (multiple choice)

- Organised specific training courses for the workers
- Started a process of cultural sharing towards change
- Started a supporting path
- Other kind of actions on technical or cultural training
- None of the previous options

24.3. [WIL CHA] If the company defines some strategies and defines some indicators related to them, does the company organise any exchange of views about them (with employees)?

- Yes, regularly
- Yes, not regularly
- No

24.3.1. [WIL CHA] If not, why?

- Because of lack of time
- Because from previous experiences they are considered useless for the company
- To have a controlling vision separated from those working on it
- For a specific choice about decisions accordingly to the hierarchy
- Other reasons

24.3.2. [WIL CHA] If yes, for what kind of indicators?

- For all the indicators categories
- For organisational indicators
- For operative indicators

24.3.3. [WIL CHA] If yes, does the company record data about the exchange of views?

- Yes, in electronic format
- Yes, in paper format
- No

24.4. [WIL CHA] Does the company use results as a lesson learned?

- Yes, when planning next activities
- Yes, when controlling next activities
- No

24.4.1. [WIL CHA] If not, why?

- Lack of time
- Workers with high tacit knowledge
- The activity is considered not relevant
- Other reasons

24.5. [SOC COL] The operational decisions are mainly made by:

- Managers together with white collars
- Managers together with white and blue collars
- Managers after consulting white collars
- Managers after consulting white and blue collars
- Management group
- Single manager

24.6. [SOC COL] Strategic decisions are mainly made by:

- Managers together with workers
- Managers after consulting workers
- Management group
- Single manager

25. Data-driven approach

This section investigate the characteristics of the decisional process and the importance of data in this kind of activity

25.1. [WIL CHA] How much does the company use the data-driven approach?

- Workers are driven by the knowledge they learn from data
- Workers based their knowledge on personal observations
- Labourers execute decisions made by other people

25.2. [WIL CHA] Within the company, do you define sharing policies about know-how?

- Yes
- No

25.2.1. [WIL CHA] If not, do the workers (both white and blue collars) communicate and share their know-how deriving from their job?

- Yes, they both have time, place and context to share their experience
- Yes, during specific available moments
- Yes, during specific occasions organised by the company out of the working time
- No

25.3. [WIL CHA] Does the company carry out open innovation in R&D?

- Yes
- No, because it is considered not needed
- No, even if it is needed

25.4. [WIL CHA] How much does the company base its decisions on data?

- The decisions are made after the analysis on recorded data
- The decisions are made on the experience about not recorded data
- The decisions are guided by the context without considering data

25.5. [SOC COL] Are workers (both white and blue collars) aware of the advantages deriving from the information system?

- Yes
- No

25.6. [SOC COL] Do the workers have trust in the information system?

- Yes, they execute the activities according to standards
- No, they often run away from the system

25.7. [SOC COL] How often are the results of the analysis made with the information system shared with the workers?

- Often
- Not often
- Never

26. Communication

This section investigate how the company promote communication within workers

26.1. [WIL CHA] Does the company define policies of soft skills continuing education?

- Yes, through job rotation in all departments
- Yes, within the same department
- No

26.1.1. [WIL CHA] If not, why?

- This kind of competencies are not known
- This kind of competencies are not considered relevant
- Insufficient resources
- Other reasons

26.2. [SOC COL] Does the company state policies for information sharing on operational activities between blue and white collars or between plant employees and the rest of the organisation?

- Yes
- No

26.2.1. [SOC COL] If not, why?

- The sharing is considered not relevant
- The sharing of previous experiences is considered not effective within the company
- Insufficient resources
- Other reasons

26.3. [SOC COL] Which communication systems are adopted between blue and white collars or between plant employees and the rest of the organisation?

(multiple choice)

- Verbally
- Notice board
- Phone
- Radio
- Email
- Cellular phone
- Dedicated devices

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