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Process Mapping and Optimization of Expropriation Procedures: Applying Flowchart Standards and Quality Principles

A Case Study in Public Administration: S.C.R. Piemonte

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1. INTRODUCTION

1.1. GENERAL CONTEXT

In recent years, public institutions have faced increasing pressure to enhance operational efficiency, transparency and service quality. The above-mentioned challenges are particularly critical in sectors where processes are extremely complex and highly regulated, such as public procurement and expropriation. These areas involve multiple stakeholders, strict legal requirements and often have significant impacts on citizens and local communities.

Against this backdrop, the analysis and optimization of business processes have become fundamental tools for improving performance and accountability. Mapping workflows, identifying inefficiencies and applying quality management principles across all the activities enable organizations to reduce delays and streamline operations.

The present thesis focuses on the analysis and optimization of the expropriation process in a public administration context. In particular, it illustrates a case study developed during a traineeship at S.C.R Piemonte S.p.A., with the goal of examining and proposing improvements to the existing workflow by applying process mapping techniques and quality management principles, in order to enhance operational efficiency and ensure alignment with regulatory standards.

1.1.1. S.C.R. PIEMONTE

S.C.R. Piemonte S.p.A. is a public company owned by the Region of Piedmont established by the Regional Law no. 19 of 6 August 2007. It operates as a central contracting and aggregating entity for the Region, with the primary goal of rationalising public expenditure and optimising the procedures for selecting public contractors in areas of regional interest. These areas include infrastructure, transport and telecommunications, healthcare, and common goods and services.

As the acquiring company, SCR operates on behalf of the Piedmont Region contributing to the economic, financial and social development of the region. Furthermore, it cooperates with a range of public and territorial entities located in its territory:

- Municipalities, companies, educational and university institutions, territorial home agencies;
- Public-law bodies set up or participated in by the Piedmont Region and their consortia and associations;
- Regional health authorities and companies.

The company's core functions are aimed at optimising expenditure, reducing the costs and the time associated with supplier selection, and ensuring transparency and free competition.

These goals are pursued in compliance with EU legislation, national and regional law concerning public contracts for works, services and suppliers, and in alignment with national collective bargaining agreements (i.e., Directive 2014/24/EU, Legislative Decree No. 36/2023, Legislative Decree No. 50/2016, Regional Law No. 19/2007, and National collective labour agreements (CCNL)).

Over the years, S.C.R.'s strategic role in regional public procurement has expanded significantly, supporting the Piedmont Region and other public entities in managing their processes from planning and tender aggregation to contract execution.
Thanks to its centralized model, the company helps public bodies achieve economies of scale, streamline procedures and ensure transparency. It is particularly involved in major infrastructures and public investment projects, where efficiency and coordination are essential.
Among the areas most impacted by the organization's activities there is the expropriation process, which is crucial for the implementation of public works. In this domain, S.C.R. oversees the procedural, legal and administrative steps needed to acquire land for public use, applying a process-based approach to ensure timeliness and support contracting authorities effectively.

Figure 1: SCR logo

1.1.2. ORGANISATIONAL STRUCTURE OF THE HOLDING

The organizational chart of the company (*Figure 2*) reflects a hierarchical organisational structure composed of various levels of responsibilities and functions, including Corporate Bodies ('Organi Societari'), Other Bodies and Functions ('Altri organismi e funzioni'), and Operational Organisational Structures ('Strutture organizzative operative').

At the top are the company's governing bodies: the Board of Directors ('Consiglio di Amministrazione'), which is entrusted with the management of the company, the Board of Statutory Auditors ('Collegio Sindacale'), responsible for controlling the administration and the Supervisory Body ('Organismo di Vigilanza'), which is responsible for monitoring the liability of institutions.

Alongside these governing bodies, there are other support and monitoring bodies and functions of significant importance. Notably, we highlight the function dedicated to Anti-corruption, anti-money laundering and transparency (‘Anticorruzione, antiriciclaggio e trasparenza’), essential to ensure the legality and integrity of operations, and the Internal Audit (Internal Audit), fundamental for the internal verification of processes and controls. Beneath these bodies, the General Manager (‘Direttore Generale’) holds primary responsibility, who assumes a central role in the overall operational management of the entity.

In support of the Directorate-General (‘Direzione Generale’) and general activities, several key functions are distinguished below:

- Human Resources, General Affairs and Information Systems function (‘Funzione Risorse Umane, Affari Generali e Sistemi Informativi’), which takes care of human capital, general services and technological infrastructure and includes the O.U. General Secretariat and Communication (‘U.O. Segreteria Generale e Comunicazione’);
- Management Control and Legal Affairs function (‘Funzione Controllo di Gestione e Affari Legali’), which provides advice and support in legal matters;
- Contract management function (‘Funzione Gestione Contratti’), handling contract administration.

In addition, the Directorate-General oversees three main operational directorates:

- The Public Works Department (‘Direzione Opere Pubbliche’): in which we find the RUP Function (‘Funzione RUP’), the Works Management/High Surveillance Function (‘Funzione Direzione Lavori / Alta Sorveglianza’), the U.O. Technical Administrative Support (‘U.O. Supporto Tecnico Amministrativo’), and the U.O. Expropriated (‘U.O. Espropri’), dedicated to the expropriation procedures to which this thesis pays particular attention;
- Budget and Finance Department (‘Direzione Bilancio e Finanza’): responsible for economic and financial management;
- The Procurement Department (‘Direzione Appalti’): focused on other types of contracts, where we find the Aggregator Function (‘Funzione Soggetto Aggregatore’) and the Public Works Contracts and Tenders Delegation Function (‘Funzione Appalti Opere Pubbliche e Gare su Delega’), with the U.O. Region, Other Entities and Internal Acquisitions ('U.O. Regione, Altri Enti e Acquisizioni Interne’).

In summary, the organization of SCR Piemonte is a complex and well-defined structure, designed to respond effectively to the different functions and responsibilities of the institution, through a clear distinction of roles and competences between government bodies, support functions and operational directions.

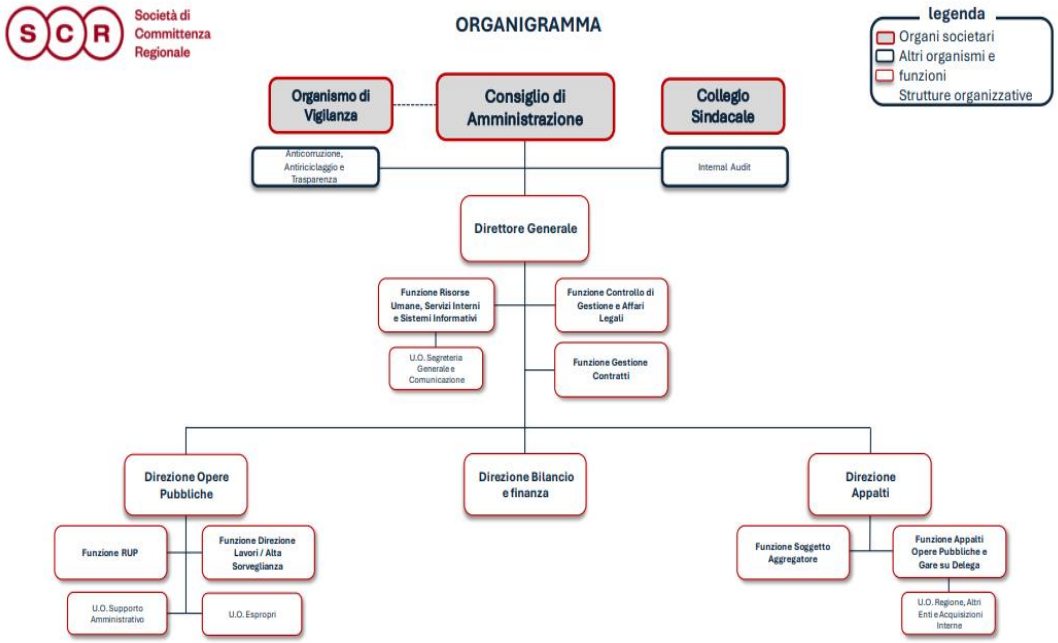


Figure 2: SCR Piemonte organisational chart

1.1.3. OPERATIONAL EFFICIENCY AND QUALITY

Within the operational framework of S.C.R. Piemonte, process efficiency and activity quality represent two strategic pillars essential to organizational success.

These pillars are not only functional requirements, but also fundamental attributes of effective governance. In a public administrative landscape that is increasingly oriented towards transparency, simplification and digitisation, the adoption of efficient and high-quality organizational practices is a necessary condition for meeting deadlines, ensuring procedural correctness and enhancing the effectiveness of public action.

Indeed, with clearer and well-defined processes, a greater traceability of activities is achieved, facilitating the understanding by stakeholders - subjects bearing a specific interest in a company - and the elimination of unnecessary passages leads to a significant operational improvement. Finally, efficient process digitization requires optimized workflows; otherwise, their digital transcription will not deliver the expected benefits.

The efficiency of a process refers to the company's ability to achieve specific objectives by minimizing the consumption of time, effort and resources. From a managerial perspective, it implies the optimal allocation and use of inputs (human, financial, technological) to generate desired outputs (services, contracts, procedures) with maximum effectiveness.

Efficient operations reduce waste, eliminate redundancies and improve overall performance, enabling deadlines and legal obligations to be met with greater predictability and control.
At the same time, quality is understood not only as adherence to formal standards or regulatory compliance, but also as an intrinsic capacity of the organization to respond in a timely, reliable and goal-oriented way to the specific needs of public procurement.
To this end, the company aligns itself with international quality standards, such as ISO 9001, which provides systematic criteria for quality management and continuous improvement. A clear and well-structured process design enables greater traceability of activities, facilitating both monitoring and transparency. When procedures are streamlined and responsibilities clearly allocated, stakeholders can more easily understand the logic and objectives of administrative actions.
Importantly, digital transformation efforts within the organization must be built upon optimized workflows. Digitising processes efficiently is a prerequisite for a successful digitalization (not merely its by-product), because a poor and inefficient design will not fail to deliver the intended benefits and may instead perpetuate existing inefficiencies in a digital form.

These considerations become even more critical in complex and sensitive proceedings such as expropriations for public utility, which are central to the implementation of infrastructure projects. These procedures involve multiple actors, operate within stringent time constraints and often have significant implications for the rights of individuals and communities. In this context, a meticulous focus on efficiency can mean the reduction of procedural errors and delays that could generate legal disputes that are costly and damaging to the image of the institution.
Similarly, the application of high-quality standards ensures transparent communications, well-grounded decisions and predictable outcomes, all of which are fundamental to prevent disputes and ensure a responsible use of public resources allocated to the compensation and execution of public works. The company's ability to ensure procedural accuracy, regulatory compliance and stakeholder engagement directly affects its institutional reputation and capacity to deliver value-added services.
In conclusion, efficiency enables S.C.R. Piemonte to deploy its resources in the most effective manner, while quality ensures that public objectives are pursued and achieved in line with the principles of fairness, accountability and good administration.
Together, these two dimensions form the foundation for a high-performing public organization capable of managing complexity and delivering on its mandate.

1.2. MOTIVATION AND OBJECTIVES OF RESEARCH

Analysing and optimizing business processes represents a crucial challenge for most organizations, particularly in contests characterized by increasing complexity, evolving standards and the growing influence of digital transformation.

This challenge becomes even more pronounced in the public sector, where institutions must operate with high levels of accountability, efficient use of resources, and strict adherence to deadlines and legal obligations. Process optimization offers numerous advantages in this regard: it helps companies to achieve the predetermined objectives and to obtain the improvement and simplification of organizational performance.
The motivation behind this thesis arises from the need to intervene in an existing operational process that, in its current configuration, presents inefficiencies, redundancies and non-conformity with quality standards and norms. In particular, the case study analysed is that of expropriations for public benefit (espropri per pubblica utilità) which is a complex administrative practice, often characterized by complex bureaucratic steps, prolonged delays and difficulties in ensuring regulatory compliance.
Its proper execution is essential not only from a legal standpoint but also in ensuring the successful and timely delivery of strategic public works.

During the preliminary analysis, a non-compliant and poorly structured flow diagram of the process was identified. This deficiency is not merely a documentation issue but reflects deeper dysfunctions in the operational management of the procedure. The absence of a standardized, clear, and logically coherent representation of the process contributes to confusion, misinterpretation and inconsistency in practice execution. It also hampers internal training, the monitoring of procedural performance and the replicability of key activities.

Given these considerations, this research sets out two main objectives:

- To critically analyse the current process of public utility expropriations: identifying its structural weaknesses, redundant steps and elements that hinder compliance. This diagnostic phase leverages quality management tools such as flowchart mapping and SWOT analysis to provide a grounded and systematic evaluation;

- To propose an optimized version of the process, supported by a flow diagram that is not only compliant with regulatory and symbolic standards, but also oriented toward greater efficiency, digital readiness and higher service quality.
  Particular attention is given to the elimination of redundant actions and the enhancement of process traceability and simplification.

Beyond addressing the specific case of expropriations, this work aspires to offer a replicable methodology applicable to other organizational processes within public administration. Using practical tools and focusing on continuous improvement, the research aims to contribute to the promotion of quality-driven management practices that are both sustainable and aligned with the principles of good governance.

1.3. IMPORTANCE OF BUSINESS PROCESS ANALYSIS

Business Process Analysis (BPA) is a crucial tool for understanding, governing and improving operational activities within an organization. By providing a visual and descriptive representation of workflows through process mapping, BPA makes it possible to clarify how tasks are structured and how various departments and actors interact. This representation enhances transparency and helps pinpoint interdependencies and areas of inefficiency across the company.
One of the core advantages of the methodology is its ability to optimize the day-to-day operations of business, aligning them more strategically with broader organizational goals and improving the effectiveness of decision-making. So, business process analysis is not limited to describe what happens within the company, but it also plays a diagnostic role, identifying redundancies, inefficiencies and areas of potential simplification. This analysis lays the foundation for leaner processes and fosters a culture of continuous improvement.

Among the most significant benefits of BPA are:

- Organizational efficiency: achieved through the elimination of redundant activities, the reduction of execution times and the improvement in overall service quality;
- Clearer definition of roles and responsibilities: which reduces overlaps and avoids ambiguity, ensuring greater transparency and facilitating communication between the different compartments;
- Promotion of a quality-oriented culture: the adoption of analysis and mapping tools promotes the dissemination of a common language, makes the processes clear to all staff and stimulates greater participation in improvement paths;
- Support for risk management and compliance: by making procedures more visible and traceable, BPA contributes to better control over risks and ensures greater adherence to legal and regulatory requirements.

In the context of public administration, business process analysis is a fundamental prerequisite to ensure efficiency, transparency and innovation, which are crucial aspects for strengthening the relationship with citizens and stakeholders. In addition, precise mapping is the prerequisite for future digitisation and automation measures, which have the potential to further improve operations.
In conclusion, BPA is not merely a technical or operational exercise, but it is also a strategic enabler of organizational innovation, service quality and the continuous evolution of public and private sectors. Its value lies in the ability to provide a clear picture of how an organization works and, more importantly, how it can work better.

1.4. METHODOLOGY ADOPTED

This study adopts a qualitative and descriptive methodology, a research approach aimed at understanding organizational and operational phenomena rather than quantitative measurement of them. Such a methodology is particularly intended to analyse real-world practices within complex organizational systems like S.C.R. Piemonte S.p.A., where process dynamics involve regulatory compliance, multiple actors, and evolving standards. The objective was to examine an actual internal process (the expropriation procedure for public utility), identifying its operational and documentary issues and proposing an optimized version of the expropriation flow that complies with current regulations and quality standards.

The approach followed is iterative and participatory, combining documentary review, stakeholder engagement, and methodological tools from Business Process Analysis (BPA) and Quality Management.

The phases followed are summarized in *Figure 3* and detailed below:

i. Analysis of the existing process: in the first phase, a detailed reconstruction of the expropriation process currently in use at the company was carried out, analysing the internal documentation and the operating flows adopted, as well as the analysis of flowcharts already present within the organization.
   This revision has been further enriched through meetings and direct discussions with the employees involved in the process, to obtain a complete view of the activities carried out, the operational criticalities and demanding perceived by the different actors. This participatory approach has made it possible to integrate documentary analysis with qualitative elements which are essential for an optimal understanding of the process.

ii. Identification of criticalities: This second phase concerns the analysis of the existing flowchart, through which numerous structural anomalies and deficiencies have been identified. Among the main problems are the use of incorrect symbols not compliant with UNI ISO 5807:1985 and BPMN standards, the absence of a clear distinction between procedural and decision-making activities and the failure to indicate the actors involved. In addition, there were redundancies at some operational stages and poor traceability of responsibilities.
   These criticalities lead to inefficiencies in the execution times, ambiguities of interpretation between the parties involved and a risk of regulatory non-compliance, which may compromise the quality of the service provided and the organisation's ability to ensure efficiency and control over the process.

iii. Redefinition of the diagram: following an in-depth analysis of the existing flowchart and the critical points identified in the previous point, a new flowchart diagram has been developed at this stage in an optimized version and compliant with the standards.

The main objective was to overcome identified inefficiencies, improve clarity and ensure alignment with regulatory requirements and quality practices. The symbology defined by ISO 5807:1985 was used for the representation of the new process, which provides a standardized system to ensure greater transparency, traceability and easy understanding by all stakeholders.
In particular, this phase represents a focal point not only for the formal correction of the diagram, but above all to promote a more streamlined vision, controlled and oriented towards continuous improvement.

iv. Optimization proposal: after the new flow diagram has been prepared, the verification and validation phase of the improvement proposals has started to ensure consistency with the current quality standards and norms.
Especially, this phase included three main activities:

- Comparison between the stages of the process and existing legislation on expropriation, with reference to procedural guidelines at regional and national level;
- Consistency analysis with respect to symbolic conformity and quality management system, for example regarding the principles of transparency, clarity of roles and traceability;
- Comparison with staff directly involved in the process to obtain feedback and observations and to improve and consolidate the validity of the work carried out.

Through these steps we have therefore tried to lay the foundations for an operational applicability and sustainability in the real context of the organization.

v. Objectives and replicability: this last step included a critical and comprehensive reflection on the approach adopted, with the aim of evaluating its effectiveness, the limits and possible areas in which this method can be extended. Experience has shown that the structured analysis of processes, accompanied by graphical representation tools, leads to greater efficiency and transparency, also constituting a valuable support for quality management.

In particular, the following key aspects have been identified:

- The importance of an integrated approach that can combine process analysis tools (such as BPA) with standardised visual representation methodologies (e.g. ISO 5807 flowchart);
- The need to involve different stakeholders in the redefinition of flows, for a realistic understanding and to ensure acceptability of changes;
- The availability of clear and standardized visual documentation supports both internal training and external transparency;

- Replicability to other business processes, especially in the public domain, where transparency and traceability are key.

This evidence has provided a starting point for a wider organisational evolution towards quality and efficiency-oriented process management.

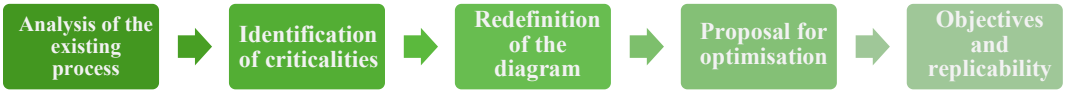


Figure 3: phases of the methodology

In summary, the methodology adopted enabled a structured intervention on a real organizational process marked by inefficiencies and non-conformities. By combining qualitative insights, stakeholder involvement, and standardized analytical tools, the research produced not only a revised and optimized process flow but also a scalable model applicable to other contexts. This contributes to a broader evolution toward quality- and efficiency-oriented public administration.

1.5. STRUCTURE OF THE THESIS

This thesis is divided into five chapters, designed to guide the reader through a path that begins with the theoretical and operational framing of the subject addressed and culminates in a concrete proposal for improving the analysed process.
Each chapter addresses a specific aspect of the research, contributing to the development of a coherent and integrated logical-methodological pathway, where theoretical insights and practical applications are closely connected.

- Chapter 1 - Introduction: this first chapter provides a description of the organizational context and a general overview of the paper. In addition, the motivation and objectives of the research are explained along with the methodology adopted to conduct the analysis and the path that it is intended to follow, providing a summary of the structure of the thesis.

- Chapter 2 - State of the art: this section explores the theoretical and normative framework underlying process management. It focuses on key concepts related to business processes, operational quality, and process mapping. In addition, special attention is dedicated to the standard ISO 9001, giving also a brief reference to ISO 5807:1985 and the Legislative Decree no. 327/2001, which provides the regulatory basis for expropriation procedures.

- Chapter 3 - Methodology and approach adopted: it introduces the Business Model Analysis (BPA) and compares the tools available for the representation of processes, including flowcharts, BMN models and cause-effect diagrams. After evaluating their respective advantages and limitations, the rationale for selecting flowcharts based on ISO 5807:1985 as the main representation tool is explained.

- Chapter 4 - Results and discussion: represents the operational heart of the thesis. It presents and analyses the expropriation process in use at S.C.R. Piemonte S.p.A., highlighting the critical issues identified and the symbolic inconsistencies. In support of this analysis, a SWOT assessment is carried out on the original process to identify strengths, weaknesses, opportunities and threats.
  After that, we proceed with the development of an optimized version of the process that is compliant with standards and more oriented to operational efficiency.

- Chapter 5 - Conclusions: the final section of the thesis deals with the final conclusions of the activities carried out and the main results obtained, followed by a reflection on the limits and future developments of the work. These include extending the proposed methodology to other organizational areas, exploring possibilities for digitalization and automation, and introducing monitoring systems based on performance indicators (KPIs).

Overall, the sequence of chapters was designed to ensure a modular and progressive reading experience. It enables the reader to gradually develop a solid understanding of the theoretical foundations, the methodological framework, and the practical results achieved, highlighting the consistency and relevance of the proposed improvements within the analysed organizational context.

2. STATE OF THE ART

This section provides a review of the existing literature and conceptual frameworks relevant to the analysis and optimization of the expropriation process during the internship. The chapter begins by defining what is a business process and describing its key elements. Then it outlines the different types of processes that are typically found within organizations and introduces the process-based approach to business management. As the chapter proceeds, the ISO 9001 standard is presented, including its evolution over time and its effects on process mapping. The final sections discuss the benefits of process mapping, highlighting the context of public administration, and reflect also its potential risks and limitations.
Such part of the work serves as the foundation for the following chapters, which aim to apply these concepts to a real-case process and identify potential areas for improvement.

2.1. BUSINESS PROCESS

2.1.1. DEFINITION OF BUSINESS PROCESS

According to ISO 9000:2015, a process is defined as 'a set of related or interacting activities that transform inputs into outputs'. This definition highlights the operational and transformational nature of the process, emphasizing the logical concatenation of activities, the connection between input and output and the goal of achieving a measurable result and value creation. In the corporate contest, a process can therefore be understood as a structured and interconnected set of interdependent activities and operations, which are carried out in sequence or in parallel to obtain a specific result.
These activities require the use of resources which can be of various nature: human, material, technological and information, allowing the transformation of one or more inputs into outputs.
It is essential to emphasize that these outputs must have a value perceived by a recipient, which can be both internal (like other company departments) and external to the organization (clients, suppliers, public bodies, etc.).

The fundamental objective of a business process is to generate added value through an efficient, consistent and controlled transformation of initial resources into products and services that meet specific requirements.
From this perspective, the process is not only a set of operational activities but also a strategic tool that enables the company to translate its long-term goals into action. The processes are, in fact, the operational heart of the organization itself, as they describe the way in which the company achieves its mission through systematic and repeatable daily activities, translating the corporate vision and mission into concrete actions, that can be monitored and improved over time.

Finally, through in-depth analysis and careful planning, companies can obtain numerous advantages and benefits that positively impact on the efficiency and quality of the services offered.

2.1.2. ELEMENTS OF A BUSINESS PROCESS FLOW

Every business process is composed of several fundamental components that interact in a coordinated manner to enable the effective execution, monitoring and improvement of organizational activities.
These elements provide a structured framework for understanding how a process functions from beginning to end, ensuring that each phase contributes to value creation.
As follows, a list of the most significant ones (*figure 4*):

i. Events: signals that indicate the occurrence of something significant within or inside the process. They may act as starting points, intermediate milestones, or end markers for the process. Events can also be an action resulting from the completion of another process, the fulfillment of certain conditions, or the arrival of a particular point in time.

ii. Inputs: the resources, both tangible and intangible, required to perform the activities within a process. They may include raw materials, data, customer requirements, or financial resources. Inputs are transformed by the process into deliverables that realise specific organizational or client needs.

iii. Sub processes: defined components within a larger process. When the complexity or scope of a set of activities cannot be adequately captured by a single process flow, it's often useful to define sub-processes. These follow the same structural logic as primary processes and may include their own inputs, outputs, activities and performance metrics.

iv. Activities: the lowest level of work in a process or, using other words, the actionable units of work within a process. They represent the specific tasks or operations carried out to transform inputs into outputs. Activities can be manual, semi-automated, or fully automated, and they are usually organized in a logical sequence to achieve process objectives.

v. Resources: all the assets used to carry out the process activities. These include people (individuals or teams), organizational units, equipment, IT system and infrastructure. The availability and allocation of resources have a direct impact on the performance, cost and quality of the process.

vi. Process metrics: performance indicators which help and guide the process owner in controlling and determining if the system is efficient and effective.
That is, determining the process meets the stated performance measurements and business goals.

The purpose of the metrics is to understand how well the process is meeting customer and stakeholders' expectations and to identify the potential areas of improvement in the process. These may include measures such as throughput time, cost per unit, error rates, or customer satisfaction levels.

vii. Outputs: all the data, information and physical assets which are generated by the procedure. Outputs should deliver value to internal or external stakeholders and contribute to the attainment of the business measurements and goals. They represent events and actions, or the results of those actions.

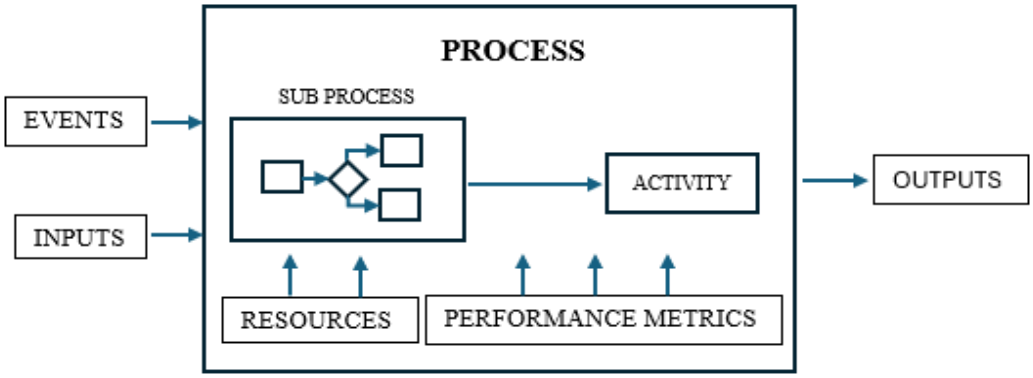


Figure 4: elements of a business process flow

2.2. TYPES OF BUSINESS PROCESSES

Understanding the various types of business processes is essential for the effective control and optimization of organizational activities. Business processes can generally be categorized into three broad groups, each of which plays a distinct role in achieving corporate objectives: primary, support, and management processes. This classification (*table 1*) provides a foundational framework for analysing and optimizing operations by highlighting their strategic relevance and interdependencies. In the following sections, each category is explored in detail to illustrate its purpose, key characteristics and typical examples within organizational contexts.

2.2.1. PRIMARY PROCESSES

Primary processes, also referred to as core processes, are directly responsible for creating value for customers and generating revenue for the organization. These activities compose the essential operations that constitute the corporation's core business and are typically aligned with its strategic goals and missions. Due to their centrality, primary processes are often highly structured, standardized and subject to continuous improvement efforts.

By nature, core processes are customer-facing: they begin with a particular customer need and conclude with the delivery of a product or service that achieves that need. As such, they play an essential role in determining client satisfaction and competitive positioning in the market. Examples include product development, order fulfilment, marketing campaigns, sales operations and service delivery.
Given their importance, organizations typically managed primary processes using integrated technological solutions such as Enterprise Resource Planning (ERP), Customer Relationship Management (CRM) platforms, or vertical Software-as-a-Service (Saas) applications. Implementing a system of engagement, designed to enhance collaboration and responsiveness, could further contribute to optimize these core activities and to improve the overall customer experience.

In summary, primary processes represent the backbone of value creation within an enterprise, and their effective management is crucial for achieving performance excellence and achieving long-term sustainability.
Below are some typical examples of primary processes found across different business contexts:

- Sales: the process of generating leads, making sales calls, negotiating deals and following up with customers. The goal is to convert potential customers into actual buyers, contributing directly to revenue generation;

- Marketing: involves identifying target audiences, developing marketing strategies and promoting products or services to stimulate demand and build brand awareness;

- Product or Service Delivery: includes the production, packaging and distribution of goods or the provision of services. This process ensures that customer orders are fulfilled in accordance with specifications, quality standards and delivery timelines;

- Procurement: although often classified as a support function, procurement can be considered a core activity in contexts where acquiring goods or services is essential to operations (e.g., retail or supply chain sectors). It involves sourcing, negotiating and managing supplier relationships to ensure timely and cost-effective access to resources;

- Customer Support and Service: in service-oriented or customer-centric businesses, post-sale support becomes a crucial primary process. Activities such as help desk assistance, complaint resolution and maintenance services are vital to ensuring customer satisfaction and fostering loyalty;

- Project management: represents a central activity in project-based industries such as consulting, constructing or engineering. It includes planning, executing and

monitoring project phases to deliver outcomes that meet client specifications and business objectives.

These examples underline the diversity of primary processes within organizations. The effectiveness of these activities is often a critical determinant of customer satisfaction, operational efficiency and ultimately, the competitiveness of the organization in its market.

2.2.2. SUPPORT PROCESSES

Support processes, also known as enabling or ancillary processes, are essential components that sustain a company's ability to deliver its services or products effectively. While they do not directly contribute to the generation of customer value or revenue, they play a crucial role in ensuring the seamless functioning of core business activities.

These processes provide the necessary infrastructure, services and internal capabilities that allow core business activities to operate without disruptions.

Unlike primary activities, support ones are typically internal-facing and serve other functions or departments within the organization. The main objectives are to maintain operational stability, promote organizational coherence and personnel development.

In addition, support activities are usually standardized and governed by policies, best practices and compliance frameworks.

Although they may not be directly visible to the public, their performance indirectly influences some aspects such as customer satisfaction, productivity and the company’s ability to compete in dynamic environments.

While support functions vary across industries, some fundamental processes are common to most organizations. Key examples include:

- Human Resources (HR) processes: they are essential for recruiting, training and retaining employees, ensuring that the organization has the right skills to meet operational demands. HR is also responsible for employee relations, payroll, benefits and compliance with labor laws. Finally, a well-structured HR department fosters a motivated and productive workforce, which contributes to innovation and long-term success;

- Information Technology (IT) services: they are one of the most vital support functions in modern businesses, ensuring that technology infrastructure, software systems and data security are well-managed. The team handles system maintenance, troubleshooting, cybersecurity and cloud computing solutions, all of which are critical for seamless business operations. Without reliable IT processes, activities that rely on digital tools and data access would be severely disrupted;

- Procurement processes: procurement involves sourcing goods and services required for business operations. Whether it’s purchasing raw materials,

office supplies, or third-party services, procurement teams negotiate contracts, evaluate vendors, and optimize costs.
Efficient procurement processes help organizations secure the best deals and ensure timely availability of resources, minimizing disruptions in core business operations;

- Facility Management processes: these include the maintenance and oversight of physical infrastructure such as office spaces, equipment and utilities. Effective facility management ensures that employees work in a safe, efficient and comfortable environment, which in turn supports productivity and reduces operational risk;

- Finance and Accounting procedures: finance teams handle budgeting, accounting, payroll, and financial reporting, ensuring that businesses remain financially healthy. Effective financial processes allow organizations to manage cash flow, control expenses, and make strategic investment decisions. Without severe financial management, even the most successful businesses can experience cash shortages, mismanaged budgets, or compliance failures;

- Legal and Compliance processes: these functions ensure that the organization operates within the boundaries of applicable laws and regulations. They support contract management, dispute resolution, risk assessment and internal audits. Strong compliance practices protect the company from legal liabilities and enhance its reputation.

Support processes form the structural backbone of any organization. Their performance directly affects the efficiency, resilience, and scalability of business operations.
When these processes fail or are inefficient, they can become bottlenecks that impact the entire organizational workflow. For instance, IT system outages can paralyze daily operations, while weak HR practices may hinder talent management and morale.
In conclusion, although support processes operate behind the scenes, they are foundational to organizational success. Their integration, continuous improvement, and alignment with strategic goals are critical for ensuring a robust, agile, and high-performing business environment.

2.2.3. MANAGEMENT PROCESSES

Management processes encompass all activities and processes within a company that are focused on ensuring the effective operation and overall functioning of the organization. These processes form the backbone of strategic direction and governance and are essential to aligning operational efforts with long-term organizational objectives.
Management processes are not directly involved in the production or delivery of services but instead provide the guidance, planning, and oversight necessary to ensure that both primary and support processes operate effectively. Their scope ranges from high-level strategic planning to the daily oversight of operations, encompassing all aspects of

resource allocation, performance monitoring, decision-making, and continuous improvement.
At their core, they consist of a series of structured and recurring activities aimed at planning, organizing, directing and controlling resources to ensure the achievement of the company's mission and vision. Their purpose is to safeguard the interests of stakeholders and promote long-term sustainability.

Key components of management processes include:

- Strategic planning: defines the organization's long-term vision, mission, values and goals. This process involves market and context analysis, SWOT assessment, competitive positioning and the identification of strategic initiatives. It serves as the foundation for aligning operational activities with broader organizational aims;

- Operations management: oversees the day-to-day execution of business functions, ensuring that resources are used efficiently and that services or products are delivered to the expected standards. It includes scheduling, process optimization, capacity planning and performance measurement to improve productivity and reduce waste;

- Risk management: regards the identification, analysis, and mitigation of risks that could hinder the achievement of strategic or operational goals. Effective risk management supports organizational resilience and helps maintain stakeholder trust, especially in dynamic environments;
- Quality management: ensures that the company meets quality standards, complies with regulations and continuously improves its services. It includes the implementation of quality management systems (e.g., ISO 9001), performance monitoring and corrective actions to align outcomes with stakeholder expectations;

- Communication and relations: refers to the structured management of internal and external communication. It includes the coordination of information flows, relationship building with key stakeholders (e.g., clients, institutions, suppliers), and the promotion of organizational transparency and accountability;

- Team management and Leadership: involves leading, motivating and coordinating teams to achieve organizational goals. This includes performance evaluation, conflict resolution, fostering collaboration and promoting a culture of responsibility and continuous improvement.

These processes are often cyclical and interdependent and they require feedback loops, performance assessment and data-driven decision-making. In public companies, they are particularly essential for promoting transparency, ensuring regulatory compliance and supporting citizen-centric governance.

In summary, management practices represent the steering mechanism of a corporation, as they provide direction, ensure alignment across departments and establish a culture of accountability and excellence.
Without effective management processes, even the most efficient operational system may lack of coordination, unclear priorities or unmitigated risks.

Process type	Main function	Typical examples
Primary	Create direct value for customers and generate revenue.	Sales, marketing, product/service delivery, customer support, project management.
Support	Provide necessary resources and services to ensure the efficiency of core processes.	Human resources, IT services, accounting and finance, procurement, legal and compliance.
Management	Guide the organization by setting goals, strategies, and monitoring performance.	Strategic planning, operations management, risk management, quality management, communication and relations, team management and leadership.

Table 1: process types

2.3. PROCESS-BASED APPROACH IN BUSINESS MANAGEMENT

A process-based approach views organizational activities as interconnected processes, where inputs are transformed into outputs to achieve desired results.
It emphasizes the understanding, management and continuous improvement of these processes to maximize efficiency, consistency and overall effectiveness.
Widely adopted across various fields (including business management, project development, and even healthcare) this approach forms the foundation for achieving strategic and operational goals.
In the context of business management, a process-based methodology facilitates the alignment of day-to-day operations with long-term objectives, and it encourages a systematic way of working, where responsibilities, performance indicators and resource flow are clearly defined and optimized.
This framework is central to quality management systems such as ISO 9001, which promote standardization, customer satisfaction and continuous improvement through process control and monitoring.

The core principles of a process-based approach are as follows:

- Customer-focused processes: activities should be designed and continually improved to fulfil and exceed customer expectations. Delivering value to clients is the priority and requires a consistent focus on understanding requirements and enhancing satisfaction;
- Leadership and vision: leaders are responsible for establishing a unified direction and purpose. Effective leadership ensures that strategies are translated into operational objectives, fostering a culture of trust, engagement and performance;
- Empowerment of people: the success of any process relies heavily on the competence, involvement and motivation of the people executing it. Empowered employees, supported by training and clear communication, are better equipped to drive innovation and sustain improvements;
- Integrated processes: Operations are recognized as an interconnected system that functions cohesively to deliver consistent quality. Understanding how processes interact and influence one another improves coordination, reduces inefficiencies and ensures organizational coherence;
- Commitment to improvement: continuous improvement is a fundamental principle of process-based approaches. Organizations should seek opportunities to enhance process performance, adapt to change and innovate;
- Informed decision-making: decisions should be based on meticulous analysis of data and performance indicators. Data-driven decision-making allows better risk management, more accurate forecasting and evidence-based strategies;
- Strategic relationships management: sustainable performance requires effective relationships with interested stakeholders, such as suppliers, partners and clients. Building mutual trust and shared objectives across the value chain enhances process reliability and long-term success.

In addition, advances in technology and digital tools increasingly support the implementation of process-based approaches by enabling better data collection, real-time monitoring and automation of routine task. The previous technologies facilitate process transparency and faster feedback loops.
Moreover, this framework fosters organizational agility, allowing companies to respond more quickly and effectively to market changes, regulatory updates and evolving customer needs. This adaptability is crucial for maintaining competitive advantage in dynamic business environments.
Together, these principles and enablers ensure that the organizational processes are not only efficient and effective, but also aligned with broader goals and values, supporting structured growth, quality assurance and long-term sustainability.

However, adopting a process-based approach can present challenges, such as encountering resistance to change inside a company, when shifting from siloed work habits to integrated process thinking.
Additionally, mapping complex or highly variable processes can be difficult and time-consuming. Successful implementation requires sustained commitment from leadership, continuous training and investment in appropriate tools to maintain transparency and improvement over time.

2.4. THE CONCEPT OF QUALITY IN BUSINESS PROCESSES

Quality in business processes is a multidimensional concept that fundamentally revolves around meeting or exceeding customer requirements while ensuring operational excellence. It reflects the company's ability to consistently deliver products or services that satisfy customers, comply with regulations and optimize resource use.
More specifically, quality in this context goes beyond simply avoiding errors or defects but it refers to the capacity of the organization to design and manage its activities in a way that consistently fulfills customer expectations. This involves delivering outputs that match promised specifications while doing so in a reliable, efficient and timely manner.

Furthermore, quality in business processes is closely tied to the concept of operational excellence, which involves the optimal use of resources (e.g., time, labor and materials), reducing waste and adhering to applicable regulations and standards. High-quality processes are characterized by their predictability, repeatability and resilience, making them not only efficient but also adaptable to changing customer expectations and evolving market conditions.

In essence, quality reflects how effectively an organization designs, executes and control its processes to achieve several outcomes: delivering consistent value to customers, ensuring consistency and reliability, complying with industry and regulatory requirements, and continuously enhancing internal efficiency and competitiveness.
This comprehensive view of quality is essential for sustainable performance, and it is closely aligned with modern management systems such as ISO 9001, which emphasizes customer focus, leadership, process approach and ongoing improvement as foundational principles.

2.4.1. TOOLS

To effectively apply the concept of quality in business processes, organizations rely on structured tools and methodologies that help standardize, monitor and continuously improve their operations.

Some of the most widely used tools include:

i. Process mapping and flowcharts: these visual techniques map out the sequence of activities within a process, helping to identify inefficiencies, redundancies and bottlenecks. They are essential for standardizing workflows and ensuring everyone understands how processes are performed as we introduced in the first chapter.

ii. PDCA cycle (Plan-Do-Check-Act): is an improvement cycle based on the scientific method of proposing a change in a process. It consists of four steps: Plan (determine goals for a process and needed changes to achieve them), Do (implement the changes), Check (evaluate the results in terms of performance) and Act (standardize and stabilize the change or begin the cycle again, depending on the results).

iii. Key Performance Indicators (KPIs): a quantifiable measure of performance over time for a specific objective. KPIs help teams set targets, track progress, identify issues early, and make informed decisions to drive improvement.

iv. Root Cause Analysis (RCA): a problem-solving technique used for identifying the underlying cause of faults or problems. Widely implemented in IT operations, manufacturing, industrial process control, accident analysis and healthcare industry. RCA combines inductive inference (first create a *root* based on empirical evidence) with deductive inference (test the theory with empirical data).

v. Benchmarking: it measures and compares the performance, efficiency or quality of a product, service or process against recognized standards or competitors. Businesses use this tool in many different contexts to identify areas for improvement and drive better performance.

vi. Standard Operating Procedures (SOPs): procedures that prescribe the operational steps to be followed in relation to processes or policies. SOPs are drafted by staff directly involved with the process in question following a template that it is used throughout the organisation to give consistency and clarity.

vii. Internal and External Audits: internal audits are an inner assessment of a company's operations and processes with the purpose to evaluate the effectiveness of internal controls and ensure that the company's operations follow internal policies and procedures.
On the other hand, an external audit is an independent assessment of a company's financial information and records. It is usually conducted by a certified public accountant (CPA) or a firm that specialises in external audits. The purpose of an external audit is to provide assurance to stakeholders, such as shareholders and creditors, that the company's financial statements are accurate and in compliance with relevant laws and regulations.

viii. Customer Feedback Systems: structured methods for collecting, analysing, and acting on feedback from customers. These systems enable organizations to better understand customer needs, improve the customer experience, and align business processes with client expectations.

2.4.2. EXAMPLES

To illustrate how quality principles translate into operational practices, the following examples show how different organizations implement quality-oriented approaches in their processes:

i. Manufacturing sector - Toyota Production System (TPS):
Toyota's approach is globally recognized for its focus on process quality through lean production and continuous improvement (Kaizen). The basic philosophy of the Toyota Production System (*figure 5*) is based on two pillars.
The first one is jidoka, which can be loosely translated as "automation with a human touch" and it is based on the concepts of stopping immediately when abnormalities are detected to prevent defective products from being produced and improving productivity to eliminate the need for people to be simply watching over machines.
The second pillar is Just-in-Time, based on the concept of synchronizing production processes, linking all plants and their production processes in a continuous flow, by making only what is needed, when it is needed, and in the amount needed. These two pillars enable the production of vehicles that satisfy customer requirements quickly, at a low cost, and with high quality.

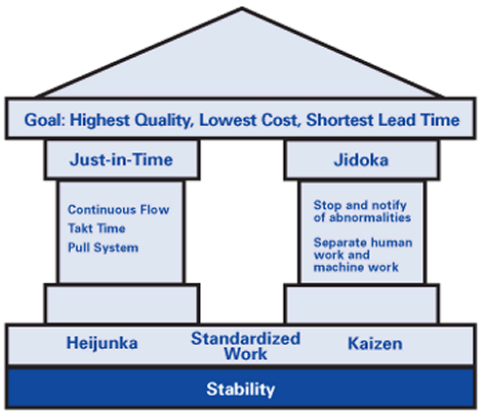


Figure 5: TPS house

ii. Healthcare – Mayo Clinic:
In healthcare, consistent patient outcomes and safety are fundamental. The Mayo Clinic defines quality as a comprehensive look at all aspects of a patient's experience.

It measures quality as outcomes achieved such mortality rates and surgical infections or as the volume of patients with complex diagnoses and procedures successfully treated or also as the safety record of the institutions.

iii. Service industry – Ritz-Carlton Hotels:
Ritz-Carlton is known for its commitment to customer satisfaction. Every employee is trained to respond to customer needs with personalized service, and feedback is continuously gathered and used to improve processes. This results in high levels of repeatability and brand loyalty.

iv. Public sector – Digitalization of administrative services:
Public agencies improving back-office processes through digital platforms (e.g., online document submissions, e-procurement) demonstrate how process quality boosts accessibility, reduces delays, and ensures compliance with legal standards while enhancing citizen satisfaction.

Each of these cases underscores how quality management in processes goes beyond compliance, becoming a strategic tool to deliver consistent value, reduce inefficiencies, and ensure organizational agility in the face of change.

2.5. ISO 9001

ISO 9001 (*figure 6*) is a globally recognized standard for quality management, which defines how to establish, implement, maintain and improve a quality management system (QMS). Organizations use the standard to demonstrate their ability to consistently provide products and services that meet customer and regulatory requirements, as well as the company's own needs.
The norm places the customer at the focal point of quality management, viewing the company as a set of processes that are closely interconnected to each other. This framework promotes a culture of continuous improvement and supports the alignment of operational activities with strategic objectives.
The key advantages of ISO 9001 include the systematic evaluation of risk and opportunities, the adoption of an integrated and process-oriented approach, improved transparency, and the ability to meet both customer and regulatory requirements in a structured manner.

The standard was originally published in 1987 by the International Organization for Standardization (ISO), a worldwide administration comprising the national standards bodies of more than 170 countries.
Furthermore, with more than 1 million certified users, it is the most popular ISO standard and the only one within the ISO 9000 series of standards which companies can certify.

A process of periodic review is embedded in all ISO management systems standards, requiring member bodies to examine the relevance of each standard every five years. When doing so, the member bodies can decide to continue publication without revision, revise, or discontinue issuance.

Figure 6: ISO 9001

2.5.1. MULTIPLE REVISIONS

ISO 9001 has undergone several revisions since its first publication to adapt to evolving business environments and quality management practices:

i. 1994: the first adjustment introduced changes to improve the control of design and development clause, as well as to clarify various requirements. The roles of ISO 9002 and 9003 were also slightly modified to reflect different scopes of application.

ii. 2000: this major revision transformed ISO 9001 into a process-based standard, moving away from a prescriptive approach based on numerous documented procedures. ISO 9001, ISO 9002, and ISO 9003 were integrated into a single applicable QMS standard that allowed for justified exclusions of product realization requirements that were not applicable to the organization. Other key changes included a stronger emphasis on top leadership involvement, the use of key performance indicators, and a focus on continual improvement.

iii. 2008: it provided clarifications on the 2000 version based on feedback from users. While it did not introduce new requirements, it enhanced consistency and understanding of the existing ones.

iv. 2015: this version ensured that the standard continued to adapt to the changing environments in which organizations operate. Some key updates included the introduction of new terminology, restructuring of content to align with the high-level structure (Annex SL), emphasis on risk-based thinking, and enhanced applicability to service organizations. It also reinforced leadership responsibilities and promoted a more strategic integration of the QMS into business operations.

Currently, the standard is going through another revision cycle and is expected to be published in 2026.

2.5.2. ISO 9001 AND PROCESS MAPPING

One of the core principles of ISO 9001 is the process approach, which views an organization as a system of interrelated and interdependent processes that must be managed cohesively to achieve outcomes.
In particular, ISO 9001:2015 encourages companies to understand how processes interact, assign roles and responsibilities, define inputs and outputs, and monitor performance indicators. In this context, process mapping becomes a critical tool for implementing and maintaining an effective Quality Management System (QMS). It proposes visual and structured tools necessary to implement and monitor the standard's requirements.

Key clauses inside the ISO 9001:2015 where process mapping evidences particularly useful include:

- Clause 4.4 - Quality management system and its processes: this part requires the organization to determine inputs and outputs, resources expected, sequence and interaction of processes, assign the responsibilities and authorities for these activities, and address risks and opportunities. Process mapping support this by visually illustrating the flow and interaction of activities, making it easier to identify these elements;

- Clause 5.3 - Organizational roles, responsibilities and authorities: top management must assign the responsibility and authority for ensuring that the QMS conforms to the requirements of the standard and that the processes deliver their intended outputs. For instance, swimlane diagrams facilitate identifying specific roles for each step of a process, assuring accountability and reducing ambiguity;

- Clause 6.1 - Actions to address risks and opportunities: when planning for the QMS the company should determine the risks and opportunities that help providing assurance to meet objectives, enhance desirable effects, prevent or mitigate undesired effects, and achieve improvement. Mapping highlights those steps that are critical or potential failure points, supporting a risk-based approach and facilitating the implementation of preventive controls;

- Clause 7.1.6 - Organizational knowledge: the organization must determine the knowledge necessary for process operation and to achieve conformity of products and services. Documented process maps about the working of the company preserve tacit knowledge, making it easier to train the staff and guarantee continuity despite personnel changes;

- Clause 8.1 - Operational planning and control: the clause emphasizes how planning and control of the processes are essential to meet the requirements and establish criteria for products or services.

This can be accomplished by determining the resources needed and keeping documented information to the extent necessary. Visualizing how operations are planned enables consistent delivery of outcomes and highlights where control is required;

- Clause 10.2 - Nonconformity and corrective actions: the organization should react to nonconformities by taking action to control and correct it and by dealing with the consequences. When an issue occurs, process maps support root cause analysis by revealing where failures originate or which activities may be inefficient, facilitating effective corrective actions.

In addition to the content of ISO 9001, it is worth observing that process mapping also takes advantage from the use of standardized graphical convention. In particular, ISO 5807:1985 provides formal guidelines for the design and use of flowcharts, contributing to the clarity, uniformity and effectiveness of the diagrams.
While ISO 9001 focuses of a Quality Management System, ISO 5807 offers practical guidelines on how to represent activities visually. The application of this standard is discussed further in chapter 3, which provides an overview of the main tools used for mapping processes.

In summary, process mapping is a fundamental practice that not only enhance transparency and understanding of the organization, but also directly supports compliance with key ISO 9001:2015 requirements.

2.6. BENEFITS OF PROCESS MAPPING

Process mapping is a method that promotes a better understanding of organizational processes and identifies areas for improvement. By providing a visual representation of workflows, it enables stakeholders to visualize activities more clearly and to analyze how they are structured. There are various types of process maps, often referred to by different names such as flowcharts, swimlane diagrams, value-stream maps or workflow diagrams. Regardless of format, the core objective remains the same: to clarify the sequence of tasks, decision points and interactions within a process.

The first structured method for documenting process flow was presented to the American Society of Mechanical Engineers (ASME) in 1921 by the engineer Frank Bunker Gilbreth. In 1947, ASME adopted a symbol set derived from Gilbreth's original work as the ASME Standard for Process Charts.
Since then, process mapping has become increasingly prevalent and understood and is now recognised as a versatile tool that can be applied across various sectors and functions. These days, it plays a fundamental role in strategic management, operational excellence and quality assurance.

For example, ISO 9001:2015 explicitly encourages organisations to adopt a process approach and highlights the importance of understanding how processes interact within a QMS.

The primary purpose of business process mapping is to support companies in becoming more efficient and effective in achieving their tasks. By providing greater transparency, it facilitates the identification of redundancies and bottlenecks both within and between processes. This enables organizations to respond proactively to internal inefficiencies and external pressure. Additionally, the use of visual elements and standardized symbols allows for clearer communication across different functions and departments, increasing the engagement even among stakeholders who may not be familiar with the technical details of the operations. For instance, process maps can be instrumental in hiring new employees, aligning cross-departmental teams, or preparing for internal or external audits.

Moreover, with the availability of pre-made templates within process mapping software teams can collaborate more effectively, streamlining work procedures and brainstorming improvement.
This approach not only supports continuous improvement (Kaizen), but also helps address specific challenges such as employee training, performance gaps, or declining sales.
In the context of digital transformation, this technique is often the first step before automating workflows or implementing enterprise systems (e.g., ERP), ensuring that technology is aligned with business needs.

Below are some of the key benefits of process mapping (*figure 7*):

- Cross-functionality: process maps show employees how individual tasks connect across other teams and departments, highlighting how their roles contribute to broader organizational outcome. They also illustrate interdependencies, collaboration patterns and handoffs between teams;

- Increased standardization and awareness of roles and responsibilities: visual documentation supports understanding who is responsible for each activity and ensures that tasks are performed consistently across the organization;
- More straightforward identification of opportunities: managers, engineers and supervisors can review these documents to identify areas that could be more profitable or efficient. Process mapping often leads to evaluate how valuable each activity is, giving the company the ability to identify opportunities to reduce waste and increase production;

- Job satisfaction and efficiency: by understanding workflows and their specific role, employees are able to reduce confusion and rework. This leads to better job satisfaction, increased satisfaction and smoother task execution;

- Transparency: visualizing processes makes them more accessible and understandable to a wide range of stakeholders, including the ones that are outside the core process team. Transparency builds trust, supports compliance and facilitates more informed decision-making;
- Inefficiencies detection: companies can identify bottlenecks, redundancies, delays and non-value-added activities by using workflows, supporting lean thinking and process optimization;
- Risk management: another benefit is its use in risk management. By mapping processes organizations can more easily spot points of vulnerability, control weaknesses or steps prone to errors. So, this method helps companies to prepare for both internal reviews and external inspections.

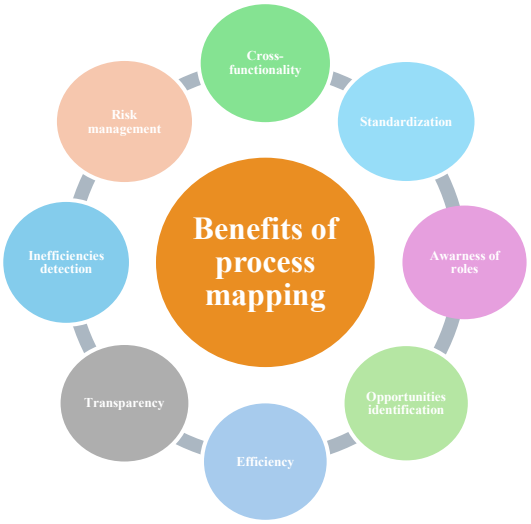


Figure 7: benefits of process mapping

2.6.1. PUBLIC SECTOR

In the public sector, process mapping offers significant advantages in improving service delivery, enhancing accountability, and reducing procedural complexity. By visually representing activities, government bodies and public agencies can better ensure compliance with laws and regulations, streamline administrative steps, and reinforce interdepartmental coordination.
In contexts where multiple stakeholders are involved (e.g., municipalities, contractors and citizens), such visualisation tools foster a shared understanding of procedures and facilitate communication and collaboration. This aligns with broader goals of public value creation, operational excellence, and open government.

For instance, in the management of public procurement or expropriation procedures, process mapping can clarify responsibilities, reduce processing times and mitigate legal risks by ensuring that all steps follow regulatory guidelines.

In the case of expropriations, for example, legislative Decree no. 327/2001, the Consolidated Act on Expropriation for Public Utility, regulates the procedures for the expropriation of real estate or rights relating to real estate necessary for the construction of public works or public utility projects. Mapping these procedures helps ensure conformity with such legal requirements while improving also operational efficiency.

During an internship at S.C.R. Piemonte, a process mapping activity was carried out on the expropriation process, resulting in a standardized flowchart that conformed both current legal requirements and internal procedures. This tool proved that it can be used not only for internal analysis and process optimization, but also as a support for new staff and enhancing transparency across departments.
In this way, process mapping becomes a powerful level for improving PA performance, ensuring procedural clarity and supporting a citizen-centric approach to service delivery.

2.7. LIMITS AND RISKS OF PROCESS MAPPING

Despite its effectiveness as an essential tool for visualizing and analysing business processes, process mapping presents also several empirical and conceptual limitations and risks. These drawbacks may derive from technical, organizational or strategic challenges and recognizing such risks is fundamental to avoid inefficient implementation of process diagrams.

i. Increase complexity: even if the goal of the diagrams is to simplify understanding, the result may be the opposite. When a process map contains excessive information, it becomes difficult to organize and comprehend, making it extremely complicated for leadership to prioritize improvement actions. This is the case of complex organizations or highly regulated sectors, where numerous activities, decision points and roles make the diagram illegible;

ii. Consumption of time and resources: creating and develop accurate maps requires a large investment of time, effort and organizational resources.
Moreover, the procedure might involve multiple revisions, collection and analysis of data, and the involvement of different stakeholders. Additionally, process flows must be updated several times to be aligned with the regulation and practices.

iii. Resistance to change: it's a common reaction and attitude in any organization where workers are comfortable with their routines and a disruption can generate uncertainty and fear.
Employees may resist process mapping if it perceived as a threat to their autonomy or job security and if not managed properly, this resistance can lead to non-cooperation or biased information;

iv. Accuracy and relevance: the information contained in the process flow diagram must be accurate and reflect the actual working of the activities to be useful. Maps should always be updated to the most recent version, to ensure alignment with the last laws, policies and protocols. There is a risk that flows will become obsolete or inaccurate with the passing of time, leading to reduction of efficiencies and increase of errors in execution;

v. Incorrect interpretation: even a well-constructed diagram can be misinterpreted if someone lacks appropriate background or knowledge to read correctly the flows. Failure to understand or interpret activities correctly might lead to incorrect decisions and inconsistent interventions, which can adversely affect the working of the company;

vi. Dependency on mapping tools: software tools enhance the efficiency of mapping effort, but excessive dependence on them may limit in-depth understanding of processes and creativity in problem solving;

vii. Inconsistencies in notation: it is important to use standardized notations or the chances of confusion coming from the usage of different symbols are increased. This is problematic in contexts of large companies or public administration, where different units may have substantial autonomy;

viii. Financial costs: although basic mapping tools are often freely available, the purchase of specialized software and staff training incur a significant amount of cost;

ix. Over-simplification: there is a risk that critical steps of the process may be omitted to make the flow clearer and easier to understand. This can lead to a distorted representation of the reality, resulting in the identification of the incorrect problems or misaligned goals, as well as an inaccurate understanding of the activities;

x. Inadequate implementation: process mapping is useful if it is well implemented and used to continuously improve activities. Instead, poor implementation may include lack of stakeholder involvement, insufficient training, or unclear objectives. This undermines both the credibility of the diagram and the willingness of staff to engage with these tools.

By considering these potential limitations and risks associated with process mapping, organizations can anticipate and mitigate such challenges by fostering collaboration, investing in training, selecting the appropriate tools, and ensuring continuous improvement and update.

3. METHODOLOGY OR APPROACH ADOPTED

The chapter is divided into four main parts, where the first one introduces the definition and objectives of BPA. The next section focuses on the use of flowcharts, discussing the common notation and their functionality, whereas the third one explores additional tools that can support BPA, such as BPMN diagrams, swimlanes and cause-and-effect analysis. The chapter concludes with a discussion on how to choose the most appropriate tool based on the specific characteristics and objectives of the process under investigation.

3.1. INTRODUCTION TO BUSINESS PROCESS ANALYSIS

As introduced in the previous chapters, Business Process Analysis (BPA) is an approach aimed at examining, maintaining, and improving the business operation activities within an organization. It involves a detailed, multi-step examination of each part of a process in order to identify what is working well and what needs to be upgraded.
Business process analyses can have a huge impact on the organizational performance: by being able to determine the core values of the activities within a company and showing areas for improvement, it allows to find inefficiencies and redundancies.
Moreover, this approach can help create a better process flow that improves employee engagement, improves resource allocation, and generates more efficient workflows.
This improvement can be measured through key performance indicators (KPIs) such as cycle times, throughput, or resource utilization rates.

In particular, within public administrations, where procedures are often highly complex and regulated, BPA enables institution to increase transparency, reduce inefficiencies and ensure compliance with legal and quality standards.

3.1.1. OBJECTIVES AND BENEFITS OF BPA

The primary goal of business process analysis is to detect the implicit knowledge that subsists in the organization's existing or 'as-is' processes and make this knowledge available in a model to organize and represent such data. By doing so, BPA converts tacit operational practices into explicit and structured representations that can be studied and shared. Through these accurate as-is models, organizations can visualize how activities are actually performed and their interactions. Also, it helps identifying deviations from formal procedures and inaccuracies or complexities inside the processes,
Moreover, the processes, along with their related dynamic and static business structures, should ultimately support and align the strategic business objectives and critical success factors of the organization. BPA ensures that workflows are not only efficient, but also strategically coherent, allowing the company to deliver value effectively and sustainably.
In terms of benefits, business process analysis helps organizations uncover areas of waste, such as delays, bottlenecks or excessive resource consumption. As a result, it supports the reduction of operational costs as well as the optimization of resource needed.

These gains can be monitored through performance metrics like return on investment (ROI) or cost per unit. Furthermore, by optimizing activities, the analysis contributes to the delivery of higher-quality products and services to the customer, meeting their requirements more effectively and increasing satisfaction levels.
Further benefits include the achievement of a transparent and objective performance measurement system, often by the definition of a set of key performance indicators (KPIs) based on the processes. These indicators assist the company to track progress and ensure continued alignment with its strategic objectives.
As previously noted, BPA enables continuous improvement by identifying opportunities for innovation and optimization, which are fundamental in maintaining process effectiveness over time, minimizing waste and errors, and increasing the quality of the outputs.

3.1.2. STEPS OF BPA

The analysis process comprehends five key steps, each contributing to a deeper understanding of how activities function and how they can be optimized.
These stages are explained below:

i. Review alignment with larger goals: processes, the 'how' through which a business achieves its goals, should be closely connected to the broader strategic mission, or the 'why'. This first step requires reviewing existing processes and understand how they fit within the workflows, departments and long-term objectives, that are the basis of the organization's overall mission;

ii. Data collection on processes: this is the information-gathering stage. Before any meaningful analysis take place about the processes inside an organization, detailed information must be collected on how they are executed. The best way to do this is by speaking with the individuals who are directly involved with these operational activities. Interviews with key stakeholders, creation of surveys and review associated KPIs and metrics are also valuable tools at this point. Although, this step may take some time, but it's essential to get a comprehensive understanding of the activities before making any changes;

iii. Process analysis: in this phase, all the data collected needs to be compiled to examine the full scope of each activity, including all process steps, relevant diagrams, team members, and current success metrics and KPIs. Business process mapping is often useful to create a visual layout of all the activities and workflows. These maps enable to produce a flowchart or other graphic tools to allow a better visualization of processes, identifying patterns and gaps in the flow;

iv. Identify opportunities for improvement: based on the analysis, this fourth step focuses on identifying redundancies and inefficiencies, that need to be addressed. These are key areas for improvement;

For instance, there can be activities where workers spend too much time, and further investigation is required to find the root causes that enable to develop corrective actions;

v. Implement changes: business process improvement (BPI) techniques are used to adapt and make changes to the processes, with the goal of increasing profitability, efficiency and value creation. This last step involves the understanding of all the information gathered during the previous stages to optimize the activities or create new ones. Successful implementation also requires communication, training and continuous monitoring to ensure sustainable progresses.

3.1.3. BPA METHODS AND TOOLS

To deliver the objectives described in the previous paragraph, various analytical BPA practices (*figure 8*) can be applied to see immediate results and make better decisions when applied correctly. Among the most common ones are five core techniques: value-added analysis, gap analysis, root cause analysis, impact analysis, and predictive analysis.

The first method, the value-added analysis, quantifies the contribution of each activity within a business process to the overall value delivered of a product or service.
By examining each step, the organization can distinguish between value-added activities (those directly contributing to customer satisfaction) and non-value-added ones. This enables the reduction of costs by eliminating these wasteful processes.
Its objective is to attribute the value of the work represented by the process while ensuring those processes deliver maximum value and align with overall business goals.

Closely related to this is the gap analysis, which helps to understand the business value that a process is currently delivering. Specifically, the tool compares an organization's current performance with its desired one. By identifying the gaps or differences between the two states, the company can develop strategies to reduce the discontinuity.
This involves detecting current processes, desired outcomes, and the barriers that prevent the achievement of those goals.

Instead, root cause analysis is a structured problem-solving method that seeks to identify the underlying reasons for a specific issue or problem that arises within a business process. Organizations, by addressing the causes rather than just treating the effects, are able to implement long-term solutions that prevent the recurrence of the problem. This comprehends also a systematic approach, such as the '5 Whys' technique or a fishbone diagram, to identify and understand the root causes of a matter.

Moving forward, the impact analysis focuses on identifying the dependencies between the existing processes and other relevant elements, such as applications, systems, policies and regulatory obligations. This technique helps assess the potential consequences of changes that occur within a process.

Understanding these interconnections allows organizations to mitigate risks and manage change more effectively, ensuring that any modification does not disrupt other critical operations.

Finally, there is the predictive analysis, also known as a simulation analysis.
It's a tool that is generally used after the root cause analysis has discovered where the process needs to be optimized. It allows the organization to plug in the variables or new values from value and gap analyses into the problematic areas of the process uncovered in the root cause analysis and simulate the execution of the new, improved process.
Predictive analysis enables stakeholders to evaluate potential outcomes and choose the most effective process improvement strategies before implementing them in real operations.

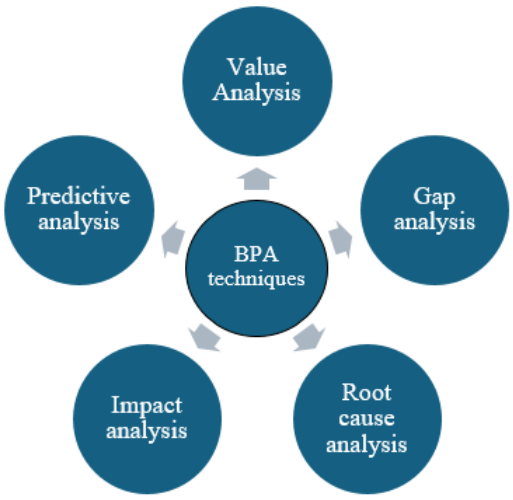


Figure 8: techniques of BPA

To sum up, the application of these tools provides a structured and evidence-based approach to better understand the structure and connections of each process.
By combining the five techniques, organizations are more equipped to identify inefficiencies and areas of improvement. Such practices not only support continuous process enhancement but also foster a culture of informed decision-making and operational quality.

3.1.4. DIFFERENCES BETWEEN MAPPING AND MODELLING

In the context of Business Process Analysis, it is important to make a distinction between the two concepts of process mapping and process modelling.
The two terms are often used interchangeably when discussing how to record business processes, yet they refer to distinct approaches and serve different purposes.

To some extent, process modelling and mapping are similar, as they both aim to provide a visual representation of an activity within the organization. However, they differ significantly in terms of objectives, accuracy, and methodologies.

Process mapping concerns drawing out all the steps and tasks involved in a business process to create a visual representation or a map of how that process operates. It is generally a qualitative and subjective tool, often based on surveys, observations or documentation. The focus is on illustrating the perceived or intended process, making it useful for recognizing redundancies, bottlenecks or unclear responsibilities.

By contrast, process modelling is done by applying data-mining algorithms to event log data to automatically generate a visual workflow. It is a more quantitative and objective approach. These models reflect how the process actually unfolds in real time and contain detailed information such as event types, actors involved, paths taken within the workflow, timelines of each step, and performance metrics like success rates and delays. The key benefit of process modelling is that it provides a data-driven picture of how activities truly occur, rather than how the enterprise believes they happen.
This evidence-based insight is fundamental for identifying discrepancies between expected and actual performance, thus encouraging more accurate analysis and process optimization. Ultimately, it is also a more dynamic, agile approach that puts the processes in the context of the entire organization, which supports process lifecycles and continuous improvement.

To sum up, while both methodologies contribute to visualizing and understanding a business process, they serve distinct but complementary roles. Mapping offers an accessible, high-level view based on perceived workflows, whereas modelling provides a data-driven, real-time representation. Combining both approaches can lead to a more complete and effective process analysis.

3.2. THE FLOWCHART

A flowchart is a diagram that depicts a process, system or computer algorithm through a sequence of steps. Process flowcharts, also known as process maps, propose a visual representation of complex activities, making them easier to understand and analyse. These diagrams consist of standard shapes (for example rectangles, ovals and rhombuses) connected by arrows and they represent step-by-step procedures or decisions.
Their objective is to aid decision-making, reduce ambiguity and improve workflow efficiency. When designing and planning a process, maps help to identify its core steps and visualize features of the activity that can be refined to improve its efficiency, such as bottlenecks, flaws or unnecessary steps.
Mapping allows the organization of the tasks in chronological order and their classification by type (i.e., process, decision, data input/output). This facilitates a better understanding of how each element interacts within the process structure.

Flow diagrams are an essential document in nearly every sector, used to visualize, design and document a broad range of systems and procedures.
Common applications include:

- Documenting a process or procedure;
- Support brainstorming sessions;
- Conducting business process analysis (BPA) or business process management (BPM);
- Outlining a decision-making procedures;
- Optimizing existing workflows;
- Explaining how a process is done;
- Increasing clarity and improving communication between employees.

Flowcharts are especially valuable during process improvement efforts, as they deliver a clear and shared understanding of activities, allowing collaboration and targeted intervention.

3.2.1. SYMBOLOGY

Flowcharts typically depend on a standardized set of symbols to understand processes clearly and reliably. These standards were first introduced by the America National Standards Institute (ANSI) in the 1960s and subsequently adopted by the international Organization for Standardization (ISO) in 1970. The current reference is the ISO 5807 standard published in 1985 and last reviewed in 2019, which defines symbols and conventions for documenting information systems, data flows and business processes.
The following symbology includes both standardized symbols and additional commonly used shapes adopted in software tools and business process mapping conventions:

i. Activity: illustrated by a rectangular box, it represents a process, action or function that changes value and form of data. This shape is the most used in flowcharting;

ii. Start/End: known as the ‘terminator symbol’, it characterizes the start and end points or potential outcomes of a path. The shape used is an oval or stadium, and often contains the words ‘Start’ or ‘End’ inside it;

iii. Decision: a diamond (rhombus) is used to pose a question to be answered, usually binary (i.e., yes/no, true/false). Following it, the chart may then split off into different branches depending on the outcome;

iv. Input/Output: it indicates data that is available for input or output, as well as resources used or generated. It is represented by a parallelogram (rhomboid);

v. Flowline: it shows the process’s order of operations and it is represented by a line coming from one symbol and pointing at another.

Arrowheads are added to show the direction, especially if the flow is not the standard top-to-bottom or left-to-right;

vi. Predefined process: it shows named process which is defined elsewhere and its shape is the one of a rectangle with double-struck vertical edges.

vii. Annotation (comment): an open rectangle connected by a dashed or solid line represents additional information about a step in the program;

viii. On-page connector: it corresponds to a pair of labelled connectors that replace long or confusing lines on a flowchart page. A small circle with a letter inside is used to denotes this symbol;

ix. Off-page connector: a labelled connector to use when the target is on another page. Represented as a home plate-shaped pentagon;

x. Delay: it is shaped like a truncated oval and it's helpful to specify the exact length of delay within a process;

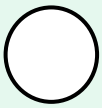
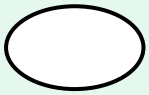
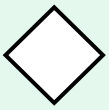
xi. Or: this shape of a circle with a plus sign (+) inside signals that the process flow continues in more than two branches;

xii. And: Indicates a point in the flowchart where multiple branches converge back into a single process. The shape is a circular one with a cross (x) inside;

xiii. Document: single documents are denoted as a rectangle with a wavy base. Instead, multiple documents are represented as a stack of rectangles with wavy bases;

xiv. Data File or database: data are shown by a cylinder symbolizing a disk drive;

In the following table (*table 2*) a compact representation of the standard symbols used when representing a process using a flow diagram is provided.

Symbol	Name	Symbol	Name
	Activity		On-page connector
	Start/End		Off-page connector
	Decision		Delay
	Input/Output		Or

→	Flowline	⊕	And
▭	Annotation	▭	Document
▭	Predefined process	⌭	Data

Table 2: flowchart symbols

While the standard symbols defined in ISO 5807:1985 apply to conventional flowcharts and workflow diagrams, other types of diagrams may rely on different notations, as they serve more specialized or technical purposes.

3.2.2. FLOWCHART TYPES

Once the use of the flowchart has been identified, the next step is to select the most appropriate type of diagram to represent the process. While the basic (common) flowchart is the most widely used and versatile, there are several other specialized types that can be used depending on the complexity, context or focus of the process.

- Common flowchart or Workflow Diagram: this is the most popular and it adopts the standard symbology defined by ISO 5807, illustrated in the paragraph above. These types of diagrams are ideal for mapping simple to moderately complex processes and are useful for identifying redundancies, inefficiencies and decision points. An example of a basic flowchart illustrating the order process is shown below (*figure 9*).

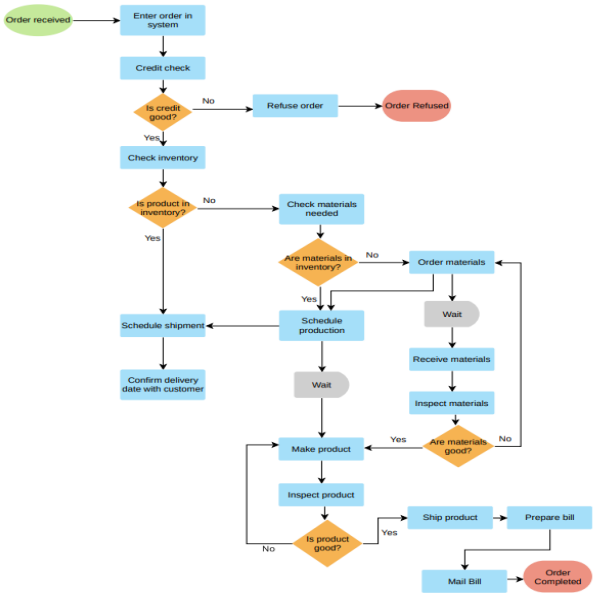


Figure 9: example of a common flowchart

- Swimlane Flowchart (*figure 10*): a swimlane flowchart is used in process flow diagrams that visually distinguishes job sharing and responsibilities for sub-processes within an organization. This tool differs from other flowcharts, because decisions are grouped visually by placing them in lanes, where each line corresponds to a specific person or group. This structure is especially useful when a process involves more than one department, as it clearly illustrates different functional capabilities or responsibilities (organizational roles).

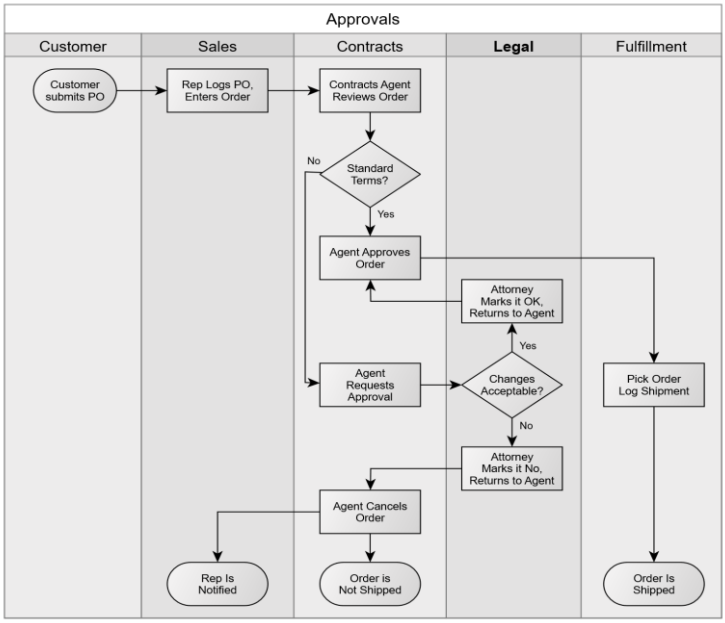


Figure 10: example of a swimlane diagram

- Data Flow Diagram (DFD): it is a visual representation of the flow of data within an information systems or business process. As shown in *figure 11*, DFDs use graphical symbols to illustrate the paths, processes, and storage repositories for data from its entry point in the system until it exists.
  Although the symbology adopted, such as circles, ovals, arrows and rectangles, may resemble those used in the common flowchart, they have different meanings in this circumstance.
  There are four main components in a DFD, each represented by a specific notation: external entities are described by rectangles and they represent sources or destinations of data, circles or rectangles with rounded corners represent the processes, data stores are depicted using parallel lines or open-ended rectangles, and horizontal lines or arrows characterise data flows.

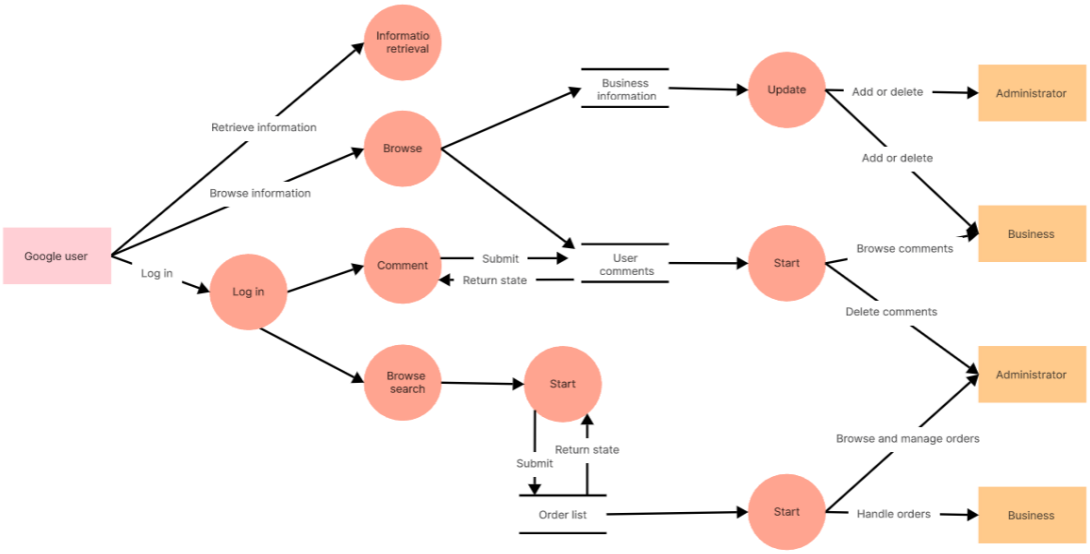


Figure 11: example of data flow diagram

- Event-driven Process Chain (EPC) Diagram (*figure 12*): it is a flowchart model introduced in the early1990s to represent business process workflows. This tool uses graphical symbols to show the control-flow structure of the activities as a sequence of events and functions. The main building blocks used in EPC diagram are the following: events are described by hexagons, functions are shown as rectangles with rounded corners and they indicate activities performed, and logical operators such as OR, AND, and XOR, which allow alternative and parallel execution. Additionally, information resources can be included as inputs using standard rectangles.

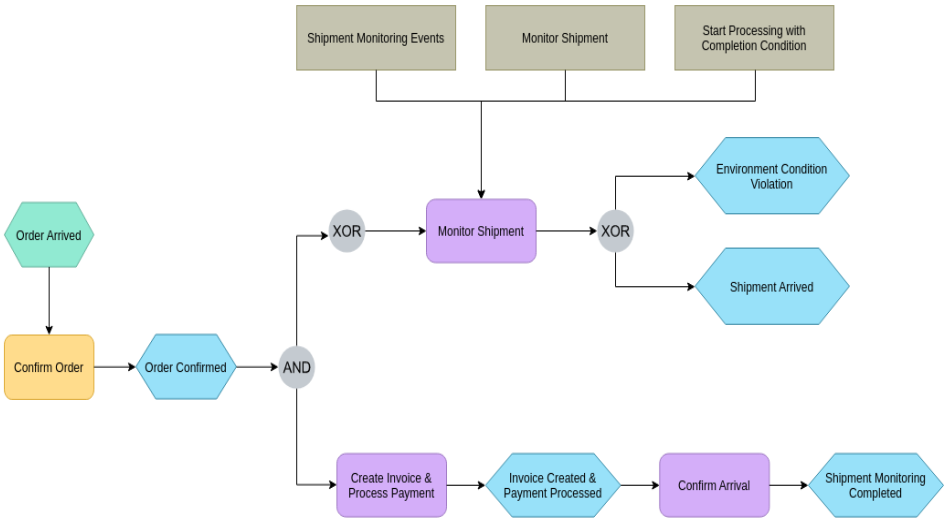


Figure 12: example of an EPC diagram

- Specification and Description Language (SDL) Diagram: this type of flowchart is used to illustrate a system's architecture and functionality. It provides a visual framework for understanding complex systems by breaking them into manageable components and showing their interactions. SDL diagrams are widely adopted in software engineering and system design to convey the structure and behaviour of systems in a clear and organized manner.
  This tool typically uses a variety of symbols and notations to represent different components within a process. Start point is depicted as an oval, indicating the beginning of a process, while inputs and outputs are represented by distinctive parallelogram-like shapes with a notched side. Standard rectangles show states of the system, and process blocks appear as rectangles with rounded corners. Diamonds are used for decisions, from which different paths may arise.
  Then, flows are illustrated by arrows and storage blocks are shown using two parallel horizontal lines. An example of an SDL diagram is shown in *figure 13*, where the symbology adopted is illustrated.

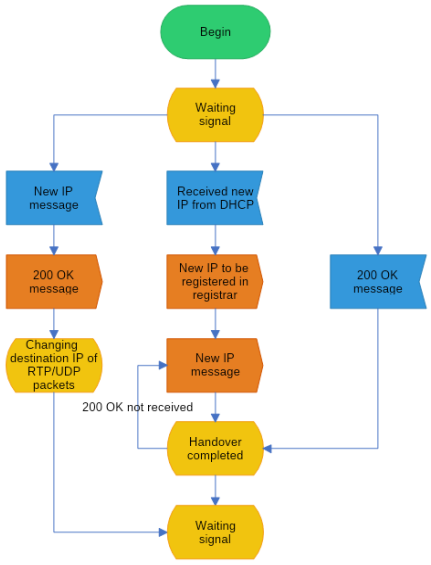


Figure 13: example of an SDL diagram

- Process Map: A process map (*figure 14*) is a planning and management tool that visually describes the flow of work by showing a series of events that produce a specific result. It identifies who and what is involved in a process, making it applicable to any business or organizational context. Process maps are useful for revealing gaps or inefficiencies, highlighting areas where improvement can be made. As far as common flowcharts are concerned, they break down the complex process into different steps to make it easily understandable.
  On the other hand, you can get much more details with a process map. Moreover, a process map also comes with a timeline, which means you can get an idea of the time required to complete every step and the whole process.

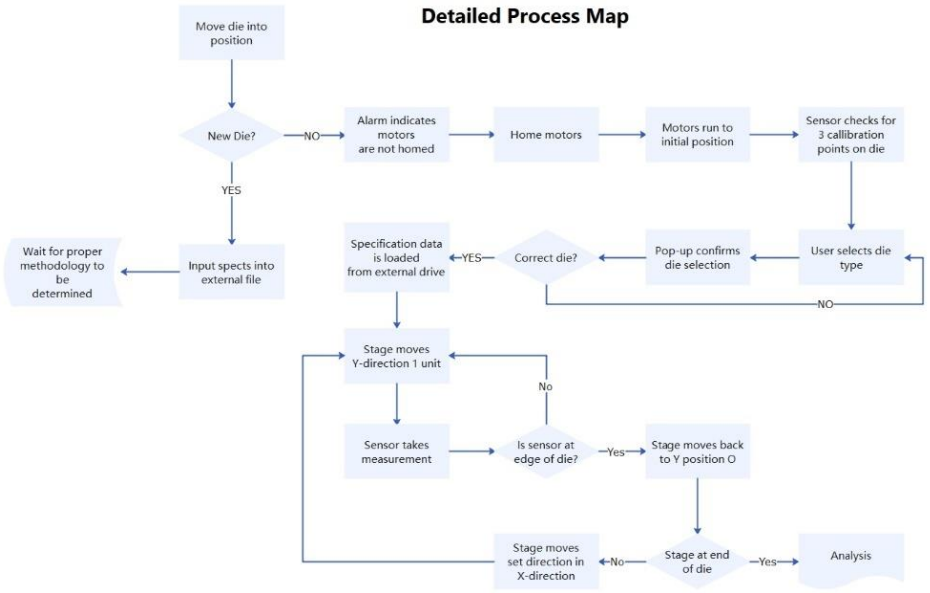


Figure 14: process map example

- Process Flow Diagram (PFD): it is a type of flowchart that illustrates the relationships between major components at an industrial plant (*figure 15*).
  It is primarily used in chemical engineering and process engineering, although its concepts are sometimes applied to other processes as well. It is applied to document a process, improve a process or model a new one.
  The most common PFD symbols in use today are standardized and come from agencies such the ISO 10628, the German Institute for Standardization (DIN) and the ANSI. However, many companies adopt their own symbols, which are often similar but vary as they become more detailed.
  A complete PFD typically include major equipment, information on heat flows, material and energy balance, tag number, and chemical composition.
  Among the most frequent symbols are those representing equipment (i.e., pumps, valves, heat exchangers, and reactors), typically shown with simplified geometric shapes; pipelines, represented by lines indicating the flow of materials; and directional arrows, used to show the direction of the process stream.
  Additional symbols may include indicators for mixing points, separators, or storage tanks, all essential to understanding the overall flow and functionality of the system.

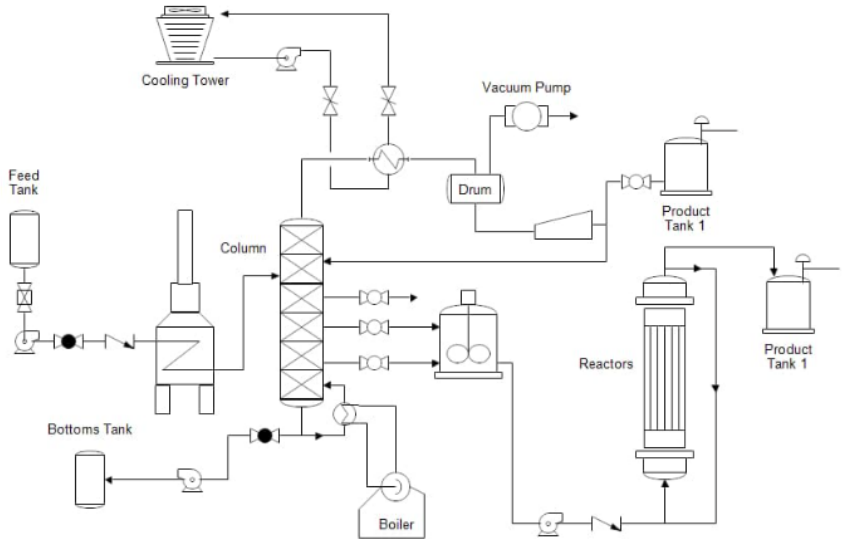


Figure 15: PFD diagram

3.2.3. INTRINSIC ERRORS

When designing a flowchart, clarity and coherence are essential to ensure that the diagram effectively communicates the process it is intended to represent. However, there are several common mistakes that can make a flowchart confusing and difficult to understand. These can range from poor design choices, lack of standardization, or inadequate content of the process being mapped. Recognizing those errors is crucial for producing a high-quality graph that helps supporting decision-making and continuous improvement.

One of the most frequent issues is overcomplicating the diagram. When the flowchart becomes too complex, it loses its clarity and fails to serve its intended purpose.
Adopting a reductive approach, when implemented correctly (without omitting essential information), aids designers working to avoid this problem.
Diagrams built on this principle can help portray sophisticated ideas, support educational activities, and promote a more intuitive understanding among users. However, simplicity can be ineffective too: if a flowchart is too abstract or lacks of fundamental details, it won't communicate anything useful.

Another typical error when creating a flowchart is the use of inconsistent symbols and formatting. It is essential to use standard symbols, such as diamonds for decisions or rectangles for activities, to ensure that the diagram can be understood by everyone.
Using non-standard or improvised notations can confuse readers, particularly those not directly involved in the processes depicted. To fix this mistake, personnel should familiarize with the most used symbols and use them consistently in the diagrams, possibly through training programs or internal guidelines, in particular for new staff.

Moving forward, the excessive use of colour can also be a concern. While colour may be an effective tool to differentiate elements or highlight specific steps, overusing it takes away the real message of the chart and creates visual noise and distraction.
A restrained and purposeful use of colour is therefore recommended, ensuring that it improves comprehension rather than deteriorating it.

Similarly, inconsistent element sizing compromises readability. Symbols of varying dimensions may disrupt the visual balance of the diagram, making it harder to interpret. Ideally, flowchart elements should maintain uniform height and width. When it is not feasible consistency should be preserved within the chosen orientation: for example, maintaining equal widths in top-to-bottom flowcharts and equal heights in left-to-right diagrams.

Neglecting decision points is another critical mistake that leads to an incomplete or ambiguous representation of the processes. Decision nodes within a flowchart are crucial for evaluating key factors such as cost-benefit considerations, timing, and resource allocation. Their absence may lead to oversights in how key operational choices are made. Incorporating them ensures that alternative paths are properly explored and documented.
The use of an uneven flow direction is also a frequent error to avoid, because following the stream of the process will be more difficult. Choosing a consistent layout such as down-to-up or left-to-right can help make the flowchart easier to read.
For example, a common practice could be making the True conditions always flow out of the bottom of decision symbols and the False conditions flow out of the right sides of the symbols, thereby providing a clear and intuitive structure for the viewer.

A final point to consider is the absence of descriptive labels or annotations. Without concise text within or next to each symbol, users may struggle to interpret the flow correctly, especially when dealing with abstract or technical processes.
Including brief, informative descriptions within the symbols can significantly enhance clarity and usability. Additionally, if non-standard or rarely used symbols are employed, it is essential to include a legend that can help explain their meaning.
Without a such reference, the diagram may become ambiguous or misleading to readers unfamiliar with the notation, ultimately undermining the purpose of the flowchart.

By avoiding these common mistakes, it is possible to create clear and effective flowcharts that are easy to understand and follow, thereby enhancing communication and supporting process improvement.

3.3. OTHER USEFUL TOOLS

Flowcharts are the among the most common tools used for process mapping, particularly appreciated for their simplicity and visual clarity.

However, as organizations increasingly face complex systems or cross-functional operations, they are not always the most exhaustive way to represent these intricate processes, where alternative ways have gained prominence.
In fact, there is a wide range of tools available for process mapping, each with a specific purpose. The selection of the appropriate tool often depends on several interrelated factors, including the complexity and maturity of the process, the intended audience (i.e., technical staff, management, or external stakeholders), the nature of the insights requested (i.e., diagnosis of inefficiencies, high-level process scoping, or compliance analysis), and the phase of the improvement or documentation cycle.
While some tools are better suited for high-level overviews, others are more appropriate for detailed root cause analysis or communication between different departments.

In the following sections, several alternatives to flowcharts are introduced and presented, highlighting their characteristics, advantages, and typical notation. Through the exploration of these tools, a complete overview emerges to support how to choose and apply the best technique for effectively representing the business process relevant to the case study analysed in the subsequent chapters.

3.3.1. BPMN

A Business Process Model and Notation (BPMN) is a widely adopted method used by project managers and analysts to visualize the structure and dynamics of a process and what outcome it is expected to produce. BPMN was originally developed in 2004 by the Business Process Management Initiative (BPMI). A year later, BPMI merged with the Object Management Group (OMG), a computer industry standards consortium.
Together, they released a specification document that outlined the BPMN notation and semantics, including the best practices for creating a BPMN diagram.
In 2011, OMG released the BPMN 2.0 specification, which offered a more detailed version of the standard. This release included a richer set of symbols and notations for creating business process diagrams.

BPMN diagrams are built using a standard set of symbols that are categorized into four main groups: flow objects, connecting objects, swimlanes, and artifacts.

- Flow objects: these are the primary elements that define the behaviour of a business process and they include events, activities and gateways, which depict the flow of a process. Events represent what happen during a process, such as starting, ending, timer, message and so on. These are illustrated by circles with an appropriate symbol of the event occurred.
  Activities describe the kind of work being done in a particular process instance, depicted as rounded rectangles. Then, gateways are decision points used to control the divergence and convergence of flows. They are represented by a diamond (rhombuses) with a different logo inside to distinguish between types such as exclusive, parallel, event-based, and inclusive gateways.

- Connecting objects: such items are depicted by lines that connect flow objects and define the relationships between them. The three main types are sequence flows, which indicate the order of activities; message flows, which represent the communication among different participants in the process; and associations, used to connect artifacts or relevant information to specific flow objects in the diagram.

- Swimlanes: these are used to organize aspects of a process in a BPMN diagram. They visually group objects into lanes, with each aspect of the process added to a separate lane, and are typically used to distinguish between different departments, systems, or actors involved in the process. These elements can be arranged either horizontally or vertically, and they can also reveal delays, inefficiencies, and the workers responsible for each step in a process.

- Artifacts: Artifacts represent supplementary information relevant to the model but not to individual elements within the process. The three types are annotations, groups, and data objects that can be used in a BPMN diagram.

By using these symbols (*figure 16*), BPMN diagrams provide a powerful and standardized way to visually represent and communicate business processes, facilitating process analysis, and supports continuous improvement efforts.

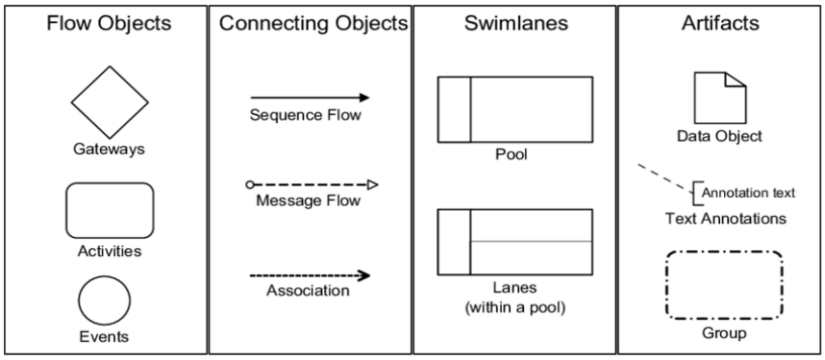


Figure 16: main symbols in BPMN

BPMN tools offer a high degree of flexibility, allowing companies to adapt to many unique business processes, without changing their overall structure. This adaptability provides various features that are rarely available on other systems. In particular, BPMNs are also effective in cross-functional and cross-corporate communications, facilitating transparency and trust among all stakeholders.
However, it has some disadvantages. Its complexity can be a barrier and a challenge to read for those unfamiliar with the notation, because it uses many symbols, elements, and rules that confuse the reader. Moreover, the instrument is mainly designed for structured and predictable operations, but it may not capture some processes' dynamic and adaptive nature. It tends to limit innovation due to its highly rigid framework.

BPMN enforces a predefined and standardized way of modelling processes, which may constrain the creativity and flexibility of the process participants and designers.
Compared to traditional flowcharts, BPMN is more complex as it provides more symbols to represent the various aspects of a process. It delivers also a more detailed representation of processes, as it can specify the exact roles, responsibilities, data, and events involved in all the activities of the organization.

An example of a BPMN diagram is shown in *Figure 17*, which visually summarizes the elements and concepts previously discussed, highlighting the richness of notation and the structured organization of activities across roles.

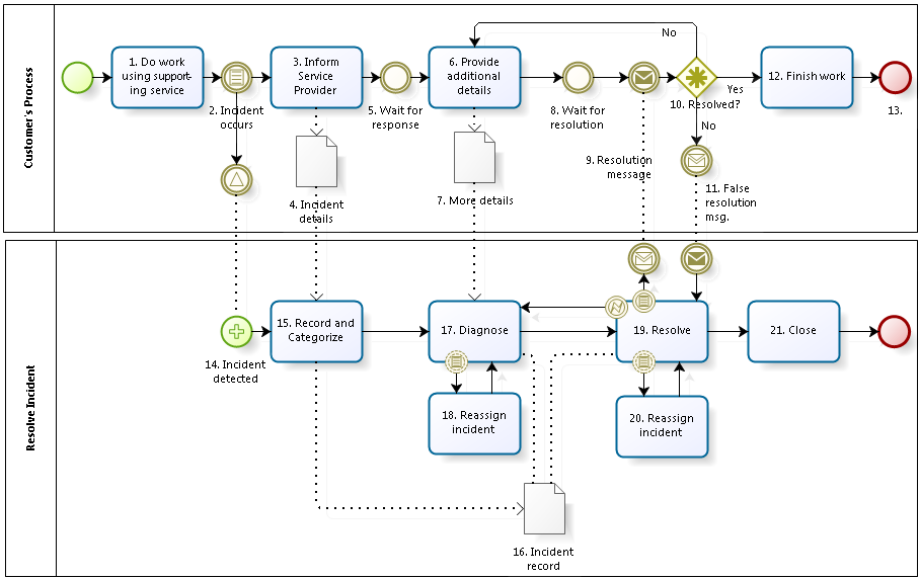


Figure 17: an incident resolution process using BPMN notation

3.3.2. SIPOC

A SIPOC diagram (*figure 18*) summarizes the key elements of one or more business processes in tabular form, with each letter of the acronym representing a column in the table used in the analysis: Suppliers, Inputs, Process, Outputs, and Customers. A list of these elements helps to mark the boundaries of a process at a high level.

It was introduced during the Total Quality Management (TQM) programs of the late 1980s and continues to be used today within technologies such as Six Sigma, lean manufacturing, and business process management, particularly in the context of continuous improvement of business processes.
Six Sigma, in particular, aims to minimize defects and inconsistencies in the final product and it is especially effective for improving manufacturing or any process associated with customer experience.

SIPOC involves investigating current processes, planning how to improve them, and implementing those changes with strategic initiatives.
This tool provides a workflow diagram that focuses on who creates and receives materials or data throughout a business process.
Unlike traditional workflow diagrams that are organized with each process step mapped out chronologically, SIPOC diagram doesn't map out dependencies (i.e., tasks that need to be completed before others). Instead, it focuses on identifying who provides and receives inputs and outputs across a process, offering a clear, static overview.
Its benefits include high transparency across the organization, support for problem-solving initiatives, and the provision of a clear overview of a project for stakeholders. However, SIPOC diagrams are not intended to offer detailed analysis; rather, they provide a high-level process map that helps stakeholders make decisions and generate improvement ideas. In this sense, SIPOC is one of several tools used in Business Process Management (BPM) to align processes with organizational goals.

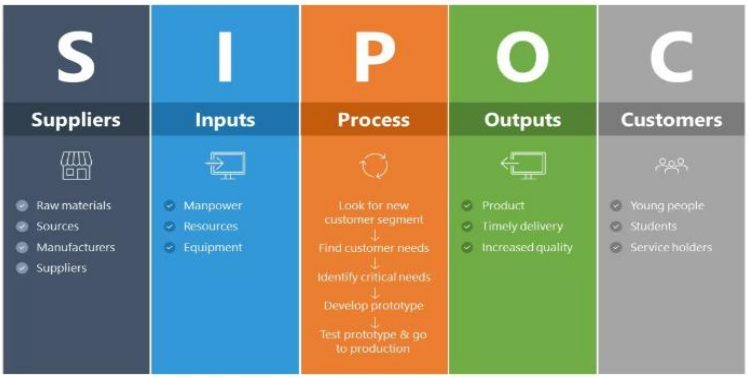


Figure 18: SIPOC diagram example

3.3.3. CAUSE AND EFFECT DIAGRAMS

Also known as the Ishikawa or fishbone diagram (due to its shape as a fish skeleton), the cause and effect diagram is widely used tools in quality management. It is considered one of the Seven basic quality tools and it provides its users with an in-depth analysis of the reasons standing behind a particular problem or effect.
The diagram helps to explore why an event took place or is bound to happen by organizing all potential causes into categories.
The process begins by clearly detecting the main problem, which is placed in a box at the far right of the diagram. Next, a brainstorming session is conducted to identify the possible causes of that problem, which are grouped into major categories.
Typically, there are generic classes to consider: equipment, process, people, materials, environment, and management. These should be all placed in separate boxes, where each is represented as a 'bone' branching off the central arrow (*figure 19*).

This cause analysis tool is particularly beneficial when brainstorming the potential root causes of a problem or when a team's thinking processes fall into a routine and becomes less creative.
In smaller projects or when immediate action is needed, the fishbone diagram may be the only tool used to determine the root causes of a problem and guide actions.
In more complex problems, however, it is often used in combination with other tools, such as a responsibility matrix or an action-planning matrix, to support a more comprehensive improvement process.

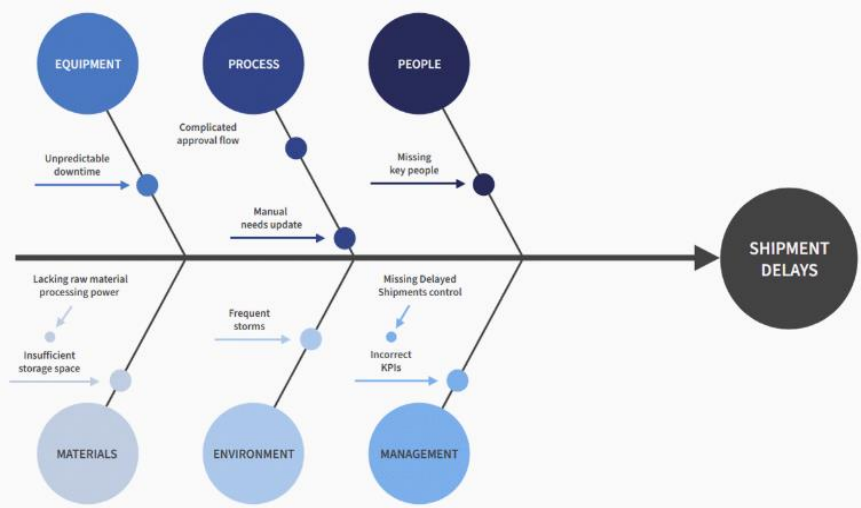


Figure 19: cause and effect diagram

The structure provided by the diagram helps team members approach problems in a very systematic way. Among its main benefits, it facilitates the identification of the root causes of a problem or quality characteristic using a structured approach, and it encourages group participation, promoting collaboration and shared understanding.
It also offers an orderly and easy-to-read format to illustrate cause-and-effect relationships. Furthermore, the diagram contributes to increase the knowledge of the process, enabling participants to learn more about the influencing factors at work and how they relate. Finally, it identifies areas where data should be collected to support deeper analysis or further investigation.

3.3.4. GANTT CHARTS

A Gantt chart is a horizontal bar chart used to illustrate the timeline of a project and its activities, assisting in the planning, coordination and scheduling of tasks. Each bar in the diagram represents a specific activity, while the length of the bars reflects the amount of time needed to complete that step or task. This visual format allows to see what the various activities are, their duration and schedule, any potential overlap between them, and the start and end date of the whole project.

Additional elements commonly included in Gantt charts are milestones, marked points that signify key events or deliverables, and dependencies, which indicate the logical relationship between tasks (e.g., when one task must be completed before another can begin). Some charts also display assigned resources, showing who is responsible for each task or what equipment is required.
In more comprehensive project management tools, Gantt charts can incorporate budget tracking, enabling project managers to monitor the financial progress of each phase and ensure that the overall project stays within the allocated costs.
To summarize, a Gantt chart (*figure 20*) shows you what needs to be done (the activities) and when (the schedule). When zoomed out to see the bigger picture, the Gantt chart gives project managers and teams a comprehensive overview of what needs to be done, who is responsible for it, and when.

The first Gantt chart was devised in the mid-1890s by Karol Adamiecki, a Polish engineer who ran a steelwork in southern Poland and had become interested in management ideas and techniques. However, the version that became most well-known and popular in western countries was developed around 15 years later by Henry Gantt, an American engineer and management consultant, whose name is now most commonly associated with this type of chart.
Today, Gantt charts are most used for tracking project schedules. They are especially effective when supplemented with additional information about the various tasks or phases of the project, for example how the tasks relate to each other, how far each task has progressed, what resources are being used for each activity and so on.

A key benefit of a Gantt chart is its ability to show a high-level perspective of a project. Gantt diagrams help both team members and managers track tasks and monitor progress. Managers can use them to allocate resources wisely, ensuring that deadlines are met and the project proceeds as scheduled. It provides an advanced perspective of a project, improving its overall efficiency and enabling more effective tracking of all the activities. It also supports better resource management, allowing managers to allocate resources according to schedules and timelines.
Moreover, one of its main advantages is that it illustrates how tasks in a project might overlap or that the beginning of a task can be dependent on the completion of another one. That kind of information allows project leaders to schedule work and provide resources in a way that doesn’t impede the progress of a project. A Gantt chart enables team members to visualize their tasks within the broader project framework, thereby increasing motivation by showing progress and fostering a sense of contribution as they observe their own and others' tasks being completed.

Despite their many advantages, Gantt charts also present some limitations, especially when applied to complex or large-scale projects. As the number of activities increase, the chart becomes overly detailed and difficult to understand, reducing its effectiveness as a planning tool. Furthermore, these charts focus on presenting the tasks in a project, the order of those tasks, and the approximate time it takes to complete them.

The charts don't show the priority of the particular tasks you need to complete for the project to be a success. With such an omission, team members might not understand those priorities the way they should.

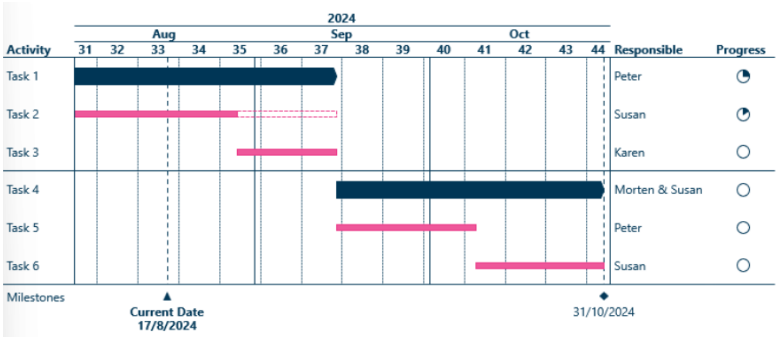


Figure 20: Gantt chart

3.3.5. VALUE STREAM MAP

A Value Stream Map (VSM) is a graphical representation used to illustrate every step involved in the material and information flows needed to bring a product from order to delivery. A VSM identifies what is present in the process (materials, components, inventory), explains why it is here (production control, pull signals, etc.) and assesses how efficient the system operates (cycle time, value added time, lead time). By mapping this information in a standard format, it becomes easier to distinguish between value-added and non-value-added activities, helping organizations to identify inefficiencies and sources of waste.
It is associated with lean manufacturing, but nowadays can be applied to various fields, including service-related industries, administrative and office processes, and software development. Toyota developed the tool, which refers to it as a Material and Information Flow Diagram, and it remains a critical part of the Toyota Production System.

There is a common set of symbols used in value stream mapping, some of which were introduced in the influential workbook "Learning to See," published by the Lean Enterprise Institute in 2009. However, VSM symbols are not universally standardized and can be modified or created new symbols based on the specific needs of an organization.
The following section illustrates the main labels used in Value Stream Mapping, along with an example map presented in *Figure 21*.

- Supplier/Customer: illustrated by a square or rectangle with a serrated top edge, resembling the outline of a factory. When placed in the upper left corner of a value stream map, the typical starting place for material flow, this icon represents the supplier. Conversely, when placed in the upper right corner, it is the customer, the final recipient of the product.

- Material flows: are illustrated using open arrows that symbolize the movement of products from one process to another. Following the direction of these arrows reveals how well materials are transferred across the value stream, making it easier to identify bottlenecks or redundancies in the flow.

- Processes: are depicted as a simple rectangle, which represents a specific department, process operation or machine with a fixed and continuous internal material flow.
  Each process box is typically labelled with the name of the process it represents and serves as a central component in the map, illustrating the main steps required to deliver a product or service from start to finish.

- Data box: is a rectangular area placed directly below a process symbol. It contains detailed information related to that process, such as cycle time, changeover time, uptime, number of operators, scrap rate, and batch size.

- Inventory: the inventory between two processes is represented by a triangle, indicating the presence of stored materials. It can also be used to indicate inventory at the start/end of a process and stored inventory.

- Information flow: is shown with a simple arrow that can be either solid or dashed, representing communication between different actors or systems. For example, information arrows may illustrate how the production control department sends schedules to various processes.

- External shipment type: shipment types are represented using specific icons that correspond to the mode of transportation, such as a truck, ship, train, or airplane. These symbols show how products are moved between the organization and external entities, either incoming from suppliers or outgoing to customers.

- Operator: this icon resembles a stylized eye with a number inside, used to show how many operators are needed to process the VSM family at a particular workstation.

- Timeline: on a value stream map, the timeline is placed at the bottom and shows waiting times and processing times. It consists of two layers: one for processing times and one for waiting times. The top layer represents value-added time, showing how long each process step takes, while the bottom layer captures non-value-added time, such as delays or storage periods. This can be used to calculate Lead Time (the total time a product or service takes to go through the process) and Total Cycle Time (the total time required for the entire process).

- Other information: represented as a rectangle, it indicates an information flow or schedule. It offers flexibility in capturing all the elements necessary for a complete understanding of the system.

VSM is well suited to relate manufacturing processes to its supply chains and distribution channels. It also facilitates the integration of both material and information flows. In this context it links production control and scheduling functions, such as production planning and shop floor control, by using operating parameters like cycle times and changeover durations.
This technique offers several benefits to a business. Aside from providing clarity and a comprehensive understanding of how operations work, it helps identify sources of waste, bottlenecks and constrains, while also opportunities for improving the processes. As a result, product quality can be enhanced and activities can be streamlined to make every step more efficient.
However, Value Stream Mapping applied in isolation may not produce meaningful results in a variety of contexts. VSM might fail outright in scenarios with multiple products with no identical material flow maps. Moreover, this tool lacks economic measures for 'value' (i.e., profit, throughput, operating costs and inventory expenses). Additionally, when dealing with complex, multi-tier product Bills of Materials (BoMs) with multi-level operation process charts, the mapping process may become unclear and difficult to interpret.

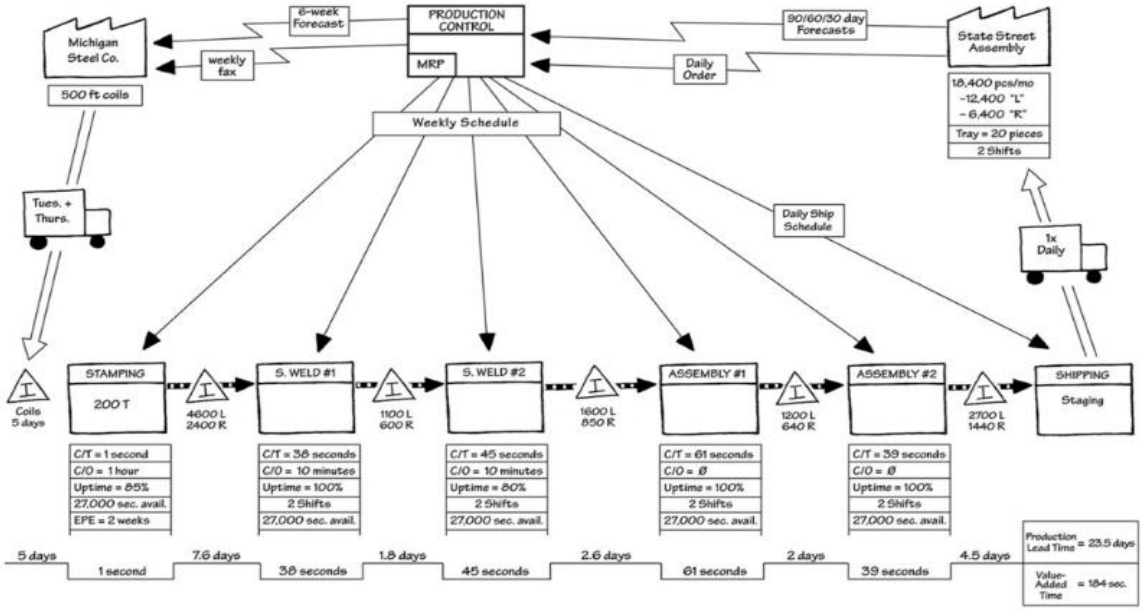


Figure 21: value stream map

3.4. CHOOSING THE MOST SUITABLE TOOL

As outlined in the previous sections, there are many types of process maps available, each offering a different lens for deconstructing complex processes or gaining a high-level view of business operations.

Given the wide variety of available tools, such as flowcharts, SIPOC diagrams, value stream maps, swimlane diagrams, and BPMN, choosing the most suitable one depends on the specific characteristics and goals of the process being analysed.
Each method offers a distinct perspective and is best suited to specific scenarios, ranging from high-level overviews to granular analyses of roles, responsibilities, and value-added activities. Therefore, the selection of the tool is not trivial and must be guided by a clear understanding of the process characteristics and the intended outcomes.
In this section, a comparison is provided to evaluate each method's strengths and limitations. Then, the final subsection will justify the choice of flowcharts as the most suitable mapping tool for the expropriation process, considering its specific administrative and legal context.

3.4.1. COMPARISON

When conducting a process mapping comparison, the effectiveness of flowcharts can be illustrated through several key criteria. Their main strengths lie in clarity and simplicity, which make them successful in reducing confusion and facilitating understanding, even in complex context. The adaptability of flowcharts is also noteworthy, as they can be tailored to different processes across various industries.
Furthermore, their collaborative nature allows teams to work together more effectively, fostering a shared understanding of procedures. These factors contribute to the popularity of flowchart-based mapping as a foundational technique for optimizing operations and enhancing efficiency.

SIPOC enhances traditional flow-based representations by offering a structured high-level overview of a process and its environment. Unlike simple flowcharts, SIPOC diagrams emphasize not just the sequence of activities but also the context in which they occur, identifying key suppliers who provide inputs, the nature and scope of those inputs, the internal steps that transform them, the outputs generated, and the final customers who receive them. This is very helpful when analysing cross-functional processes, especially those that include several handoffs between departments and suppliers.
If the customer is directly involved in the process, this tool supports a customer-centric perspective, helping the company to understand how actions upstream influence the overall user experience. Its simplicity, combined with its comprehensive framing, makes SIPOC a highly effective tool during the early stages of process definition and improvement initiatives.

The Value Stream Map is considered one of the most advanced tools for process analysis, particularly in the context of lean management. It proves especially impactful when organizations seek to implement change management initiatives or drive continuous improvement. Unlike other visual tools that merely document workflows, VSM provides a quantitative and qualitative analysis of a process by capturing both the material and information flows involved in delivering a product or service.

It goes beyond identifying process steps by integrating critical performance indicators, which enables the distinction between value-added and non-value-added activities.
This detailed insight supports data-driven decision-making, allowing organizations to identify inefficiencies and eliminate or redesign non-essential steps to enhance overall performance. While it requires more data and effort to develop than other tools, the depth of understanding generated from a well-constructed VSM often justifies the investment.

Swimlane diagrams present a structured way to visualize processes by distinguishing responsibilities among different participants or departments. They are a valuable tool for organizations seeking not only to document workflows but also to improve accountability in these cross-functional operations. Swimlane graphs introduce an additional layer of clarity by delineating responsibilities across functional lanes. This feature makes them especially effective in highlighting interdepartmental handoffs, indicating where coordination or delays might occur.
When comparing swimlane diagrams with other process mapping techniques, such as flowcharts or value stream maps, several key aspects emerge. Firstly, they outclass in clarifying roles and responsibilities, reducing ambiguity in complex workflows. Secondly, by visually associating each activity with a specific actor or department, they enhance communication and alignment among stakeholders.
Finally, the format facilitates the identification of bottlenecks, redundancies, or excessive handovers, which are often responsible for inefficiencies.

To conclude, Business Process Model and Notation (BPMN) tools are particularly effective in cross-functional and cross-corporate communications. BPMN provides a standardized, detailed, and formalized method to model business processes, allowing organizations to capture complex workflows with precision. Compared to simpler tools like flowcharts, BPMN utilizes a richer set of symbols and elements to represent a wide range of process components, including events, tasks, gateways, and message flows.
This increased complexity enables BPMN to specify exact roles, responsibilities, triggers, and interactions within and between business units or organizations, offering a comprehensive view of the process dynamics.
Due to its precision and standardization, this tool is especially valuable in contexts where process automation, system integration, or detailed documentation is required.
However, such complexity often demands specialized training to develop and interpret BPMN diagrams, which can limit accessibility for some stakeholders.

To consolidate the insights from the comparison above, the following table (*table 3*) summarizes the main characteristics, strengths, limitations, and typical applications of the most used process mapping tools.

Tool	Purpose	Strengths	Limitations
Flowchart	Graphically represent the sequence of operations and decisions in a process	Simple Intuitive Flexible	May lacks detail Not defines roles or responsibilities
SIPOC diagram	Provide a high-level overview of Suppliers, Inputs, Process, Outputs, and Customers	Stakeholder focus Clarifies scope	Not detailed enough for operational analysis Lacks process flow detail
Value Stream Map	Analyse the flow of materials and information of a manufacturing line	Identify waste Distinguish value- and non-value-added activities Includes process metrics	Data-intensive Requires training and deeper understanding
Swimlane diagram	Show process steps divided by several actors	Clarify roles and responsibilities	Can become complex with many actors
BPMN	Standardized and detailed process modelling	Precise Numerous symbols Supports automation	Requires expertise and familiarity Complex

Table 3: comparison between mapping tools

3.4.2. EXPROPRIATION CONTEXT

In the context of the expropriation process, the flowchart was selected as the most appropriate process mapping tool based on a combination of practical, organizational, and communicative factors. The expropriation procedure involves multiple steps regulated by strict legal norms, administrative checks, and the participation of various internal and external stakeholders, such as technical personnel, legal experts, public authorities, and sometimes private citizens. Therefore, the representation method had to balance clarity, accessibility, and adherence to regulatory logic.

Among the tools compared, the flowchart stood out for its simplicity and intuitive structure. Its standardized and limited set of graphical symbols (i.e., rectangles for activities, diamonds for decisions, arrows for flow direction) makes it easily interpretable even by individuals without a background in process analysis or management methodologies. This feature is mostly relevant in the public administration environment, where not all users are trained in advanced modelling techniques like BPMN or familiar with tools like SIPOC or VSM.
Using a flowchart enables quick understanding of the sequence of actions and decision points, facilitating both internal communication and the transparency of procedures.

Another important reason behind this choice lies in the existing familiarity of staff within the organization. Operators, especially those involved in technical and legal departments, are already accustomed to using and reading flowcharts in their daily activities.
This familiarity reduces the learning curve and increases the acceptance of the mapping effort, making the flowchart not only a visual tool but also a functional instrument to support procedural improvements. The introduction of more complex formats such as BPMN or Value Stream Maps, although more detailed, would have required additional training, time, and resources, elements not always available in public-sector projects constrained by deadlines and budgets.
Additionally, the flowchart allows a flexible level of granularity, which can be adapted according to the specific stage of the process or the audience involved. For instance, a high-level version can be used to provide an overview to external stakeholders or citizens, while a more detailed version can guide internal operational execution. The visual flow of activities makes it easier to identify redundancies, unnecessary steps, or bottlenecks in the process, thereby supporting both diagnostic and optimization efforts.

Lastly, in terms of legal compliance and documentation, the flowchart is compatible with requirements for process transparency and procedural accountability. In particular, it aligns properly with the process-oriented approach promoted by quality standards such as ISO 9001, which the organization references. For these reasons (clarity, ease of use, organizational alignment, and suitability for both analysis and communication) the flowchart was chosen as the preferred tool for mapping the expropriation process.

4. ANALYSIS OF THE CURRENT PROCESS

This chapter provides a comprehensive analysis of the current expropriation process adopted by the organization. It begins with the description of the whole process, specifying its objectives, stakeholders and the expected outputs.
The subsequent sections break down the process into its key activities and interactions, illustrating the role involved and interconnections between phases.
Afterwards, an investigation of the original flowchart is presented, focusing on its structure, visual representation and symbolic consistency. The goal of this study is to identify ambiguity, criticalities and inefficiencies that impede the quality and usability of the diagram. The chapter concludes with an assessment of the impact of these issues on the overall process performance, followed by a SWOT analysis, a technique that evaluates the strengths, weaknesses, opportunities, and threats related to the current configuration.

4.1. DESCRIPTION OF THE OPERATING CONTEXT

The process under examination in this thesis is the expropriation procedure, a highly regulated administrative process where a government acquires a property that is privately owned for public interest. Since the government seizes property with or without the owner's consent, it must always be accompanied by a fair compensation, which normally should be equivalent to the market value of the property.
In general, properties are expropriated to facilitate the construction of public infrastructures (i.e., roadways, airports, and other infrastructure projects) or to enable private projects deemed to serve a public interest.
In some cases, the government can also expropriate property for environmental or social purposes, such as relocate residents from heavily polluted locality to a place with a cleaner environment.

In the Italian legal system, expropriation for public utility is governed primarily by the Article 42 of the Constitution, which recognizes private property but establishes its limits, allowing expropriation for reasons of general interest and subject to compensation.
This principle is reinforced by Article 834 of the Civil Code, which requires a legally declared cause of public interest and the payment of fair compensation, and by Presidential Decree 327/2001 (the Consolidated Law on Expropriation), introduced to comprehensively regulate the procedures and the criteria for compensation.

The two pillars of the institution are: the definition of expropriation cases by law, and the owner's right to receive fair compensation. However, there are some exceptions to expropriation that apply to certain categories of property, such as those in the public domain, those subject to civic use, or those belonging to the State's inalienable assets. These can only be taken under specific conditions or following a prior act of removal from public possession.

The process is divided into three main phases:

i. Pre-expropriation restriction: The property is designated for construction through an approved urban planning scheme. It is valid for five years.

ii. Declaration of public utility: The owner's full property becomes a legitimate interest. This act legitimizes the expropriation and it must be completed within 5 years from the imposition of the constraint.

iii. Provisional calculation of compensation: A sum proposed to the owner is determined. If it is accepted, the process can conclude with a voluntary agreement, otherwise a formal expropriation decree is issued. The compensation is determined according to criteria established by law and is not considered reparative in nature, and it is often lower than the market price of the expropriated property. The owner has the right to verify the regularity of the procedure and, once the expropriation has taken place, to ensure that the cadastral data is updated.

In the context of this thesis, the expropriation process under analysis refers specifically to the internal workflow adopted by SCR Piemonte S.p.A., a strategic partner of the Piedmont Region that is responsible for supporting public authorities in procurement and infrastructure development.

The primary objective of this process is to ensure the timely, lawful and efficient acquisition of land required for the execution of public works and infrastructure projects. This is obtained by complying with the relevant regulatory framework and administrative deadlines, and by providing specialized technical and legal assistance to contracting authorities during the preparation of the expropriation-related documentation.
Moreover, the procedure must guarantee transparency, traceability and legal certainty, ensuring the properly documentation of every activity of the process and its alignment with the law. This structured approach leads to a reduction of errors and disputes, while also protecting the rights of all the parties involved.

Among the most relevant outputs of the expropriation process are the issuance of formal communications and notifications to property owners and relevant stakeholders, as well as the publication and notification of the declaration of public utility, which provides the legal basis for proceeding with the acquisition.
In addition, the execution and registration of expropriation decrees or, where applicable, the signing of voluntary transfer agreements. These legal instruments formalize the transfer of ownership and must be accompanied by the updating of cadastral data, ensuring that the new ownership is correctly reflected in official land registries.
Another critical output is the payment or legal deposit of compensation to the affected parties, which completes the financial phase of the process and ensures compliance with the constitutional right to fair indemnification.

Taken together, these outputs represent the administrative, legal, and financial milestones that identify a properly concluded expropriation procedure. They also serve as key indicators for assessing the efficiency, transparency, and legal robustness of the process managed by SCR Piemonte.

4.2. ORIGINAL FLOWCHART

The original flowchart adopted by SCR Piemonte provides a complete representation of the expropriation process in both ordinary and urgent procedures.
As said in the previous section, it is structured in accordance with the Presidential Decree 327/2001, mapping all the activities from initial project phase to the execution of the expropriation (from phase 00 to phase 13), and it represents all the administrative actions required for a valid procedure. Moreover, the process distinguishes between ordinary and urgent procedures and it accounts also for specific cases like temporary occupation or irregular possession.
However, the graphic representation relies on linear arrangements of text boxes, without role separation or standard flowchart symbols, limiting its readability and functionality as a communication and analysis technique.

Below there is the breakdown of the entire process, mapped using the original flowchart used within the company:

- Phase 00: 'Verification and support for the preparation of project documents'.
  The expropriation process begins with the drafting of the feasibility, final, and executive design phases (*figure 22*). Once the Sole Person in Charge of the Procedure (in Italian 'RUP') informs the Expropriation Unit ('U.O. Espropri'), standardized expropriation templates are provided, and technical support is offered to designers. This ensures compliance with legal and administrative requirements from the outset. The lack of clearly formalized timelines or digital collaboration tools may lead to inconsistencies in processing times and affect the overall efficiency of the phase.

- Phase 01: 'Provisions on drafting the project'. (*figure 22*)
  In this stage, in line with Article 15 of DPR 327/2001, the project is prepared for approval in view of activating the expropriation procedure.
  The RUP may request authorizations for access to private land parcels, and communications are sent to property owners and occupants. These steps are essential to lawfully initiate the process and to allow for future declarations of public utility.

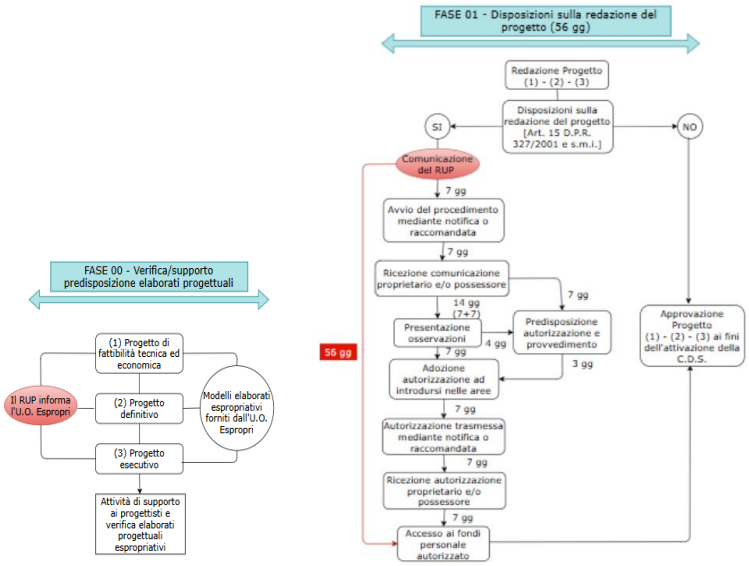


Figure 22: phases 00 and 01

- Phase 02: 'Initiation of the procedure for establishing or reiterating the preordained constraint ('V.P.E.') and P.R.G.C. variation' (*figure 23*).
  If the public work is not yet consistent with local urban plans, a binding constraint ('Vincolo Preordinato all'Esproprio' or V.P.E.) must be established or reiterated. This phase includes the launch of a Conference of Services ('C.d.S.') to approve any urban planning variation and to start the expropriation process. An official notice of initiation is drafted and published, notifications are sent to owners, and a public consultation period is opened (30 + 7 days) to gather any observations.

- Phase 03: 'Conclusion of the procedure for establishing or reiterating the preordained constraint (V.P.E.) and P.R.G.C. variation' (*figure 24*).
  Once the consultation period ends, a final decision is adopted to confirm the urban planning modification and the imposition of the constraint. This is followed by comprehensive publication and notification, ensuring full transparency and respect for legal deadlines.

- Phase 04: 'Initiation of the procedure for the declaration of public utility (P.U.)'.
  When the project aligns with the urban plan, either initially or after a variation, the declaration of public utility may be requested under Articles 9 and 11 of DPR 327/2001. The Expropriation Unit handles the preparation and dissemination of the initiation notice. Observations submitted during the consultation are evaluated and addressed through counterarguments, which are then sent to the C.d.S. for final approval of the project and the declaration of public utility (*figure 23*).

- Phase 05: 'Conclusion of the procedure for the declaration of public utility'.
  After having declared the P.U., a notice should be published and sent to the relevant stakeholders.

At this point, interested parties may submit supporting documentation relevant to the determination of the compensation, following the participatory approach of the Law 241/1990. This step can be spotted in *figure 24*.

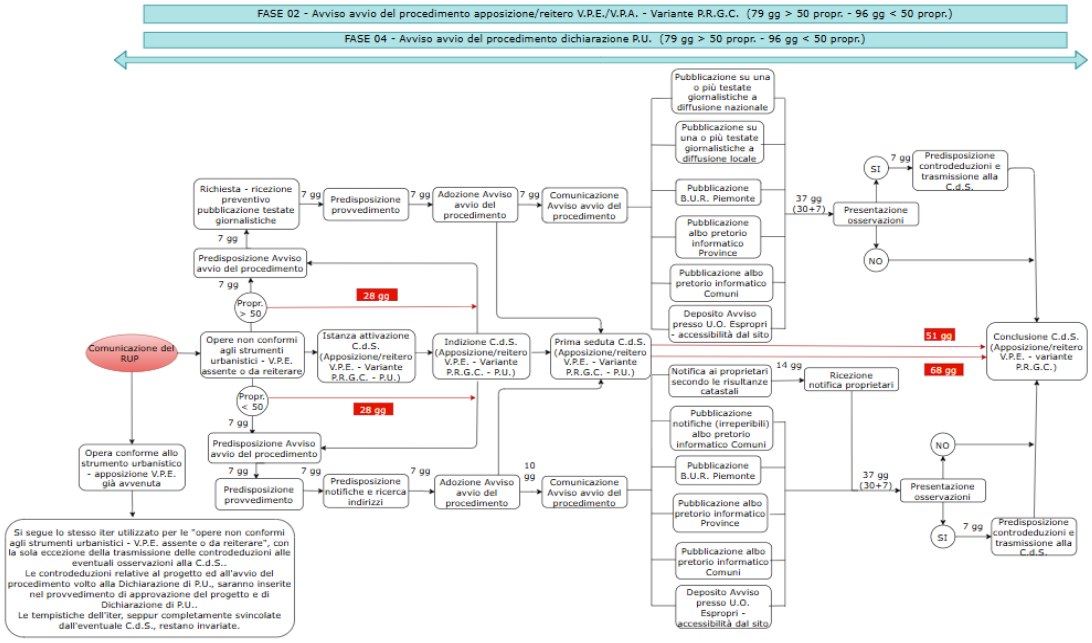


Figure 23: phase 02 and phase 04

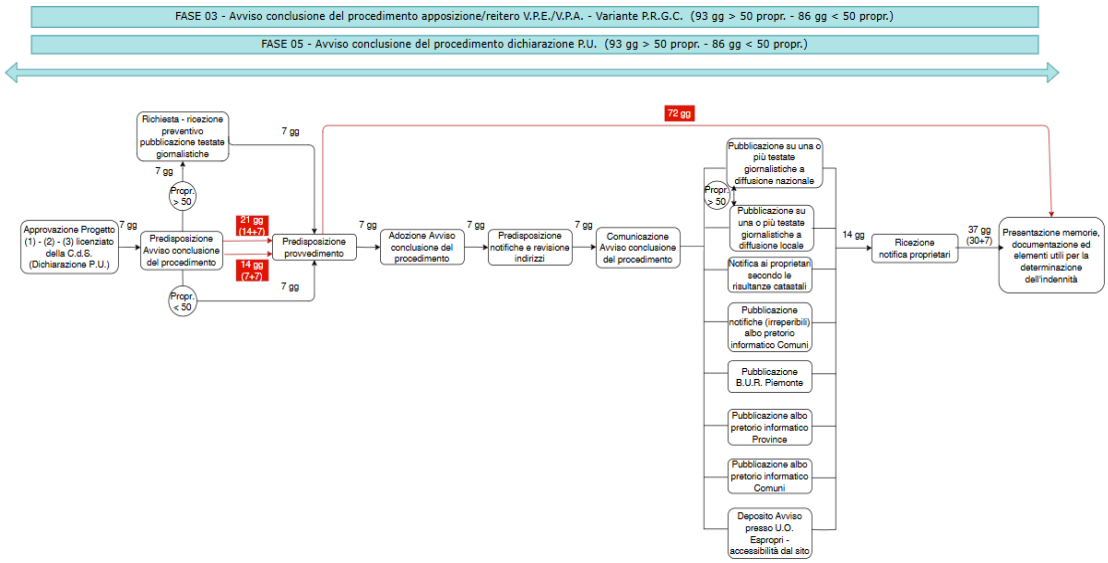


Figure 24: phase 03 and phase 05

- Phase 06: 'Execution of the expropriation process'.
  This is the core of the procedure (*figure 25 and figure 26*), representing its most complex and articulated part. Depending on the number of affected property owners and the urgency of the public work, the process follows two distinct branches:

i. The urgent procedure (06A), regulated by Article 22 of DPR 327/2001, is applied when more than 50 owners are involved or when specific urgency conditions occur. The process begins with the preparation and publication of the notice of initiation (A1), which informs the owners of the intention to proceed with urgent occupation. The notice includes the provisional compensation amount and the expected timeline for possession.
Then, the administration commissions a professional to conduct the land parcelling ('frazionamento') and to coordinate the formal entry into possession (A2), ensuring the accurate identification and documentation of the areas involved. A formal decree of urgent occupation is then issued and notified to the owners (A3).
Once officially published, it allows the administration to legally take possession of the land even before the expropriation decree is issued. Owners are offered advance payments for the partial compensation of the expropriated property (A4).
If accepted, the amounts are liquidated; otherwise, they are deposited. Meanwhile, the technical work for defining the exact boundaries and measurements of the expropriated areas is carried out (A5).
Based on the outcomes of the previous phases, the final compensation amount is calculated and either paid to the accepting parties or deposited in the event of disagreement or absence (A6).
The final step of the urgent procedure is the issuance of the expropriation decree (A7), which definitively transfers ownership to the public authority and it is subsequently registered and transcribed in the public property registers.

ii. The ordinary procedure (06B), based on Articles 20 and 23 of the decree, is used in standard situations involving fewer owners and no urgency.
It starts with a notice of initiation (B1), which informs the owners about the intent to proceed with the Decree of Expropriation and/or Easement ('asservimento'), complying with the standard publication and notification requirements. Just like in the urgent procedure, a technician is then appointed to carry out parcelling operations and coordinate the physical possession of the land (B2).
Once the exact value and ownership details are computed, the compensation balances are determined and either paid directly or deposited (B3).
Finally, the expropriation decree is issued, notified and formally executed.

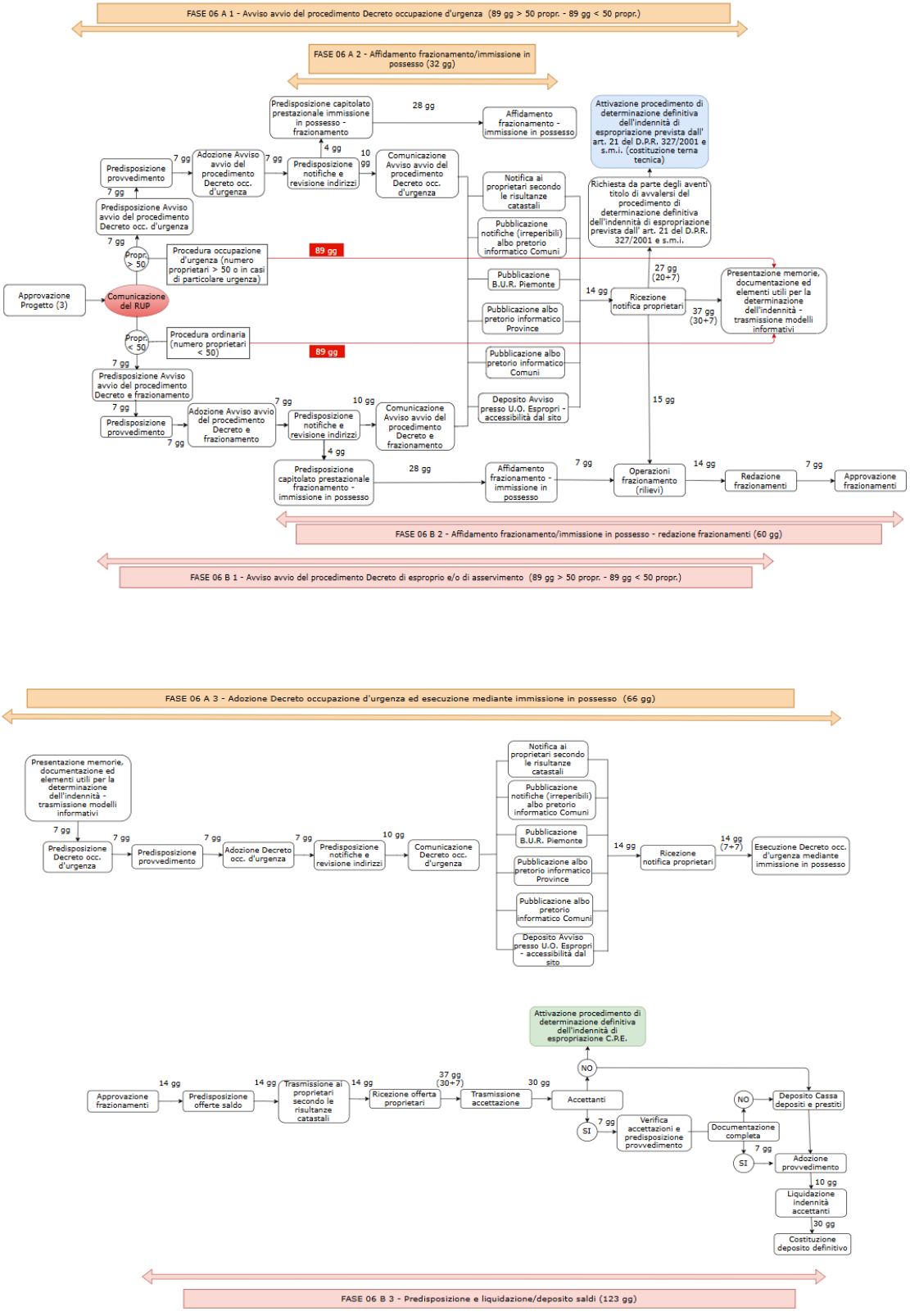


Figure 25: phase 06 A1, A2, A3, B, B2, B3

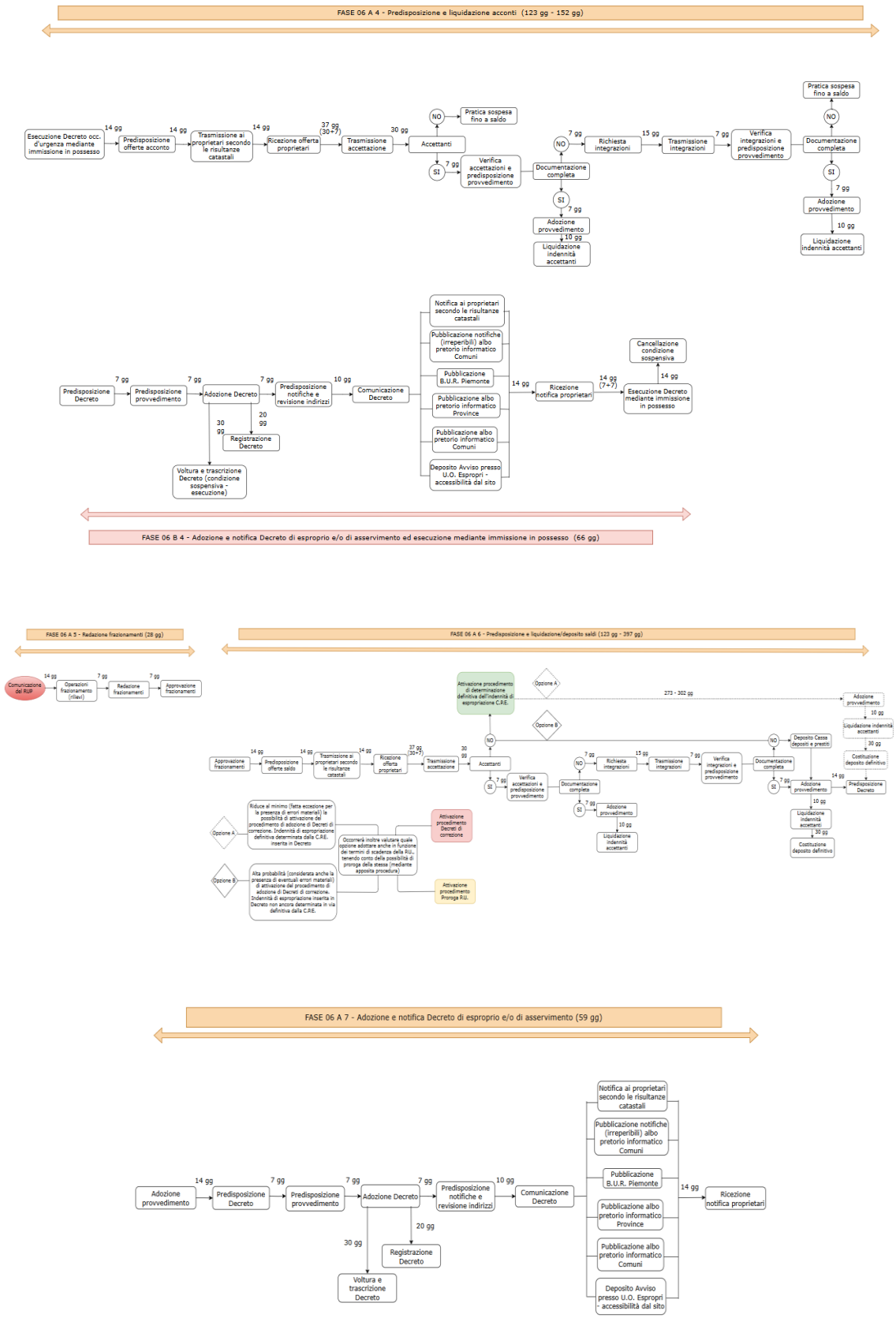


Figure 26: phase 06 A4, A5, A6, A7, B4

- Phase 07: ‘Final Determination and Liquidation of Compensation by the C.P.E.’.
  This phase (*figure 27*) is activated when owners do not accept the compensation initially proposed, following the Article 21 of DPR 327/2001 (07A). Upon request from the entitled party, the commission is convened, and a technical appraisal is carried out to determine the fair market value of the expropriated property.
  The resulting indemnity may differ from the provisional offer and is communicated to the parties. Following the determination, the process moves to phase 07B, which involves the preparation of payment and the liquidation or deposit of the indemnity.
  If the owner formally accepts the amount established by the C.P.E., the compensation is paid directly; otherwise, it is deposited with the deposits and loans fund (‘Cassa Depositi e Prestiti’), fulfilling the authority’s obligation to guarantee compensation.

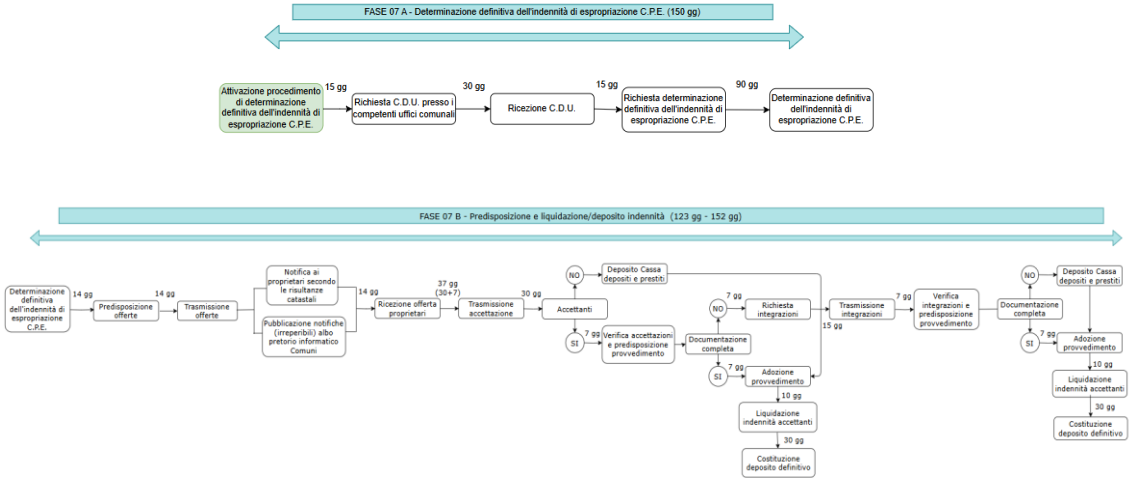


Figure 27: phase 07

- Phase 08: ‘Determination of Compensation by a Technical Panel’.
  The property owner or the authority may request the activation of the procedure for the final determination of compensation by a technical panel, composed of three appointed experts (terna tecnica), as allowed by Article 21 of DPR 327/2001. This process begins with the appointment of the panel and the drafting of an independent technical appraisal aimed at estimating the fair value of the expropriated property (08A). Once the expert valuation is completed and officially submitted, the administration proceeds with the preparation of the payment offer, followed by the transmission of the documentation to the owner.
  If the owner accepts the indemnity amount, it is paid directly; otherwise, the sum is deposited (08B). The phase (*figure 28*) concludes with the liquidation or deposit of the indemnity and the fulfilment of all procedural obligations (08C), thereby allowing the expropriation process to move forward while respecting the owner’s right to fair compensation.

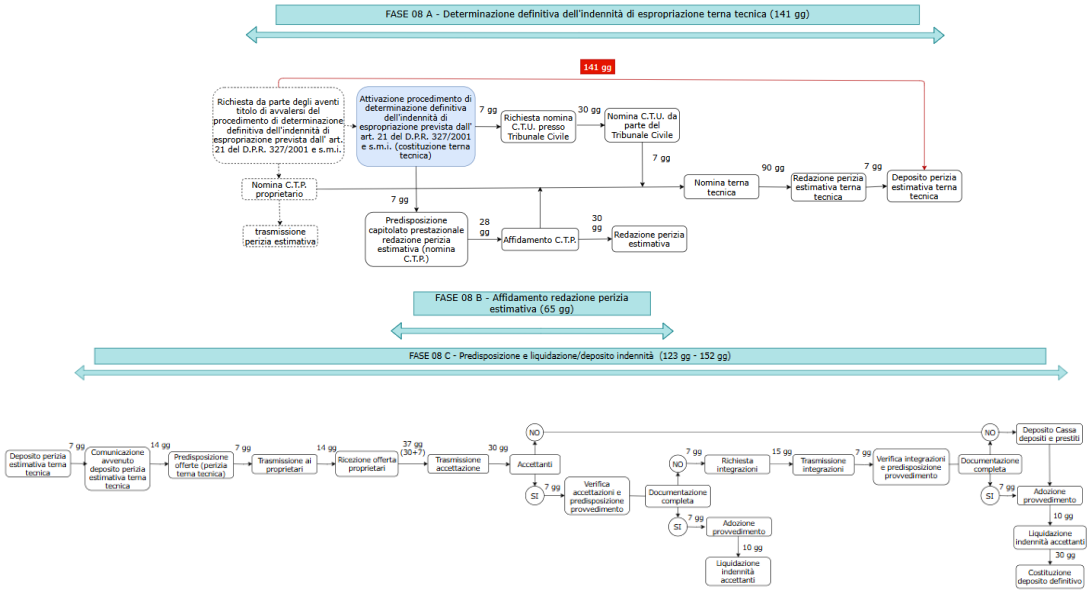


Figure 28: phase 08

- Phase 09: 'Temporary occupation procedure' (*figure 29*).
  Phase 09 governs the procedure for the temporary occupation of areas, typically necessary for preparatory activities, regulated by Article 49 and 50 of the decree. It begins with the initiation of the procedure (09A), through the drafting and publication of the notice, which includes the purpose, duration, and the provisional compensation amount. The administration then appoints a professional in charge of executing the entry into possession (09B), ensuring that the occupation occurs in compliance with legal and cadastral documentation. Once this is completed, the Ordinance for Temporary Occupation is formally adopted and notified (09C), granting the authority the legal right to access and use the private land for a limited time.

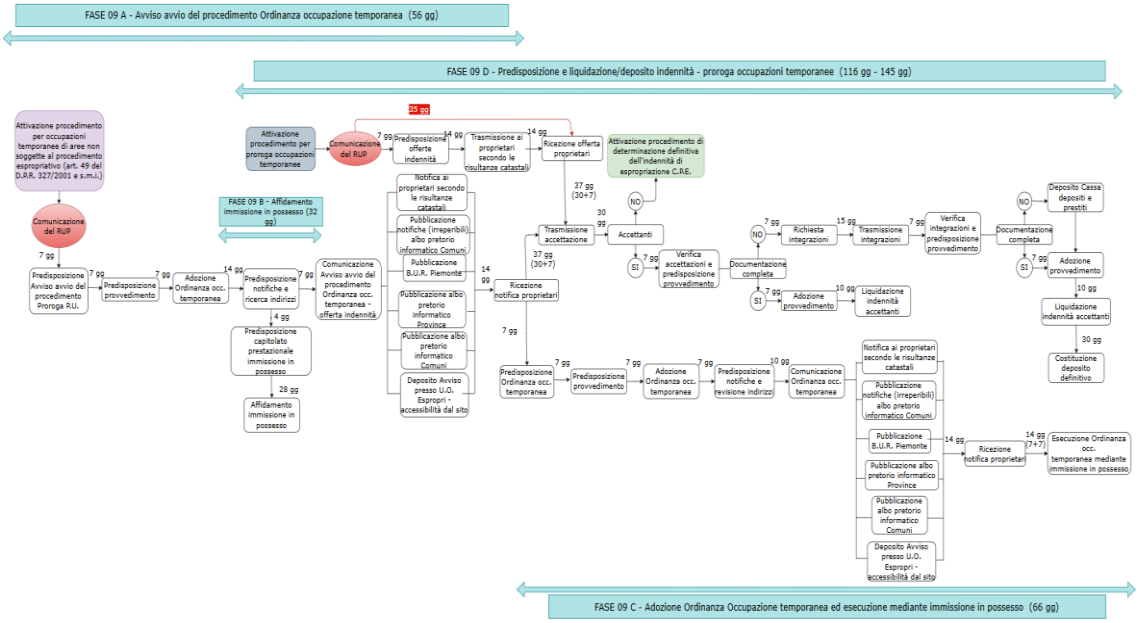


Figure 29: phase 09

- Phase 10: ‘Extension of the Declaration of Public Utility.’ (*figure 30*)
  According to Article 13 of DPR 327/2001, if the expropriation procedure is not completed within a specific timeframe, the P.U. loses effectiveness unless an extension is formally adopted. Phase 10 addresses this issue by providing a procedure to ensure the continuity and legal validity of the expropriation process.
  The extension procedure begins with phase 10A, which involves the drafting and publication of a new notice that informs the interested parties of the administration’s intention to extend the effects of the previously declared public utility.
  This notice is subject to all standard publication and notification requirements and opens a period during which affected owners may submit observations or objections.
  Following the consultation phase, phase 10B concludes the process with the adoption of the final provision granting the extension.
  The decision is then published and notified, restoring full legal effectiveness to the declaration and enabling the continuation of the expropriation process.
  This phase ensures compliance with legal deadlines and protects public interest projects from procedural interruptions, while preserving the participatory rights of affected individuals.

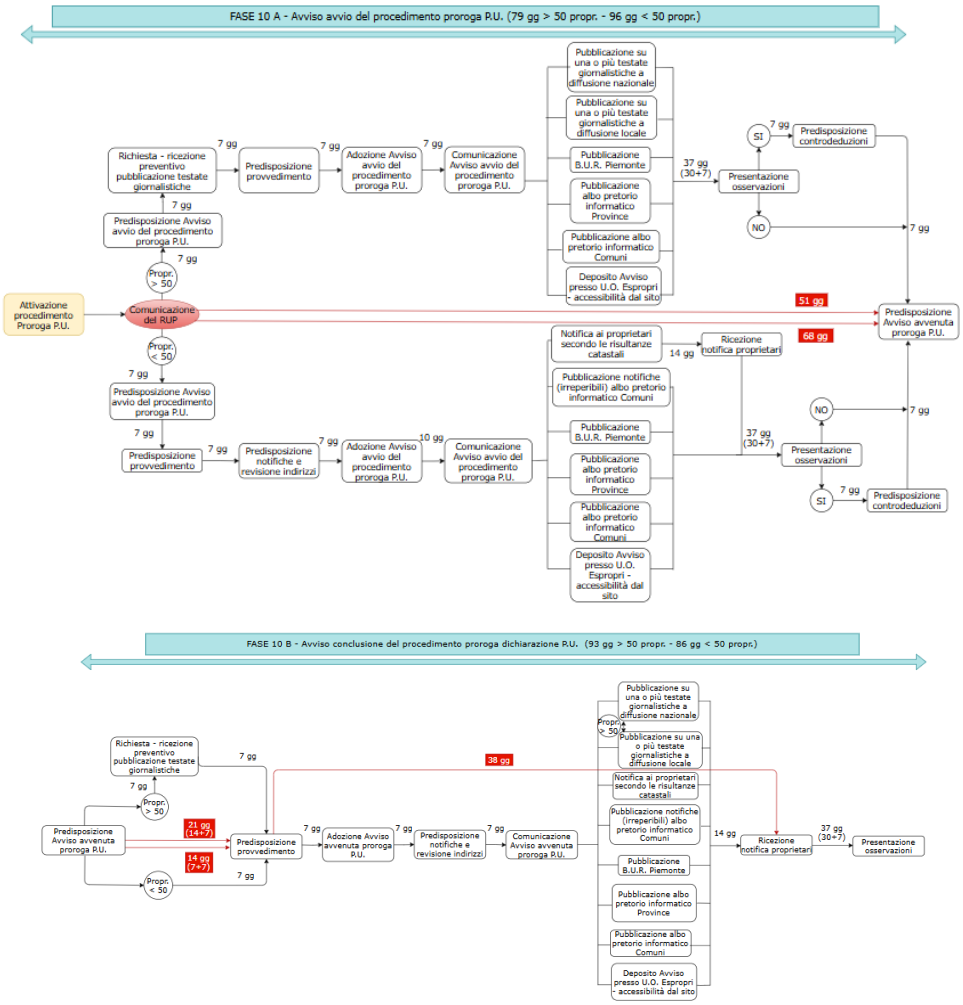


Figure 30: phase 10

- Phase 11: ‘Correction of Expropriation Decrees’.
  This step (*figure 31*) addresses cases in which errors are identified in a previously adopted decree, for instance inaccuracies in cadastral data or property descriptions. To ensure legal compliance, a correction decree can be implemented. The process begins with Phase 11A, which consists of the adoption and notification of the correction decree to the affected parties. This decree rectifies the identified errors without altering the substantive content of the original expropriation decision.
  Once adopted, the procedure continues with Phase 11B, during which the administration arranges for the transcription and registration of the corrected decree, assigning the necessary technical tasks to competent professionals. This step is essential to guarantee that the expropriation measures are properly recorded in the public registers and can be legally enforced without ambiguity or risk of dispute.

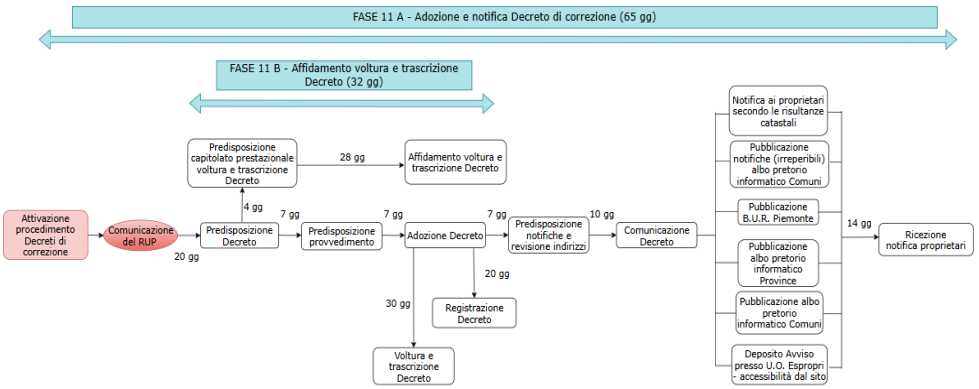


Figure 31: phase 11

- Phase 12: ‘Release of deposited compensation (‘svincolo indennità’)’ (*figure 32*).
  In cases where compensation is deposited (due to lack of agreement or missing documentation), the entitled party may submit a request for the release (‘svincolo’) of the sum. This procedure includes document verification, potential requests for integration, and the issuance of a release decree, which is then transmitted to the deposits and loans fund. Such step plays a critical role in ensuring that compensation is eventually paid to the rightful beneficiary, even when legal or administrative obstacles delay the process.

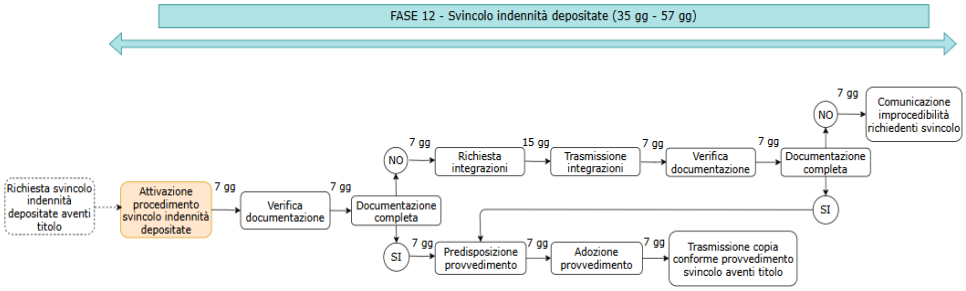
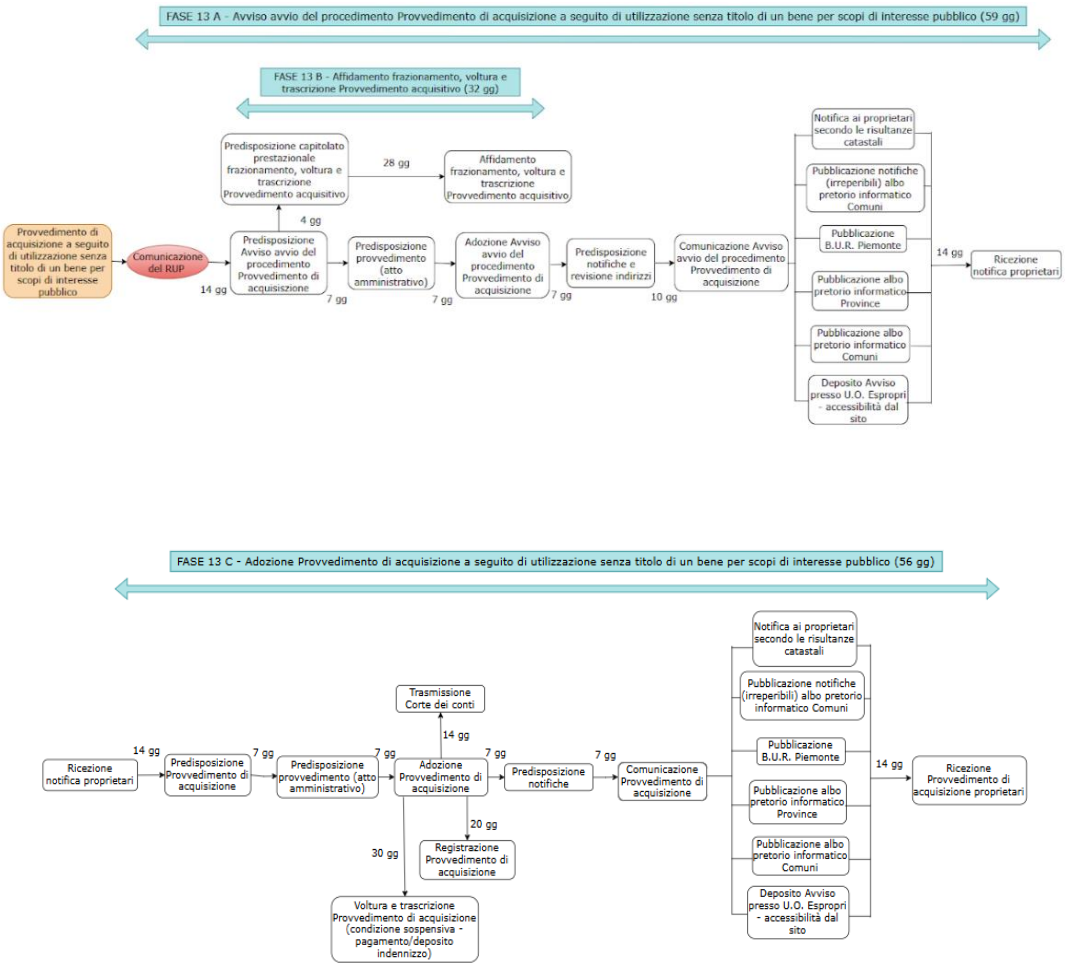


Figure 32: phase 12

- Phase 13: 'Acquisition Following Unlawful Occupation' (*figure 33*).
  This phase governs a remedial procedure applied when a public authority has occupied private land without a valid legal title, in violation of the standard expropriation process. In such cases, the administration may opt to regularize the situation ex post by issuing a formal acquisition provision under Article 42-bis of DPR 327/2001.
  This procedure begins with Phase 13A, which involves the initiation and publication of the notice that informs the affected owner of the intent to acquire the property due to its irreversible transformation for public purposes.
  This is followed by Phase 13B, in which professionals are appointed to carry out the necessary technical tasks, including parcelling, transcription, and cadastral updates, that will support the administrative act of acquisition. The process continues with Phase 13C, where the acquisition provision is formally adopted and notified, officially transferring ownership of the property to the public authority.
  The provision is subsequently registered and transcribed in the land registers. In Phase 13D, the compensation is determined and either liquidated or deposited, depending on whether the owner accepts the proposed amount.



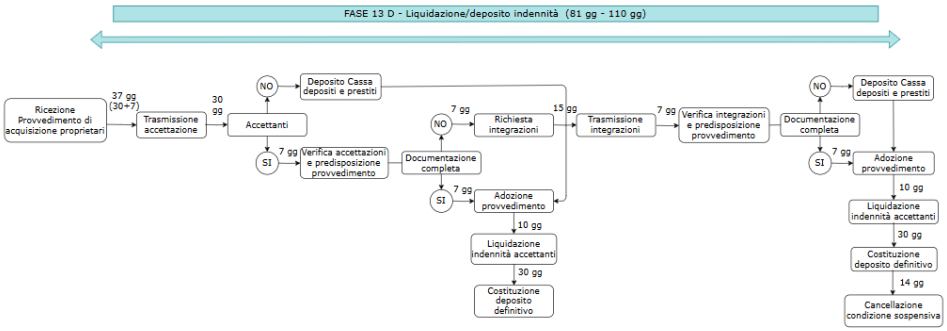


Figure 33: phase 13

The phases described above illustrate all the steps involved in the expropriation process managed by S.C.R. Piemonte, with the existing flowchart providing a detailed representation of each activity. However, upon analysing these procedures, several inconsistencies and inaccuracies within the flowchart emerged, warranting a critical review of its current design.

4.3. DETECTED ERRORS AND INCONSISTENCIES

The analysis of the original flowchart reveals several critical issues that undermine its clarity, correctness, and standardization. These issues limit the chart's usefulness, particularly in a public context where quality and transparency are essential.
As such, the diagram should be corrected, and a revised version must be created to ensure better compliance with standard symbology, improved readability, higher quality and easier understanding. However, before proceeding with the redesign, it is crucial to comprehend the nature and implications of the identified criticalities, as outlined in the following paragraphs.

One of the most evident weaknesses concerns the use of symbology. The flowchart makes incorrect utilization of symbols, failing to comply to standards such as the ISO 5807, as discussed in chapter 3. More specifically, in the entire diagram all activities are drawn using rounded rectangles, whereas the correct convention prescribes rectangles with straight angles to indicate process steps. Additionally, decision points are never represented using diamonds, which are essential for distinguish alternative paths.
For instance, when differentiating between the urgent or the ordinary procedures, the diagram simply uses a test label (i.e., 'prop.>50') without visually expressing the logic through standard decision symbol, preventing the viewer from recognizing alternative paths. Another issue that contributes to weaken the diagram concerns the lack of defined start and end points, which are usually indicated using ovals: their absence reduces significantly the clarity of the flow.

Furthermore, the flowchart lacks a proper legend, which would help the reader instantly understand the meaning of the symbols, shapes, and any other visual conventions used.

In complex administrative procedures such as expropriation, a legend is not a marginal element but a key component for ensuring clarity and standardisation. For example, the use of different colours could be systematically applied to distinguish between phases under the responsibility of different actors, to highlight urgent procedures versus standard ones, or to indicate legal deadlines.
Similarly, specific icons or visual markers could be explained in the legend to denote documents to be issued, notifications to be sent, or decisions to be taken. The absence of such a guide forces the reader to interpret the diagram without a shared reference system, increasing the risk of misunderstanding and inconsistent interpretations between different stakeholders.

Another failing in the flowchart is the lack of assignment of roles and responsibilities to specific phases. Across all phases, key actors (i.e., RUP, expropriation office, technical professionals and property owners) are not explicitly linked to the tasks they are responsible for, which significantly limits the understanding of the diagram.
A clear example of this issue can be seen in phase 08A, where the property owner has the right to appoint a technical consultant ('C.T.P.'), but the chart fails to indicate this important element.
Temporal aspects also present notable inadequacy. Although the diagram includes some temporal indications about the duration of each task, their use is sometimes inaccurate.
In certain stages, time constraints imposed by the DPR 327 are correctly mentioned, for instance the 30-day window for submitting observations following the publication of the declaration of public utility. However, deadlines are either omitted or incorrectly placed in certain parts of the chart, creating confusion about the procedural time.
In several instances, some total durations are incorrectly calculated, with the sum of sub-steps not matching the overall time indicated.
These discrepancies can undermine reliability, misleading the reader about the real length of time of activities, and potentially affect the compliance with legal deadlines.
Furthermore, time indications are not standardized throughout the diagram (i.e., sometimes expressed in days, other times not indicated at all), reducing precision and making it difficult to assess compliance with legal timeframes.

Beyond formal aspects, the flowchart exhibits structural inefficiencies that limit the effectiveness of the overall process, where redundancy is the most important.
Certain actions, such as the assignment of technical professionals or the definition of compensation, are characterized in multiple phases, even though they are typically performed once and reused across steps.
For instance, the activity related to compensation determination appears both in phase 06 A6, where the final amount is calculated and either paid or deposited, and again in phase 08C, where the technical triad ('terna tecnica') performs a new evaluation.
While these may reflect different roles or stages, the lack of distinction in the diagram creates confusion and gives the impression of duplicated efforts.

Additionally, the communication of the expropriation decree appears across several phases (i.e., 06 A7, 08C, and 09) without clarifying whether it is the same document or part of separate parallel procedures. This repeating inflates the visual complexity and may lead to misunderstandings about how many decrees are issued and when.

Lastly, the current configuration lacks opportunities for digitalization. There are no references to the use of information systems, shared databases, or digital workflows, elements that are necessary in modern public administration to ensure better efficiency and traceability.

In conclusion, the absence of these components makes the diagram less aligned with current best practices and limits its value as a tool for process monitoring and future optimisation.

4.4. IMPACT OF THE DETECTED ISSUES ON THE PROCESS

The criticalities identified in the original diagram have a direct and tangible impact on the efficiency, transparency and legal compliance of the expropriation process.
In the context of a public company, where a highly regulated framework is present and multiple stakeholders with different roles are involved, these issues generate not only operational inefficiencies but also cause significant reputational consequences and legal disputes.
Public authorities are expected to operate with precision, traceability, and clarity: any ambiguity in procedural representation can be perceived as a sign of disorganisation or even mismanagement.

One of the most significant effects arise from the incorrect use of symbology. The absence of clear decision logic and the adoption of unsuitable shapes fail to comply with ISO standards, thereby compromising the interpretation of the diagram.
For example, replacing standard decision diamonds with plain text labels, such as the ‘prop.>50’ notation for distinguishing between urgent and ordinary procedures, forces the reader to deduce the decision point rather than recognise it instantly from the standard symbol. This lack of visual signs may lead to misinterpretation when different departments or external professionals consult the diagram independently, especially if they are not familiar with its conventions.
Such ambiguity increases the likelihood of procedural errors, such as initiating the wrong procedure, delays due to the need for clarification, and misaligned responsibilities when actors disagree on the intended path. Over time, these errors can cascade into missed legal deadlines, disputes over procedural validity, and even formal appeals by affected property owners.

Equally impactful is the lack of explicit role attribution. Without a clear representation of which actor is responsible for an activity, it becomes complex to assign ownership, verify the status of the process, and resolve disputes regarding procedural responsibilities.
In the case of this thesis, where expropriation involves numerous stakeholders (RUP, expropriation office, technical professionals and property owners), the absence of explicit role mapping can lead to overlaps, delays, or procedural incongruencies if legal requirements are not demonstrably met.

Timing inaccuracies represent another critical weakness, given that the expropriation procedure is tightly bound to legal deadlines defined in the DPR 327/2001. In the current diagram, deadlines are sometimes omitted, expressed in inconsistent units (i.e., 'days' in some steps, none in others), or miscalculated in cumulative durations.
Such errors undermine the reliability of the process map as a planning tool. Internally, this makes it harder to allocate resources effectively, schedule inspections, or align notifications with the legal timeframe.
Externally, unclear or incorrect timelines risk eroding public trust and can provide property owners with legal grounds to challenge the process. Missing or misleading time indications may also cause bottlenecks, with phases starting later than required or running over their permitted duration.
Structural redundancies, such as repeated representation of compensation determination or decree notification, further increase needless complexity and can cause operational duplication in real life if interpreted literally.

For instance, compensation assessment appears both in Phase 06A6 and Phase 08C, potentially giving the impression of unnecessary duplication.
If taken literally, this could prompt multiple assessments in practice, generating avoidable work and administrative costs. Ambiguous transitions between phases exacerbate these risks.
Where the flowchart does not clearly indicate the condition for moving from one step to the next, such as the link between the outcome of Phase 06 and the activation of Phase 07, there is a threat of procedural gaps.
These gaps can lead to delayed actions, missed notifications, or uncoordinated activities across departments.
Finally, the absence of any reference to digital tools limits the chart's capacity to support modernisation initiatives. Without explicit integration points for information systems, shared databases, or e-signature platforms, the flowchart remains purely descriptive and cannot serve as a blueprint for automation or process monitoring.
This omission not only reduces operational efficiency but also prevents alignment with EU and national digitalisation objectives, keeping the process locked in a paper-based, manual paradigm.

In summary, the detected issues weaknesses reduce the technical accuracy of the flowchart, weaken its legal defensibility, and limit its capacity to serve as a functional and strategic tool for process management.

Correcting these shortcomings is therefore essential to produce a process map that is accurate, compliant, and capable of guiding both current operations and future optimisation initiatives.

4.5. SWOT ANALYSIS

A SWOT analysis is a technique used to assess the performance, competition, risk, and potential of a specific object of study. While it is often applied to businesses, it can also be adapted to evaluate a process or tool, such as a product line or division, an industry, or other entity. This methodology identifies elements that work well, areas for improvement, and external factors that may influence its effectiveness. By combining internal and external perspectives, it enables decision-makers to form a balanced understanding of the subject under examination and to design targeted improvement strategies.

Information in a SWOT analysis is organized into internal and external factors:

i. Strengths and Weaknesses represent the internal characteristics of the object under analysis. The former refers to elements that currently work well and can be preserved or leveraged, while the latter indicates areas in need of correction or improvement. These focus on the current situation.

ii. Opportunities and Threats refer to the external environment in which the company operates. They relate to industry trends, legislative changes, technological developments, and socio-economic conditions that could either support or hinder the organisation. These focus on future conditions.

4.5.1. EXISTING FLOWCHART EXAMINATION

In this thesis, the SWOT framework is applied to the existing expropriation flowchart used by S.C.R. Piemonte. The objective is to provide a structured assessment of its technical, structural, and contextual characteristics.
The analysis seeks to preserve and capitalise on the strengths that already support process understanding and compliance, identify and address weaknesses that reduce clarity, usability, and adherence to standards, leverage opportunities offered by the external environment, such as advances in digital public administration, regulatory updates, and funding programmes for process improvement, and anticipate and mitigate threats that could undermine the implementation, acceptance, or long-term relevance of the improved flowchart.

The internal factors (Strengths and Weaknesses) examine the technical and structural characteristics of the diagram, while the external ones (Opportunities and Threats) reflect the legal, technological and organizational environment in which S.C.R. operates.

This evaluation draws on the content of the existing diagram, the applicable regulatory framework (particularly D.P.R. 327/2001), ISO standards for process mapping, and recognised best practices in public administration. It focuses on the flowchart as a representational tool, not on the operational performance of the expropriation process itself.

- Strengths: despite its inefficiencies, the current configuration contains several positive aspects that provide a solid basis for improvement. It offers a complete portrait of the main steps within the complex process, covering the workflow from initiation to conclusion, thereby ensuring that no major procedural stage is omitted. Moreover, it is linear and sequential, allowing users who already have some familiarity with the subject to follow the timeline without too much difficulty.
  The inclusion of references linked to DPR 327 (i.e., legal timeframes or procedural steps) shows at least a partial alignment with the regulatory requirement.
  In conclusion, having a visual diagram of the entire process makes the information more accessible for staff who may be less accustomed to detailed legislative documents.

- Weaknesses: drawbacks are recurrent in the diagram, significantly limiting its operational usefulness. The most evident one is the incorrect use of symbols, which fails to comply with ISO standards and compromises both quality and clarity of the chart. The absence of explicit role attribution means that responsibilities are not clearly defined, causing doubts and possible duplication of work.
  Furthermore, there are some inconsistencies regarding time indications, that are sometimes incomplete, inaccurate or miscalculated, reducing the reliability of the flow. The presence of redundancies also increases the complexity of the diagram providing excessive information and symbols.
  A further limitation regards the lack of a legend, which might help the reader to interpret symbols, colours, and visual conventions adopted more easily.

- Opportunities: the flowchart offers multiple opportunities to enhance the expropriation flowchart and the underlying process.
  The increasing emphasis on digital transformation in public administration, promoted through both national initiatives and EU programmes such as the Digital Europe Programme, provides a favourable framework for adopting advanced process mapping and automation tools.
  The integration of information systems, shared databases, and e-signature platforms could significantly improve efficiency, traceability, and legal compliance, while reducing administrative burden.
  Furthermore, the growing demand for transparency and accountability in public processes creates a positive context for introducing clearer, standard-compliant visual representations that facilitate understanding by both internal staff and external stakeholders. The availability of funding and training for process improvement initiatives in public entities can also support the implementation of a revised, optimised flowchart.

Finally, the evolving regulatory environment, including updates to expropriation-related legislation, may provide the opportunity to align the process map with the most recent requirements, ensuring long-term relevance and adaptability.

- Threats: despite the potential for improvements, several external factors could threaten the effectiveness and adoption of a revised expropriation flowchart. Frequent changes in legislation, such as amendments to the D.P.R. 327/2001 or related regional provisions, could render the updated diagram obsolete in a short time, requiring continuous revisions and consuming additional resources. Resistance to change among internal staff or external stakeholders, particularly when introducing new symbology or digital tools, could slow down or hinder implementation. Budgetary constraints within the public administration may also limit the scope of technological integration or training programmes, preventing full exploitation of optimisation opportunities.
  Additionally, discrepancies in interpretation between different departments, municipalities, or technical professionals may persist even after the redesign if the flowchart is not accompanied by adequate guidelines and training.
  Finally, external socio-economic factors, such as political instability, legal disputes initiated by property owners or public opposition to expropriation projects, could affect the overall process execution, undermining the benefits of the improved mapping.

The SWOT analysis highlights that, while the current flowchart provides a comprehensive visual representation of the expropriation process, its operational value is hindered by several weaknesses that require targeted corrections.
At the same time, the external environment offers significant opportunities for improvement, driven by technological advancements and regulatory developments, although certain threats may limit the effectiveness or sustainability of future changes.
By balancing these four dimensions, the organisation can prioritise interventions that not only address existing gaps but also position the process mapping to remain relevant, efficient, and legally compliant over the long term.

The following figure (*figure 34*) summarises the main findings of the SWOT analysis, providing a visual overview of the internal and external factors identified during the evaluation.

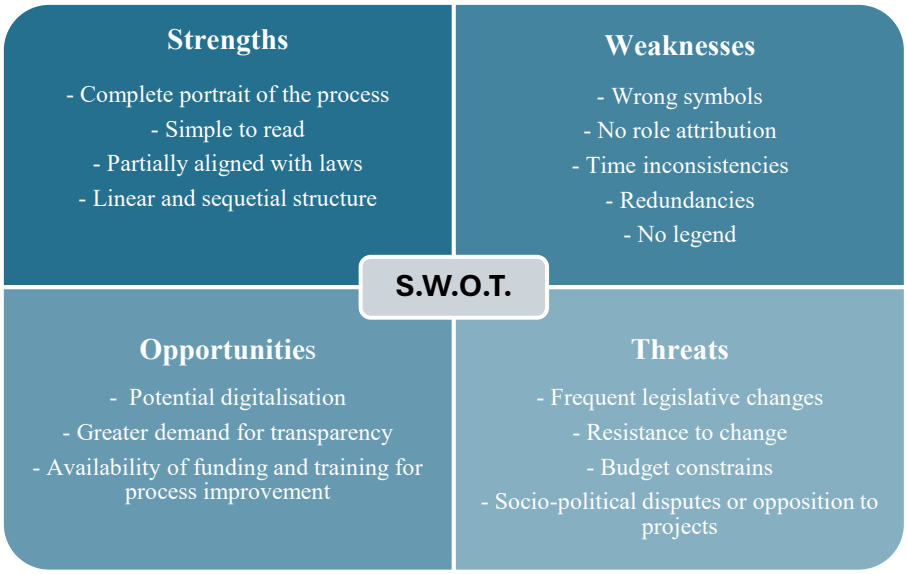


Figure 34: SWOT analysis of the existing flowchart

4.6. FINAL CONSIDERATIONS

The analysis carried out in this chapter has provided a detailed examination of the original expropriation flowchart, highlighting its weaknesses in structure, form, and operations, as well as its potential for continuous improvement.
By identifying errors and inefficiencies, and applying tools like the SWOT technique, it has been possible to recognise key proprieties for action. Such main concerns form the basis for the redesign process, which focuses on the correcting inaccuracies, ensuring legal compliance, and optimizing transparency and quality throughout the workflow.

Building on these findings, chapter 5 will present the proposed optimised flowchart, illustrating the choices made, the corrective measures implemented, and the innovations introduced to meet the requirements of all the stakeholders involved.
Then, it will explore elements that could be leveraged in the future, including digitalization, process monitoring, and other enhancements aimed at improving efficiency, traceability, and decision-making within the expropriation process.

5. OPTIMIZED FLOWCHART AND FINAL CONCLUSIONS

In this closing part of the thesis, the optimized expropriation flowchart is illustrated and discussed in detail. The examination begins with a phase-by-phase comparison between the original and the improved diagram, showing the differences and improvements introduced.
The chapter then considers the main limitations encountered during the redesign, including variability in practices across different units, incomplete historical data, and regulatory constraints that restricted the simplification of certain steps.
Following this, a synthesis of the key improvements obtained across the chart is provided, highlighting concrete benefits such as standardized symbols, clearer role assignments, more precise sequencing, and the introduction of a comprehensive legend.
Moreover, the chapter continues outlining potential future developments, such as digitalization and KPI-based monitoring, which SCR Piemonte can adopt to achieve more standardization and transparency across all the stakeholders involved in the procedure.
The final section of the study reflects on the results achieved and their implications for the optimization of the expropriation process.

5.1. ACTIVITIES PERFORMED AND MAIN RESULTS

A detailed account of the activities carried out during the optimization of the expropriation process diagram is presented in this section, highlighting the corrective actions taken in response to the weaknesses identified in chapter 4 and the main results achieved. The analysis is structured phase by phase, providing a clear comparison between the original and the revised flowchart.
For each stage, the discussion underlines the specific adjustments implemented, the rationale behind them, and the benefits they brought to the overall process.
In addition to the graphical redesign, particular attention has been devoted to clarifying roles and responsibilities: RACI matrices have been developed for critical phases, such as Phase 06 and Phase 13, to illustrate ‘who does what’ in the most sensitive activities.
By examining these differences in detail, it becomes possible to understand how the redesign improved clarity, efficiency and compliance, and to appreciate the concrete enrichments introduced in each part of the workflow.

- Phase 00:
  In the original diagram, role distinction was not visible and ISO-compliant symbols were used wrongly, with the omission of the start/end symbols as well as the diamond to clarify the type of project that should be prepared.
  Moreover, the regulatory framework changed over the years and the final project (progetto definitivo) is no longer included within the expropriation procedure, making part of the original depiction outdated.

In the optimised version (*figure 35*), the correct symbols were introduced, the project typology is verified through a decision point, and the process start is clearly marked, ensuring both compliance with ISO standards and alignment with current legislation. Both start and end points are now represented with green circles when they indicate generic activities, making them immediately distinguishable from the rest of the workflow. Otherwise, circles appear in purple of red when they represent tasks done by external entities or when they denote critical activities.
This convention is consistently applied throughout the entire diagram, ensuring that readers can quickly identify the process boundaries in every phase.
Moreover, to distinguish between responsibilities, the colour purple has been used to show the steps performed by the RUP.

- Phase 01:
  Key inefficiencies here were the lack of a clear distinction between the two paths and roles, making it difficult to interpret correctly. In the improved diagram (*figure 35*), the activity is refined through a decision diamond distinguishing between compliant and non-compliant projects. Responsibilities are attributed, and any corrective actions are explicitly included, improving accountability and preventing the progression of incomplete or non-compliant documentation.
  Both start and end points are now represented using circles with the appropriate colour, as specified in the previous phase.

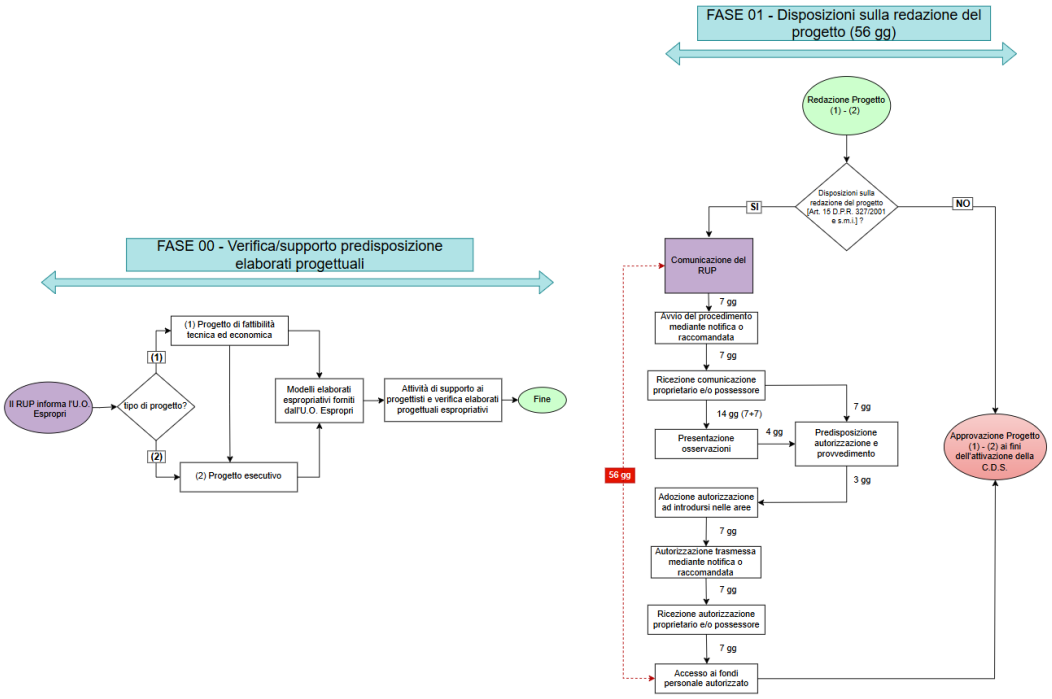


Figure 35: revised phases 00 and 01

- Phase 02 and Phase 4:
  Also for these segments, the main problems identified in the previous diagram were the non-compliance with the symbology, the lack of decision points, and time inaccuracies.
  To overcome such weaknesses, in the new version a decision diamond has been introduced to separate the paths based on the number of property owners involved: if the number exceeds 30 (from the previous 50 after changes in the law for these phases), the process follows the upper branch, otherwise it follows the lower one.
  To streamline the workflow, the documentation and notifications to be sent are consolidated into a single activity, accompanied by a note listing all required items.
  Additionally, yellow callouts have been inserted to provide clarifying remarks, offering the reader supplementary information about the specific steps and making easier to understand the procedure.
  Roles are now explicitly attributed to the responsible actors: purple is designated to the RUP and white indicates the responsibility of the expropriation office. Furthermore, all deadlines are expressed in a standardised format (days) and positioned consistently, ensuring both clarity and compliance with legal time limits.

  In conclusion, red blocks can be seen (*figure 36*) throughout the flow to highlight important deliverables that must not be overlooked. This last improvement was specifically requested by SCR Piemonte staff to ensure a clear visualisation of the most critical elements to be remembered.

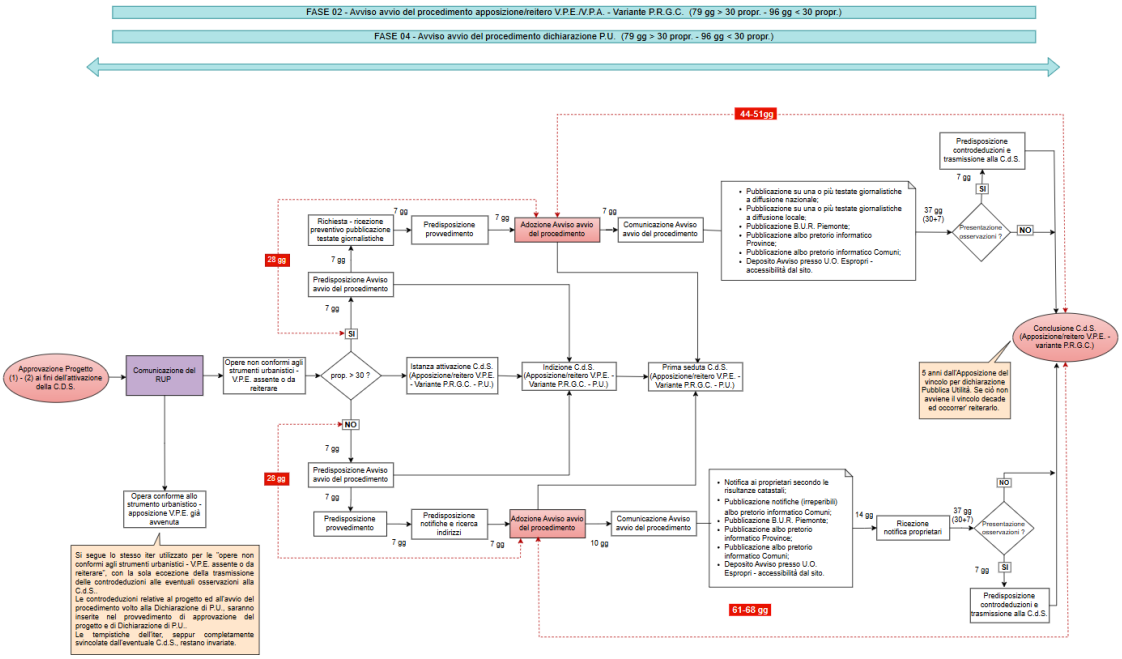


Figure 36: revised phases 02 and 04

- Phase 03 and Phase 05:
  These two stages share the same diagram layout, making it possible to apply improvements simultaneously. The optimization work focused on enhancing readability and ensuring that the sequence of actions is immediately clear to anyone following the process.
  In the earlier version, the absence of proper decision symbols and the incorrect use of activity shapes reduced the clarity of the workflow, forcing readers to interpret the process from the text alone.
  However, in the new configuration the greatest improvement is the introduction of decision diamonds that separates the workflow depending on the number of property owners, following the same logic applied in the previous phases.
  The documentation and notification tasks have been consolidated into a single block, alongside a note detailing all items to be sent. Additional callouts provide contextual notes to explain specific procedural steps, helping both technical staff and external stakeholders in understanding the logic behind certain actions.
  Key activities, such as the adoption of the notice of conclusion of the procedure ('adozione avviso conclusione del procedimento') are highlighted in red as asked by SCR Piemonte. These enhancements not only improve readability but also strengthen transparency, reduce the risk of procedural errors, and support compliance with regulatory requirements.
  Overall, the redesigned phases (*figure 37*) allow users to follow the process more intuitively while maintaining full control over all critical activities.

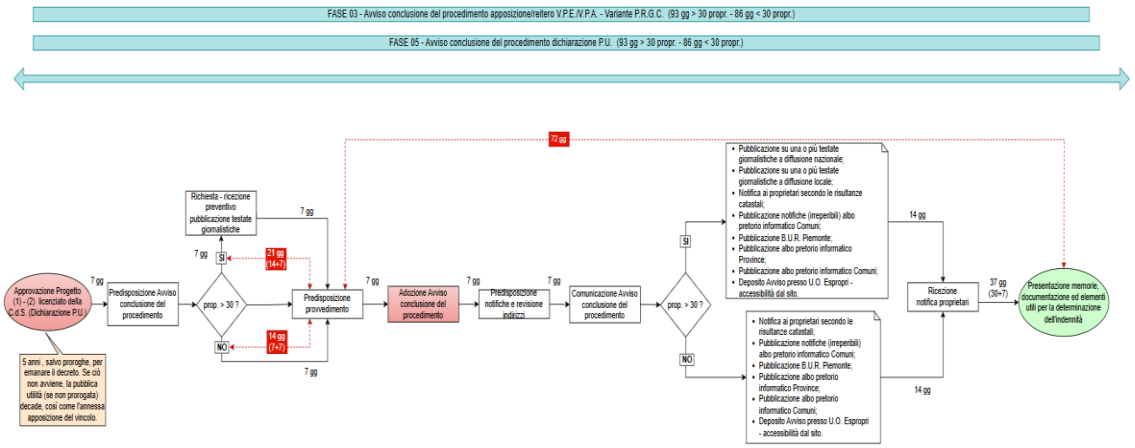


Figure 37: revised phases 03 and 05

- Phase 06:
  This phase is the most articulated and delicate section of the entire process, being divided into numerous sub-steps that govern critical activities such as compensation determination, decree issuance, and related notifications.
  In the original diagram, the intrinsic complexity was further worsened by formal inconsistencies, most notably the misuse of symbols, the absence of decision diamonds, and the repetition of some activities.

These weaknesses made it extremely difficult to follow the logical sequence of operations, often forcing the reader to rely on prior knowledge rather than the diagram itself. In the optimised version (*figure 38 and figure 39*), particular attention was given to structuring the workflow in a more linear and coherent way.

Decision diamonds have been systematically introduced to represent all critical junctures, especially in moments where procedural options depend on specific conditions (i.e., the presence of multiple owners or the acceptance/refusal of compensation). In addition, the OR operator has been added to indicate points where alternative paths may be followed, making it immediately clear that only one of several possible actions should be executed. Such improvements make the logic of the process explicit and avoids forcing the reader to rely only on textual labels, in particular they are significant in phase 06 because the separation of paths occurs repeatedly throughout the execution of the expropriation process, and clear visual logic is indispensable to avoid misunderstandings.

Moreover, corrections like the previous stages have been implemented, for example the introduction of yellow callouts and notes to help the reader to follow the process more consistently. The use of colour coding has also been refined to ensure that role attribution is immediately recognisable. Red blocks were also introduced to emphasise major deliverables, such as decrees or official notifications, which are particularly important to monitor carefully as they represent milestones with legal and procedural significance.

Finally, time constraints are now standardised, expressed in days and positioned consistently across all sub-phases. This provides a clear overview of the deadlines that must be respected, reinforcing legal compliance and improving the readability of the timeline. Thanks to these adjustments, phase 06 is transformed from one of the most problematic and ambiguous parts of the original chart into a structured and transparent representation of the expropriation activities.

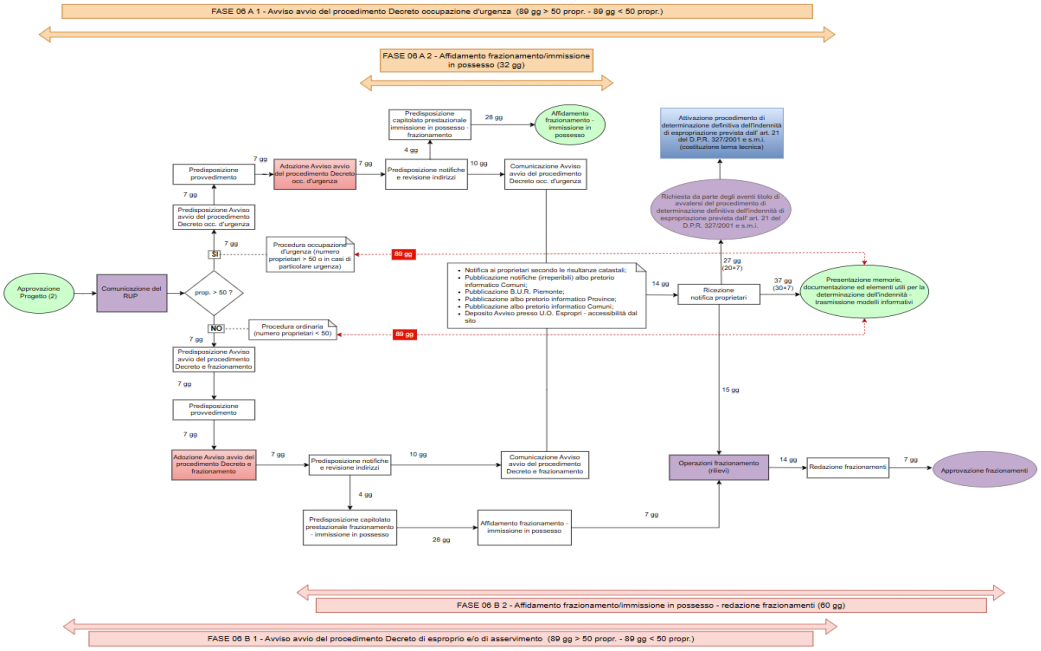


Figure 38: revised phases 06 A1, A2, B1, B2

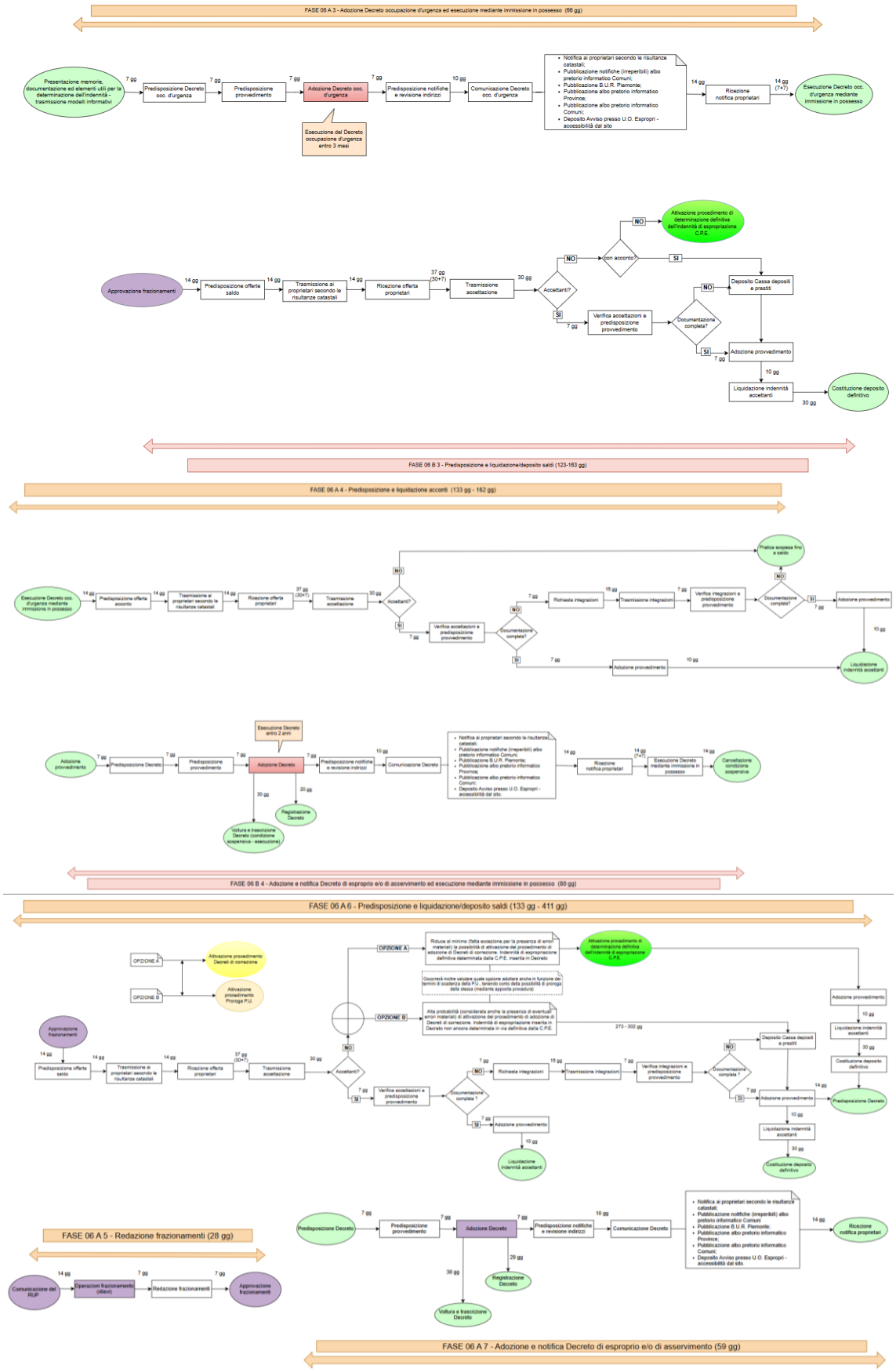
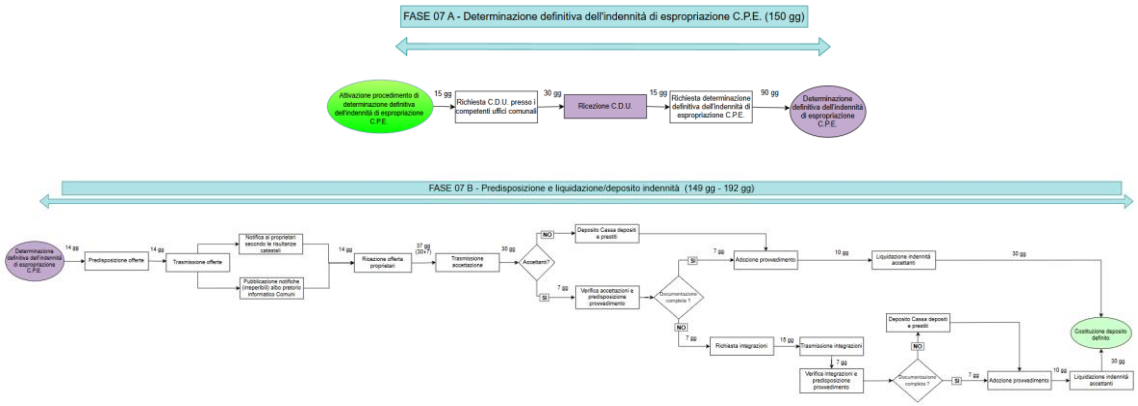


Figure 39: revised phases 06 A3, A4, A5, A6, A7, B3, B4, B5

- Phase 07:
  This step is particularly sensitive as it concerns the definition, communication and deposit of the indemnity due to property owners. It represents the financial counterpart of the procedure, so its proper illustration is essential both for compliance with the DPR 327/2001 and for ensuring transparency towards stakeholders.
  In the previous chart, the connection between phase 06 and phase 07 was ambiguous: the condition that triggers the start of indemnity activities (whether the property owner has accepted or refused the compensation) was not clearly depicted.
  Furthermore, all activities were represented with rounded rectangles, decision points were omitted, and roles were not explicitly attributed, which made the process difficult to interpret.

  In the revised version (*figure 40*), the workflow has been redesigned to explicitly separate the possible outcomes. A decision diamond now clarifies whether the owner accepts the compensation: if so, the route leads directly to payment, while in the case of refusal, the flow continues towards the deposit with the deposits and loans fund.
  Moreover, a bright green colour is used to visually link this step with the corresponding activity in phase 06 A6, highlighting their connection and improving traceability within the process.
  This correction highlights the two alternative procedural paths and ensures that the logical sequence is immediately visible without relying only on textual notes. Standardised symbology has also been applied: process steps are displayed in rectangular shapes, start and end points, and responsibilities remain visually distinct through colour coding, while timing indicators are expressed uniformly and are correctly placed.
  As a result, phase 07, though inherently complex, now combines transparency of outcomes with procedural accuracy, ensuring that financial steps are clearly understood, legally compliant, and easier to monitor.



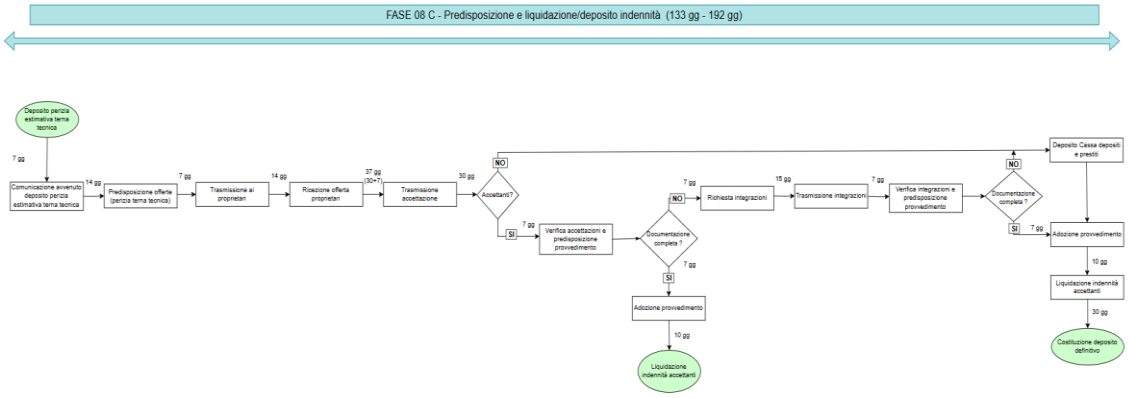


Figure 40: revised phases 07 A, B, C

- Phase 08:
  The management of disputes and the possible revision of the indemnity is represented during this step. It is very articulated, since it involves both administrative actions and the technical evaluation carried out by the technical triad.
  In the original diagram this phase appeared fragmented, with repetitions of activities already introduced in Phase 06 (such as the indemnity determination) and without a clear distinction between the contributions of different actors. The lack of explicit role attribution and the use of non-standard symbols further reduced the clarity of an already complex stage.
  The optimization involved the reorganization of the flow into a linear and coherent sequence of steps. The responsibilities are differentiated through the established colour code, ensuring that the reader can immediately understand who is in charge of each activity. A further innovation is the connection of the blue activity in this phase with the corresponding step in Phase 06 A1, which explicitly links the logic of the process across different stages. This graphical cross-reference strengthens the internal coherence of the diagram, showing that decisions taken in earlier steps directly affect later phases, and ensuring that no action is perceived in isolation.
  Phase 08 now is transformed into a structured and transparent representation (*figure 41*) of how disputes are addressed and resolved within the expropriation process.

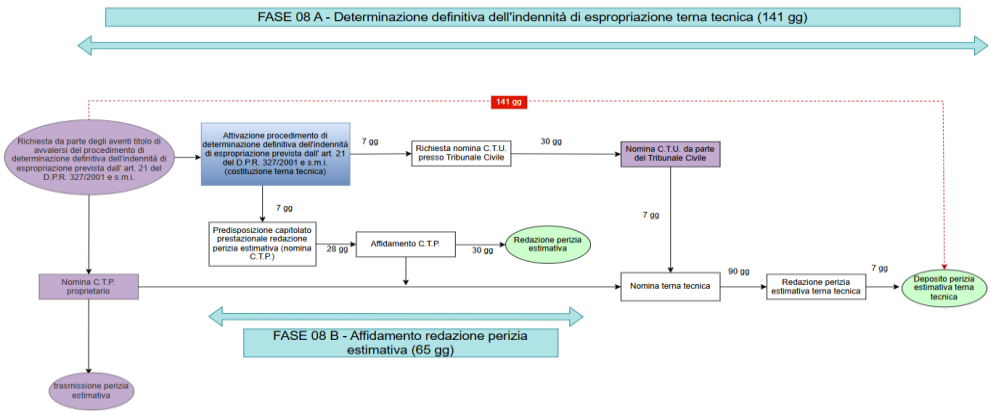


Figure 41: revised phase 08

- Phase 09:
  This phase regulates the temporary occupation of properties, a special measure allowed by law to enable the immediate start of public works while the expropriation procedure is still in progress. It is an important step because it permits the use of the land before the definitive transfer of ownership, following the conditions and time limits established by the DPR 327.

  In the original flowchart, the representation of this step was unclear and particularly weak: the absence of decision diamonds, the improper use of rounded shapes for all activities, and the lack of colour differentiation for roles resulted in a diagram that was difficult to interpret and potentially misleading. This was especially critical because temporary occupation often creates tension with property owners and requires transparent communication to avoid disputes.

  The revised version addresses these shortcomings through a clearer structure and stronger visual logic. The phase now begins with the adoption of the decree of temporary occupation and concludes with the act of physical occupation of the property, both framed within start and end circles for immediate recognition.
  Activities are drawn with standard rectangular blocks, while responsibilities are attributed explicitly: the expropriation office is shown as the main executor using white, and the RUP as the supervising authority using purple.
  The activities in bright green and light indigo are used to connect such steps with other ones in the diagram, so these networks can be identified quickly.
  Temporal aspects have also been made more precise. The deadline for temporary occupation, which is legally limited in duration, is now clearly expressed in days and positioned consistently near the relevant activities. This avoids the inaccuracies of the earlier chart and makes compliance with legal limits immediately visible.
  Finally, the red blocks highlight the decree itself and its notification as major deliverables, underlining their central role.

  Thanks to these improvements, phase 09 (*figure 42*) provides a clear, coherent, and legally reliable representation of temporary occupation, making it easier for both internal staff and property owners to understand the scope and timing of this exceptional measure.

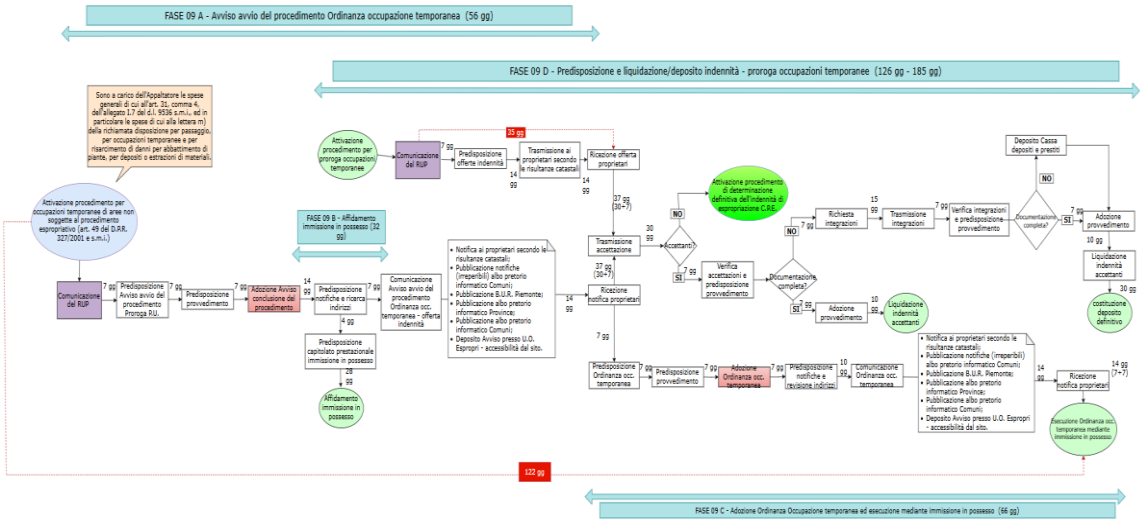


Figure 42: revised phase 09

- Phase 10 (*figure 43*):
  The extension of the declaration of public utility represents a turning point in the expropriation procedure. Unlike other stages, which follow a more linear progression, this step functions as a legal checkpoint: it verifies whether the procedure may legitimately continue or whether it risks losing validity because the original timeframe has expired. According to DPR 327/2001, strict temporal limits govern the P.U., and failure to secure an extension when needed leads to the automatic nullity of subsequent acts, making this step one of the most critical in the entire process.
  The lack of dedicated symbols and the absence of a clear start and end point in the original layout further reduced the readability of this phase, distorting the line between an ordinary continuation of the process and an exceptional extension granted under specific conditions.
  The prorogue is now explicitly represented as an autonomous step, marked by a distinct decision point that separates the possible outcomes.
  If the extension is granted, the process continues seamlessly within the new time window; if it is denied, the diagram clearly shows the interruption of the procedure.
  This dual outcome is reinforced through standardised start and end markers, highlighted in green, which provide visual clarity and ensure coherence with the rest of the flow.
  An additional feature is the use of colours to create visual links across distant phases. The starting point of phase 10 is coloured dark yellow, corresponding to the same colour used in phase 06 A6.
  This choice enables the reader to immediately perceive the connection between the two stages, even though they are positioned far apart in the overall flow.
  Furthermore, such procedure now is governed by several decision points, which separate the flow into branches depending on conditions such as the number of property owners or if observations are presented.

Finally, deadlines are now standardised, uniformly expressed in days and placed consistently across the layout. This ensures that the temporal framework of the extension is not only legible but also easily applicable in practice, reinforcing both clarity and legal compliance.

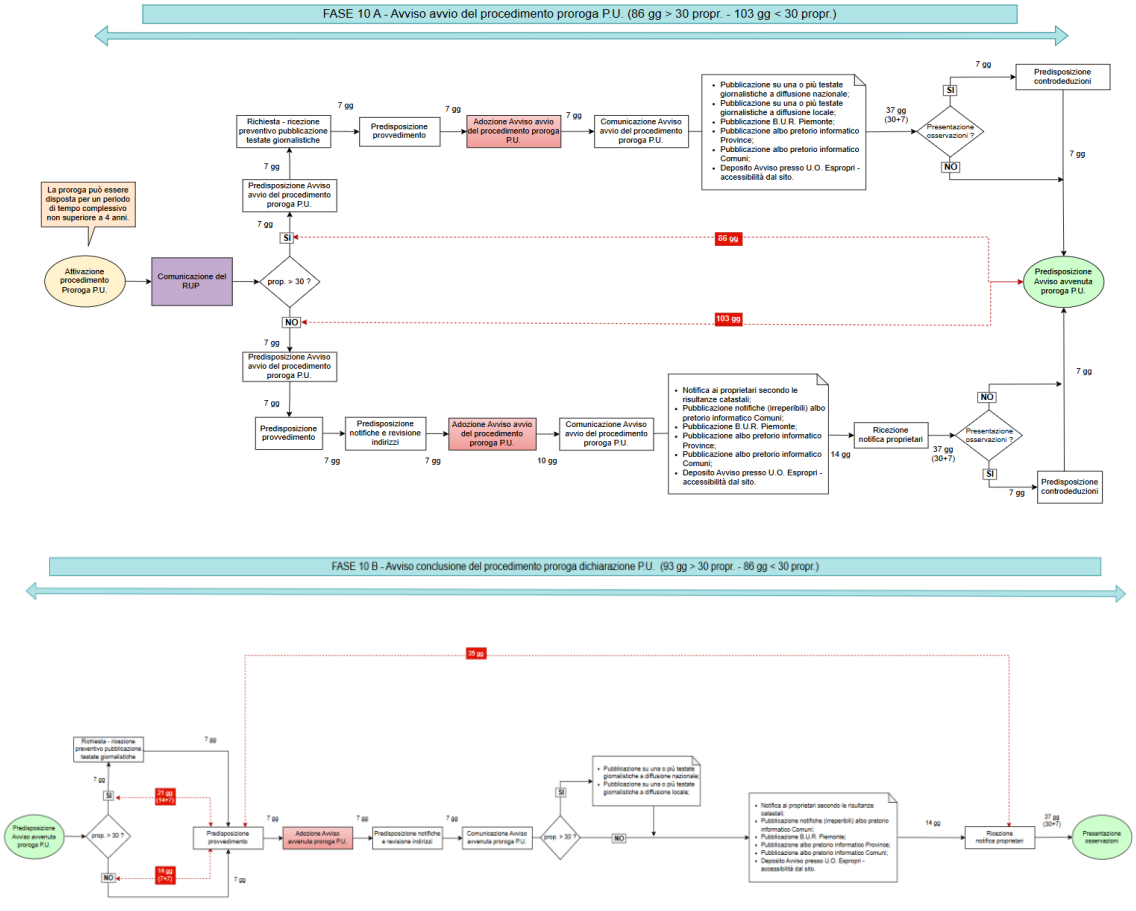


Figure 43: revised phase 10

- Phase 11:
  The adoption and notification of the correction decree marks a decisive procedural milestone in the process, since it is through this act that the administration formally regularises or amends the declaration of public utility when errors or omissions are identified.
  Unlike the other phases, which involve alternative paths or conditional choices, this one follows a more compact structure: the emphasis is on the correct issuance of the decree and on its timely communication to the interested parties.

  In the optimised chart (*figure 44*), particular care was given to enhancing visual clarity and traceability. The phase opens with a start marker highlighted in bright yellow, a colour that connects it with the earlier phase 06 A6 and helps readers immediately identify where the corrective procedure begins.

The flow then progresses through standardised rectangular blocks that represent the drafting and formal adoption of the decree, followed by the notification to property owners. To emphasise the importance of this step, the decree itself and its notification are represented using red deliverable blocks, in line with the convention introduced across the revised diagram. This allows users to instantly recognise the outputs that require careful monitoring and legal validation.
The end of the phase is marked by a green terminator, which provides closure and clearly separates this corrective path from subsequent activities.
Responsibility attribution remains explicit through the colour scheme: the expropriation office (white) is designated as the main actor for operational tasks, while the RUP (purple) retains a supervisory role, ensuring compliance and alignment with procedural standards.
No decision diamonds are needed here, as the sequence is linear and unambiguous, which makes the workflow particularly straightforward to follow.

Overall, phase 11 benefits from a clearer start and end structure, stronger colour differentiation, and a sharper emphasis on deliverables, transforming what was previously a vague and compressed passage into a precise and immediately understandable stage.

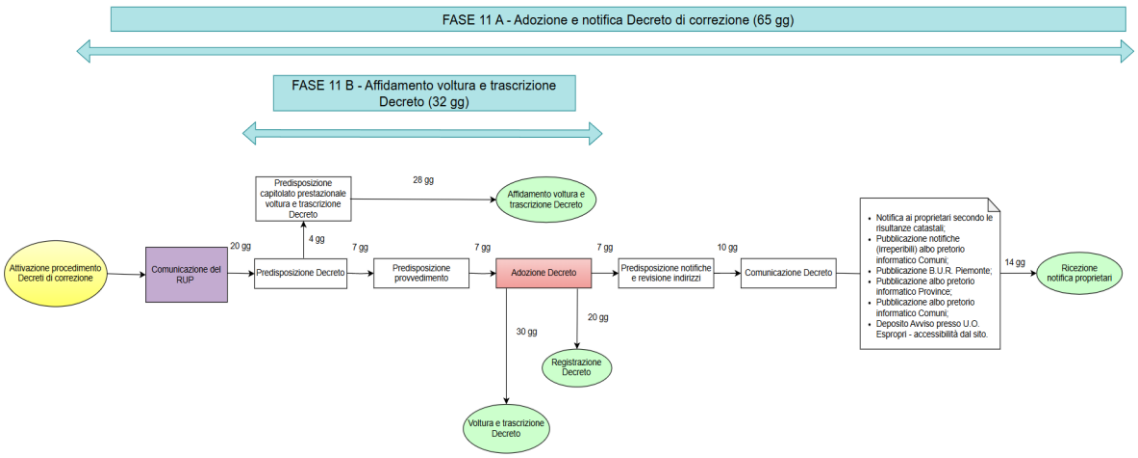


Figure 44: revised phase 11

- Phase 12:
  Such part of the procedure concerns the final release of indemnities that were previously deposited, completing the financial obligations of the expropriation procedure.
  In the original flowchart, this stage lacked clear indications about the verification steps required before releasing the funds and did not specify the roles responsible for authorization, which risked delays and procedural ambiguities.

The optimized flowchart (*figure 45*) addresses these shortcomings by introducing decision diamonds to distinguish between standard releases and cases requiring additional checks, ensuring that exceptions are handled analytically.
Key deliverables within this phase are highlighted in red, drawing attention to critical documentation and actions that must be completed to proceed.
This configuration improves the clarity and logical sequencing of the workflow, allowing users to understand briefly which steps require verification and which deliverables are essential.
As a result, phase 12 now provides a transparent and efficient conclusion to the financial aspects of the expropriation process, supporting procedural accuracy and compliance with regulatory requirements.

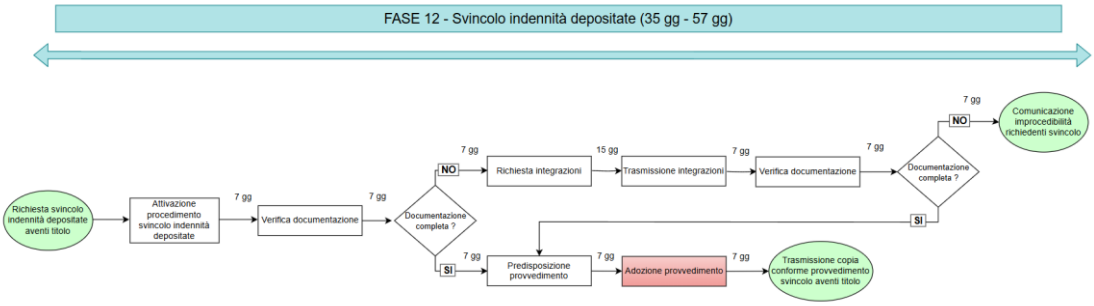


Figure 45: revised phase 12

- Phase 13:
  Stage 13 represents the final chapter of the expropriation process, encompassing all activities necessary to formally close the procedure, including the issuance of notices, adoption of acquisition acts, assignment and registration of properties, and the liquidation or deposit of any indemnities due.
  In the original chart, the absence of clearly defined roles and the lack of explicit boundaries for each activity created ambiguity, making it difficult to interpret the workflow and to understand who was responsible for specific tasks or how different actions were connected within the phase.
  In the optimized version, decision diamonds have been introduced to guide the process through different outcomes and exceptions, ensuring that each step is completed correctly before proceeding. Key deliverables are highlighted in red, drawing attention to the documents and actions essential for closing the procedure. Moreover, responsibilities are visually distinguished using colour coding, as implemented in previous phases, allowing readers to easily identify which tasks fall under each role.
  These improvements not only enhance the overall clarity of the process but also strengthen compliance with applicable legal and regulatory frameworks.
  By clearly defining each step, delineating responsibilities, and emphasizing critical deliverables, the redesign facilitates both internal monitoring and external understanding of the procedure.

Consequently, the optimized phase (*figure 46*) represents a transparent, coherent, and methodically structured conclusion to the expropriation process, providing stakeholders with a reliable reference for both execution and verification.

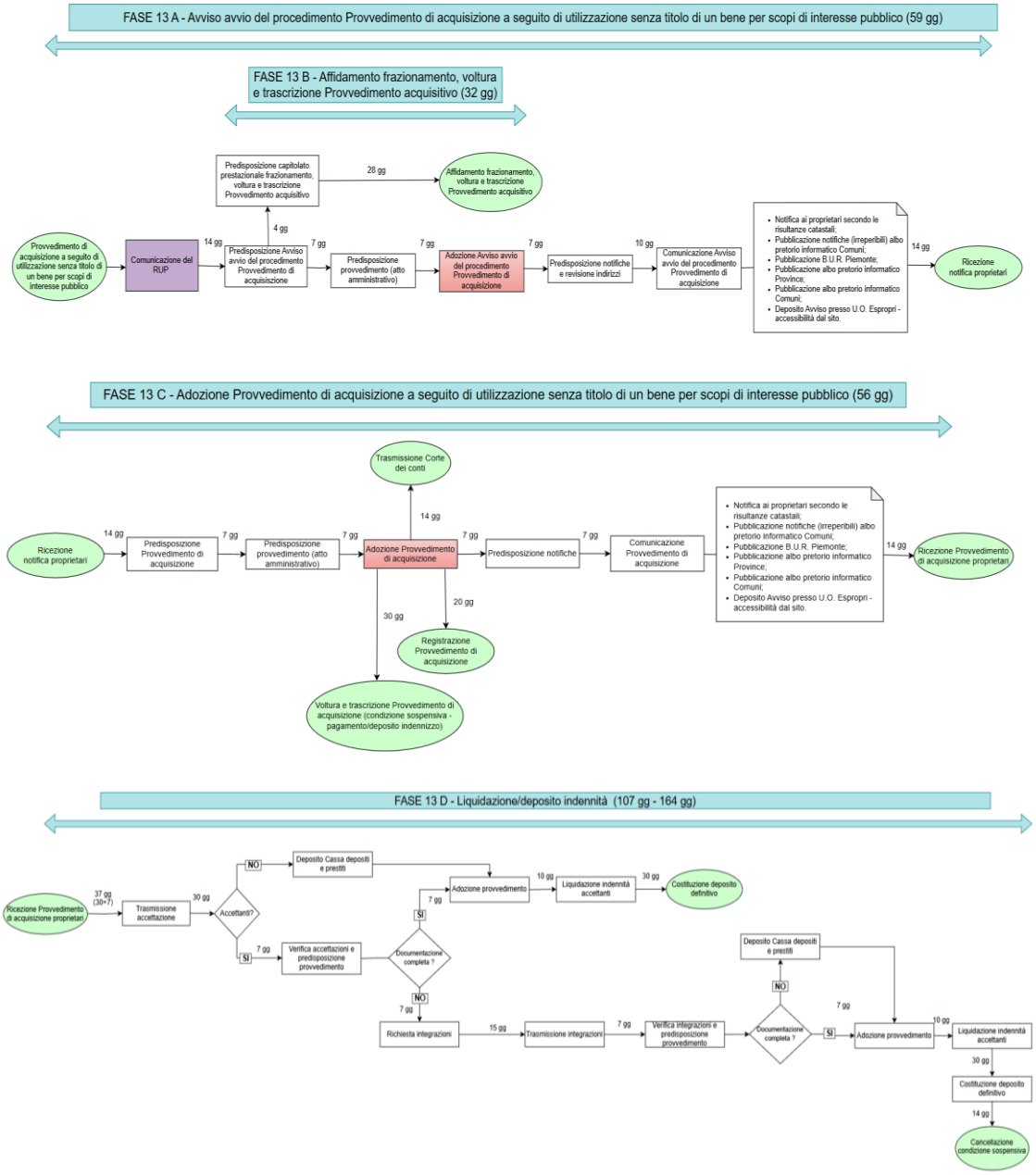


Figure 46: revised phases 13 A, B, C, D.

In addition to the structural and graphical improvements introduced in each phase, the redesigned flowchart has been enriched with a comprehensive legend (*figure 47*) to further improve the quality and understanding of the diagram.
The inclusion of a legend is not a secondary detail, but rather a fundamental element that ensures the accessibility of the tool to a broad spectrum of users.

While employees directly involved in the expropriation procedure may already be familiar with the sequence of activities, technical terms, and formal requirements, a wider audience (i.e., external stakeholders, administrative authorities, or even citizens affected by the procedure) often lacks such background knowledge.
For these users, the presence of a clear legend significantly reduces the risk of misinterpretation and mistakes, since it provides an immediate explanation of the symbols, shapes, and colours employed in the chart.

By defining the meaning of decision diamonds, process steps, or start/end points, as well as the colours depicted in the flow, the legend enables readers to orient themselves within the flow, distinguishing responsibilities and understanding the critical points of the procedure. This approach not only enhances the communicative function of the flowchart but also strengthens its role as a transparency tool, in line with the legal and administrative principles that govern expropriations.
In practice, the legend alters the chart from a technical representation intended for specialists into a user-friendly guide, capable of bridging the gap between expert knowledge and the need for clarity and accountability toward a broader audience.

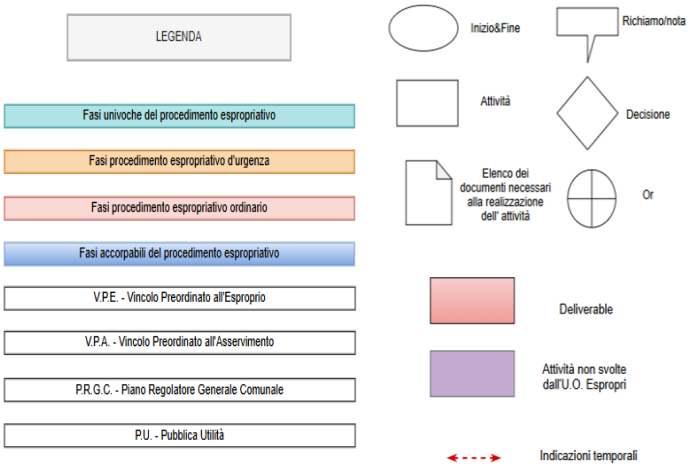


Figure 47: legend

Taken together, the detailed analysis and optimization of all phases of the expropriation process demonstrate how the redesign has transformed the original workflow into a coherent, transparent, and legally compliant system.
In particular, the introduction of a comprehensive legend further enhances the clarity and accessibility of the diagram, ensuring that both experts and non-specialist stakeholders can easily interpret its structure, symbols, and logical progression.

5.1.1. RACI ANALYSIS OF CRITICAL PHASES

To complement the phase-by-phase redesign of the expropriation process, a RACI analysis was carried out to clarify the allocation of roles and responsibilities.

While the flowchart highlights the sequence of activities, the RACI matrices provide a complementary perspective, showing which actors are responsible, accountable, consulted, or informed in the most sensitive stages.
The RACI framework distinguishes between:

- R (Responsible): the actor who performs the activity;
- A (Accountable): the actor ultimately answerable for the completion and correctness of the task;
- C (Consulted): the actor providing input or expertise;
- I (Informed): the actor who is kept updated on progress or outcomes.

Given the complexity of the procedure, two phases were selected as representative examples: phase 06, which constitutes the core of the expropriation process, and phase 13, which covers the acquisition measure following unlawful occupation of land for public purposes. The following tables (*table 4* and *table 5*) summarise the distribution of responsibilities among the main actors (the RUP, the Expropriation Office and the Property Owners) for these two critical phases.

Sub-phase	RUP	Expropriation Office	Property Owners
06 A1 / 06 B1: Notice of initiation of the procedure (Urgent occupation / Expropriation decree)	A	R	I
06 A2 / 06 B2: Entrustment of land subdivision and taking possession	C	R	I
06 A3: Adoption of urgent occupation decree and execution	A	R	I
06 A4: Preparation and payment of advances	A	R	C
06 A5 / 06 B2: Drafting of subdivision plans	C	R	I
06 A6 / 06 B3: Preparation and payment/deposit of balances	A	R	C
06 A7 / 06 B4: Adoption and notification of expropriation decree	A	R	I

Table 4: RACI of phase 6

Sub-phase	RUP	Expropriation Office	Property Owners
13 A: Notice of initiation of the acquisition procedure	A	R	I
13 B: Entrustment of subdivision, transfer of title, and transcription of acquisition measure	C	R	I
13 C: Adoption of the acquisition measure	A	R	I
13 D: Liquidation/deposit of compensation	A	R	C

Table 5: RACI of phase 13

This role-based representation reinforces the clarity and accountability of the expropriation workflow. By making explicit who is responsible, accountable, consulted, or informed in the most sensitive activities, the RACI matrices complement the flowchart and contribute to greater transparency, consistency, and process standardisation.

5.2. LIMITATIONS ENCOUNTERED

During the optimization process, several structural and contextual limitations emerged, which inevitably influenced the scope of the improvements that could be introduced.
The expropriation procedure is an articulated and heavily regulated process, being fragmented into multiple phases and characterised by a high level of formalism. This makes it resistant to radical modifications, since every change must remain strictly aligned with the provisions of the D.P.R. 327/2001 and with the operational practices consolidated within the staff of S.C.R. Piemonte.
Unlike other types of administrative workflows, where inefficiencies can be alleviated by reducing redundancies or compressing timelines, in expropriation procedures the legal framework establishes precise deadlines, obligatory steps, and formal requirements that cannot be bypassed or reinterpreted without compromising compliance.

One of the most evident consequences of this rigidity concerns time management. Several phases of the process have very long durations: for instance, phase 07, which deals with the determination and deposit of the indemnity, can last even 342 days, whereas phase 06, often considered the core of the procedure, may extend up to 815 days.
These long periods naturally emerged as a critical point during the analysis, since they represent a source of inefficiency and delay in the completion of the public works.

An intuitive reaction would have been to suggest reducing the duration of certain activities (i.e., shortening the timeframe for the submission of observation by property owners or accelerating the deadlines for notifications and responses).
However, such reductions proved to be unfeasible. All the timeframes underlined in the diagram are either mandated by law or expressly required by the internal staff of S.C.R. to ensure traceability and fairness in the management of the procedure. For example, the waiting time assigned to property owners to present their observations is not a negotiable margin, but a legally guaranteed right.
Accordingly, any attempt to shorten it would not only invalidate the procedure but also expose the administration to appeals and legal disputes.
Similarly, the maximum durations of phases such as phase 06 are embedded in the legislative text and linked to the very validity of the declaration of public utility. Consequently, while long time periods were recognised as one of the most persistent inefficiencies, the optimisation process had to deliberately avoid this aspect, concentrating instead on improving clarity, usability, and monitoring of the deadlines, rather than attempting to alter their legal duration.

Another significant constraint occurred from the rigidity of the legal and procedural framework, which goes beyond the issue of time management.
Many of the steps included in the flowchart are not organisational choices but mandatory requirements established either by law or by long-standing administrative practices.
As such, they cannot be removed or simplified, even if they appear redundant from a process-management perspective.
Notifications and publications are a clear example: every decree, communication or procedural milestone must not only be published in the regional journal but also notified individually to all affected property owners.
At first sight, this dual mechanism may seem duplicative and unnecessarily burdensome. However, it is indispensable to guarantee transparency, ensure that every interested party is properly informed, and to safeguard the administration against potential appeals or judicial challenges.
For this reason, the optimisation process could not intervene by cutting or merging these passages, as this would have damaged the legal validity of the entire expropriation procedure. Instead, the focus had to shift towards improving their representation in the diagram: activities were restructured to clarify their chronological order, responsibilities were explicitly attributed to the appropriate actors, and deliverables were highlighted to draw attention to the most sensitive outputs.
In this way, although the number of steps could not be reduced, their organisation and clarity were improved, allowing the flow to remain legally compliant while easier to follow.

A further limitation emerged from the technical constraints of the diagramming tool employed. These platforms, although easy to use online and accessible without the need for specific software installations or advanced hardware requirements, showed limits when applied to such a complex and articulated process.

Although the entire process could be displayed on a single page, the numerous branches, conditional paths, and exceptions made it necessary to subdivide some phases into separate sections within that page. Moreover, the tools often struggled with advanced formatting needs, such as aligning multiple decision paths, managing overlapping connectors, or maintaining consistent spacing and sizing across a large diagram.
These limitations required additional manual adjustments to preserve readability and coherence, highlighting that even user-friendly diagramming platforms can pose significant challenges when representing highly detailed and multi-branched practices.

Organisational and human factors also played an important role in limiting the scope of redesign the chart. Process mapping is not a neutral activity, but one that directly influences the daily work of the staff that relies on it.
Introducing new symbols, colours, or logical separations may enhance theoretical readability and clarity, but such changes inevitably require staff training and a period of adaptation to ensure correct interpretation and effective use.
During the optimisation, S.C.R. personnel expressed specific requests, such as highlighting key deliverables in red to make certain activities immediately visible or adding further notes and callouts to help the readability.
While these interventions substantially increased the diagram's practical utility, they also imposed certain constraints on design freedom, as some of the conventions adopted diverge slightly from strict ISO standards.

This highlights a necessary trade-off between methodological rigor and practical usability: the goal was not only to produce a technically correct flowchart but also to ensure that it would be intuitively understood and actively used by its intended audience. Ultimately, these human and organisational considerations shaped the final design, balancing compliance, clarity, and real-world applicability.

Finally, a last limitation concerns the inherent contextual variability of expropriation cases. Unlike standardised industrial or administrative processes, each expropriation may present different conditions: the number of property owners, the presence of constraints or protected areas, the willingness or opposition of stakeholders, and the occurrence of legal disputes. Though the optimised diagram provides a structured and comprehensive representation of the general procedure, it cannot capture every possible exception or contingency.

For example, the presence of multiple owners with conflicting interests may lead to judicial appeals or parallel procedures that are not easily integrated into a single schematic representation. Similarly, local variations in interpretation by municipalities or technical offices may affect how certain steps are carried out in practice.
This intrinsic variability represents a restriction for any attempt at standardisation, since the flowchart must necessarily remain at a level of abstraction that balances clarity with adaptability.

In conclusion, the optimisation process was strongly influenced by the coexistence of strict legal constraints, technical challenges, organisational dynamics, and contextual variability. These limitations did not prevent the creation of a clearer and more coherent flowchart, but they did set boundaries on the extent of innovation that could be achieved. The improvements established therefore focus on enhancing visual clarity, standardisation, and usability, rather than radically transforming the underlying legal or organisational logic of the expropriation process.

5.3. OVERALL IMPROVEMENTS

The optimization of the entire expropriation flowchart used by S.C.R. Piemonte S.p.A. led to a series of overall improvements and benefits that significantly enriched its clarity, quality and compliance compared to the original version.
Whereas the previous diagram provided a broad overview of the procedure, it suffered from critical limitations in terms of readability, standardisation, and consistency.
The revised flowchart not only corrects these shortcomings but also introduces elements that make the process easier to follow for all the stakeholders involved in the activities.
The result is a tool that combines precision with accessibility, transforming what was once a compressed and fragmented representation into a coherent and transparent guide to the expropriation procedure.

A first area of improvement concerns clarity and readability. The original chart was characterised by a confusing use of symbols, where activities, decisions, and outputs were often represented with the same shape. This lack of distinction forced users to rely heavily on prior knowledge rather than the diagram itself, undermining its usefulness.
In the new version, standard symbology has been adopted: rectangular blocks for activities, diamonds for decision points, circles for start and end markers.
The adoption of red blocks for deliverables, as requested by S.C.R. Piemonte, guarantees that the most critical outputs are clearly emphasized and easily monitored.

The outcome is a chart that communicates its logic immediately, without requiring excessive interpretation. Moreover, the introduction of green ellipses (if not red in case of decisive tasks) for start and end events ensures that the boundaries of each phase are immediately visible, providing a coherent visual rhythm throughout the flow
For instance, in *figure 48* below, where the old and the new layouts are compared, the benefits of these changes become evident. It can be noticed that compared to before there is a distinction between the different elements of the flowchart, the flow is clearer and more readable, as well as the fact that the paths are separated by diamonds and that notes and callouts simplify a lot the readability.

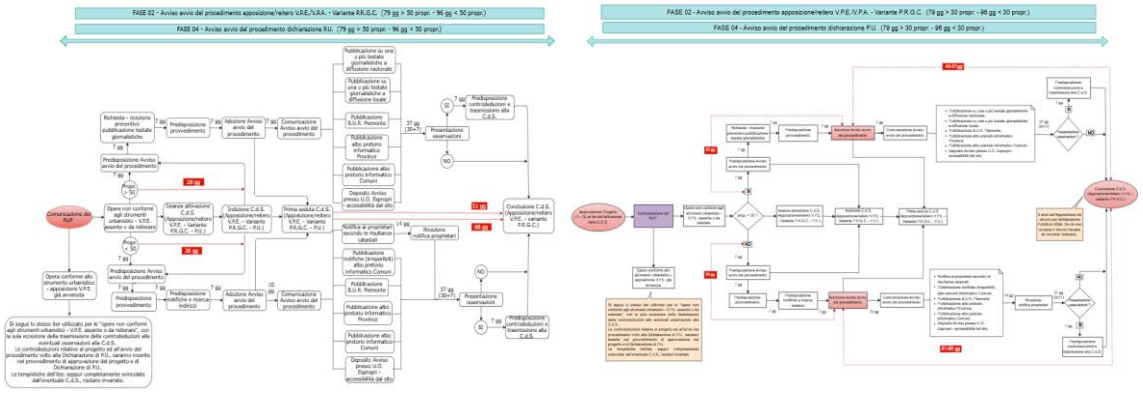


Figure 48: comparison between old and new layouts

Another significant enhancement concerns the explicit attribution of roles and responsibilities, which was entirely absent in the original diagram.
The lack of visual differentiation between actors creates confusion and ambiguity among actors, and often led to disputes regarding accountability, especially when tasks overlapped or were not clearly assigned. This vagueness risked generating inefficiencies, additional costs, and delays, since responsibilities could be shifted from one office to another without a transparent framework to follow.
In the optimised flowchart, this issue has been addressed through the strategic use of colours to assign tasks: white indicates the expropriation office, purple highlights the RUP, property owners or other institutions. This visual distinction does not only serve as an aesthetic choice but has a functional value: it provides immediate clarity on who is responsible for each stage, ensuring that duties are traceable and transparent.
Such improvement is especially important in a context like expropriation, where the involvement of multiple parties can complicate coordination.
Equally relevant are the improvements introduced in time management and deadline representation, another recurrent weakness of the original chart. The earlier diagram suffered from evident inconsistencies: some deadlines were missing entirely, others were expressed ambiguously, and their placement within the flow followed no consistent logic. These shortcomings not only undermined the clarity of the chart but also posed concrete risks of misalignment with the strict temporal limits imposed by the law.

The revised flowchart adjusts these ambiguities by standardising all deadlines in days, always placed next to the relevant activity or decision point. This uniformity not only reinforces compliance with the strict timeframes imposed by law but also allows staff to immediately grasp the timing of each phase, avoiding misunderstandings or errors in scheduling. The improvement is particularly visible in long and complex phases such as phase 06 and phase 07, where legal timeframes extend over several hundred days: here, the revised chart provides a transparent and trustworthy visual overview, helping staff to maintain compliance and to better monitor the progress of the procedure.

A further area of improvement lies in the continuity and logical coherence across phases, a crucial aspect given that the procedure analysed has many connections between stages. Moreover, the expropriation procedure spans multiple diagrams, making it difficult to maintain a complete vision: each phase appeared as a self-contained block, with limited references to what preceded or followed.
As a result, staff members risked perceiving the process as a sequence of isolated steps, rather than as a continuous and interconnected workflow. This lack of visual continuity made it harder to understand how decisions taken at one stage could influence subsequent actions, thereby reducing the practical usefulness of the chart as a monitoring and coordination tool.

The optimised version addresses this problem through the introduction of visual bridges that explicitly link distant phases. One significant example is the use of colour-coded starting points: the starting point of phase 10 is marked in dark yellow, the same colour used in phase 06 A6. This deliberate choice allows readers to immediately perceive the connection between the two stages, even if they are separated in the diagram layout, and to recognise that the initiation of phase 10 is conditional on the outcomes of Phase 06.
In the same way, bright green and indigo activities are employed to highlight specific interdependencies across the flow, signalling that certain steps cannot be understood or executed in isolation but require constant reference to earlier or parallel activities.
These measures reduce the sense of fragmentation, strengthen the overall coherence of the process, and enable users to move across diagrams without losing sight of the broader logic. For example, when the staff of S.C.R. Piemonte examines a phase positioned toward the end of the flow, such as the extension of the declaration of public utility (phase 10), the colour connection immediately recalls its origin and prerequisites, avoiding misinterpretations or omissions.

Ultimately, this approach transforms the flowchart into a more narrative and integrated representation, where each phase is clearly anchored to the previous and following ones. This continuity ensures that the diagram is not only a technical tool for documenting activities but also a cognitive aid that guides users through the entire lifecycle of the expropriation process.

Another important upgrade relates to the support for comprehension through annotations. In the original version, readers were often left alone to interpret technical passages and this omission forced staff to rely heavily on previous knowledge of the regulation, creating the risk of misinterpretation.
The optimised chart introduces yellow callouts and notes in specific phases, providing additional explanations or reminders about key activities. These annotations are especially helpful for readers who may not be familiar with the technicalities of the DPR 327/2001, as they offer clarifications that facilitate understanding.
At the same time, the selective use of annotations avoids overloading the diagram with excessive textual information: callouts are present only where truly necessary, ensuring that the diagram remains a visual tool first and foremost.

The result is a flowchart that combines technical accuracy with accessibility, allowing different categories of users to interpret the process without ambiguity.

Lastly, there is the stronger alignment with legal requirements and transparency. By correcting inaccuracies present in the previous flowchart, standardising deadlines, and clearly depicting mandatory notifications and publications, the diagram ensures full compliance with the DPR 327/2001.
At the same time, the visual emphasis on key deliverables in red strengthens accountability and transparency, making the diagram not only an internal management tool but also a potential instrument of communication with external stakeholders.
By making obligations explicit and verifiable, the diagram reflects one of the guiding principles of public administration: processes must be transparent, traceable, and accountable.

In summary, the optimised diagram introduces a set of improvements that, taken together, transform the expropriation flowchart from a basic representation into an operational tool. It is clearer, more standardised, and more accessible, while also being fully compliant with the legal framework. The combination of improved readability, explicit role attribution, consistent time management, logical continuity, and legal alignment provides a stronger basis for process monitoring and evaluation.
Beyond its immediate benefits, the revised chart also opens the door to further developments, such as digitalisation, automated tracking of deadlines, or integration with information systems. Thus, the overall improvements achieved represent not only a corrective effort but also a forward-looking step towards innovation and efficiency in the management of expropriation procedures.

5.4. POSSIBLE FUTURE DEVELOPMENTS

The work of optimization and improvement of the expropriation flowchart carried out in this thesis constitutes an important achievement, but it should not be considered a final result. Rather, it constitutes an intermediate step, a platform that lays the foundation for further innovation. The corrections and enhancements introduced in the chart improve its clarity, compliance, and usability, but they also open up opportunities to rethink the management of expropriation procedures in a broader, more modern perspective.
In this context, several possible future developments can be foreseen, ranging from the automation of repetitive tasks to the digitalisation and integration of procedures into IT systems, to the systematic monitoring of performance through Key Performance Indicators (KPIs), and finally to the adaptation of the methodology to other business processes.

5.4.1. AUTOMATION OF REPETITIVE TASKS

One of the most promising areas for future improvement lies in the automation of repetitive steps. The expropriation procedure, as illustrated throughout the thesis, includes a significant number of repetitive and standardised operations, such as the preparation of decrees, the sending of notifications to property owners, or the publication of documents in official journals. At present, all these tasks are performed manually by the staff of S.C.R., with a considerable investment of time and resources. This not only increases operational costs but also heightens the risk of clerical errors, which in a procedure as formalised as expropriation can lead to invalid acts or potential legal disputes.

The introduction of automation tools like Robotic Process Automation (RPA) systems or advanced document generation platforms, would allow many of these routine steps to be streamlined. For instance, once the database of property owners has been uploaded, the system could automatically generate personalised notification letters, complete with all the required attachments, and schedule their dispatch via certified digital channels (i.e., PEC).

Similarly, decree templates could be automatically pre-filled with data recovered directly from cadastral databases, avoiding redundant manual transcription and ensuring that information is accurate and consistent across different documents.

The advantages of such an approach are multiple. On the one hand, automation produces time savings and error reduction, allowing staff to focus their efforts on the most critical and non-standard activities. On the other, it guarantees compliance and traceability: standardised templates ensure that every decree includes all the legally required elements, while automated scheduling minimises the risk of missing statutory deadlines.

In a procedure where timing and formality are decisive, this represents a safeguard as much as an efficiency gain.

However, the introduction of automation should not be interpreted as a replacement for staff, but rather as a supporting tool.

Human intervention remains essential in cases where judgment, interpretation, or negotiation is required, such as handling appeals, evaluating exceptional circumstances, or interacting directly with property owners.

In this way, staff would see their role shift from carrying out repetitive tasks to higher-value activities, strengthening their professional contribution rather than diminishing it.

Nevertheless, the adoption of automation also faces potential barriers linked to organisational culture. Staff familiar to manual practices may initially perceive automation as a threat, fearing a reduction in their responsibilities or even the loss of their role. This resistance is a common phenomenon in public administration, where innovations can challenge long-established routines and consolidated habits.

Overcoming these concerns requires not only the introduction of technical tools but also accompanying change management measures: training sessions to familiarise staff with the new systems, communication strategies to emphasise the supportive nature of automation, and the gradual introduction of pilot projects that demonstrate the concrete benefits in terms of workload reduction and error minimisation.

In conclusion, automation of repetitive tasks represents a concrete opportunity to modernise the expropriation process, ensuring greater efficiency, reliability, and compliance. Its successful implementation will depend not only on technical feasibility but also on the ability of the organisation to manage the human and cultural side of change, transforming potential resistance into acceptance and eventually into active support.

5.4.2. DIGITALISATION

The challenge of digitalisation is connected to automation, but it regards a broader scope: while the latter focuses on replacing or supporting repetitive manual activities, digitalisation involves the creation of an integrated digital ecosystem in which all the documents, communications, and procedural steps are managed electronically, ensuring better traceability and accessibility at every stage of the process.

For the moment, many of the steps in the expropriation procedure still rely on paper-based practices or to fragmented digital files that circulate through email, local servers, or even printed forms. This situation leads to delays, loss of information, and difficulties in reconstructing the complete history of a procedure when needed.
For example, if a property owner appeals against a decree, reconstructing the exact sequence of notifications and responses may require searching across multiple paper archives or individual email accounts, wasting precious time and creating legal risks.
So, the adoption of a digital platform could lead to reduce these inefficiencies, allowing each activity to be assigned to a unique digital folder, accessible by all authorised actors (i.e., RUP, expropriation office, or external consultants), in which every decree, notification and observation is achieved chronologically.

Documents could be digitally signed, ensuring their legal validity, while notifications could be automatically tracked, with timestamps certifying dispatch and receipt.
Certain areas of public administration have already adopted this transition, such as the procurement platforms which now allow the entire procedure to be managed digitally, guaranteeing transparency to all the information. Applying the same principle to expropriation would mean that every property owner could, if allowed, check the status of their practice online, improving transparency and trust.

With a digital archive, the risk of losing documents is virtually eliminated, while traceability is ensured by default. Moreover, the ability to share information digitally simplifies collaboration among different offices, especially in complex procedures involving multiple institutions.
Digitalisation also involves many challenges in its implementation. A first one regards the staff of the organization that may not be familiar with these platforms, so introducing new tools could generate confusion or resistance.
This aspect requires targeted training programmes and the design of systems with user-friendly interfaces, so that they are intuitive even for less experienced staff.

Another difficulty relates to data protection and cybersecurity: handling sensitive information, such as cadastral data or personal details of property owners, demands robust safeguards to prevent unauthorised access or data breaches.
A further barrier may come from the cultural habits of staff, many of whom are still attached to the tangible security of paper documents. Overcoming this necessitates not only technical solutions but also institutional support and gradual implementation.
For example, hybrid systems can be introduced at first, where documents are managed digitally but also archived in paper format, progressively reducing the reliance on the latter as staff confidence grows.

In summary, digitalisation has the potential to improve even more the expropriation process, delivering transparency and traceability. But the organization should be careful in implementing it, accompanying the transition with support and training.

5.4.3. MONITORING THROUGH KPIs

Another important step for future development is the introduction of Key Performance Indicators (KPIs) to monitor the progress and performance of the expropriation process.
At present, the procedure is still governed through compliance with deadlines and legal requirements, but a system for measuring its efficiency and quality should be implemented. This absence makes it difficult for managers to identify bottlenecks, compare performance across different projects, or employ corrective actions based on objective and measurable evidence.
The adoption of KPIs would transform the flowchart from a static representation of the process into a dynamic monitoring tool, capable of providing continuous feedback.

By associating each phase of the process with one or more indicators, it would be possible to track in real time how long specific activities take, whether delays tend to concentrate in particular steps, and how effectively communication with property owners and other stakeholders is managed.

Some concrete examples of useful KPIs in the expropriation context include:

- Average duration of each phase: this indicator allows the staff to identify where time losses are most likely to occur. For example, phase 06, which can last even more than 800 days, could be monitored to detect whether certain sub-tasks take longer than expected.
  If the average completion time for this phase deviates significantly from the legal maximum, it may signal inefficiencies in coordination or communication.

- Percentage of notifications delivered on time: notifications are very recurrent during the process, so monitoring them is crucial. A KPI could measure the share of notifications sent within an established timeframe.
  If this percentage is low, corrective actions could be introduced, such as automated reminders or improved scheduling.

- Numbers of appeals submitted by property owners: a high number of appeals may symbolize weaknesses in communication or dissatisfaction with the indemnity proposal. By monitoring such an indicator, S.C.R. Piemonte could understand if disputes are increasing, their concentration in specific projects, and what aspects of the process are most contested.

- Rate of errors in documentation: this KPI highlights the percentage of documents (e.g. decrees, notifications, publications) that require correction or re-issue due to errors. Even minor mistakes can generate delays and additional costs, and tracking this rate would help identify whether errors originate from lack of training, poor templates, or insufficient cross-checking.

- Satisfaction level of stakeholders: although more qualitative, this indicator would measure the perception of transparency and fairness among property owners and internal staff. Surveys or structured feedback tools could provide insights into whether communications are clear, whether property owners feel sufficiently informed, and whether staff find the tools efficient and easy to use.

In practice, these KPIs could be visualised through dashboards linked to the digitalised flowchart, providing a real-time overview for stakeholders and decision-makers. For instance, a traffic-light system (green, yellow, red) could be applied to each phase: green if the phase is within time and quality standards, yellow if critical thresholds are approaching, and red if legal deadlines or error limits are exceeded.

Table 6 provides a simulated comparison of four key performance indicators, contrasting the current state (‘As-Is’) with the optimized process (‘To-Be’). The figures are indicative and serve to illustrate potential improvements rather than reflect real statistical evidence. The comparison highlights how process standardization and KPI monitoring could reduce errors, limit rework, and ensure greater punctuality, thereby strengthening the overall reliability of the expropriation procedure. Although legal deadlines, particularly relevant in longer phases such as phase 06, cannot be shortened, optimization reduces the likelihood of exceeding them and minimizes the risk of disputes.
In this way, efficiency gains are achieved without altering the legal framework, but by improving process quality and governance.

* Data are simulated for illustrative purposes and do not represent actual statistics.

KPI	As-Is	To-Be	Additional note
Lead time (average duration of the procedure)	Close to maximum legal deadlines	Stable within legal deadlines, with reduced risk of exceeding them	More reliable and predictable process
Number of process steps completed without rework	65%	90%	Fewer corrections and resubmissions
Documentation error rate	25–30% of documents require revision	5-10%	Standard templates and cross-checks reduce mistakes
Number of appeals submitted by property owners	10-12% of cases	5-7%	Improved accuracy and clearer communication

Table 6: As-Is and To-Be comparison

This approach leads to several advantages: it allows early detection of problems, enabling managers to intervene promptly when KPIs highlight an ongoing activity.
Then, facilitates benchmarking across projects, where the organization can compare results, identifies best practices, and use successful strategies. Finally, it strengthens accountability and transparency, since staff performance and process quality are evaluated based on measurable data rather than subjective impressions.

One of the main obstacles could be resistance from staff, who may perceive KPIs as an additional layer of control rather than as a tool to improve efficiency. To overcome this, it would be necessary to emphasise that indicators are not punitive but supportive, helping to distribute workload more fairly and avoid last-minute emergencies. Another difficulty lies in data collection: without a prior step of digitalisation, gathering accurate and timely data for indicators would be laborious and unreliable.
Despite these challenges, the introduction of KPIs would represent a cultural and managerial jump for S.C.R. Piemonte, moving the company from a reactive approach to a proactive one that relies on continuous measurement and improvement.

5.4.4. ADAPTATION TO OTHER BUSINESS PROCESSES

The methodology of optimization and process mapping used in the present work does not have to remain confined to this single case. On the contrary, one of the most promising directions for future development lies in its adaptation to other business processes managed by S.C.R. Piemonte or by public administrations in general.
The expropriation procedure is among the most complex administrative workflows, given its legal strictness, multiplicity of actors, and long timelines.

If such a demanding process can be effectively represented, standardised and optimised, then the same principles can be applied to other procedures, which are often less formalised but equally likely to inefficiencies.

For example, within S.C.R. Piemonte, public procurement procedures could benefit from a similar approach. The tendering process, from the publication of calls to the evaluation of bids and the awarding of contracts, involves numerous repetitive activities (i.e., checking documentation, communicating with suppliers, publishing results).
By adopting the same logic of clear symbology, explicit role attribution, and visual continuity across phases, the tendering process could be represented in a transparent way, reducing ambiguity and making the responsibilities of offices and commissions more evident. The addition of deliverable markers and deadlines, already tested in the expropriation flowchart, would help ensure compliance with procurement regulations and improve the monitoring of timelines.
Another example concerns internal administrative processes, such as the management of personnel requests, reporting obligations, or internal audits.
These are often perceived by staff as opaque or unnecessarily bureaucratic, precisely because they lack a clear visualisation.
By creating flowcharts similar to the one redesigned in this thesis, it would be possible to standardise procedures, highlight potential redundancies, and facilitate onboarding of new staff members, who could rely on diagrams rather than lengthy textual instructions.

Beyond S.C.R., the methodology could be extended to other public authorities that face similar challenges of complexity and transparency. Municipalities, for instance, often deal with urban planning permits, building concessions, or environmental authorisations. These processes typically involve multiple steps of notification, evaluation, and decision-making, like expropriations. Mapping them with consistent visual standards would not only improve their efficiency but also make them more understandable to citizens, thereby reinforcing trust in public administration.
Of course, the adaptation to other business processes is not without challenges. The first one is the resistance to change among staff, who may perceive process mapping as an external imposition or as an unnecessary layer of bureaucracy.
Moreover, not all processes have the same level of formalisation as expropriation. Some internal workflows are more flexible or ad hoc, and codifying them into a diagram may require negotiation and consensus among different offices.
Ultimately, the adaptation of this methodology to other processes can create a culture of process orientation within the organisation. Rather than perceiving activities as isolated tasks, staff and managers would start to see them as part of a structured flow, where clarity, accountability, and standardisation matter.
This cultural shift would lay the foundation for more advanced innovations, such as the integration of flowcharts into digital platforms, real-time monitoring across processes, or even cross-comparison of performance indicators.

In this sense, the work done on the expropriation procedure represents a pilot project: a first concrete demonstration that process mapping and optimisation, when applied rigorously, can make even the most intricate administrative workflows clearer, more efficient, and more transparent. Extending the same methodology to procurement, human resources, environmental permits, or any other public service process could multiply the benefits achieved, making S.C.R. Piemonte, and potentially other public bodies, a model of best practice in process management and innovation within the public sector.

5.5. FINAL CONSIDERATIONS

The work carried out in this thesis focuses on the analysis, optimization, and redesign of the expropriation process currently adopted by S.C.R. Piemonte S.p.A.
The starting point of the research was the identification of the main weaknesses of the original flowchart, which undermined both the clarity and the standardisation of the procedure.
Since expropriation represents a highly articulated process, strictly governed by the provisions of the D.P.R. 327/2001, a structured reorganisation was necessary in order to ensure higher levels of transparency, legal accuracy, and operational efficiency. The study demonstrated that, without a targeted intervention, the original diagram risked remained only a partial and ambiguous representation of the procedure, unsuitable for supporting management activities or providing reliable communication to stakeholders.

Despite the rigidity of the regulatory framework, the work showed that meaningful improvements are still achievable and can bring concrete benefits.
For this reason, a revised flowchart was developed, addressing several critical weaknesses: the inconsistent use of symbols, the absence of decision points, the inaccurate representation of deadlines, and the lack of clarity regarding roles and responsibilities.
By adopting standardised shapes, colour codes, and explanatory annotations, the new version provides a representation that is clearer, more accessible, and aligned with the principles of quality management and process control.

One of the most significant results achieved is the enhanced readability of the flow. Where the initial chart obliged users to rely heavily on prior knowledge to interpret the logic, the redesigned chart makes the sequence of actions explicit, simple and coherent. This transformation allows the tool to be useful not only for experts in expropriation law but also for technical staff, administrative employees and even external stakeholders, who now have access to a more transparent overview of the procedure.
Equally important is the clarification of roles and responsibilities, where everyone is able to understand their job and for what activities it is responsible. The optimization regards the usage of colours to distinguish between actors (RUP, expropriation office or property owners) and to reduce ambiguities and traceability.

Since expropriation often involves overlaps or disputes among parties, the explicit attribution of responsibilities represents a crucial improvement for the smooth running of the entire process.

A further area of progress concerns the management of timelines. In the earlier version, the sum of activity durations was sometimes inconsistent, and several deadlines were either missing or ambiguously indicated. By correcting these inadequacies and expressing all time limits in days, the new flow guarantees precision and reliability.
This adjustment is especially beneficial in long and complex phases, where legal deadlines play a decisive role and must be respected. In this way, the diagram is transformed into an operational instrument that supports both scheduling and project control, reducing the risk of errors or delays.
Moreover, the continuity across phases is improved by a great margin. The introduction of colour connections and reference points allows readers to immediately perceive how distant stages are linked, avoiding fragmentation and ensuring that the procedure is understood as a single, coherent pathway.
For example, the use of dark yellow in phase 10 to recall phase 06 A6 or the green and indigo connectors introduced in phase 09 provide a more integrated perspective of the process, reinforcing its logical progression and strengthening its interpretability.

The optimization also contributes to greater legal alignment and transparency, fundamental in public companies where every act is subject to scrutiny.
By clearly distinguishing deliverables and emphasising them in red blocks, the new flowchart ensures that critical steps, such as decrees, notifications, and publications, are never neglected. This method strengthens internal control, helping staff monitor progress with greater accuracy, as well as reinforcing external accountability, allowing stakeholders to verify that the activities are carried out in full compliance with regulation.
In a sector like expropriation, where disputes are common and the legitimacy of each decision may be contested, having a process that is both transparent and traceable becomes a key guarantee of fairness and institutional reliability.
The study also highlighted several limitations that inevitably shaped the scope of the optimisation. The rigidity of the legal framework did not allow for a reduction in the number of steps or deadlines, since these are mandated either by law or by administrative practice. Similarly, the technical constraints of diagramming tools required considerable manual effort to maintain coherence across multiple phases.
These obstacles, however, reinforced the importance of adopting a rational approach: rather than seeking to radically simplify the process, the optimisation focused on clarity, organisation, and transparency.

Beyond the improvements achieved, this thesis has laid the foundations for future developments. The optimised chart can serve as a starting point for more advanced innovations, such as automation of repetitive tasks, digitalisation of the procedure, systematic monitoring through Key Performance Indicators (KPIs), and the adaptation of this methodology to other business processes.

In this perspective, the work carried out should not be considered a definitive end point, but rather a platform for continuous improvement capable of supporting the evolution of the expropriation process in line with modern principles of public administration.

In conclusion, the contribution of this research lies in having transformed the expropriation flowchart from a static and partially flawed representation into a dynamic and operational instrument. The improved version combines legal compliance with managerial principles, making the process more transparent, efficient, and reliable.
While respecting the constraints imposed by the normative framework, the work demonstrates that there is always room for improvement and innovation, even in highly regulated fields. The expropriation procedure, by its nature, remains a delicate balance between the needs of the public interest and the rights of private property owners.
This thesis has contributed to making that balance more visible, traceable, and manageable, opening the way to further innovations that could progressively strengthen the quality and sustainability of public administration practices.

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