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Scuola di Ingegneria Industriale e dell'Informazione



Master of Science in Management Engineering

**Business Process Reengineering for
Digital Transformation in Public
Settings:
An Empirical Case on a Socio-care Process of
Milan Municipality**

Supervisor: Prof. Luca GASTALDI

Master Graduation Thesis by:

Giacomo MESSINA

Student ID: 928395

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Table of contents

Abstract	9
EXECUTIVE SUMMARY	10
1. INTRODUCTION	20
2. LITERATURE REVIEW	22
2.1 Digital transformation.....	22
2.1.1 Digital transformation in private sector	25
2.1.2 PA's digital transformation	27
2.1.3 Digital transformation of Italian PAs	29
2.2 Business process management.....	35
2.2.1 Business Process Modeling.....	37
2.2.2 BPM for Digital transformation	39
2.2.3 BPM for PAs	40
3. METHODOLOGY	44
3.1 Literature review	44
3.2 Business process management implementation	45
3.2.1 Case study selection.....	46
3.2.2 Case study analysis	47
4. EMPIRICAL CASE ANALYSIS	58
4.1 Business process modeling.....	58
4.2 Key Performance Indicators	63
4.3 Analysis of current issues.....	67
4.4 Suggested improvement.....	72
4.4.1 REQ1: Digitization of the request for inclusion in day centres for the disabled.....	74
4.4.2 REQ2: Attendance System Implementation.....	78
4.4.3 REQ2A: Communication with ats application.....	80
4.4.4 REQ3: Digitization Individual Plan	80

4.5	Expected benefits	84
4.6	Action plan.....	90
5.	CONCLUSION.....	93
5.1	Managerial contribution	93
5.2	Managerial Implications.....	94
5.3	Limitation	95
BIBLIOGRAPHY AND SITOGRAPHY		96
Bibliography		96
Sitography.....		100

List of figures

Figure 1 - Determinants' model.....	17
Figure 2 - Actors involved in PA Digital Transformation (Agenzia per l'Italia digitale, 2019)	30
Figure 3 - DESI integration of Digital Technologies Indicator Italy vs European Union (European Commission,2020)	33
Figure 4 - DESI Human Capital Indicator Italy vs European Union (European Commission,2020).....	33
Figure 5 - DESI Digital Public Services Indicator Italy vs European Union (European Commission,2020).....	34
Figure 6 - Force Field Analysis diagram (Tregear & Jenkins, 2007).....	41
Figure 7 - Determinants' model	54
Figure 8 - AS IS diagram	59
Figure 9 - Attendance registration process AS IS scenario	60
Figure 10 - Determinants' model in the empirical case	67
Figure 11 - Request for inclusion in day centres for the disabled	74
Figure 12 - Filling out the form.....	75
Figure 13 - Receiving form	75
Figure 14 - Document evaluation.....	76
Figure 15 - Evaluation of the proposal.....	76
Figure 16 - CDD Selection.....	77
Figure 17 - Interview with the family + form signature	78
Figure 18 - Attendance System implementation	78
Figure 19 - Attendance system.....	79
Figure 20 - Canteen and transport service use detection	79
Figure 21 - Other additional service use detection	80
Figure 22 - Communication with ats application	80
Figure 23 - Digitization Individual Plan.....	81
Figure 24 - TO BE diagram.....	82
Figure 25 - Attendance registration municipality CDD	83
Figure 26 - Attendance registration affiliated CDD	83

List of tables

Table 1 - CdM KPIs	17
Table 2 - Functional requirements	18
Table 3 - DT factors.....	24
Table 4 - BPMN elements.....	50
Table 5 - Crossing time of the Request for inclusion in day centres for the disabled	60
Table 6 - Crossing time of attendance registration activities in analog process.....	61
Table 7 - Crossing time of IP activities in analog process.....	62
Table 8 - COBIT's KPI	64
Table 9 - Other KPIs	66
Table 10 - Determinants' model analysis.....	67
Table 11 - Criticism of the activities	70
Table 12 - Criticism of the indicators.....	70
Table 13 - Functional requirements	73
Table 14 - Digitization of the request for inclusion in day centres for the disabled (Benefits for citizen) optimistic view	85
Table 15 - Digitization of the request for inclusion in day centres for the disabled (Benefits for the public administration) optimistic view.....	85
Table 16 - Attendance registration optimistic view.....	86
Table 17 - Filling out individual plan optimistic view	86
Table 18 - Expected benefits optimistic view	87
Table 19 - Attendance registration pessimistic view	88
Table 20 - Filling out individual plan pessimistic view	88
Table 21 - Expected benefits pessimistic view	88
Table 22 - Attendance registration realistic view	89
Table 23 - Filling out individual plan realistic view	89
Table 24 - Expected benefits realistic view.....	90
Table 25 - Requirements' plan.....	90
Table 26 - Indicators' plan	91

Abstract

Purpose, originality and value: the main objective of the thesis is to shed light on the role that the use of an approach such as BPM has in the Digital Transformation (DT) of a Public Administration (PA). The research aims to demonstrate the advantages that the activities proposed by this approach bring to a public body, which allows the digitization of processes allowing greater efficiency and less waste.

Design, methodology and approach: thanks to a review of the literature, it was possible to increase knowledge on the topic under analysis, giving the opportunity to identify existing gaps in standard approaches to guide the DT of PAs and methods to overcome the obstacles they face. The implementation of BPM in a specific case study (Milan Municipality – CdM) has allowed to collect important evidence leading to assess the importance of using these approaches.

Findings: a well-structured analysis, flanked by the BPM methodology, with the various steps proposed to make the digitization process semi-standardized, offer the opportunity to (1) model the process, (2) identify the critical issues, (3) evaluate the possible improvements, (4) evaluate the possible benefits, (5) control the process. The activities described above allow to reduce the difficulties in managing DT in the PA thanks to specific actions that allow better control over the activities.

Practical and managerial implications: the research has highlighted the advantages of the PA that begins its DT by digitizing its processes through BPM. The research results confirm the correlation between the digitization of the PA and the improvement of efficiency that allows a reduction in costs. Findings represent a useful tool to help PA in DT.

Limits and future research: the main limitations of the work consist in the difficulties of communication between different bodies of the PA, and the impossibility of calculating with certainty the times for activities that have yet to be digitized and which consequently do not allow the exact measurement of the duration of the three different solutions. To validate the emerged outputs, in order to test the results of this thesis and to collect more useful information about this subject the research should be replicated in other PAs.

EXECUTIVE SUMMARY

Innovation is the implementation of a new significant improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations. There are various types of innovations within organisations (Óri & Szabó, 2018) and among them it is possible to consider mainly digital transformation (DT), through the use also of Big Data, Internet of Things and other new technologies that are changing the economy. Effective ways are being sought to address this transformation (Ivancic, et al., 2019).

Since society and the economy are evolving at a frightening speed, companies have to keep up with the changes in different contexts. In this sense Digital Transformation is changing the way workers think about their jobs and how the company manages its production processes: companies and organizations are adapting their strategy, business models, products and services as well as business processes and information systems in order to increase their level of digitization through smart services and digitally enhanced products. This brings DT as the dominant transformation business are facing and it also has a strong influence on how digital services and products are designed (Zimmermann A., et al., 2021).

In this sense, not only companies, but also cities and public administrations are increasingly thinking about new complementary digital activities and corresponding service models thanks to the growing digital network, smart services, omnipresent access technologies and dynamic customer requirements: to meet the challenge of customer satisfaction in terms of leisure, entertainment, family life and cultural activities, cities need to modernize their portfolio of digital services such as ticketing, e-mobility, traffic control, public and intelligent services, as well as energy and waste management (J. Wichmann, et al. 2020).

Literature review

Digital transformation (DT), a term used principally for the private sector, is correlated with the necessity of using new technologies to remain competitive in the digital era, where services and products are delivered both online and offline (Merger et al., 2019). Digitization can be understood as a generic term that identifies efforts to convert

information, processes, products or services into a framework that can be developed or supported by information technology (Wißotzki et al., 2021).

To introduce any digital innovation, it is important, first of all, to define one or more interfaces where the flow of information or material resources are crossing a boundary. The digitization of these interfaces allows, around it, to build a new digital initiative that involves changes to the components of the corporate architecture such as the business model or corporate services, etc. In order to find digital opportunities, it is essential to initially understand around which existing or implicit interfaces such opportunities can potentially emerge (Gøtze and Romanov, 2021).

To summarize all the studies made in the different articles, it is possible to assert that DT is not only employing digital technologies, but it could be considered as a combination of seven factors: (I) Strategy; (II) People; (III) Organizations; (IV) Customer; (V) Ecosystem; (VI) Technology and (VII) Innovation.

Regarding the private sector, in recent years, people, businesses and systems have been greatly impacted by digital transformation. The revolution is altering the way companies operates, and develop relationships within and across ecosystems (e.g. with consumers, suppliers), creating new managerial opportunities and challenges (Bresciani et al., 2021).

In general, digital transformation takes into account the change of a company towards creating and delivering digital value propositions and, at the same time, the exploitation of digital technologies in operational processes (Vial et al., 2019).

On the other hand, public sector is an area that is not very positively influenced by technological development. There are multiple reasons for that: low effectiveness of digital investments in this field is not the most critical one. It is considerable the consequence rather than the cause of this state. The nature of PAs, which are objectively considered more complicated than other kind of organizations, is the reason why advances with the use of digital technologies in the public domain are difficult to achieve. First, PA is hardly complex and abstract (Řepa, et al., 2021).

The main problem of the application of IT in PAs, which would lead to business transformation, is in the management itself. The famous definition of E-government (Information Society Commission) also outlines this idea: "E-government is the use of

ICT as a tool to achieve better government” (Řepa, et al., 2021). Process innovation in public services is difficult to address, due to the characteristics of the public sector, characterized by incremental changes, limited exposure to the market, and low propensity to reduce costs and improve efficiency (Forliano et al. 2020).

Specifically to the Italian PAs system, according to the DESI 2020, Italy occupies the third last place among the 28 EU member states, with a score of 43.6 (compared to the EU average of 52.6).

Consequently, the Italian digitization process requires solid governance in terms of IT, process management, policies and services and becomes a fundamental action to use BPM to digitize the critical process to guide the Digital Transformation of Italian PAs. In particular, Business Process Management could help overcome the constraints and difficulties experienced up to now by accelerating DT.

Business Processes (BP) are a sequence of activities that could be fully understood and modelled as well as (re-)modelled when needed (Baiyere et al., 2020). From a pragmatic viewpoint, a BP describes how the activities are done in an organization. BPM is defined as an area that consolidates the skills to manage in the best possible way the management of the redesign of business processes and how to develop a fundamental BPM capability in organizations that satisfy a variety of purposes and contexts (Baiyere et al., 2020).

Baiyere (2020), in his article, define why the BPM is very difficult to implement in a specific context. The private sector is characterized by continuous flux of changes linked to the DT. For this reason, he speaks about “Tension in process logic”, that corresponds to difficulty to maintain the tradition of updating business process models for all business processes in the DT context.

Baiyere (2020), in his article, define why the BPM is very difficult to implement in a specific context. The private sector is characterized by continuous flux of changes linked to the DT. For this reason, he speaks about “Tension in process logic”, that corresponds to difficulty to maintain the tradition of updating business process models for all business processes in the DT context. It is necessary to describe in detail the two types of force. The first one, or rather restrictive, are linked to the political conditions in which the public sector operates and to its complexity. On the other hand, there are forces that push towards the implementation of BPM for the public sector,

they provide strong incentives for the adoption of process-based approaches (Papadopoulos, et al., 2018).

The two main incentives that push public organizations to implement Business Process Management in their operations are related to: public law and the integration of new information technologies. In adopting new technology, the public sector has always been slower than the private one. This situation may have some benefits for the public sector because it is possible to select and implement only the best activities that have been tested in the private sector (Papadopoulos, et al., 2018).

Methodology

This section provides a description of the process addressed to develop the different stages of this work, starting with the literature review and then with the BPM implementation.

To investigate which process to digitize, the first step was to decide what activity carry out. The literature review suggested BPM as a sequence of activities needed to do this.

To correctly apply the BPM and the suggested methodology, the following steps were followed:

1. Design and Analysis: To begin, the existing process was analyzed. Subsequently, an assessment of the issues and the impact they have on the process was carried out.
2. Model creation: the existing process has been modeled with the BPMN.
3. Execution: After creating the process model, it was evaluated what changes could be made, making sure to also document the respective reasons that led to these proposals.
4. Possible benefits analysis: Once the implementation of the new process was completed, it was necessary to evaluate the possible effectiveness of the improvements made. To make it, the available data were used, identifying any increases in efficiency, cost reduction and benefits for citizens.
5. Optimization and automation: Once you have applied the BPM methodology to a process, you will need to continue to monitor and optimize it over time. BPM

is an ongoing process that needs to be improved periodically. If the new process is working efficiently, try to figure out if other tasks can be automated.

However, the implementation of BPM required identifying a real context in which to develop the research.

Case study selection

The objective of the analysis was the digitization in a specific case, in order to collect the useful evidence to evaluate the effects it has in the PA. To assess the possible impacts, it was necessary to identify a specific case of an Italian PA.

An organization that satisfies all the requests and that has been chosen as case study is the Municipality of Milan (CdM).

CdM is a structured Italian PA that for several years has started its own DT by undertaking and implementing various projects in the field of citizen services and internal services. In addition, in recent years, CdM has experienced a strong push towards digitization and innovation: many projects have already been carried out, but many are also still in progress, which have benefited from the DT initiatives promoted by the SIAD Department (Information Systems and Digital Agenda) of CdM.

Particularly, inside the CdM the CDD (CDD, in Italian *Centro Diurno per Disabili*) process is very critical because in each step the employee use paper and nothing is digitized.

Case study analysis

The use of multiple sources of evidence adds reliability and validity to the information collected by increasing the value of the work (Yin, 2009). In particular, in this research (1) interviews and (2) documents were exploited as means to implement the analysis of the process necessary for proposing possible changes aimed at digitization.

Thanks to the two sources, a very in-depth analysis of the process was carried out, giving the opportunity to continue with the suggested improvement and expected benefits phases.

Taking into consideration a specific aspect of the BPM, the BPMN, and therefore through some documents and the various interviews, the initial situation of the process

relative to the CDD has been evaluated, after which the flow of the activity has been diagrammed (AS-IS mapping).

To analyze the possible KPIs to take into account, it is important to follow several steps:

1. Definition of the objectives of the analysis.
2. Identification of the critical success factors for the process.
3. Identification of performance indicators and description.
4. Selection of indicators.
5. Performance measurement, interpretation of the detected values and comparison with the target.

Critical Success Factors (CSF) are defined according to:

- The general business strategy.
- The strategic vision of change, in relation to the BPR project in progress.

The Determinants model is used to make an evaluation of the process. In order to have a clearer view of the context, each determinant has to be analyzed in detail.

After the analysis of the several determinants, it is evaluated the performance of the process through a performance analysis.

Performance analysis can have several objectives:

- *Cognitive.*
- *Evaluative.*
- *Project.*

After defining which were the critical points of the process, and which KPIs to take into consideration, it was necessary to evaluate which possible improvements to be addressed. To do this, through meetings with some employees of the DSIAD department, it was evaluated on which parts of the process to make changes. Through these analyzes, a functional analysis was drawn up.

To evaluate the possible benefits of the functional requirements' improvement, in relation to the selected KPIs, it has been used an internal model of the CdM. This model is used a lot since the majority of the data of the analog process, necessary to complete it, are already known, and so the model could be completed to understand the possible benefits of the digitization.

However, some problems have been found to calculate the necessary data for the digital process since the digital form of different documents are not already developed and also the time necessary to complete some activities is not known. Also, the time to fill out the different digitized forms is not possible to calculate, consequently, several possibilities are hypothesized.

So, to calculate it, three different solution are made:

- Optimistic view, where the maximum optimization of the time necessary to complete the different steps is taken into consideration;
- Pessimistic view, where the digitization of the different steps of the process do not represent a big advantage for the CdM;
- Realistic view, where a middle solution is analyzed.

In the end, a possible action plan has been made, where the order of the functional requirement, defined in the analysis of current issues, are defined. It has been made considering the level of criticism of the different activities of the process.

EMPIRICAL CASE ANALYSIS

This chapter describes the phases that have led to the digitization of the process related to the day centers for disabled (CDD, in Italian Centro Diurno per Disabili) people in Milan Municipality.

The initial situation has been analyzed, using the BPMN the AS-IS scenario is represented. After that, with the interviews at the CdM employees the time to make the different activities are valued.

First of all, a performance analysis was made, from which the cognitive objective has been defined. Subsequently, it has been important to understand which is the Critical Success Factors (CSF), based on the strategic vision of change relating to this project. After defining the CSFs, an analysis has been made to determine the indicators, aimed at evaluating external and internal performance and describing the operating parameters of the process. After schematized the process, the next step to understand which stages of the process are most critical is the determination of the different KPIs through which keeping it under control over time.

To make a more structured analysis KPIs to take into account the framework COBIT2019 has been used, indeed the framework includes several goals in his structure.

After that, an internal model of Milan Municipality has been used. It include KPIs for the PA but also useful for the citizens.

Table 1 - CdM KPIs

Beneficiary	KPI
Public Administration	Efficient allocation of resources (FTEs)
	Efficient allocation of resources (€)
	Reduction of paper consumption (Number of sheets)
	Reduction of paper consumption (Number of trees)
Citizens	Saving time
	Cost saving
	Reducing CO ₂ emissions

After choosing which KPI to take into account, it has to be determined what were the critical points of the process. To make it, several meetings were held both with the coordinators of different centres and with some employees of the Social Policy Department.

In order to define the critical points of the process, it should be followed the so known “Determinant’s model”, illustrated in Figure 1.

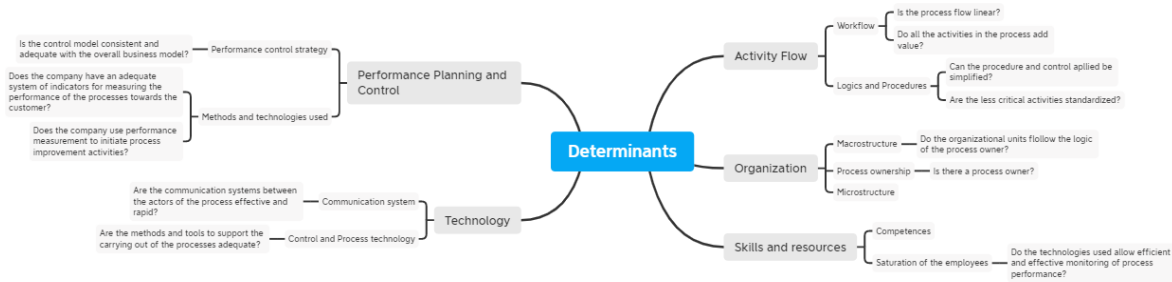


Figure 1 - Determinants' model

After that, using the questions of the determinants' model, two table for the criticism has been made, the first one for the activities, the second one for the indicators valued before.

Mainly, three types of problems has been encountered:

1. Problems of efficiency
2. Problems of satisfaction
3. Paper management problems

After investigating what could be the most critical issues in the process, it has been analyzed in which parts of the process these problems impacted more. Hence, it turned out that 3 parts were very critical: registration form, attendance registration and "individual plan" form.

To understand in a better way how to develop the process a functional analysis has been made, starting from the following functional requirements described in the table 2.

Table 2 - Functional requirements

CODE	NAME
REQ1	Digitization of the request for inclusion in day centres for the disabled
REQ2	Attendance detection system implementation
REQ2A	Communication with ats application
REQ3	Digitization of individual plan

After that, using the BPMN a TO-BE diagram has been made, modifying the AS-IS scenario with the functional analysis' proposal.

After that, the possible benefits of the improvement of the functional requirements is evaluated, in relation to the KPI established. To analyze it, the internal model of the CdM has been used because there are all the data to compare the results between the analog and the digital process.

To conclude the analysis of the process, a plan to decide in which order the functional requirements is made. The sequence is established understanding the priorities for the Municipality and considering the criticism tables used in the analysis of current issues.

1. INTRODUCTION

Innovation is the implementation of a new significant improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations. There are various types of innovations within organizations (Óri & Szabó, 2018) and among them it is possible to consider mainly digital transformation (DT), through the use also of Big Data, Internet of Things and other new technologies that are changing the economy. Effective ways are being sought to address this transformation (Ivancic, et al., 2019).

Since society and the economy are evolving at a frightening speed, companies have to keep up with the changes in different contexts. In this sense Digital Transformation is changing the way workers think about their jobs and how the company manages its production processes: companies and organizations are adapting their strategy, business models, products and services as well as business processes and information systems in order to increase their level of digitization through smart services and digitally enhanced products. This brings DT as the dominant transformation business are facing and it also has a strong influence on how digital services and products are designed (Zimmermann A., et al., 2021).

In this sense, not only companies, but also cities and public administrations are increasingly thinking about new complementary digital activities and corresponding service models thanks to the growing digital network, smart services, omnipresent access technologies and dynamic customer requirements: to meet the challenge of customer satisfaction in terms of leisure, entertainment, family life and cultural activities, cities need to modernize their portfolio of digital services such as ticketing, e-mobility, traffic control, public and intelligent services, as well as energy and waste management (J. Wichmann, et al. 2020).

In this paper, the specific case of Public Administration (PA) has been addressed, which due to various barriers affecting it make DT more difficult than in the private sector. Consequently, for this sector it is important to define some guidelines to monitor appropriate DT strategies (Korachi & Bounabat, 2019). For the reasons mentioned above, the identification of the gaps and problems in PAs has been defined as an objective of the analysis studied in the next chapters:

- The first step includes the analysis of DT in a generic context, taking into account its definition and characteristics, then a specific analysis of it in the private sector, followed by a comparison with the public sector, analysing the particular case of the Italian PA;
- After that, how the digitization of processes can lead to improvements has been analyzed. Therefore, a general overview of Business Process Management (BPM) has been presented, describing in detail the Business Process Modeling Notation (BPMN) standard, and then the relationship that BPM has with DT in public administration;
- At last, the specific context on which this research is based has been presented: the digitization of the process of insertion of users in day centres for the disabled and the subsequent activities carried out in the same places.

In this thesis, after the literature review it is going to present the methodology used during the internship at the CdM for the digitization of a process, to improve the efficiency of a process. This chapter include how the literature research has been made and how the Business Process Management implementation.

As final topic, the analysis of a specific case will be presented: a BPM approach is used to evolve an analog process into a digital process. The case regards the Day Centre for Disabled (CDD, in Italian *Centro Diurno per Disabili*) that represent a critical aspect in the CdM administration for the low efficiency of the process.

2. LITERATURE REVIEW

In this section it was condensed all the elements that were extrapolated from literature analysis and that are useful to understand the context and each player involved as well as its contribution. The chapter starts analyzing the context of the Digital Transformation (DT), and its relationship with both private sector and Public Administrations (PAs), and the particular case of Italian PA. After, it is analyzed the Business Process Management (BPM), and its connection with both PAs and DT.

2.1 Digital transformation

Digital transformation (DT), a term used principally for the private sector, is correlated with the necessity of using new technologies to remain competitive in the digital era, where services and products are delivered both online and offline (Merger et al., 2019).

DT is the dominant type of business transformation, having IT both as a technology enabler and as a strategic driver. The main drivers for digitization are digital technologies, because they are altering the approach through which business are conducted and have the possibility to disrupt them (Zimmermann et al., 2021).

To summarize, digitization can be understood as a generic term that identifies efforts to convert information, processes, products or services into a framework that can be developed or supported by information technology (Wißotzki et al., 2021).

The current wave of digital innovations has already been reported to lead to the transformation and disruption of established business strategies and models (Baiyere et al., 2020). In digital transformation, it is expected that innovation come in the form of offering new digital products and services, and invention emerges at both the managerial and the operational level (Baiyere et al., 2020).

It is possible to divide digitalization in four thematic areas (Brunetti et al., 2020).

The first one view “digitalization as a bundle of social, economic and cultural changes” that are caused by the increasing use of digital technologies, or, through digital communications and applications, as a set of transformation in the techno-economic environment and socio-institutional operations. From a more business-oriented viewpoint, digitalization is often perceived as a source of disruptions triggering strategic responses, and as a driver of product and marketing innovation (Brunetti et al., 2020).

The second thematic area is related to the “key technologies of digitalization”. To create digital variants of product and/or services, different technologies can be used, which allow communication and interaction between machines, people and objects (Brunetti et al., 2020).

The third issue deals with the main “challenges of digitalization”. It is possible to divide them into three categories: (1) market challenges, (2) organizational challenges and (3) economic and societal challenges (Brunetti et al., 2020).

“More precisely, market challenges include the transformation of specific businesses models (Matzler et al., 2018), such as the evolution of servitisation (Coreynen et al., 2017; Paiola, 2018), the impact of digitalisation on supply chains (Caputo et al., 2018) and producer–customer relationships (Fremont et al., 2018) and the potential relocation of firms’ operations in high labour cost countries (reshoring) made possible by the increased degree of automation of production processes (Wiesmann et al., 2017). Organisational challenges mainly deal with knowledge management, grounded in the increasing accessibility of document repositories and information-based platforms (Yoo et al., 2012). Economic challenges basically refer to the impact of new digital paradigms on labour demand (Kaivo-Oja et al., 2017; Dengler and Matthes, 2018), while societal challenges deal with the impact of environmental sustainability, notably resource efficiency (Beier et al., 2017) and energy consumption (Tiefenbeck et al., 2018).” (Brunetti et al., 2020).

The fourth area deals with the “enabling factors” that companies and the surrounding system should develop to exploit advantage of new digital paradigms (Brunetti et al., 2020).

To introduce any digital innovation, it is important, first of all, to define one or more interfaces where the flow of information or material resources are crossing a boundary. The digitization of these interfaces allows, around it, to build a new digital initiative that involves changes to the components of the corporate architecture such as the business model or corporate services, etc. In order to find digital opportunities, it is essential to initially understand around which existing or implicit interfaces such opportunities can potentially emerge (Götze and Romanov, 2021).

In brief, it is possible to see how the academic literature focuses mainly on specific aspects such as key technologies, challenges and drivers of digital transformation (Brunetti et al., 2020).

To summarize all the studies made in the different articles, it is possible to assert that DT is not only employing digital technologies but it could be considered as a combination of seven factors: (I) Strategy; (II) People; (III) Organizations; (IV) Customer; (V) Ecosystem; (VI) Technology and (VII) Innovation.

Table 3 - DT factors

Factors	Description
Strategy	Sharing a common digital vision is considered an important factor for the success of DT (Ivancic, et al., 2019). However, each company develops its own strategy based on its needs and stage of the DT process.
People	Leverage on people is fundamental for the development of a digital culture and DT needs digital skills and knowledge from employees.
Organizations	DT should involve all units of companies that cannot manage projects alone or separately from the rest of the company.
Customer	The end-to-end customer journey is a key guide in designing digital solutions (Ivancic, et al., 2019), so products and services are rethought and redesigned in order to offer higher quality, higher value and a better customer experience.
Ecosystem	DT involves different parties perceived as an ecosystem. Indeed, the increased need for knowledge, driven by current digitization, fosters collaboration with partners, including business-to-business (B2B) customers, public and government organizations, or even unknown actors in a process of co-creation of value (Ivancic, et al., 2019).
Technology	Digital Technologies are the primary means by which companies manage DT. Especially, organizations have the ability to choose from a pool of abundant modern technologies, depending on the areas of digitization they focus on.

Innovation	Innovation could be the ultimate goal of companies dealing with DT. It should be received as a common goal at all organizational levels encouraged by the management.
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Ivancic et al. (2019) analyzed three case studies in three different fields: telecommunications, manufacturing, and insurance. They have identified some common resources and activities through which companies acted on the seven dimensions to implement effective DT.

In the next chapters, it will be discussed the digital transformation in two different settings: private sector and PAs. In particular, about the last one, it will be discussed the Italian case.

2.1.1 Digital transformation in private sector

Transformation of a firm refers to the process by which the firm improves performance indicators in order to survive or better develop, on the basis of reviewing and rethinking the traditional functional organizational structure (Jin et al., 2020).

In recent years, people, business and systems have been greatly impacted by digital transformation. The revolution is altering the way companies operates, and develop relationships within and across ecosystems (e.g. with consumers, suppliers), creating new managerial opportunities and challenges (Bresciani et al., 2021).

In general, digital transformation takes into account the change of a company towards creating and delivering digital value propositions and, at the same time, the exploitation of digital technologies in operational processes (Vial et al., 2019).

Digital transformation is not limited to particularly innovative businesses, digital start-ups and high-tech giants, however, but it can be considered a process that embraces companies of all sizes, operating in different industries (Bresciani et al., 2021).

Frequently, for many companies, digitization is associated with historically "earlier" phases of digitalization and with activities such as the optimization of internal business processes, sales channels or products; the automation of internal workflows, the improvement of business processes, the exchange of data with customers and suppliers; and the use of electronic commercial transaction possibilities (Wißotzki et al., 2021).

Gøtze and Romanov (2021), in their article, assert that an organization, that aims to be digitally adaptive, needs capability to anticipate, at least roughly:

- where the introduction of digital interface may be needed in its business economy;
- what business opportunities would create such introduction;
- what changes to the business model would require, together with related socio-cultural changes or training;
- what security/privacy/compliance issues this can cause and how to address them.

An enterprise has three potential areas for introducing digital interfaces:

- Type 1: External interfaces to external clients. These may exist, or be the “future state”, and may currently operate through different channels from over the counter from regular mail to digital one.
- Type 2: Already existing external interfaces for third party providers, suppliers, partners, etc. the current ecosystem. These, too, may already exist or be expected in the future and may work through various, including digital, channels.
- Type 3: Internal interfaces between the “sets of business functionality” within the enterprise. It is possible to make it through different frameworks (Gøtze and A. Romanov, 2021).

The current wave of digital innovations has already been reported to lead to the transformation and disruption of established business strategies and models (Baiyere & Hukal, 2020; Loebbecke & Picot, 2017; Nambisan, Lyytinen, Majchrzak, & Song, 2017). In digital transformation, it is expected that innovation come in the form of offer of new digital products and services, and improvisation emerges at both the managerial and the operational level. By allowing new offer of product/service (Nambisan et al., 2017), an innovation company can adopt operational and product attributes similar to a born-digital company (Bossert, 2016).

2.1.2 PA's digital transformation

In the collective culture, public sector has always been considered a step backward compared to the private sphere as regard digitalization topic because less capable to innovate (Cinar et al., 2019; Vries et al., 2016; Bloch & Bugge, 2013).

Public sector is an area that is not very positively influenced by technological development. There are multiple reasons for that: low effectiveness of digital investments in this field is not the most critical one. It is considerable the consequence rather than the cause of this state. The nature of PAs, which are objectively considered more complicated than other kind of organizations, is the reason why advances with the use of digital technologies in the public domain are difficult to achieve. First, PA is hardly complex and abstract (Řepa, et al., 2021).

Digital transformation in the public sector means new ways of working with stakeholders, building new frameworks of service delivery and creating new forms of relationships (Merger et al., 2019).

In PA, the concept of client covers besides traditional citizens many other social roles and groups including organizations of various forms and informal societies even if their members do not realize their membership (Řepa et al., 2021).

IT development is a key factor in business progress. To use as best as possible the value of new technology, it is necessary to change business practices and process. Therefore, regarding the management of the organization it is necessary to express the concept according to which it has to be based on the explicit knowledge of its business processes and, moreover, be ready for the fast implementation of their relevant changes allowed by the new technological phenomena (Řepa et al., 2021).

The main problem of the application of IT in PAs, which would lead to business transformation, is in the management itself. The famous definition of E-government (Information Society Commission) also outlines this idea: "E-government is the use of ICT as a tool to achieve better government". McKendrick explains: "The impact of e-government at the broadest level is simply better government "e-government is more about government than about "e" (Řepa, 2021).

Řepa (2021), in his article, expresses that the main difference between market-oriented organizations and public ones is that in the latter the market is absent.

Furthermore, he states that the PAs are based on the natural monopoly deriving from the territorial division of local authority from the entities of other territories, consequently, the local authority is the only ruler in the given territory, but its power is limited only by legislation, not by concurrent authorities. Strategy of society is usually implemented as a set of rules, mainly in the legislative form. This lack of competition among PAs cause fatal problems with the quality and the costs of public services. Unlike the market, PAs lack the natural mechanism determining the proper cost of the service (Řepa, 2021).

Having to manage local authorities independently, it is also necessary to introduce "smart cities", this term is closely related to the theme of digitization and characterizes the goal of various stakeholders (for instance citizens and firms) of an urban transformation. The latter addresses the problems of urban life, such as increasing the quality of life and sustainability of cities through technological solutions (Martynov et al., 2018).

Process innovation in public services is difficult to address, due to the characteristics of the public sector, characterized by incremental changes, limited exposure to the market, and low propensity to reduce costs and improve efficiency (Forliano et al. 2020).

In the monopolistic environment of PAs, the costs of the services have to be approximated in other ways. The same approach can also be seen on the quality of services, which is a natural counterbalance to the price. The certain way to overcome this critical insufficiency can be to bring the market into the PA game as much as possible (Řepa et al., 2021).

In PAs, customers are varied, which is why they can be defined as an abstract entity. They can be from individuals to legal entities, both public and private, with different purposes in the country/region where a public entity operates. Other types of customers are: purpose-built civic associations, groups of people with the same goals or problems, etc. The last type of PA customers is the whole of society, for instance to prevent crime or even environmental issues (Řepa et al., 2021).

However, there is a very important point coming out from the public literature review. PAs have tremendous difficulties in managing the change since they have to deal with many barriers at different level of the organization structure (Watad, 2019).

2.1.3 Digital transformation of Italian PAs

Digital Transformation of Italian PAs has started late and with more difficulties compared to the majority of European countries (Galia et al., 2012).

The fragmentation of the Italian public system added to existing inefficiencies. The PA system in the country is composed of a complex hierarchy of intertwined organs and it has uncleared and overlapping competencies (Datta et al. 2020).

As a result, services for citizens are sometimes based on processes not fully integrated and supported by automation, and personal data are replicated in several, frequently inconsistent, databases. It comes as no surprise that the Italian PAs host nearly 11,600 databases and 11,000 data centers across the peninsula (Datta et al. 2020).

Greater efficiency through digital transformation comes from many avenues on the government systems roadmap. There is time savings for existing work and faster communication, both of which come from digitalization of mundane tasks (Datta et al., 2020).

However, in Italy, bureaucratic clutter has further vilified the digital transformation initiatives of Italian PAs, often to the disappointment and chagrin of officers and citizens. As a consequence, of the inefficiency of public organs and of the long lead times to successfully implement a digital transformation project, which lead to a delay in the use of these services, new programs, when they will be launched, start to become obsolete, as a result end user are often disappointed from the initiatives that are proposed. For this reason, they do not continue to push for new digital innovations, consequently also public officers lose faith in the digital transformation. For this reason, it is increasingly difficult to change. This phenomenon also occurs in the private sector, it is possible to make example of some manufacturing companies, considering the time between timing of adoption of the technology and the timing of fulfillment of the production contract, it is possible to see a strong misalignment. In those cases, however, the company loses faith in the technological transformation and this leads them to bankruptcy because they are unable to keep up with the times (Datta et al., 2020).

Despite earlier attempts to advance a digital transformation agenda to address and mitigate Italy's problems of tax evasion, corruption, and lack of PA transparency, there

had not been much progress. Starting in 2016, under the auspices of Prime Minister Matteo Renzi, Team Digitale, a newly formed team of talented individuals has undertaken the restart of the efficiency of the Italian PA and the digital innovation footprint of the country (Datta et al., 2020).

To understand the structure of the Italian PA, Figure 2 provides a diagram of the actors who have a role in the digital transformation of the country. The *Piano Triennale per l'Informatica delle PA* is an essential tool to promote DT of Italian public sector by establishing the fundamental architectural principles and the rules of usability and interoperability to be followed.

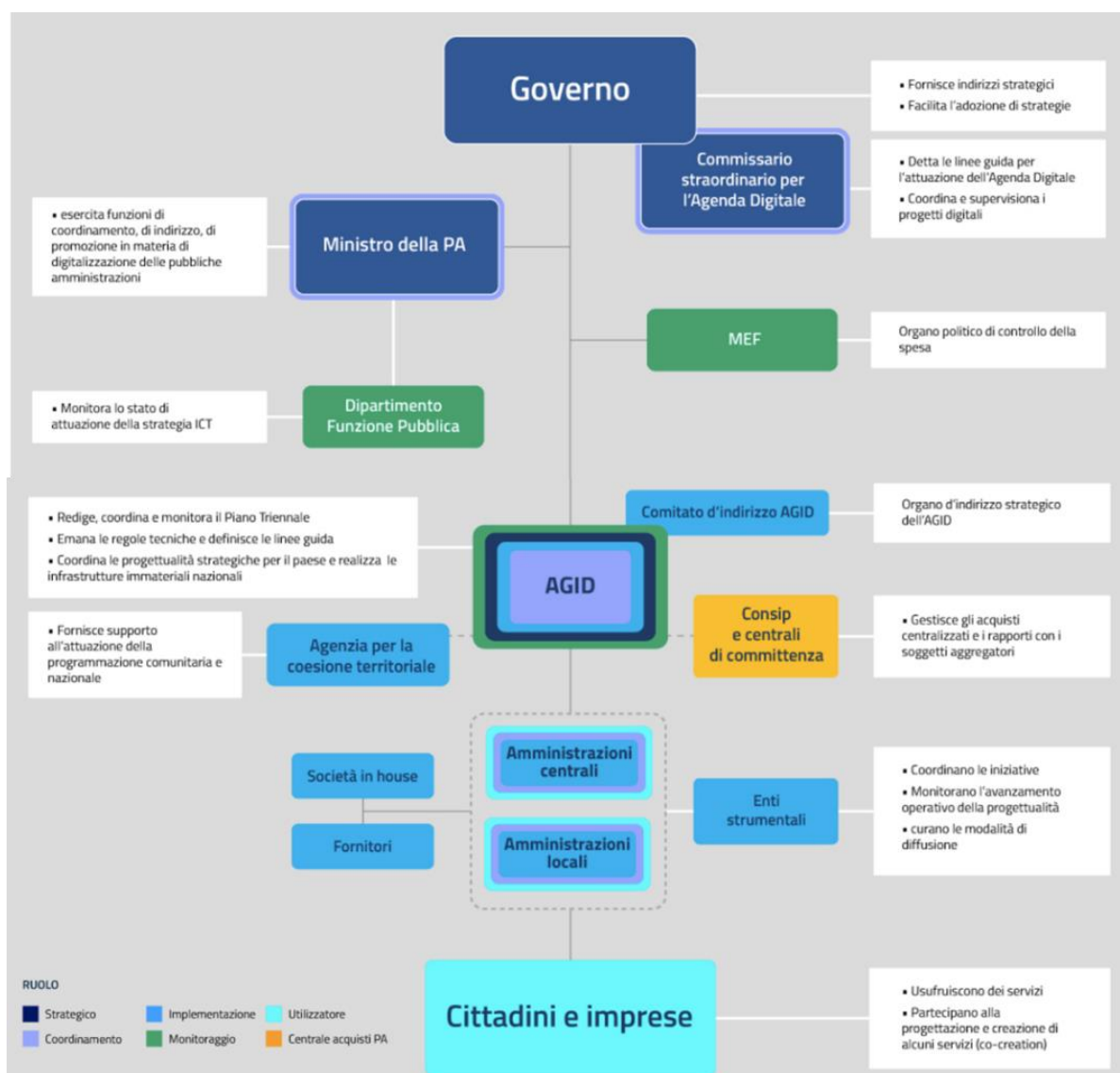


Figure 2 - Actors involved in PA Digital Transformation (Agenzia per l'Italia digitale, 2019)

Figure 2 highlights all the actors involved in the process and their relationships. They all have specific tasks, citing the most characteristic:

- *Government* provides the general strategic guidelines of PAs DT. In particular, it discloses the regulatory instruments that facilitate their adoption.
- *Agenzia per l'Italia Digitale (AgID)*, identifies the best solutions for the digitization of PA, translating strategic objectives in specific projects. It monitors the quality of services provided to citizens, promotes digital literacy among employees, freelancer and citizens.
- *Consip* is a company that operates at the exclusive service of the Public Administration, according to the strategic guidelines defined by its sole shareholder, the Ministry of the Economy and Finance. It publishes the tender and stipulates contracts with suppliers and make the use of public resources more efficient and transparent.
- *Local administration* is a crucial component in providing services to citizens. Indeed, local and regional administration plays an important role in the modernization of services and is responsible for meeting the expectations of citizens.

Team Digitale has begun to redesign and relaunch ANPR, PagoPA, SPID, and CIE. ANPR, the national digital registry of residents, PagoPA, the single payment system, SPID, the digital identity system, and CIE, an electronic Identity Card. The team has built a common, secure and standard data platform with transparency and interoperability. PagoPA was the centralized financial platform designed for every form of payment and provision of the PA. All the citizen of the country could use PagoPA to pay for everything from traffic fines to taxes, licenses, and utility bills. The platform would also allow all the citizen to receive any expenditures from the government, including taxes returns and pensions. The PagoPA platform is comfortable and safe. PagoPA has built an ecosystem consisting of all major credit cards, banks, payment networks, and payment providers (Datta et al. 2020).

Datta, et al., (2020) in their article, argue that: "Public trust in the digital transformation of Italian PAs also requires a simplification of bureaucratic friction. Bureaucracy decreases efficiency, increases complexity and costs, and reduces trust. Italian PA

digital transformation, essentially meant to reduce bureaucracy, still relies on too many agencies”.

The Digital Agenda is defined as a series of initiatives aimed at organizing and transforming a country lever on digital technologies (Agency for Digital Italy, 2019). Specifically, it is a document in which each member country of the European Union promotes digital innovation and the development of technological infrastructures within their own country.

To manage a country's Digital Agenda, it is necessary to act along three dimensions: direction, coordination and implementation (Osservatorio Agenda Digitale, 2018; Giannone & Santaniello, 2019). Leading means defining digitization policies and strategies; The coordination level acts on the organization and monitoring of the actors involved in the process; Implementation is the operational phase in which key projects are developed as well as the formulation of technical rules, interoperability standards, to accelerate the digitization process.

To analyze the Italian situation the DESI reports (Digital Economy and Society Index) are used. They are the tool through which the European Commission monitors the digital progress of the Member States.

In particular, according to the DESI 2020, Italy occupies the third last place among the 28 EU member states, with a score of 43.6 (compared to the EU figure of 52.6), thus returning to 25th ranking. Among the rearmost, in the same low-ranking position formalized in DESI 2018 (score of 36.2 compared to the European figure of 46.5), after the slight increase, as a brief parenthesis of DESI 2019, which had allowed our Country to reach 23rd place (score of 41.6 compared to the EU figure of 49.4).

From the point of view of "Connectivity", Italy obtained a score of 50.0 (close to the European figure of 50.1), occupying 17th place, however down compared to the result of DESI 2019 (12th place, score of 48 compared to the European figure of 44.7), but a clear improvement compared to DESI 2018 (25th place, score of 35.1 compared to the European figure of 39.9).

Despite the declared intent to improve the state of digitalization of the PA and the economy, as a priority commitment of the political-institutional agenda set out in the "Italy 2025" Strategy by the Ministry for Technological Innovation and Digitization

(MID), the serious cognitive delay described by the "Human capital" indicator continues to cause concern, according to which, compared to the EU average, in Italy the "very low" levels of basic and advanced digital skills are further aggravated by an almost small number of specialists and ICT graduates "far below the EU average", with negative repercussions on the effective use of technologies. ranks last in the ranking (score 32.5 compared to the European figure of 49.3), with worse performances, therefore, compared to the result obtained at DESI 2019 (26th place, score of 32 compared to the European of 47.9).

The reflection of this assumption is visible in the following charts, where some indicators of Italian e-Government are compared with European average (European Commission, 2020).

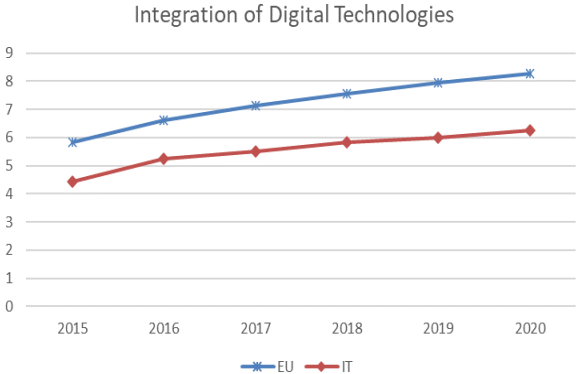


Figure 3 - DESI integration of Digital Technologies Indicator Italy vs European Union (European Commission,2020)

Only 42% of people aged between 16 and 74 have at least basic digital skills (compared to 58% in the EU) and only 22% have digital skills above basic ones (compared to 33% in the EU).

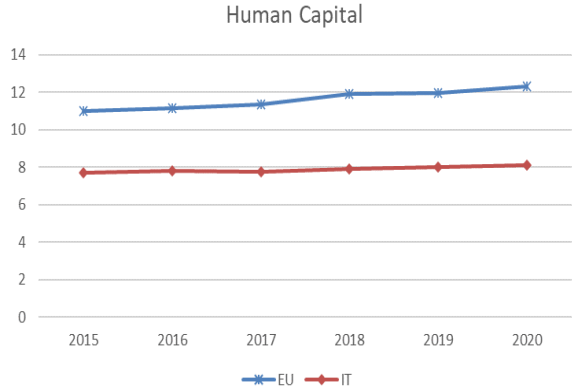


Figure 4 - DESI Human Capital Indicator Italy vs European Union (European Commission,2020)

As regards digital public services, Italy occupies 19th place in the ranking (with a score of 67.5 compared to the European figure of 72.0, maintaining a stable position compared to DESI 2019 in which it was nineteenth with a score of 61.9 compared to the European figure of 67.0), but always below the European average.

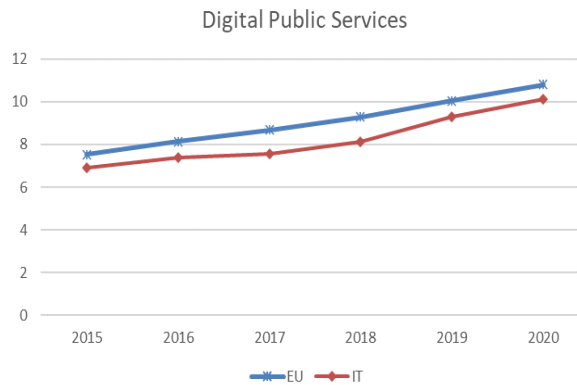


Figure 5 - DESI Digital Public Services Indicator Italy vs European Union (European Commission,2020)

However, despite the good performance achieved in e-Gov and OpenData, only 32% of Italian online users actually use the services (compared to the EU average of 67%).

From the figures 3, 4 and 5 emerges a clear idea of the situation of Italian underdevelopment: taking into account all the indicators, Italy is always lagging behind the European average.

Consequently, the Italian digitization process requires solid governance in terms of IT, process management, policies and services and becomes a fundamental action to use BPM to digitize the critical process to guide the Digital Transformation of Italian PAs. In this way, the Italian context represents a good context in which to develop this research because the scenario highlights and confirms the need to start DT with the analysis of still analog processes, in order to be able to evaluate the critical points and be able to digitize them. In particular, Business Process Management could help overcome the constraints and difficulties experienced up to now by accelerating DT.

This section of the chapter made it possible to introduce the specific context in which to position the research and to highlight the main reasons beyond the choice.

2.2 Business process management

Business Processes (BP) are a sequence of activities that could be fully understood and modelled as well as (re-)modelled when needed (Baiyere et al., 2020).

BP are essential assets of companies, because they reflect the way in which products and services are provided to the market. They have significant business value and could be successfully implemented if stakeholders collaborate and if technology is used to support the process (Eldman et al. 2009).

From a pragmatic viewpoint, a BP describes how the activities are done in an organization. Business is an organizational entity that distributes resources to provide customers with desired products or services. A process is a concept a bit more ambiguous with different meanings, depending on the context in which it is used (Laguna M., Marklund J., 2013).

Merriam-Webster Dictionary defines processes as:

- A natural phenomenon marked by gradual change that led to a particular result.
- A natural continuing activity or function.
- A series of actions or operations conducing to the end.

Instead, process management deals with the issues of managing, controlling, and improving processes. Processes design is an important element to successfully manage a process; however, so are the design implementation and the continuous improvement and control system required to achieve a desirable level of process performance. Another important aspect is the management of the people involved in the process (Laguna M., Marklund J., 2013).

The assumption used before are useful to understand what Business Process management (BPM) is.

BPM is defined as an area that consolidates the skills to manage in the best possible way the management of the redesign of business processes and how to develop a fundamental BPM capability in organizations that satisfy a variety of purposes and contexts (Baiyere et al., 2020).

Research on Business Process Management summarizes it with three fundamental logics. They are: the careful modeling of business processes; the design of IT

infrastructures to support these processes; and empowering employees and teams to complete tasks. Each part represents the basis about the way BPM takes part in the process, infrastructures and agencies (Baiyere et al., 2020).

In this perspective, BPM requires a very specific infrastructure, which must be effective so that it can be redesigned to align with the modeling objectives regarding the processes it has to facilitate. Michael Hammer (1990) specified that processes have to be automated, through the use of traditional Business Process Management, which is often called BPR, to try to achieve predefined objectives, furthermore in his article he added that processes have to be in a way that unnecessary information flows are redesigned and eliminated, in order to appropriately replaced by the business process to be described (Baiyere et al., 2020).

Instead, Davenport and Short (1990) defined BPR as "analyzing and designing workflows and processes within an organization". Although they can be considered the first promoters of this theory, Hammer and Champy (1993), have reinterpreted it as a "fundamental rethinking and radical redesign of business processes to achieve significant improvements in critical and contemporary measurements of performance, such as cost, quality, service and speed ", this has made it popular. More recently, these approaches have been modified because they were in conflict with the incremental approaches needed for the ever-changing technology. Furthermore, this process has evolved more because it is now also used for organizational restructuring also in the outsourcing field (Baiyere et al., 2020).

It is desirable that as much as possible of the work done in the organization is represented as explicit knowledge so that workflow diagrams and flowcharts can be created, and inefficient paths identified. For example, Davenport and Short (1990) recommend that, if not all, at least some critical processes should be redesigned and that existing processes should be accurately understood and measured. Should some portion of the work be tacit knowledge, which is not codified but still exists as part of the organizational routine, that part of the work should be rigorously modeled so that it, too, will be subjected to analysis in the BPM effort. It is typically not acceptable in BPM that the work activity could not be modelled or that it should not be modelled; every crucial activity – to the level at which meaningful performance improvements can

be realized – is assumed to be understood and possible to model. Consequently, the dominant view in process logic is modelling (Baiyere et al., 2020).

Business process models are the key instruments to successful implementation of business processes (Eldman et al. 2009).

In the following sub-charter, it is expressed three different aspect of the Business Process Management: Business Process Modeling, the relation between the BPM and the Public Administration and the relation between BPM and Digital Transformation.

2.2.1 Business Process Modeling

Fernández et al. (2009) define Business Process Modeling as “a set of techniques that allow to model those business aspects necessary for a correct performance of business process applications”.

The technologies for the management of business processes, in addition to the purposes described above, have the objective of modeling processes. Modeling techniques make it possible to help, as noted in recent years, to reduce errors, costs and increase productivity in certain types of companies, such as manufacturing, governments and telecommunications providers (Fernández et al. 2009).

However, some problems were found in the process modeling logic, because owners, employees and consultants find it very difficult to update the models while maintaining the tradition, due to the constant changes and modifications that characterize the digital transformation. DT induces changes in various business processes, which, in turn, often lead to even more changes in interconnected business processes (Baiyere et al., 2020).

For the reasons mentioned above, the ability to adapt to digital transformation is seen as an essential property. In addition, in exploring new digital business opportunities, organizations often need to support business process models for their existing business, while also creating new variations of those models for digital offerings (Baiyere et al., 2020).

The questions that BPM professionals post what measures need to be taken to process the order? Who is responsible for what? Business process modeling tries to represent these working procedures as clearly as possible in order to provide a common understanding of the business process (Fernández et al., 2009).

2.2.1.1 *Business Process Modeling Notation*

Business Process Modeling Notation (BPMN) is an emerging standard language for the acquisition of business processes, particularly at the level of domain analysis and high-level system design in industry and economics. It is increasingly establishing itself as a standard tool for business process modeling. It can be interpreted as a computer program that allows the description and a relatively simple graphic form of complex processes (Scheuerlein et al. 2012; Fernández et al. 2009).

Processes may be described in a text or table form in the easiest way. Within the BPMN it is possible to distinguish the tasks that correspond to a unit of work that takes time to perform. This does not enough for complex processes with branching, events, detailed administrative units, data flow, etc. In these cases, proper notation is required. A notation for graphical process modeling defines, among other features, which symbols the different elements of the process should be represented with, what exactly they mean, and how they may be combined. Such a notation is, therefore, the common language for describing the process. BPMN is thought to be established, cost efficient, rational, standardized, intuitive and flexible (Scheuerlein et al. 2012).

This notation has as its main objective to provide a diagram that is understandable for all users of the company. In fact, it consists of a single business process diagram called the Business Process Diagram (BPD). In order to be understood and used by all users of the company, the BPD has to provide an expressive model (Fernández H.F., et al. 2009).

The problem is the inability of business analyst to model all aspects of the business because the analyst creates the process model based on their knowledge of process languages and not in the business domain. The cost and complexity that business users would have to teach existing model notations emerges as a problem. For this reason, it is necessary that business users could represent all aspect of the business (Fernández H.F., et al. 2009).

BPMN has also been used to model healthcare processes, which could be considered special cases of Public Administration processes, by Müller and Rogge-Solti (2011) and by Ruiz et al. (2012). These works aim at showing the effectiveness of a rigorous modeling approach in a regulated, human-intensive environment, with the aim of

facilitating decision making. Other works make a step forward and focus on the analysis of the BPMN models of the Public Administration (Ferrari et al., 2016).

2.2.2 BPM for Digital transformation

Digital transformation presents a unique context for BPM in two ways. First, it draws on the properties and the affordances of the digital domain with inherent generative properties. Digital transformation involves the need to grapple with the generativity of emerging digital technologies in attempts to re-conceptualize business models and the business processes around them that are often based on trials and experiments as much as on meticulous engineering efforts. Second, digital transformation as a context for BPM results from the deep structure changes that accompany it. Prior studies have observed that deep structure changes, such as radical reengineering efforts, failed as BPM logics were not able to take into account the dynamics of change and the implications of a broader organizational transmutation (Baiyere, et al., 2020).

Baiyere (2020), in his article, define why the BPM is very difficult to implement in a specific context. The private sector is characterized by continuous flux of changes linked to the DT. For this reason, he speaks about “Tension in process logic”, that corresponds to difficulty to maintain the tradition of updating business process models for all business processes in the DT context. *“The ability to adapt to change swiftly and repeatedly has been proposed as an essential property of a digital transformation context. In addition, in exploring new digital business opportunities organizations often need to sustain business process models for their existing business while also crafting new variations of such models for digital offerings as in the exposition of the case of Volvo by Svahn, Mathiassen, and Lindgren (2017). Dealing with a large number of process model update requests is made difficult by the fact that in a transformation context, political, socio-technical and economic dimensions become determining. As research related to radical business process re-engineering of the 1990s demonstrated, initiatives for implementing substantial changes to cross-functional business processes are typically handled with reluctance by the management.”* (Baiyere, 2020, p.242-243).

2.2.3 BPM for PAs

PAs, when providing a service to citizens, have the responsibility that they comply with the law. In order to make it, the bodies must first define the procedures, or the business processes, which public employees must subsequently carry out, and which can be translated into a provision of services that is legally compliant (Ferrari et al., 2016).

There are two different reasons why the public sector may have an interest in implementing BPM. The first one is the possibility of modernizing the services, which are now provided in analog format, making them as digital as possible, applying a low-cost business model. The second reason is linked to the desire to offer citizens services with higher quality levels, which are also carried out quickly (Papadopoulos et al., 2018).

Figure 6 presents the diagram of the "Force Field Analysis" in which, through the differences between the organizations in the two sectors, public and private, the implications for the management of processes in both sectors mentioned above are described. The goal of the change is "Achieving successful, ongoing process-based management in public sector organizations", and it is placed in the center of the diagram. The driving forces, i.e. those forces that have the power to help change, are depicted on the left side. Finally, the restrictive forces, that is, the factors adverse to change, are represented on the right side of the diagram (Papadopoulos, et al., 2018).

It is necessary to describe in detail the two types of force. The first one, or rather restrictive, are linked to the political conditions in which the public sector operates and to its complexity. The difficulty derives from the variety of clients that the PA has, as it is much more diversified, because there are cultural contrasts, social objectives and multi-jurisdictional operations. These forces, being that the classified information contained in them is in higher quantities, are fueled by the nature of the processes managed by public organizations (Papadopoulos, et al., 2018).

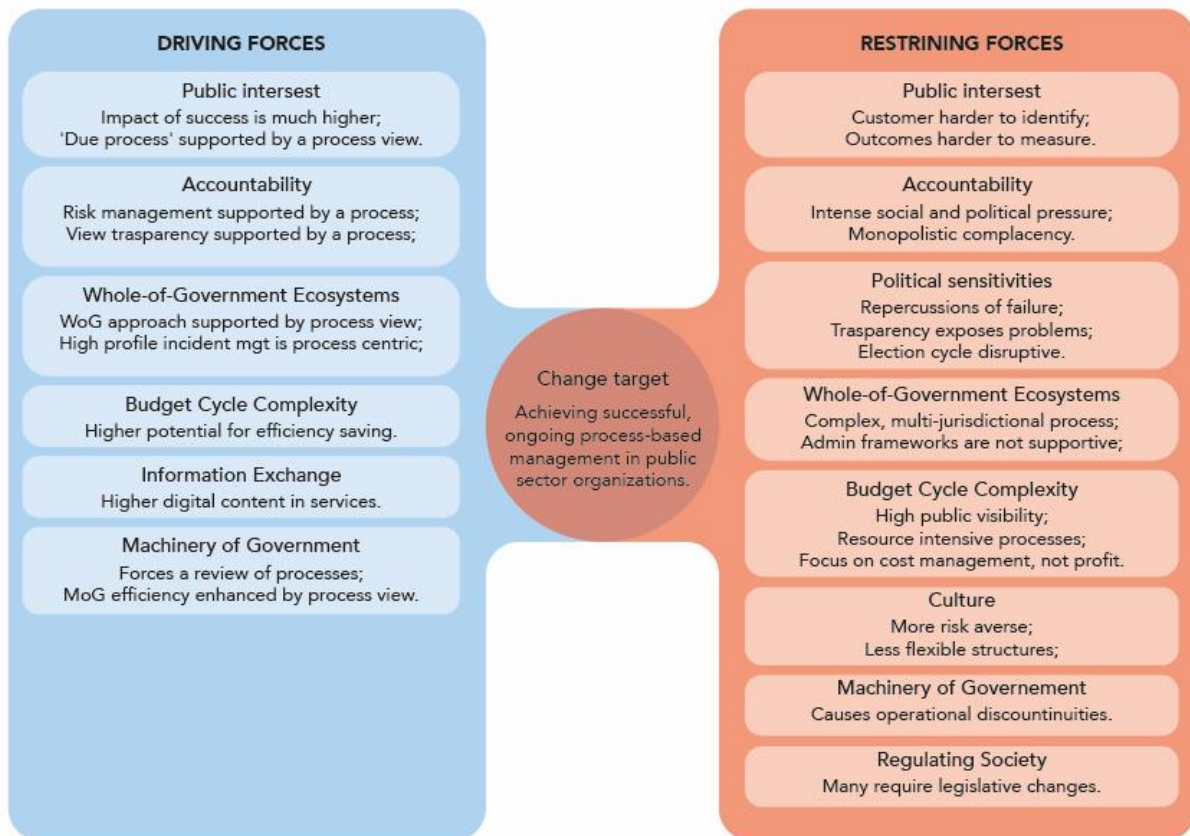


Figure 6 - Force Field Analysis diagram (Tregear & Jenkins, 2007)

On the other hand, there are forces that push towards the implementation of BPM for the public sector, they provide strong incentives for the adoption of process-based approaches. How? By helping to create responsible, transparent, effective and productive public organizations. The BPM also supports many features that the PA needs, such as risk management, transparency, reduction of bureaucracy, the entire work of the government, the efficiency of the change of the "government machine". This methodology allows to provide clear documentation, ownership, responsibility, monitoring, control and continuous improvement of processes, for this reason it is possible to consider it an ally for the modernization of public organizations (Smith & Fingar, 2003).

The two main incentives that push public organizations to implement Business Process Management in their operations are related to: public law and the integration of new information technologies. The first one, related to public law, and more specifically the law, imposes approaches to process management. Up to now, the processes are very much tied to the past with bureaucratic processes that take long time. Today, however,

processes need to be adaptable and rapidly executable to increase the level of services offered by public organizations (Papadopoulos, et al., 2018).

The second one is linked to the integration of new information technologies in public organizational processes. All information systems become practical only when they can add value to business processes. The management of the BP allows to modernize the old public process by integrating information technologies into their management, this allows to make operations more efficient (Papadopoulos, et al., 2018).

In adopting new technology, the public sector has always been slower than the private one. This situation may have some benefits for the public sector because it is possible to select and implement only the best activities that have been tested in the private sector (Papadopoulos, et al., 2018).

Business Process Management provides many advantages, one of them is the ease of customization, this allows to adapt to the BPs of individual organizations and to integrate various IT systems and, in a simple and economical way, sections of the organization. These features improve the ability to create a single vision of the organization, including the operations and systems related to resources (Papadopoulos G.A., et al., 2018).

In the public sector, the main advantage of business process management is that it fights the problem of bureaucracy that causes delays, increases in costs and complexity, and in general makes it difficult for the public organization to function properly. Other important advantages are: (Papadopoulos G.A., et al., 2018).

- The ability to improve the integration of operations and public priorities with resource management.
- The possibility of using creative and innovative approaches to improve organizational performance.
- Since most new implementations are process oriented, process management allows for the effective implementation of modern systems and standard software.
- Adjustment of the policy and strategy with the operational development.
- The increase in transparency and oversight regarding accountability.

- Improvement of the services provided thanks also to an increase in quality and a reduction in costs.
- Faster responses to changes.
- The creation of transparent, streamlined processes better aligns the priorities of central and local governmental, enabling better performance and management of risk and change.
- It allows you to simplify the analysis and improvement of process performance.
- To make the activities standardized. In addition, it helps to facilitate the alignment of activities with the organizational strategy and the implementation of quality management systems.
- Improve coordination between organizational units.
- Provide visibility of the real-time status of the entire processes.
- Improve control over the execution of business processes.
- Facilitate the analysis of activities in organizations by applying BPM tools and techniques that enable simulation on real work in organizations. The models can be used as a basis for the improvement of the business processes of managers and for the automation of the proposed solutions.
- It allows to re-engineer processes and implement unified information systems.

3. METHODOLOGY

This section provides a description of the process addressed to develop the different stages of this work, starting with the literature review and then with the BPM implementation.

The first paragraph talks about the way the literature review was carried on, with the scope of giving a significant background to the present work and to comprehend (i) the digitalization process in a more generic way, (ii) what BPM is and (iii) how it was already studied in the past years and the findings of such studies.

The second part of this section present how the BPM was carried out: it was decided to perform a BPM analysis after the literature analysis since it emerged that conducting the processes digitalization with the BPM is really helpful for the same processes' improvement.

3.1 Literature review

Starting from the first topic of the methodology, that is the part of the literature review, this sub-section discusses how the texts and cases reported above are selected. A research was carried out because the advantages that the research could bring with respect to the analysis of the case studied at the municipality were taken into consideration.

To provide valid research, the existing literature was considered, focusing mainly on the theme of digital transformation in public administration. In particular, making a comparison with the private sector and subsequently considering the specific case of the Italian public sector.

Starting from this topic, subsequently with a cascade analysis that starts from digitization, the research led to an in-depth study of topics related to still very obsolete processes and consequently to business process management and the respective notation for the remodeling of processes.

Definition of Author keywords

To research for the material necessary for the collection of related topics, some keywords have been defined: *Digital Transformation, Digitalization, Public Administration, Public sector, Digital Transformation in Public Administration, e-Government, Public sector*

process, Change, IT adoption, Public sector innovation, Cases of Digital Transformation, Digital Solutions, Digitalization strategy, Business Process Management, Business Process Modeling, Business Process Model Notation, Business Process Management for Digital Transformation, Business Process Management for Public Administration.

Analysis and selection

To select the most authoritative articles to be taken into consideration for the research, the ranking provided by AiG (Italian Association of Management Engineering) was used, which allowed to check the source and the different journals, allowing in the first place to select those considered: gold-star and gold, including the *Journal of business research* and the *International Public Management Journal*, along with others, and sometimes articles considered Silver.

Subsequently, the most recent documents were taken into consideration, giving priority to those of the last 5 years (2016-2021).

Finally, as a last step for the selection of the articles, an abstract reading was made, to evaluate if further research had been carried out but not reported in the previous steps. They were mainly used as a source of confirmation for previously found articles.

To summarize, it has been possible to define around 40 publications and 3 books, consistent with the present work. Particularly, 45% of the articles regards Digital Transformation topic, 45% Business Process Management and 10% are methodology articles.

3.2 Business process management implementation

To investigate which process to digitize, the first step was to decide what activity carry out. The literature review suggested BPM as a sequence of activities needed to do this.

To correctly apply the BPM and the suggested methodology, the following steps were followed:

1. Design and Analysis: To begin, the existing process was analyzed. Subsequently, an assessment of the issues and the impact they have on the process was carried out.
2. Model creation: the existing process has been modeled with the BPMN.

3. Execution: After creating the process model, it was evaluated what changes could be made, making sure to also document the respective reasons that led to these proposals.
4. Possible benefits analysis: Once the implementation of the new process was completed, it was necessary to evaluate the possible effectiveness of the improvements made. To make it, the available data were used, identifying any increases in efficiency, cost reduction and benefits for citizens.
5. Optimization and automation: Once you have applied the BPM methodology to a process, you will need to continue to monitor and optimize it over time. BPM is an ongoing process that needs to be improved periodically. If the new process is working efficiently, try to figure out if other tasks can be automated.

The analysis guidelines were provided in the BPM articles analyzed, which offered the explanation of how to build a solid analysis.

However, the implementation of BPM required identifying a real context in which to develop the research. In fact, the PA needs a lot of process digitization, since many are still analog, to improve its efficiency and keep up with the DT. In the literature review the general context of the analysis was defined, specifically, it is the context of the Italian PA. In the following paragraph, it is going to be illustrated the choice of a case study related the BPM in the case of CDD.

3.2.1 Case study selection

The objective of the analysis was the digitization in a specific case, in order to collect the useful evidence to evaluate the effects it has in the PA.

To assess the possible impacts, it was necessary to identify a specific case of an Italian PA. Moreover, the selected case have to be representative of the reference context or of a common case (Yin, 2009). In fact, three main requirements have been defined to guide the decision:

- Italian PA with DT projects already in progress;
- A broad and well-structured context that offers the possibility of in-depth research;
- Organization available and interested in improving its processes.

An organization that satisfies all the requests and that has been chosen as a case study is the Municipality of Milan (CdM).

CdM is a structured Italian PA that for several years has started its own DT by undertaking and implementing various projects in the field of citizen services and internal services. CdM has experienced a strong push towards digitization and innovation, promoted by various subjects:

- Citizens, who prefer digital services, integration with new technologies such as applications for mobile devices and the possibility of having access to certain services without physically going to the place those services are provided.
- Companies, which compete to offer innovative services and to evolve on new business models;
- CdM Administration, which covers two different roles. On one hand it is an active subject in the supply of digital services to citizens and businesses, on the other it plays the role of government since it has the task of supervising public and private initiatives.

Many projects have already been carried out in the last three years, but many are also still in progress, which have benefited from the DT initiatives promoted by the SIAD Department (Information Systems and Digital Agenda) of CdM.

The commitment and relevance of DT makes CdM the suitable field in which to develop research by operating in a structured context from which to extract real evidence of how the solidity of IT Governance can influence the success of the transformation.

3.2.2 Case study analysis

The use of multiple sources of evidence adds reliability and validity to the information collected by increasing the value of the work (Yin, 2009). In particular, in this research (1) interviews and (2) documents were exploited as means to implement the analysis of the process necessary for proposing possible changes aimed at digitization.

As suggested by Yin (2009), interviews are essential sources of information on case studies and can be structured, unstructured and semi-structured.

To get a complete picture of the situation, of the environments and the possible problems, it was decided to interview several municipal employees, including some

members of the department of social policies and some managers of the municipal day centers (Ferrari A., et al., 2016).

The typology of the interviews used in these works was semi-structured, as the questions were suggested by the determinant model. The interviews were exploited for the analysis of the existing process, and for the understanding of the problems within it.

Moving on to the second point, that is the documents, which can be both public and private, they allow you to integrate data consistency allowing you to conduct a reliable analysis. Private documents such as e-mails were provided directly by the interviewed actors. Instead, the public documents were sent by email from the people directly involved in the execution of the activities of the process, or they were found via the Internet mainly on the CdM website.

Thanks to the two sources, a very in-depth analysis of the process was carried out, giving the opportunity to continue with the suggested improvement and expected benefits phases.

These methodologies, that is the qualitative ones, are appropriate in order to highlight the decision-making processes of the management and the relative effects of the management approaches.

Furthermore, the lack of studies investigating business process modeling in public administrations highlights the need to develop qualitative case studies to gain in-depth knowledge on this topic (Forliano C., et al., 2020).

In qualitative research, the researcher performs a number of different activities, such as interviews, observation, interpretation of documents, and intense self-reflection. All these activities make it possible to understand, reconstruct and interpret the phenomenon of interest and, specifically, it is necessary to employ a variety of perspectives and interpretations to ensure triangulation (Forliano C., et al., 2020).

The research took place through several steps. First, the AS-IS scenario was defined to understand the actual workflow of the CDD process.

Secondly, based on the review of the literature and the information that emerged from the interviews and analysis of the documents, four different stages of the critical process emerged.

Thirdly, on the basis of these critical phases, the key variables and related feedbacks were identified in more depth.

Subsequently, a functional analysis of the possible improvement is produced. In particular, using the proposed improvement a diagram is presented as a TO-BE scenario.

Ultimately a plan is needed to understand which improvements and KPIs are most important to implement quickly and which ones to implement later.

The data collection started in November 2020 and ended in March 2021. The interviews involved managers from both the Municipality of Milan and the CDDs' employees. Having interviewed various key informants at different levels of the enterprise's hierarchy, diverse points of view could be obtained and information that came out from different sources coded and compared (Dumas M. et al., 2018). The interviews took place, through Microsoft Teams due to the pandemic situation which did not allow them to be carried out in the office.

The next chapters will explain in detail the methodology with which all the steps were addressed during the internship, which allowed the carrying out of this analysis.









3.2.2.1 ***Business Process Modeling***

In this chapter we will become familiar with the core set of symbols provided by BPMN. As stated earlier, a business process involves events and activities. Events represent things that happen instantaneously whereas activities represent units of work that have a duration. Also, we recall that in a process, events and activities are logically related (Dumas M. et al., 2018).

The most elementary form of relation is that of sequence, which implies that one event or activity A is followed by another event or activity B. Accordingly, the three most basic concepts of BPMN are events, activities, and arcs. Events are represented by circles, activities by rounded rectangles, and arcs (called sequence flows in BPMN) are represented by arrows with a full arrow-head (Dumas M., et al., 2018).

In the following table, Table 4, all the elements used to diagram the process are described.

Table 4 - BPMN elements

Elements	Description
	Start event.
	End event.
	Activity: Generally, it indicates a task or operation carried out within the process considered.
	User activity: it is a typical "workflow" activity where a user performs the task with the assistance of a software application.
	Automated activity: it is an activity that uses a web service or another application.
	Sequential connector: it is drawn with a solid arrow and is used to indicate the logical-sequential order between activities or events of a process.
	Branch (AND): it defines the points in the process where the flows of activities diverge or converge. This symbol is used to represent parallel activities.
	Branch (OR): it defines the points in the process where the flows of activities diverge or converge. This symbol is used to represent a decision point.

The AS-IS mapping was constructed through the interviews and document analysis conducted to both Municipality managers and employees of the different CDDs.

The first document used is a process flow diagram in which all the phases are described in detail. After the analysis of the document, several meetings with the CDDs' employees are made to understand if the flow is correct. With that evaluation it is discovered that some parts are obsolete. So, it is necessary to redesign the process using the notation described above.

3.2.2.2 *KPIs*

To analyze the possible KPIs to take into account, it is important to follow several steps:

1. Definition of the objectives of the analysis.
2. Identification of the critical success factors for the process.
3. Identification of performance indicators and description.
4. Selection of indicators.
5. Performance measurement, interpretation of the detected values and comparison with the target.

Critical Success Factors (CSF) are defined according to:

- The general business strategy.
- The strategic vision of change, in relation to the BPR project in progress.

On the basis of the critical success factors, the relevant performance dimensions are selected, which have a direct relationship with the company strategy.

Methodology:

- The starting point is the company's strategy and CSFs are identified as determinants of company value.
- The performance dimensions are identified that allow the determinants of corporate value to be measured.

The choice of the metrics of the indicators is rather delicate and requires some preliminary considerations:

1. Identify priorities.
2. Evaluate motivational relapses.

Among all the performance indicators identified, a limited number must be chosen, in order to have a complete and easy-to-manage dashboard.

The assessment on which indicators to consider is based on five criteria:

- Comprehensibility, that is, ease of understanding of the indicator by those who have to use it.
- Measurability, ease of obtaining and processing data for measurement.
- Significance, impact on critical success factors of the process.

- Frequency, consistency between the time horizon of the information detention and the time horizon of the measurement variation.
- Structuring, degree of objectivity of the measurement.

To validate the choice of indicators, coverage must be verified, the verification can be done by CSF or by process.

The indicators selected and inserted in the dashboard must be described in detail and their current values must be measured, using, where available, historical data or collecting the necessary data ad hoc.

3.2.2.3 **Current issues**

The objective of this module is to define a model and a methodology for analyzing and diagnosing business processes in terms of performance determinants and aimed at highlighting the criticalities of the process.

It is possible to distinguish three types of principles for process management:

Cultural principles

- Pervasiveness of process orientation
- Customer-supplier logic

Organizational principles

- Ownership of processes
- Redesign of tasks and roles

Management principles

- Documentation of processes
- Process measurement
- Optimization of activity flows and balance between pull and push logic

The principles of management for processes allow to compare the current functioning of the process with an “ideal” functioning inspired by these principles.

The Determinants model is used to make an evaluation of the process.

- Process performance is determined by a series of variables that characterize and describe the functioning of the process.

- These variables are therefore determinants of the effectiveness and efficiency of the processes.
- The determinants model translates the principles of process management into a check list that analyzes the various determinants separately in order to highlight the main critical issues and opportunities for improvement for each.

The model is divided into 5 determinants: Activity Flow, Organization, Skills, Performance Planning and Control, Technology. Each one is composed by different objects for the evaluation. Subsequently each object is divided into several evaluation criteria, that will be expressed in question form. Each question then is divided into more specific one to understand in a better way the situation.

In order to have a clearer view of the context, each determinant has to be analyzed in detail. The first one, the activity flow, is composed by Activity workflow (or Workflow) and the Logics and procedures used in carrying out the activities (or Logics and Procedures). The first object is evaluated with 3 questions: Is the process flow linear? Do the activities need to be performed in sequence or can they be parallelized or overlapped? Do all the activities in the process add value? However, the second object is assessed with 3 questions: Can the procedures and controls applied be simplified? Are the less critical activities standardized? Are the activities carried out in large batches (batch mode) or in unit batches (continuous mode)?

The second determinant is composed by 3 objects: Macrostructure, Process ownership, Microstructure (roles, tasks, responsibilities). The first one is evaluated by one question: Do the organizational units follow the logic of the process or functions? The second object is evaluated by: Is there a process owner? The last one is assessed by: Are the support activities integrated with the corresponding primary activities? Are simple activities and complex activities carried out by the same resource? Do the actors of the process have the necessary delegation to carry out the activities of the process efficiently?

The Skills are composed by the competences and the saturation of the employees. Each one is assessed by a question: Are the skills required for carrying out the activities consistent with the skills of the processors? What is the saturation level of the people involved in the process?

The fourth determinant is composed by the Performance control strategy and the Methods and technologies used. Each object is evaluated by a question: Is the control model consistent and adequate with the overall business model? Does the company have an adequate system of indicators for measuring the performance of the processes towards the customer? Is the incentive system linked to process performance? Does the company use performance measurement to initiate process improvement activities? Do the technologies support efficient monitoring of process performance?

The last one is composed by the Communication systems and the Control and process technology (ICT, methods and tools to support process activities). The first object is evaluated by: Are the communication systems between the actors of the process effective and rapid? The second one is assessed by: Are the logics of using ICT consistent with the process logic? Are the methods and tools to support the carrying out of the processes adequate?

The question used to analyze each evaluation criteria will be dealt with in the following chapters.

In this empirical case some of the questions and the objects are not taken into account because they are not relevant for the process. In the Figure 7 it is represented the complete map of the model, in the chapter 4.3 it will be represented the map considering only the object used for the analysis.

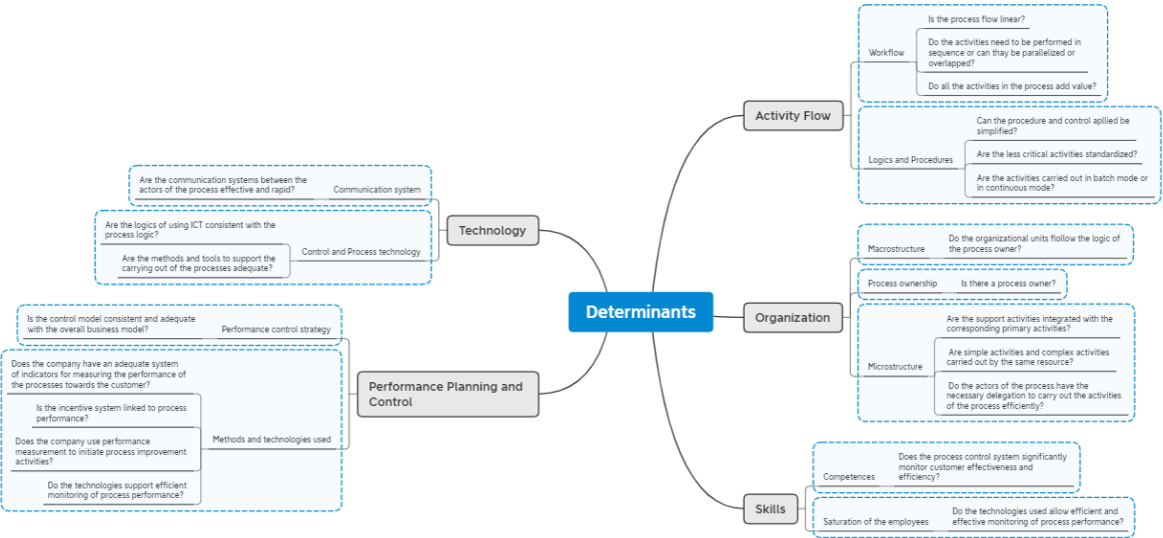


Figure 7 - Determinants' model

After the analysis of the several determinants, it is evaluated the performance of the process through a performance analysis.

Performance analysis can have several objectives:

- *Cognitive*: detecting performance in order to provide qualitative and quantitative elements for the subsequent analysis-diagnosis or redesigning phases of the process.
- *Evaluative*: evaluate the performance of the process in a parametric-comparative way (benchmarking) and analysis of the determinants of performance (analysis of criticalities, diagnosis).
- *Project*: define the relevant performances for process monitoring and related information requirements (Dashboard, Balanced Scorecard).

3.2.2.4 ***Suggested improvement***

After defining which were the critical points of the process, and which KPIs to take into consideration, it was necessary to evaluate which possible improvements to be addressed.

To do this, through meetings with some employees of the DSIAD department, it was evaluated on which parts of the process to make changes.

Through these analyzes, a functional analysis was drawn up.

In Software Engineering, the analysis of requirements is a preliminary activity to the development of a software system, the purpose of which is to define the functionalities that the new product must offer, i.e. the requirements that must be met by the software developed to satisfy the client's needs.

Requirements' analysis is a phase present essentially in all software life cycle models, albeit with different emphases and different connotations.

The requirements analysis is the first phase of the development process and must end with the drafting of a detailed requirements specification that describes the functionality of the new software in their entirety and this specification guides the subsequent phases of development, which overall are aimed at achieving the provisions of this specification.

Given a specification, there are many ways to make it happen. Of course, the choice between the different possibilities is not arbitrary, but is guided both by economic constraints and by the need to achieve adequate quality of the product or of the project itself.

The second phase is instead that of defining the functional specifications or simply the one in which the functional analysis is drawn up. The analysis phase, performed by functional analysts, essentially produces three outputs:

- The design of one or more business processes, that is the more or less complex procedures that implement the application functions.
- The definition of the data dictionary, that is, the set of objects, and their relationships, which are used by the processes previously considered.
- The definition of the navigation logics and the layout of the user interface, i.e. the specifications for the development of the application front end.

The last outputs will be made in the future from the employees of the DSIAD department of the Milan Municipality.

3.2.2.5 *Expected benefits*

To evaluate the possible benefits of the functional requirements' improvement, in relation to the selected KPIs, it has been used an internal model of the CdM. This model is used a lot since the majority of the data of the analog process, necessary to complete it, are already known, and so the model could be completed to understand the possible benefits of the digitization.

However, some problems have been found to calculate the necessary data for the digital process since the digital form of different documents are not already developed and also the time necessary to complete some activities is not known. Also, the time to fill out the different digitized forms is not possible to calculate, consequently, several possibilities are hypothesized.

So, to calculate it, three different solution are made:

- Optimistic view, where the maximum optimization of the time necessary to complete the different steps is taken into consideration;

- Pessimistic view, where the digitization of the different steps of the process do not represent a big advantage for the CdM;
- Realistic view, where a middle solution is analyzed.

3.2.2.6 **Action plan**

The last step was that of defining the order of implementation of the functional requirements and KPIs to start taking into account first.

The definition of the plan starts with the criticality summary scheme that helps to understand which KPI is more important and which part of the process is more critical.

After that, considering the several interviews made in December and the documents received in January from some employees of the Social Policy Department, it is established which part of the process for that two things is more critical.

In the end, making a combination of the scheme and the second analysis, a final evaluation is produced.

4. EMPIRICAL CASE ANALYSIS

This chapter describes the phases that have led to the digitization of the process related to the day centers for disabled (CDD, in Italian Centro Diurno per Disabili) people in Milan Municipality.

This section represents the fundamental part of the research work that led to: (i) the definition of which activities were most critical and; (ii) the definition of how these activities can be digitalized, increasing their efficiency and effectiveness. The analysis has been divided into six phases:

Business process modeling, in which the initial situation of the process is analyzed, and sequentially reported with the Business Process Modeling Notation (BPMN);

1. Key Performance Indicators, where I evaluated which indicators taking into account in order to keep the process under control;
2. Analysis of current issues, in which I describe Milan Municipality's issues.
3. Suggested improvement, in which are expressed the possible improvement solutions;
4. Expected benefits, where the results achieved with the improvement and the KPIs to be taken into account for the constant monitoring of the process are analyzed.
5. Action plan, in order to define the implementation order of the functional requirements.

The remainder of the chapter is organized around these phases.

4.1 Business process modeling

In this chapter, as introduced before, it will be analyzed the initial situation, which correspond to the analysis and the diagram of all the phases of the process.

At this stage, all the activities that were carried out in the process were analyzed, from the request procedure for inclusion in the CDDs to check of attendance and final billing.

In the following diagram, Figure 8, are represented, using the BPMN, all the phase of the process, that is divided in three different actors: CdM, affiliated CDDs, users.

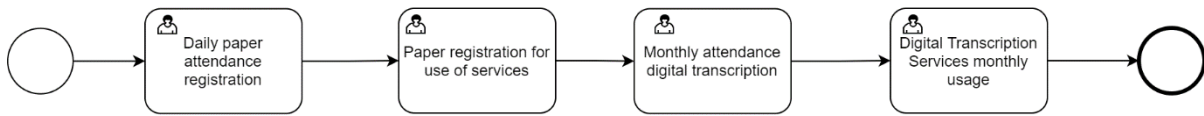


Figure 9 - Attendance registration process AS IS scenario

The citizen, or those who take her place, go to the local social service with the form printed and signed and, also, with the documents to be attached to it. After the delivery of the forms, she waits until the Milan Municipality (that has to control the documentation and has to check the availability of the place in the centre) invites her to make an interview in the Coordination Unit for Day Service, (UCSD, in Italian Unità di Coordinamento Servizi Diurni), or coordination centre. After that, she will be called again for a second interview in the selected CDD and to make the Individual Plan (IP) with doctors. IP will be made every year but also every day the CDD employees will write a daily diary. This document allows identifying the customer's daily health status and to identify the activities that the people have the necessity to make. After that, the citizen could go to the selected Centre to enjoy the experience. At the end of every month, the citizen receives and then has to pay a deposit slip for the usage of the services.

Table 5 shows the time taken to carry out the main phases.

Table 5 - Crossing time of the Request for inclusion in day centres for the disabled

Analog process	
Steps:	Time (min):
Step 1 Fill in the form	20
Step 2 Go to the municipality office	20
Step 3 Interview with UCSD	10
Costs incurred:	Costs (€):
Urban ticket A/R	4
Photocopies attachments / print form	2

The second part of Figure 3 represents the activities of the municipality. In this pool, it was necessary a further division into three different lane for the division of tasks into the various offices.

The first office is the local social service, which has the task of receiving the citizen, having the application form filled out and signed and then checking the documents presented.

During the interview with the municipality employees it emerged that, for the document evaluation and the first interview, the time they take to carry out is forty minutes per user.

The second one is the Coordination Centre, which evaluates the dossier for the selection of the CDD, checks the availability of places in the centre for disabled and summons the citizen for a cognitive interview. In the event that the citizen is placed in an affiliated center, the process continues with the sending of the file to the chosen one. Subsequently, the municipality waits for the communication of attendance by both municipal and affiliated CDDs and then uploads the data quarterly to the Sidi website, which is a site linked to the Lombardy Region necessary to control the service provided to the citizens. The municipal office, before receiving attendance from the affiliated centers, different from the municipal ones, has to send the excel file on which the center has to enter the presences, together with it the CDD sends the invoice to the municipal office.

The third office is the municipal day centre. In this case it was necessary to analyze very carefully every single activity in order to be able to assess where it was necessary to increase the efficiency because, during the interviews, the employees were very unsatisfied about the wasted time. Starting with the analysis of the process, the CDD receives the file of the citizen from the UCSD, calls the citizen for an interview and for the compilation of the individual plan, as well as the health record, which will then be filled in every day. After that, the attendance and services used are recorded daily, in paper format. Next, the presences are uploaded to an Excel file and it is sent to the coordination center that completes, as afore-described, the latest tasks.

Table 6 shows the time taken to carry out the phases of the attendance registration.

Table 6 - Crossing time of attendance registration activities in analog process

Analog Process	
Steps:	Time (min/anno):
Step 1 Paper attendance registration	3900

Step 2 Digital transcription of attendance	720
Step 3 Paper registration of the usage of services	3900
Step 4 Digital transcription of the usage of services	720

Instead, Table 7 shows the times for completing the individual plan, the second step represents the phase in which the IP is compiled the first time, the third one is about the daily diary compilation.

Table 7 - Crossing time of IP activities in analog process

Analog Process	
Steps:	Time (min):
Step 1 Print form	2
Step 2 Filling out the form	480
Step 3 Daily diary	2600

The third part of the BPM concerns the activities carried out by the affiliated day centre, which carry out the same activities of the municipal center. The only additional tasks that the affiliated CDD make, compared to the municipal one, are the receipt of the excel file by the UCSD and then the centre has to send the compiled file with attendance and invoice.

The attendance registration section, in the figure 4, corresponds to the expansion of the "Attendance registration and use of services" tasks of the main BPM, which is also valid for both types of center.

At the end of the process, the coordination centre has to upload the file in the Lombardy Region's platform, and it produces the monthly deposit slip that it fills put manually in paper format and issues it to the citizen who will pay the fee.

4.2 Key Performance Indicators

This chapter describes the procedure according to which the indicators to be used in the process were defined.

First of all, a performance analysis was made, from which the cognitive objective has been defined, noting the performance of the process to provide quantitative elements for the diagnosis phase. Subsequently, it has been important to understand which is the Critical Success Factors (CSF), based on the strategic vision of change relating to this project. Three of them were considered: convenience for the customer, resource efficiency and speed of response.

After defining the CSFs, an analysis has been made to determine the indicators, aimed at evaluating external and internal performance and describing the operating parameters of the process.

A Key Performance Indicator or **KPI** is an indicator of the progress of a business process. It could be divided into 4 categories:

- General indicators: they measure the volume of work of the process.
- Quality indicators: evaluate the quality of process output, based on certain standards (for example, relationship with an output model, or customer satisfaction).
- Cost indicators.
- Service indicators, or time indicators: they measure the response time, from the start of the process to its conclusion.

The assessment on which indicators to consider in the analysis, the five criteria explained in the methodology chapter is considered.

After schematized the process, the next step to understand which stages of the process are most critical is the determination of the different KPIs through which keeping it under control over time.

Through the COBIT framework will be analyzed the first, the second and the fourth type of KPIs, for the third one it is used an internal model of the Milan Municipality. The model is useful to understand the saving cost with the digitization of the process, and the amount of sheet that will be saved. This last saving also brings an environmental

benefit. Furthermore, it analyzes the possible benefits for the citizens, including the reduction of the emission of CO₂.

To make it, it has been found that several indicators in COBIT were very useful both for continuous monitoring of the process and for deciding which phases were critical. In addition, the analysis of certain aspect of citizens' quality of life and respect for the environment was considered very important.

The framework also includes several goals. To determine which goals to analyze, only the indicators that were present in the processes analyzed during the internship were taken into account, and, subsequently, it was evaluated which of them to use.

Below, in Table 8 are inserted which goals will be taken into account for the control, over time, of the process. The table describes the indicator, the type and the reference with respect to the type of goal (enterprise and/or alignment goal) and subsequently to which processes of the framework it is associated.

Table 8 - COBIT's KPI

Cod	Description	Indicator type	Standard references
KPI01	Number of IT incidents that critically affect the process (interruption of service, loss or compromise of personal data, etc.) and trends in the month and year before	Internal efficiency	COBIT AG05 (DSS01, BAI02, BAI03, BAI04, APO08, APO10) COBIT AG02 (DSS05) COBIT EG05 (DSS06)
KPI02	Satisfaction of operators (level %)	Internal efficacy	COBIT AG05 (DSS01, BAI02, BAI03, BAI04, APO08, APO10)
KPI03	Customer satisfaction (level %)	Perceived effectiveness	COBIT AG05 (DSS01, BAI02, BAI03, BAI04, APO08, APO10)

			COBIT EG12 (DSS06, BAI02, APO01, BAI03, APO11, BAI11)
KPI04	Operational risk level of the process (from Risk Assessment)	Efficiency	COBIT EG02 (DSS05)
KPI05	Percentage of complaints on the previous month	Perceived effectiveness	COBIT EG06 (DSS05) COBIT EG05 (DSS06)
KPI06	Measurement of the crossing times of the following stages of the process: - KPI06A Receipt of documentation and practical evaluation - KPI06B Attendance registration - KPI06C Uploading data to sidi	Internal efficiency	COBIT AG08 (DSS06)
KPI07	Number of requests to integrate documentation because it is not fully submitted	Internal efficacy	
KPI08	Satisfaction of the Social Policy Directorate (level %)	Internal efficacy	COBIT EG07 (APO11)
KPI09	Reduction of the average time to insert into the structure	Internal efficiency	COBIT EG10 (BAI08, APO08)
KPI10	Number of innovative initiatives approved	Effectiveness	COBIT AG13 (BAI08, APO08)

About the satisfaction, both of the users, employees and of the Social Policy Directorate, it will be measured through surveys at certain predetermined times, positioned in the most critical parts of the process.

In table 9, the KPIs taken into account from the Municipality model are represented.

Table 9 - Other KPIs

Beneficiary	KPI
Public Administration	Efficient allocation of resources (FTEs)
	Efficient allocation of resources (€)
	Reduction of paper consumption (Number of sheets)
	Reduction of paper consumption (Number of trees)
Citizens	Saving time
	Cost saving
	Reducing CO ₂ emissions

The first benefit for the Public Administration is the efficient allocation of resources, it has been analyzed in relation to both € and FTEs, namely full-time equivalent, that represents a method for uniquely measuring the number of employees in a company for their sizing during personnel planning, so they would end up with many hours available for other tasks including follow the customers of the CDD more carefully.

The other two indicators are linked both to saving in terms of ecological and money saved. They are the number of sheets saved and consequently to the number of fewer trees used for the production of the sheets. Indeed, they also make it possible to reduce the management of paper, which leads to a saving of time.

For the citizens were mainly evaluated 3 indicators:

- Saving time
- Cost saving
- Reducing CO₂ emissions

What are these indicators?

The first one refers to the time of filling the form, it is much greater in the case of paper form, consequently with a digital one the saving time is not indifferent. Another reason of saving time is referred to the number of times to take the public transportation or the car to go to the SSPT. With the digital document the citizen does not have to go the Local Social Service respect to the analog one because the documentation is sent online. The fact that they have not the necessity to go there allow to analyze two more

benefits, the first one is a cost saving, due to the petrol used for the car, or due to the cost of the public transport. The other benefits is linked to the reduction of CO₂.

The process phases in which the indicators have to be analyzed is discussed in the chapter 4.4.

4.3 Analysis of current issues

After choosing which KPI to take into account, it has to be determined which are the critical points of the process. To perform it, several meetings has been held both with the coordinators of different centres and with some employees of the Social Policy Department.

In order to define the critical points of the process, it should be followed the so known “Determinant’s model”, illustrated in Figure 10.

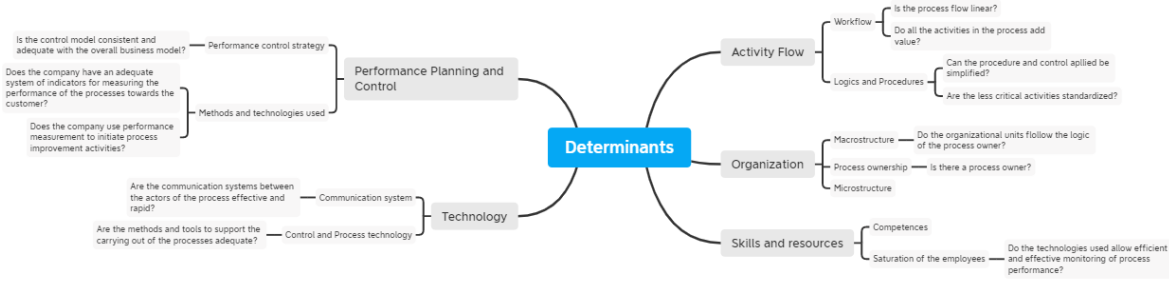


Figure 10 - Determinants’ model in the empirical case

Respect to the model analyzed in the chapter 3.2.3 some questions have not been taken into consideration because they are not related to the process in question.

The questions, in the Table 10, has been asked some to the employees of the CDDs and of the social policy department, for others some evidence has been taken into account, including the flow chart of the activities of the process.

Table 10 - Determinants’ model analysis

Determinants	Object of the evaluation	Evaluation criteria	Questions
Activity flow	Workflow	Is the process flow linear?	Which activities add customer value?
			Are the outputs valuable to the customer?

			Could the activity be avoided by doing the upstream activities better?
		Do all the activities in the process add value?	What paths do the objects treated by the process follow?
	Logics and Procedure	Can the procedure and control applied be simplified?	Is the impact of control operations within the activities justified?
		Are the less critical activities standardized?	Are there standard ways to carry out the activities upstream of the process?
Organization	Process ownership	Is there a process owner?	Are transactions with the customer taken over by a single actor who is able to guarantee their outcome?
	Macrostructure	Do the organizational units follow the logic of the process owner?	How many organizational unit steps occur along a process?
Skills and resources	Saturation of the employees	Do the technologies used allow efficient and effective monitoring of process performance?	Are there any bottlenecks in the process?
Performance Planning and Control	Performance control strategy	Is the control model consistent and adequate with the overall business model?	Are the performance measured in business processes in line with the general objectives of the company?
		Does the company have an adequate	Does the process control system significantly

	Methods and technologies used	system of indicators for measuring the performance of the processes towards the customer?	monitor efficiency and effectiveness towards the customer?
		Does the company use performance measurement to initiate process improvement activities?	Is there a systematic process of reviewing and improving processes based on measured performance?
Technology	Communication system	Are the communication systems between the actors of the process effective and rapid?	Is the information mainly transmitted on paper forms or is it computerized?
			Is the information stored on paper or in a database?
			Do you keep track of every update and verification of the recorded data?
	Control and Process technology	Are the methods and tools to support the carrying out of the processes adequate?	Are there tools for monitoring and controlling process performance?

Using the questions examined before, critical points have been found in the various activities. To analyze which one is more critical, we can follow the scheme in Table 11 where the rows presents the determinants and the linked criticism, and the columns the activities.

Table 11 - Criticism of the activities

Determinants	Criticism	Impact on activities			
		Request for inclusion in CDDs	Attendance registration	Communication with ats application	Filling out individual plan
Activity flow	Unilinear process flow		x		
	Procedure not simplified	x	x	x	x
	Critical activities not standardized	x	x		
Organization	Lack of the process owner				
Skill and resources	Bottleneck activities	x	x		
Performance Planning and Control	Activities not in line with the general objectives	x	x		x
	Not monitored efficiency	x			
	Sub-optimal use of technologies	x	x	x	x
	Lack of quality and time control system	x	x		
Technology	Monitoring and controlling performance	x	x		
	Information in paper format	x	x		x
	Information stored on paper	x			x

After analyzing the activities aspect, the same study has been made regarding the indicators. Table 10 represents the criticism that indicators permits to study: rows presents the determinants and the linked criticism, columns the indicators.

Table 12 - Criticism of the indicators

Determinants	Criticism	Impact on main indicators							
		Lead time customers	Costs for customers	Customer satisfaction	User satisfaction	Department satisfaction	Time to insert customers into the structure	Number of complaints	Lead time municipality operations
Activity flow	Unilinear process flow				x				
	Procedure not simplified	x	x	x	x		x		x
	Critical activities not standardized				x		x		x
Organization	Lack of the process owner						x		
Skill and resources	Bottleneck activities	x			x		x		x
Performance Planning and Control	Activities not in line with the general objectives					x	x		
	Not monitored efficiency	x			x	x	x	x	x
	Sub-optimal use of technologies	x	x	x	x		x		x
	Lack of quality and time control system			x	x	x	x		x
Technology	Monitoring and controlling performance			x	x	x	x	x	x
	Information in paper format	x	x	x	x	x	x		x
	Information stored on paper				x	x	x		x

From the questions is revealed three main problems in the process:

1. Problems of efficiency
2. Problems of satisfaction
3. Paper management problems

Starting from efficiency, which types of problems are observed?

Beginning with the definition of efficiency, it means a peak performance level that uses the fewest inputs to achieve the maximum amount of output. Efficiency requires reducing the number of unnecessary resources used to produce a given output, including personal time and energy¹.

The interviews, made with the municipality employees, have shown that in some parts of the process the time taken to carry out the interview is very high. The motivation for which problems arose was at the heart of the speech.

It turned out that the attendance registration procedure takes place daily in paper mode, entering the data in a diary. After that, at the end of every month the data were put into a file excel to calculate the amount of money to pay and the deposit slip will be issued. After that, the data will be download on sidi, online platform necessary for the communication with ATS (Agenzia di Tutela della Salute – Regione Lombardia).

For this part of the process, fifteen mins/day are used for each diary registration center, then every quarter an additional three hours are spent for transcription on the file to be communicated to ats.

Turning to the second problem encountered, the satisfaction, two different aspect are valuated: customers' satisfaction and employers' satisfaction.

The first one is the customer's perception, that is the offer system of a company has reached or exceed his expectations in relation to the set of benefits and costs relevant to him for the purpose of purchasing and using of that offer. The satisfaction of the users represents the primary goal of every organization oriented to the final market, and the efforts, whose efforts tend to develop an ongoing, stable and lasting relationship with customers, through the search for the satisfaction of its needs, desires and expectations. The basis of customer satisfaction is therefore the creation of value for customers, that is, the satisfaction of their needs in an effective and efficient way.

Regarding this aspect, some users are unsatisfied about the duty to go to the Area Social Service (SSPT) to fill and to sign the form, because it involves the use of a lot of time and costs for them, which can be petrol and/or tickets for the use of public transport.

The second one corresponds to the employee satisfaction.

Worker survey are useful to understand several aspects, linked to satisfaction, employee engagement and confidence. It has been observed an high unsatisfaction about the attendance registration in the day centres, because the employees use a lot of time to copy the data into the excel file, also they were disappointed about the amount of paper utilized. They mark the attendance in a diary, to make it they have to

use a sheet per day per CDD. In addition to this aspect, it was also quite complex to keep under control the affiliated day centres, which use a diversified method that is difficult to control by the Municipality. CdM receives the excel file monthly with the attendance transcribed.

The third problem, as mentioned above, is paper management. This issue can be found at various points of the process.

Paper management, due to the millions of annual photocopies of modules, reduces efficiency, it has a number of hidden costs that both companies and the municipality itself prefer to ignore in order not to face change. They are due to various aspects, it may be the time taken to send and/or receive documents by traditional mail, another reason may be the time taken to send and/or receive documents by fax. Other reasons why paper management could take longer is printing/photocopying documents and subsequent archiving. In addition, there are costs of changing the toner, paper for both printing and wasted paper due to printing problems. In that particular case the main problem is the time spent to send the forms to the different office to continue the process.

In this particular process, the problems are due to the printing of forms for the registration of citizens within the centres, which take eighteen pages per request, an excessive amount of paper is used also for the individual plan that is composed by eleven pages, and it is used for each user. The amount of customer that every year use the CDDs is 850 between municipal and affiliated centres, consequently more than 8500 sheets per year are used.

4.4 Suggested improvement

After investigating what could be the most critical issues in the process, it has been analyzed in which parts of the process these problems impacted more. Hence, it turned out that 3 parts were very critical: registration form, attendance registration and "individual plan" form.

The first criticism is due to the problems of the citizens to go too times to the SSPT, or other office, because they spent a lot of minutes to go there, and, they spend money to go there.

The second one is divided into two part: Implementation of attendance registration and communication with ATS application. Employees, during the interview, have pressed a lot on this part of the process because they are not able to keep under control the attendance in the affiliated centers, and because with this system the time taken is too much, also due to the transcription. The second objective of the attendance detection system is to allow subsequently the facilitation of communication with the ATS application.

The third issue is revealed critical because, after checking all the documents used in the CDDs, is emerged that IP is the most relevant document, and it is composed by 17 sheets per form. Considering the number of people that use the Day Centres, 858 citizens, the users explain their problem with the management of paper.

The following table shows the functional requirements required to improve the process. However, what is a functional requirement?

A functional requirement, in the field of software engineering, is a requirement that defines a function of a system of one or more of its components, defining the type of inputs and outputs, as well as the behavior.

Table 13 explain the functional requirement to improve the critical part explained in this chapter.

Table 13 - Functional requirements

CODE	NAME
REQ1	Digitization of the request for inclusion in day centres for the disabled
REQ2	Attendance detection system implementation
REQ2A	Communication with ats application
REQ3	Digitization of individual plan

To ensure that the preceding table is developed correctly it is important to explain which steps are taken into account within each requirement. In order to achieve this result, a functional analysis has been carried out.

Functional analysis is the stage of the software development process during which the processes that make up the analyzed information system are described; it is the activity

through which the specifications of the software components to be realized within the computer system are obtained.

For each requirement is described the goal to be achieved and the various steps that are taken into account, and the BPMN to describe the process. After that, each step is analyzed, explaining what the goal is, the description, the actors involved and the BPMN of that particular step.

4.4.1 REQ1: Digitization of the request for inclusion in day centres for the disabled

Objective:

The "Request for inclusion in CDDs" service provides citizens residing in the municipality of Milan the opportunity to apply for inclusion in the Day Centres for the Disabled.

The primary purpose is to provide a more efficient service both for the municipality of Milan, through the reduction of paper management, and for citizens.

Steps: Below are reported the steps necessary to allow the compilation complete to filling out the application form within the CDDs.

- Start
- Step 1: Filling out the form.
- Step 2: Receiving form.
- Step 3: Document evaluation.
- Step 4: Evaluation of the proposal.
- Step 5: CDD Selection.
- Step 6: Interview with the family + form signature.
- End

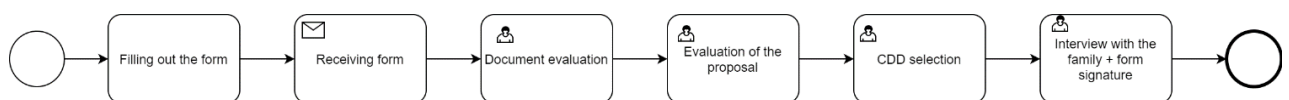


Figure 11 - Request for inclusion in day centres for the disabled

STEP 1: Filling out the form.

Objective: Transpose the "camicia" and "scheda utente" documents into a web form, possibly review the structure to increase the efficiency of the process, it has to allow the compilation and sending of the document directly remotely.

Description: The citizens download the form from the web, fills it out in digital format and then sends it to the Local Social Service.

Actor: Citizen

BPMN:

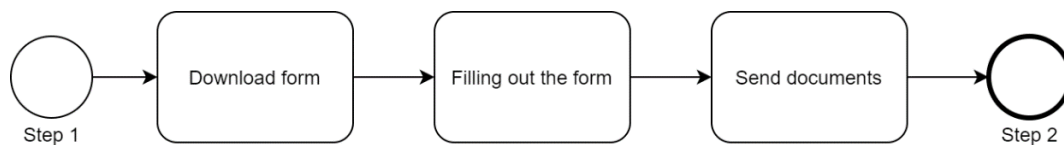


Figure 12 - Filling out the form

STEP 2: Receiving form

Objective: Receive the digital form submitted by the citizen.

Description: The citizen and/or the tutor of the citizen downloads the document from the web, fills it in and sends it to the SSPT that receives the documentation and starts the process of insertion.

Actor: SSPT

BPMN:



Figure 13 - Receiving form

STEP 3: Document evaluation

Objective: The SSPT is responsible for assessing if the documentation received is complete.

Description: The SSPT, after receiving the form completed by the citizen, evaluates all the documents. In case the documentation is not complete send an integration request for the missing documents.

Actors: SSPT

BPMN:

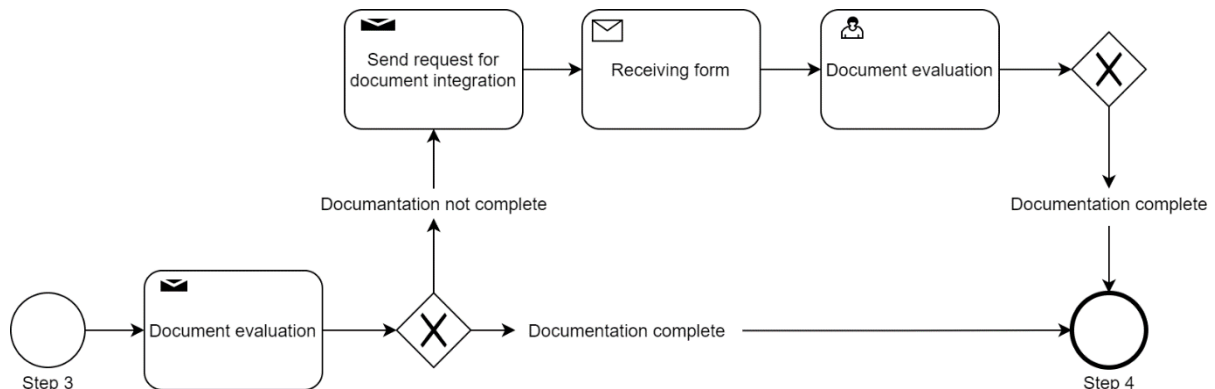


Figure 14 - Document evaluation

STEP 4: Evaluation of the proposal

Objective: Assessment of the requirements for admission within the Day Centres for the Disabled.

Description: The coordination centre receives the file. After that, the assessment of the requirements, of the citizen, necessary for inclusion in a CDD begins.

Actor: Coordination Centre

BPMN:

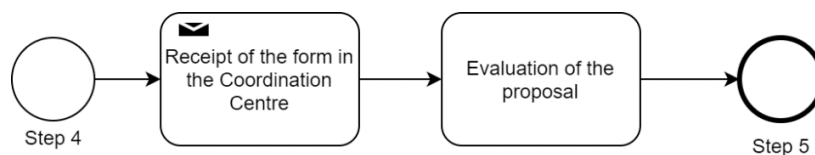


Figure 15 - Evaluation of the proposal

STEP 5: CDD selection

Objective: Select the CDD that is consistent with the requests of the citizen or the citizen's guardian. Then periodically check the availability of the chosen center.

Description: The coordination centre, depending on requests of services, including transport, timetables and opening time, selects the centre where the citizen needs to be placed.

Depending on the CDD selected, the coordination centre assesses its availability. In the event that the Day Centre for disabled people did not have available places, the citizen would be placed on the waiting list.

Actor: Coordination Centre

BPMN:

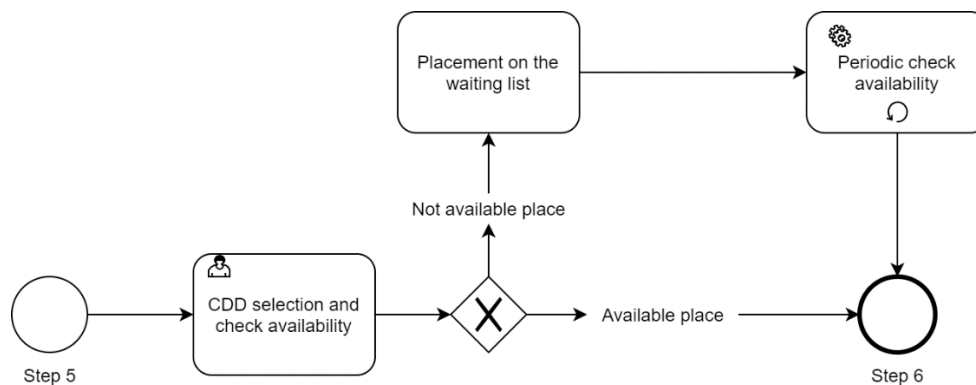


Figure 16 - CDD Selection

STEP 6: Interview with the family + form signature

Objective: Take an interview with the family and allow the citizen to sign the application document.

Description: The coordination centre supports an initial cognitive conversation with the family. During the interview, the Centre allows the citizen to sign the form submitted.

The citizen, after providing all the information necessary for the compilation of the application form, signs electronically through one of the following methods to be evaluated: electronic identity card, tablet, SPID or graphometric system.

The document may be signed by the requesting citizen or family members as appropriate. The document is then signed by the SSPT manager and the social worker.

Pending an electronic signature method, the document can be printed and signed in the local social service.

Actors: Coordination centre and citizen

BPMN:

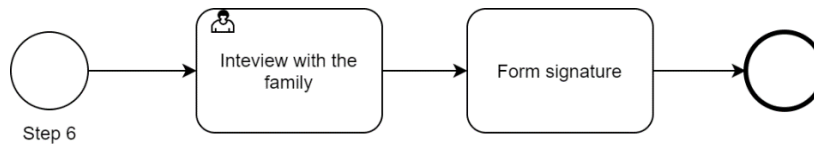


Figure 17 - Interview with the family + form signature

4.4.2 REQ2: Attendance System Implementation

Objective: Reducing the time and the paper used to record the presence of users in the CDD through the use of mechanism (such as a badge or an application that can be used through tablets) that allow to automate the system. These mechanisms could also be implemented for detecting the use of other services.

It allows to reduce the management of paper material and the reduction of control times.

Steps:

- Start: User arrives in the CDD.
- Step 1: Automating attendance detection system.
- Step 2: Automating canteen and transport service usage detection.
- Step 3: Automating usage detection other additional services.
- End

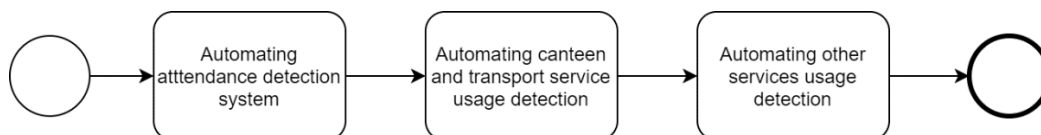


Figure 18 - Attendance System implementation

STEP 1: Automating attendance system

Objective: Automate the system of detecting the presence of users in the centre that allows to reduce the use of paper and simplify the detection process.

Description: CDD employees will take care of the recording of the user's presence through an automated system. The possible options to evaluate are badge or application on tablet.

Actors: CDD Employee

BPMN:

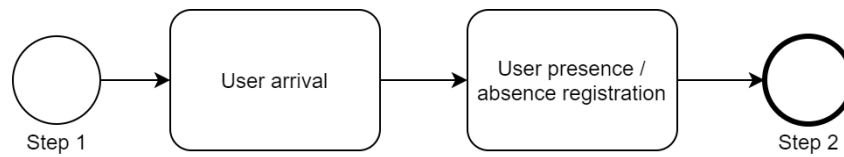


Figure 19 - Attendance system

STEP 2: Automating canteen and transport service usage detection

Objective: Simplify the system for detecting the use of canteen and transport services.

Description: CDD employees, as carried out for the presence, they will take care of the registration of the use of the two canteen and transport services through an automated system. Both services, regardless of usage, are included in the monthly reporting.

Also, for this process the options to be evaluated are the same as in the previous step.

Actor: CDD Employee

BPMN:

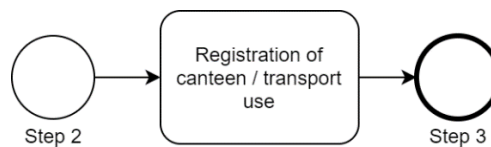


Figure 20 - Canteen and transport service use detection

STEP 3: Automating other additional services usage detection

Objective: Simplify the system of detecting the use of additional services.

Description: As for canteen and transport services, the employees will use the same automated device to record the use of them.

The additional services correspond to all those services that are not included in the fixed monthly compensation but are entered later.

Actor: CDD Employee

BPMN:



Figure 21 - Other additional service use detection

4.4.3 REQ2A: Communication with ats application

Objective: By the automating of the attendance and service usage system has to output a digitized document that complies with the request of the Sidi website. After that, it is important to make a web service to directly communicate with ats application.

Steps:

- Start
- Step 1: Download attendance files.
- Step 2: Direct application integration.
- End

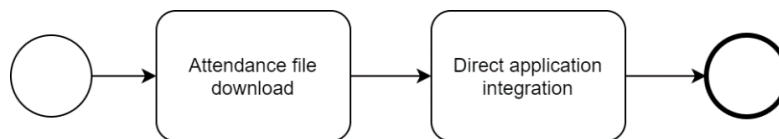


Figure 22 - Communication with ats application

4.4.4 REQ3: Digitization Individual Plan

Objective: Collect data and manage through application and not through paper. Create a link between the individual plan document and the detection of both canteen/transport services and additional services.

Steps:

- Start.
- Step 1: Compiling Personal Data.
- Step 2: Compiling medical area information.
- Step 3: Compiling motor area information.
- Step 4: Compiling Cognitive Area Information.
- Step 5: Compiling relational member area information.
- Step 6: Entering autonomies area information.
- Step 7: Entering quality of life area information.

- Step 8: Insert weekly schedule of activities.
- Step 9: Signature document.
- End.

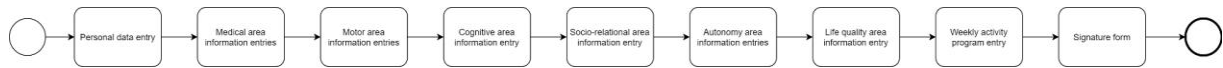


Figure 23 - Digitization Individual Plan

Taking into account the functional analysis described above, it is possible to replace the analyzed parts into the “As is” diagram to make an improved representation, called “To be” with the BPM notation.

In the process, in addition to the modify produced in the functional analysis, some dots have been inserted into well-defined steps. What do they describe? They serve to determine in which parts of the process it is necessary to analyze some KPIs which, as explained in the previous chapters, will serve to keep the process under control.

It is possible to make a distinction between three different types of dot: blue, that will serve to analyze in which part of the process to evaluate the satisfaction of municipal operators; orange, which will be used to establish in which part of the process to evaluate the crossing times of the activities; and lastly greens that will serve to analyze the satisfaction of citizens.

Why analyze KPIs at these certain points? Because they are the points of the process, as described in paragraph 4.3, that cause more efficiency and dissatisfaction problems.

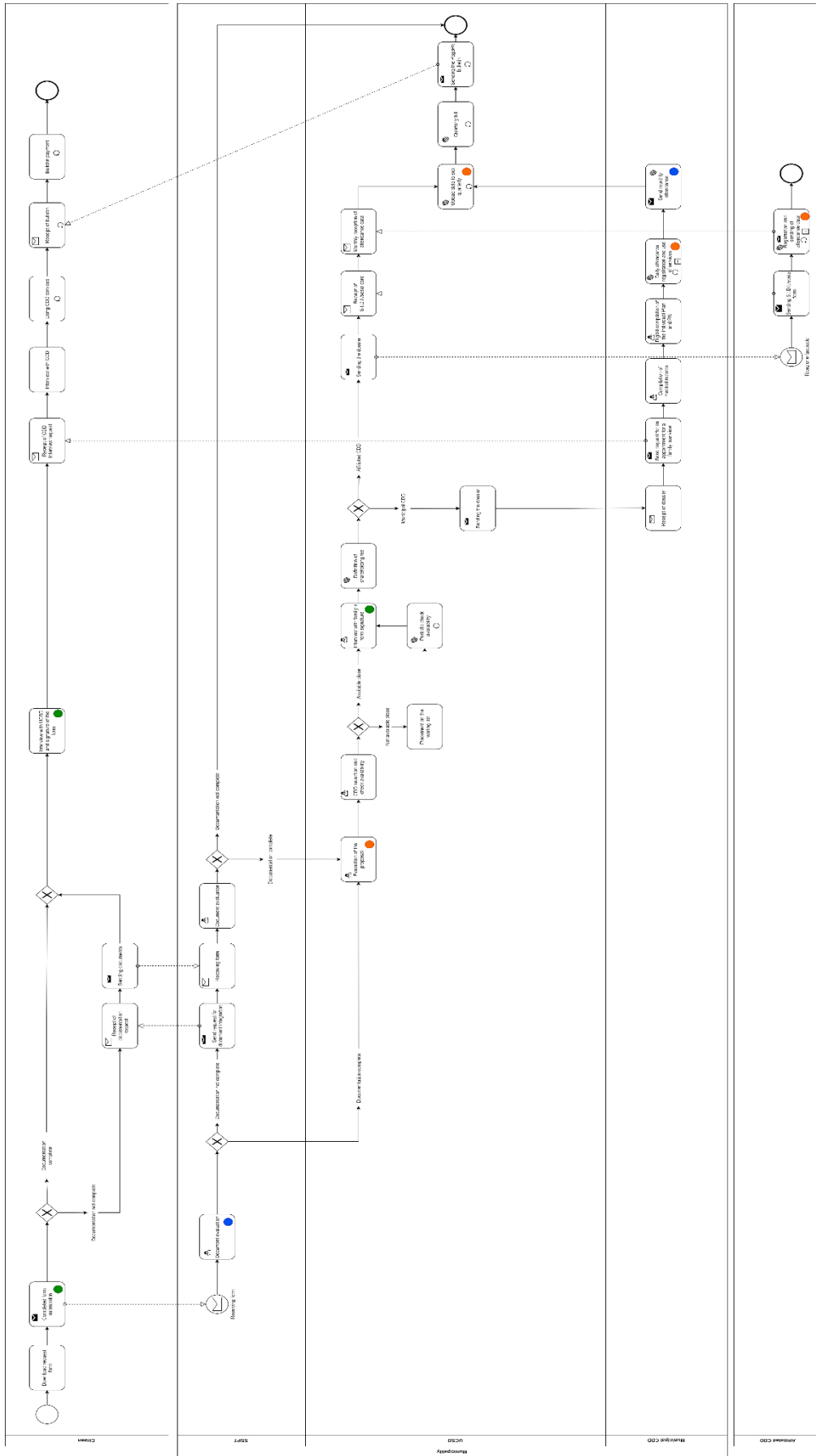


Figure 24 - TO BE diagram

Attendance registration and use of services
municipal CDD

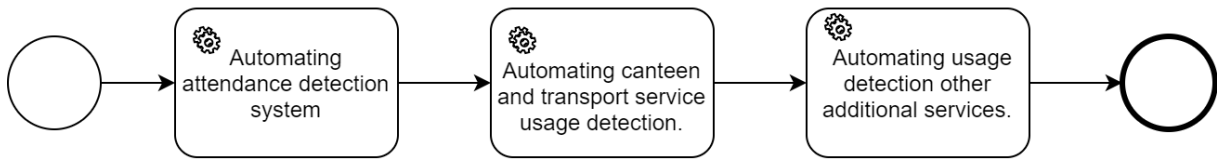


Figure 25 - Attendance registration municipality CDD

Attendance registration and use of services
affiliated CDD

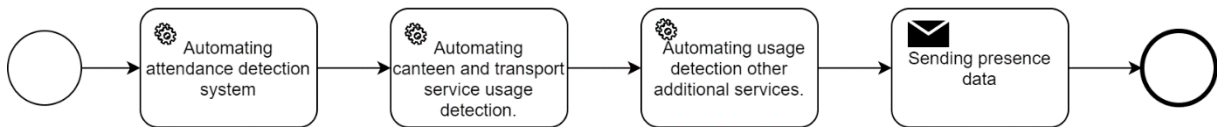


Figure 26 - Attendance registration affiliated CDD

The previous figure depicts the process “To be”.

Analyzing the three types of dots:

- Green: They will be evaluated by adding one/two questions during the compilation of the first application, and then during the first interview with the coordination center. In these two phases they will serve to evaluate if these improvements make the process more efficient and if more problem are encountered.
- Orange: They are entered in the first part of the process, until the document arrives to the coordination centre to evaluate how long does it takes, if anomalies are found, which causes a higher number of document requests than the “As is” process, and consequently a higher time lost.
- Blue: They are entered in different steps, the first one is the moment in which the municipality office receives the documentation from the users, to analyze, as explained before, if more problem are encountered with the integration of the document, that leads a higher amount of work which causes an increase of wasted time. In addition, in this part of the process, the questionnaire provided to employees helps to assess if the communication with the UCSD is improved and facilitated. Lastly, the employee satisfaction will be evaluated during the attendance and use of service registration. As expressed in the methodology paragraph, the satisfaction will be analyzed with some questions during the registration.

4.5 Expected benefits

This chapter will discuss the possible benefits that digitization, of the various stages of the process, can bring.

To evaluate the possible benefits of the improvement of the functional requirements, in relation to the KPI expressed in the chapter 4.2, it has been used the internal model of the CdM because there are all the data to compare the results between the analog and the digital process.

For all three KPIs, only the first functional requirement was taken into account, because the other two do not impact on them.

In order to calculate the benefits of digitization, three visions were taken into account:

- Optimistic view, which assesses the maximum improvement that can be achieved from these changes. It has been considered that 100% of users use the digital service rather than showing up at the SSPT to fill out the form. In addition, it is taken into account that the reduction in time for recording attendance is about a third compared to paper registration (eliminating the time for transcription in digital format) and finally that the reduction for the compilation of the individual plan is about a half.
- Pessimistic view, it takes into account the minimum improvement that can be achieved from these changes. It is considered that only 10% of users use the digital format compared to the paper format to fill in the application. In addition, it has been taken into account that the reduction in the time for recording attendance in the various centres is due only to the absence of transcription, considering that the time required for registration is the same for both digital and paper format.
- "Realistic" vision", is a vision in the middle of those described above. It was considered 50% of the use of the digital service While an intermediate reduction in timing, equivalent to approximately half, has been considered for attendance.

The three visions are explained in more detail below.

Optimistic view

For each requirement, input data is reported, which corresponds to the number of activities performed in a year or the number of centers used and the timing for each task.

Per quanto riguarda il requisito 1, come primo dato viene inserito il numero di richieste effettuate nei tre anni presi in considerazione.

Number of requests to enter day centres for the disabled:

- 2017: 68 requests
- 2018: 57 requests
- 2019: 73 requests

Subsequently, the tasks are divided between the citizen and the municipality employee ones, in which is possible to see the difference between the crossing time in the two different cases (analog and digital).

Table 14 - Digitization of the request for inclusion in day centres for the disabled (Benefits for citizen) optimistic view

Digital Process	
Steps:	Time (min/year):
Step 1 Download form	2
Step 2 Filling out the form	10
Step 3 Interview with UCSD + signature	10
Costs incurred:	Costs (€):
Urban tickets cost A/R	0

Subsequently, as previously mentioned, the digital and analog process cases were inserted with the crossing times for the various activities carried out by the employees of the CdM.

Table 15 - Digitization of the request for inclusion in day centres for the disabled (Benefits for the public administration) optimistic view

Digital Process	
Step:	Time (min/anno):
Step 1 Documentation evaluation	30

Turning to the second functional requirement, however, no distinction has been made between the advantages for the PA and the advantages for the citizen because, as already explained above, this requirement impacts only on the PA.

Below the data of the number of centres used each year, to support people with disabilities and the time of the various steps, are expressed.

As input, the number of CDDs that is equal to all years and corresponds to 40 is taken into account.

Table 16 - Attendance registration optimistic view

Digital Process	
Steps:	Time (min/year):
Step 1 Attendance registration	1300
Step 2 Service usage registration	1300

For the digitization requirement of the individual plan there are advantages only for the CdM, because it regards only the compilation of parts fill in by the employee of the CDD.



The number of people on the various CDDs each year is 848 people. Below are the crossing times of the various phases.

Table 17 - Filling out individual plan optimistic view

Digital Process	
Steps:	Time (min):
Step 1 Fill out the form	320
Step 2 Daily diary	1733,33

With the data reported above, it was possible to make an analysis of the benefits, in terms of the indicators reported previously.

Table 18 - Expected benefits optimistic view

Beneficiary	KPIs	2017	2018	2019
 PA benefits	Efficient allocation of resources (FTEs)	12,3	12,3	12,4
	Efficient allocation of resources (€)	369.672 €	369.636 €	373.028 €
	Reduction of paper consumption (# sheets)	30.572	30.363	30.767
	Reduction of paper consumption (trees)	0,4	0,4	0,4
 Citizens benefits	Saving time (minuts)	da 0 min a 28 min per trip	da 0 min a 28 min per trip	da 0 min a 28 min per trip
	Cost saving (€)	da 0€ a 6€ per trip	da 0€ a 6€ per trip	da 0€ a 6€ per trip
	Reducing CO2 emissions (T di Co2)	0,011	0,009	0,012

From the table 18 it is possible to see how an optimistic view of improvements leads to excellent benefits. There would be considerable savings, over three hundred and fifty thousand euros per year, which corresponds to the work of more than twelve people.

In addition to this advantage, it is possible to ascertain how many sheets per year would be saved: about thirty thousand; through the digitization of the initial request forms, the sheets necessary for the registration of attendance and the sheets necessary for the individual plan. They also represent an improvement on the environmental impact because each year they would lead to a saving of 0.4 trees.

For the citizens is possible to observe that they could save around thirty minutes, between filling out the application form and the time to go into the presence of the local service, which would lead to saving up to six euros and a reduction of the emission of CO₂, although minimal still great for the environment.

Pessimistic view

After the optimistic view, it is necessary to analyze the worst situation that could occur. In this particular case, compared to the previous vision, it is possible to see that only the timing on registering attendance and completing the form of the individual plan varies, the remaining steps remain unchanged.

As described above, it takes into account a reduction in time, compared to the analogue process, very low. As can be seen in Table 19, compared to table of the same activities with the timing of the analog process, it takes into account that the recording of the presence through the digital method is identical to the paper method, this leads exclusively to the deletion of the transcription from paper to digital.

Table 19 - Attendance registration pessimistic view

Digital process	
Step:	Time (min/year):
Step 1 Presence registration	3900
Step 2 Registration of the usage of services	3900



For the compilation of the PI, the time to fill in the form is the same of the paper format, taking a person with difficulty in using a computer, or other electronic device, and who takes the same time to complete the individual plan in digital format.

Table 20 - Filling out individual plan pessimistic view

Digital Process	
Step:	Time (min):
Step 1 Filling out the form	480
Step 2 Daily diary	2600

Table 21 shows the results of including the data described above in the model.

Table 21 - Expected benefits pessimistic view

Beneficiary	KPIs	2017	2018	2019
 Benefits PA	Efficient allocation of resources (FTEs)	0,6	0,6	0,6
	Efficient allocation of resources (€)	19.274 €	19.270 €	19.282 €
	Reduction of paper consumption (#sheets)	29.409	29.388	29.519
	Reduction of paper consumption (trees)	0,4	0,4	0,4
 Benefits Citizen	Saving time (minuts)	da 0 min a 28 min per trip	da 0 min a 28 min per trip	da 0 min a 28 min per trip
	Cost saving (€)	da 0€ a 6€ per trip	da 0€ a 6€ per trip	da 0€ a 6€ per trip
	Reducing CO2 emissions (T di Co2)	0,001	0,001	0,001

These results show that the effects are much lower than the case described in the previous vision. In particular, the part concerning the efficient allocation of resources stands out, both in terms of euros and, of course, in terms of FTEs. The result is more than three hundred thousand euros.

"Realistic" vision

This latest analysis uses data that we consider more realistic, obtained as a middle ground between the two extreme visions.

It has included that 50% of people who require entry into one of the structures use the digital form while the other half continues to use the tools already present. Consequently, to evaluate the reduction in the time required to fill in the form, an average was made between the two variants, as shown in the following table.

The possibility that some operators are not 100% efficient with digital devices has also been analyzed for presence recording and so it would not be possible to obtain a reduction of a third, as in the optimistic view, but a lower one.

Table 22 - Attendance registration realistic view

Digital Process	
Steps:	Time (min/anno):
Step 1 Attendance registration	2600
Step 2 Registration of the usage of services	2600



As regards the third requirement, as for the previous ones, a more realistic approach was used with a moderate reduction in the time required to fill in the form and the daily diary.

Table 23 - Filling out individual plan realistic view

Digital Process	
Steps:	Time (min):
Step 1 Filling out the form	400
Step 2 Daily diary	2000

The table 24 shown later expresses the results obtained from the latter assessment.

Table 24 - Expected benefits realistic view

Beneficiary	KPIs	2017	2018	2019
 Benefits PA	Efficient allocation of resources (FTEs)	8,0	8,0	8,1
	Efficient allocation of resources (€)	240.349 €	240.331 €	242.572 €
	Reduction of paper consumption (# sheets)	29.926	29.822	30.074
	Reduction of paper consumption (trees)	0,4	0,4	0,4
 Benefits Citizen	Saving time (minuts)	da 0 min a 28 min per trip	da 0 min a 28 min per trip	da 0 min a 28 min per trip
	Cost saving (€)	da 0€ a 6€ per trip	da 0€ a 6€ per trip	da 0€ a 6€ per trip
	Reducing CO2 emissions (T di Co2)	0,005	0,005	0,006

From it is possible to assess how the results obtained are more reasonable than the optimistic view, and less drastic than the pessimistic one. According to this vision, you would have a saving of just under two hundred thousand euros per year that corresponds to the work of 6.5 people, so a considerable savings.

The number of sheets saved is also not insignificant, in fact in three years ninety thousand sheets would be saved, which correspond to 1.2 trees.

For citizens a distinction would be made, in one hand a half could save money and time as described in the optimistic view, in the other hand the others continue to use the analog process, consequently they have not a cost and time saving. would go to support this expenditure.

4.6 Action plan

To conclude the analysis of the process, it is necessary to make a plan to decide in which order the functional requirements it is better to implement. The sequence is established understanding the priorities for the Municipality.

The table 25 represent the order in which is advisable to implement the different requirements. For each requisite is also expressed a motivation to understand the order.

Table 25 - Requirements' plan

Order	Functional requirement	Motivation
1	Attendance System Implementation	It is the most critical phase of the process. Employees have put a lot of pressure on it because it wastes too much time between

		paper and then digital registration. In addition, it is a useful part of the process for the subsequent implementation of the functional requirement 2A.
2	Request for inclusion in day centres for the disabled	This requisite does not have a noticeable impact on cost saving but it has influence also for the citizen. As this is a service that is provided to people with disabilities, it is very important to provide the most efficient service possible.
3	Digitization of individual plan	It has a great impact on the reducing of the number of sheet and also in the time used to fill out the PI, but it does not impact on citizens.
4	Communication with ats application	It is very difficult to implement because it depends on the possibility of ats application, it could be difficult to establish a directly communication.

After that, it is important to establish which KPIs is important to keep under control as soon as possible, and which one is possible to take into account later, because is more difficult to implement or because the phase of the process will be implemented in a second moment.

Table 26 - Indicators' plan

Order	KPIs	Motivation
1	User satisfaction (level %)	As for the application for the CDD the KPI is very important because impact on the customers.
2	Reduction of the average time to insert into the structure	It is a KPI already taken into account, so it is important to calculate the new time to insert an user in a Daily Centre to understand if the

		digitization of the application form makes the process more efficient.
3	Number of IT incidents that generate critical issues on the process (service interruption, loss or compromise of personal data, etc.) and trends in the previous month and year	It is an important indicator to understand the security of the data of the citizens and the problems of the service provides. It impacts on the CdM, because this kind of problem could cause wasted time, and as already said, on the citizens.

However, the motivations presented in Table 19 and Table 20 are not the only ones, since to decide the order, the table about the criticism of the activities and the indicators has been taken into account.

To summarize the digitization of the several phases of the process, the starting point was the understanding of the initial situation, how the activities has been made and how long do they take. The analysis of all the stages of the three different actors (citizen, Municipality of Milan and CDD affiliated) has been made, starting from the application form to the deposit slip to pay every month.

Once defined them, the KPIs to analyze the process have been chosen. To select which one is more adapted to use it is taken into account the COBIT framework and an internal model of the CdM. After that, using the initial situation and the KPIs chosen an analysis of the current issues was made. During that evaluation has been found three critical point: the request for inclusion in day centres for the disabled, the attendance registration and the filling of the individual plan. Starting with these problems, a functional analysis has been made to purpose the possible improvements in the several stages.

Later, an evaluation of the expected benefits was made, using the internal model of the Milan Municipality. Three different cases have been studied: optimistic, pessimistic and realistic vision. Lastly, an action plan to decide in which order implement the requirements has been made.

5. CONCLUSION

This last chapter is aimed at the conclusion of the thesis, it is divided into three sections: The limitations and possible contributions on possible future research on the subject and the management implications deriving from this research. In addition to these, the research work supported with this thesis is also summarized.

5.1 Managerial contribution

In this subchapter the theoretical contributions represented by the research of the already existing literature are expressed.

Digital transformation is a phenomenon that affects all sectors, both public and private, including the academic communities, and for this reason there is a strong interest in that subject.

However, in public organizations DT is still far behind, due to the present barriers and processes structured with non-advanced technologies. Indeed, the literature has made it possible to understand how it is possible to modify processes to allow an acceleration of digitization in this sector too, with the use of Business Process Management.

The BPM would have two functions, the first is to evaluate the criticalities of the processes, understanding the impact they have on citizens and in the communication between the various offices, the second is to reshape the process allowing a better understanding and facilitating its digitization through the use of standard notations such as BPMN.

The contributions that this research provides allow us to expand our knowledge of possible new technologies and how to implement BPM within this very rigid sector.

The analysis of these texts allowed the observation of two results.

The first aspect, relating to the digitization of the PA in Italy, has allowed us to see how the Public Administration is far behind from the point of view of digitization, and in particular how in Italy the problem is much wider, as can be seen from the various DESI indicators of 2020.

Secondly, the study has shown how a correct implementation of BPM can facilitate the DT of the PA processes, which is still far behind the current standards that new

technologies allow. This set of activities, indeed, allows in a sector in which the sudden technological changes that occur with the new technology do not impact quickly, as for the private sector, it can facilitate the achievement of certain objectives that would make the processes faster and under control. The BPM software, indeed, should allow to speed up and simplify the management and improvement of business processes. To achieve these objectives, a BPM software must monitor the execution of processes, allow managers to analyze and change technology and organization based on concrete data, rather than based on subjective opinions.

To summarize, the research highlighted the impact Business Process Management would have in the PA. The results note the correlation between the changes that the use of BPM brings and the success of DT, offering the opportunity to overcome the difficulties of change with specific changes that these activities suggest.

5.2 Managerial Implications

The work supported makes it possible to help public administration managers to manage the digitization of various organizations through the use of BPM.

In particular, as explained in chapter 3.2, the BPM allows to follow specific steps as a guideline to allow to standardize certain procedures to digitize processes. Furthermore, this series of activities have been developed and modified over time, starting from Business Process Reengineering, by specialists from various sectors, this allows the practices aimed at this end to be made optimal.

As shown by the case analysis of the process studied, the implementation of the BPM and the subsequent functional analysis require six different phases that allow the digitization of the process leading to the benefits discussed. Public managers could also start managing other processes of organizations by evaluating the most significant objectives for their context by setting a target level of digitized processes that is achievable by implementing processes that are still totally analogous. Thanks to specific KPIs, developed in process management, managers can monitor processes and activities while maintaining the adequate level of service.

The research results are a useful tool to help them guide the DT of their context.

5.3 Limitation

From the research carried out several possible limits in the application of the BPM in the PA processes.

The first limit, which could be found, is the lack of flowcharts concerning some processes. In the Public Administration many procedures are not standardized, and there is no explanatory flow chart, and consequently the initial analysis of the process, which allows to understand how it is currently carried out, should be treated in many meetings. These would occupy a greater amount of time for employees who deal with the analysis, even a greater number of hours for employees who carry out the various activities to allow to explain to the employees.

A second limit is linked to the times considered for the compilation of both the insertion request form and the individual plan. The times entered are assumptions, as the modules have not yet been digitized, and consequently it is not yet possible to know with certainty how they will be re-designed. To partially overcome this problem, the three different visions were analyzed, allowing to cover a wide variability for the compilation of the digital modules.

There are various limits in the possibility of implementing some of the functional requirements and the consequent proposed action plan. The first one is related to the possibility of implementing the attendance registration service, as it is an activity that requires various tools and for them a non-indifferent disbursement of money is needed, consequently the process for approval could be very long. A second limit is the possibility of communicating with the ATS application, because it has not been studied if it allows direct communication with other applications, consequently it is necessary that the project with the Lombardy Region has to be discussed. The third limit could be concerning the proposed order of implementation, as, for the limit expressly expressed on the implementation times of the presence registration system which is unknown, it may be more appropriate to implement a process easier as the digitization of the action plan.

In the end, a further limit can be deriving from the application of the BPM in a single municipality on a single project and not expanded it to others. As a result, the excellent results obtained may not be achieved in other PA organizations or other processes.

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