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How to implement a Smart and Sustainable City Strategy?

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ABSTRACT

Increasing attention to the smart city strategy has emerged in the last few years. This study aims to understand how to build strategy for the sustainable growth of the city (see Table 1), based on an important city. We also seek to identify the critical success factors for smart city strategy. Field research was conducted using quantitative and qualitative methodologies. The results describe some distinguishing features of planning for a smart city. The paper gives a new practical framework for the development of a strategy for a smart and sustainable city.

Negli ultimi anni è emersa una crescente attenzione alla strategia della smart city. Questo studio si propone di capire come costruire una strategia per la crescita sostenibile della città (vedi Tabella 1), osservando una città importante. Cerchiamo anche di identificare i fattori critici di successo per la strategia della città intelligente. La ricerca sul campo è stata condotta utilizzando metodologie quantitative e qualitative. I risultati descrivono alcune caratteristiche distintive della pianificazione per una smart city. Questa ricerca fornisce un nuovo quadro pratico per lo sviluppo di una strategia per una città intelligente e sostenibile.

Keywords: strategy, smart city, stakeholders' management, planning, strategic vision, sustainability,

Section: Refereed Paper

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1 – Introduction

There are many models of smart cities (Giffinger *et al.* 2007; 2010a, 2010b; Benevolo *et al.* 2013; Sharifi 2016; Eremia *et al.* 2017; Mella 2021a,b; Dabbagh 2022; Gazzola and Colombo, 2014; Gazzola and Mella 2003, 2006, 2017; Camagni 1991; Feeman 1995, 2010; Riva and Pilotti 2019; Porter 1990a,b, 1998, 2000; Pilotti and Rinolfi 2022a,b) that permit to study and

measure the level of quality of the city. This paper explores challenges and opportunities for strategic planning in the city of Milano in the north of Italy. The process of implementation of the smart city is divided into several stages (Giffinger *et al.* 2007; Benevolo *et al.* 2016; Rosa *et al.* 2017; Al-Dabbagh 2022; Benevolo *et al.* 2013; Sharifi 2016; Eremia *et al.* 2017).

I) To develop a shared vision of the mission policy by the political core of the leaders of the public and to facilitate the implementation. A clear definition of the strategy is the basis for the construction of the balanced scorecard (Coda 1988; Mella 2015).

II) To inform and involve: the staff has goals that are consistent with the strategy and receives incentives based on achieved results (Atkinson 1997).

III) To plan and set goals: establish challenging goals. The annual budgets are linked with plans for the medium and long term.

IV) To improve strategic feedback and learning: using the team as a method to solve the problems, the strategy is an ongoing process that evolves.

The use of "strategy maps" is useful to represent the relations of cause and effect between the various dimensions of analysis (Kaplan and Norton 1992, 2001, 2004). Also important is the role played by the evaluation of the CSF (*critical strategic factors*) and assessments intended to provide an understanding of the trends and results for organ, politicians and citizens in general, for a long-term strategy based on a set of values (Coda 1986, 1988; Covey 2004; Bertalanffy 1968).

We select the city of Milano because it is a very important town and win the "IL sole 24" journal award quality of the city (2021).

After the introduction, the section 2 provides some theoretical background, and section 3 specifies the methodology; section 3 shows the specific research on planning in Milano. The last section discusses the empirical findings and concludes.

2 – Theoretical background and research questions

2.1 – Theoretical background

Smart city models use technologies to improve their sustainable development in social, economic, and environmental targets following some steps. The literature has dealt with the role of smart cities studying the strategy for the sustainable growth of the city (see Table 1) (Giffinger *et al.* 2007; Benevolo *et al.* 2016; Rosa *et al.* 2017; Al-Dabbagh, 2022; Benevolo *et al.* 2013; Sharifi 2016; Eremia *et al.* 2017).

The strategy of city is the unifying theme that directs and makes consistent decisions (Porter 1980, 1990a,b, 1992, 1998, 2000; Freeman 1995, 2010; Becattini 1987, 2000; Belussi-Pilotti; 2000, 2002; Boschma 2005; Brusco 1982; Camagni 1991; Preite 2000, 2007, 2011, 2011b, 2014; Gazzola *et al.* 2020; Mella 1997, 2012, 2015; De Matteis and Preite 2016; Pilotti 2011, 2017, 2019; Riva 2007). Planning must consider the possibility of satisfying all stakeholders in harmony with the environment (Porter1990a, 1990b).

Important is the role played by the evaluation team that is an independent executive institution, which carries out investigations, analyses, and assessments intended to provide an understanding of the trends and results for organ politicians and citizens in general.

	AUTHOR(S)	THEORETICAL PERSPECTIVE	METHODOLOGY	MAIN FINDINGS	CONTEXT	SAMPLE
1	Giffinger <i>et al.</i> 2007	Global prospective based on six areas	Benchmarking (70 European cities)	Ranking of city based on 7 areas	European city	City (N=70)
2	Benevolo <i>et al.</i> 2016	Smart city and mobility	Analysis of smart mobility action	A set of indicators to measure the mobility	Digital and green city	N/A
3	Rosa <i>et al.</i> 2017	n/a	Case study (two Brazilian cities)	Important of decentralization and public policy promotion	Two Brazilian city	N/A
4	Al-Dabbagh R. 2022	Smart city strategy	Case study (Dubai)	The strategy of the smart city of Dubai	Dubai	N/A
5	Benevolo <i>et al.</i> 2013	Smart city strategy digital and green	Case study (Genova)	Strategy of Genova	Genova	N/A
6	Sharifi 2016	Smart city assessment	Critical Review	Main indicators	N/A	N/A
7	Eremia <i>et al.</i> 2017	Smart city concept	Evolution of the concept of smart city	General description of smart city	N/A	N/A

Tab. 1 – Overview of the relevant studies on smart city (source our elaboration)

2.2 – Planning and control tools

There are several strategic control tools that, although implemented by the private sector, can be used with the appropriate limits and changes to the public sector (Kaplan and Norton 1992,2001,2004; Mella 2012,2017; Riva 2007a,b). The main area of indicators are: smart mobility, smart people, smart living, smart environment, smart government, smart economy (see Figure 1).



Fig. 1 – The six main smart- city indicators (source: elaboration from Atmabrata and Tresani 2019)

The methodology of the balanced scorecard is based on a set of prospects for the analysis of the results (Macomber 2013). It has already been applied successfully in many public bodies (such as the City of Charlotte in the United States, the city of Brisbane in Australia). Many are the smart city indicators (see Table 2):

Tab. 2 – Dimension of smart city indicators	(source: elaboration from European Smart Cities
Vienna University)	

Smart Governance	Smart Mobility	Smart Environment	
 Participation public life Public and social services Transparent governance 	 Local accessibility (Intern–) nacional accessibility Availability of IT Infraestructure Sustainability of the transport system 	 Environmental condition Air qualiy (no pollution) Ecological awareness 	
Smart Living	Smart Economy	Smart People	
- Cultural facilities	-Innovative spirit	-Level of qualification	

a) The perspective of the citizen-customer: the objective is to determine how is evaluated citizen customer satisfaction.

b) The economic perspective: the purpose is to assess the economic and financial results. Among the indices used: efficiency, economy. cost reduction.

c) The perspective of internal processes: the purpose is to understand what the critical processes for the organization are.

d) The perspective of learning and growth to assess the level of improvement of the skills of employees, the level of satisfaction, the business climate.

The prospects of analysis are different and are based on a global strategy (Pilotti and Rinolfi 2022a,b; Valdani and Bertoli 2014; Ugolini *et. al.* 2017; WCED 1987). To analyze the smart city is possible to use a set of levels of layers and also the creation of a virtual-digital twin of the city to simulate the different scenarios (Huratdo and Gomez 2021). The smart city is based on some factors (Rahmanzadeh *et al.* 2018) (see Figure 2).



Fig. 2 – Factors for smart city (source: Rahmanzadeh et al.2018)

Among the most important tools are: the pyramid of performance, the business navigator, the intangible asset monitor (Sharifi 2019; Riva 2006, 2007a,b, 2008, 2010, 2012; Gazzola *et al.* 2019, 2020; De Lotto 2008; Mella 2014, 2018, 2021)

a) The *pyramid of performance* allows you to analyze some of the dimensions of the public by an internal and external analysis of the interconnections. The importance of this model lies in the integrated nature of economic variables with others of a different nature. The use of this pyramid is in daily operations and allows you to analyze different levels that are interconnected and understand the relationships of cause and effect. From the vision, we analyze the elements and actions that allow you to get the desired results that are allowed by the processes managed efficiently and effectively. The creation of a digital model of the city can help in planning strategy (see Figure 3).

- b) The *business navigator* is another methodology. It considers several factors such as the financial aspect, customers, human resources, processes, renewal, and innovation. Compared to the model of balanced scorecard, it focus more on variables of human resources.
- c) The *intangible asset monitor* is based on the enhancement of staff skills and internal and external structures. is further subdivided according to three dimensions: growth and innovation, efficiency, and risk stability.



Fig. 3 – Design for smart city digital twin (source: Hurtado and Gomez 2021)

2.3 – The research questions

In summary, the use of an integrated set of tools for monitoring the development of smart city policies is a valuable tool for the improvement of the strategy (Mintzberger 1978, 1994; Napolitano *et al.* 2018; Hardy *et al.* 2002; Riva and Pilotti 2017, 2018, 2019a,b, 2020; 2021a,b; Riva, 2005, 2006, 2007, 2012; Pilotti and Rinolfi 2022a,b).

The literature appears fragmented and partial with some limits and there is a need to investigate some areas. Consequently, this paper aims to explore the following research question:

RQ1: *Is the city of Milano a smart city, and what are the main points of strength and weakness?*

Therefore, few studies have investigated smart city strategy and the problem of its implementation, so, we develop a specific question:

RQ2: How is it possible to develop a strategy and control system for smart cities?

3 - Methodology

3.1 – The motivation of choice of the case of Milano and the primary data

We select the city of Milano because it is a very important economic city in Italy and won the "*Il sole 24 ore*" journal award 2021 for quality of the city and achieved the City Olympic Winter Games for 2026 together with Cortina d'Ampezzo. They were elected as the host city in 2019 in 134th IOC Session in Lausanne.

For primary data, we collect data (Eisenhardt and Martin 2000) and information by questionnaires and interviewees with tourist experts of the city about the area of research.

We analyze the many secondary data (see Table 3).

MAIN SECONDARY DATA	FOCUS
"Piano di governo del territorio. Milano 2030. Visione, costruzione, strategia, spazi" City of Milano (2019)	focus global strategy
"Piano annuale per la promozione della attività turistica Regione Lombardia (2019)	focus global
"Piano triennale per lo sviluppo del turismo e dell'attrattività" Regione Lombardia (2017)	focus global strategy
"Piano annuale per la promozione della attività turistica" Regione Lombardia (2019)	focus tourism strategy
"Piano strategico di sviluppo del turismo (2017-2022)" Ministero del Turismo (2017)	focus strategy
"Piano per lo sviluppo del turismo e dell'attrattività" Eurispolis (2016)	focus tourism strategy

Tab. 3 – Milano secondary data used in this research (Source: our elaboration)

3.2 – The quantitative analyses

The questionnaire is organized into several sections based on a 5-point Likert scale. It is based on the model of a smart city based on six areas (Giffinger *et al.* 2007; 2010a,b). We have chosen an elaboration of the questionary for good organization and many past applications (Table 4).

Tab. 4 – Questionnaire (5 points Likert scale)

	UNAC- CEPTABLE	Almost Accepta- Ble	ACCEPTA- BLE	Good	Excellent
	(1)	(2)	(3)	(4)	(5)
A) SMART NATURE					
Q1. Green environment					
Q2. Pollution					
Q3. Water quality					
B) SMART GOVERNANCE					
Q4. Public and social service					
Q5. Participation in decision meaning					
Q6. Sustainable and smart city governance					
C) SMART ECONOMY					
Q7. Economic growth					
Q8 Innovation spirit					
Q9. international embeddedness					
D) SMART LIVING					
Q10. Health					
Q11. Safety					
Q12. Education					
E) SMART PEOPLE					
Q13. Qualification					
Q14. Social inclusion					
Q15. Demographic trend					
F) SMART MOBILITY					
Q16. Public transport					
Q17. Traffic management					
Q18. Alternative public transport (bicycles)					

We also visit the city of Milano which is an innovative city with many cultural events. To limit the bias of the research we use the triangulation of data. About primary data, interviewees with the experts about Milano, and members of public administration (see Table 5).

DEMOGRAPHIC CHARACTERISTICS OF THE SAMPLE			
Nationality	100% Italian		
Average age	63,2 years		
Sex	45% Male 55% Female		
Average year of education: - Middle school 8 -High school 13; -University 18; -Doctoral program 21	average19 years		
PROFESSIONAL CHARACTERISTIC			
Experience in years	average 25,8 years		
The sector of the sample	100% tertiary sector		
Expert about Milano (private sector)	21 interviews		
Member of Public administration	9 interviews		
Many years of living or working in Milano	54,3 years		

Tab. 5 – Profile of the respondents (N=30) (Source: our elaboration)

3.3 – The interview protocol

The interview protocol (see Table 6) permits to focus on some areas of the research questions; it is used a triangulation method to compare the data (Table 6).

Tab. 6 – Interview protocol and main topics covered during the collection of data (Source: our elaboration)

MAIN QUESTION	SUB-QUESTION	
1) Is the city of Milano a smart city, and what is the main point of strength and weakness?	 What is the main area of excellence? What is the main weakness? Why? What are the reasons for the problems? Why are the main limitations? How is it to improve the situation? What will happen in the future? 	
2) How is the strategy of strategic vision, for sustainability?	(1) What is the rationale behind that choice? (2) What are the main priorities?	

(3) What are the achieved benefits?
(4) How is evaluated?
(5) How are strategy and process improvement used?
(6) How other strategies are applied? Why?
(7) How will the sequence continue in the future?

The semi-structured interviews permit feasibility to analyze the main questions. The interviews are conducted by telephone or face-to-face and lasted about forty and sixty minutes; all participants are experts with many years of experience in the sector.

3.4 – Control the validity and reliability of the study

To control the validity and reliability of these studies we analyze:

a) construct validity (by multiple sources of data collection);

b) internal and external validity (by using interview protocol);

c) reliability (by using a database to collect data).

Other sources of data were used as reports and public documents.

4 – Some characteristics of Milan

Milano (Cognetti, 2012) is an important city in the north of Italy and is one of the main import economic centers of Italy (see Figure 4) with a population of about 1,4 million, while the metropolitan city has about 3,2 million inhabitants.

The excellence of the city (see Table 7) is in many areas design (Camagni 1996; Riva 2008): art, fashion, tourism, education, entrainment, finance, healthcare, and research. service, chemicals. There are many city vocations in some sectors: fashion (Armani, Dolce & Gabbana), art (Leonardo), design (Ponti), university, finance, manufacturing, life sciences, cultural and creative industries. Important universities (University of Milano, Polytechnic, Bocconi, Catholic University) are present in Milano.

DIMENSION	DATA
NATIONAL GDP	Milan produces about 12% of the National
METROPOLITAN AREA	One of the most densely populated areas in Europe + 3,200,000 inhabitants + 1,9% 2010
AGE	Under 14: 13.8%; between 15 and 64: 63.8%, over 65: 22.5%;
FOREIGNERS:	8%, more numerous among young people (about 25%).
ECONOMY AND LABOUR	GDP per capita: 46,000 euros (average Italy 25,000); 300.000 companies (50% services, 25% trade); double national average

TOURISTS	11 million 2018 (vs. 5 million in 2000)		
REAL ESTATE INVESTMENTS	4th city in EU/15th in the world -		
EMPLOYED	70.7% in 2016 (+ 12% compared to the Italian average)		
MAIN TOURISTIC ATTRACTIONS			
- Duomo, Vittorio Emanuele II Gallery - The Sforzesco Castle		- The last Supper, located in the refectory of the convent adjacent to the Church of "Santa Maria delle Grazie" of Bramante	
- Monte Napoleone street - Poldi Pezzoli Museum; - Diocesan Museum		- Bagatti-Valsecchi House Museum - Museum of the Twentieth Century - Scala, Museum of Scala, Pinacoteca di Brera	



Fig. 4 – The landscape of Milano (source Comune Milano Design Week 2023)

5 – Discussion and managerial implication

5.1 – Results of quantitative analysis

We collect any data about the city profile, based on secondary data. The results of the questionnaire permit us to understand some strengths and weaknesses of the city comparing the value with the average (see Figure 5).



Fig. 5 – -Integrated representation of results of the questionnaire (our elaboration)

A strategy for Milano is a pattern that coordinates the objectives, policies, and guidelines into a unified and coherent strategy; it is important in the determination of long-term goals and implementation of policies for the allocation of resources necessary to achieve the desired results.

Milano like many other smart cities uses technologies to support their sustainable development in social, economic, and environmental terms.

Some priorities for the city are environmental, infrastructure, traffic control, and valorization of the museum, and cultural center.

It is important to monitor and measure satisfaction levels by collecting and analyzing relevant data to determine the adequacy and effectiveness of the quality management system.

5.2 – Results of qualitative analysis

The plan of the city of Milano, identified each critical process indicator that allows you to monitor the effectiveness of the processes themselves (see Table 8).

PHASE	STAGE	AIM	TARGETS	
1	Purpose	What are we trying to achieve? Why are we doing this strategy? What are the problem and the limits?	General Planning	
2	Strategic Analysis	Finance Customers Processes Potential	Strategic Objective Cause and effect chain	
3	Vision; Goal and Objective setting	Priority	KPI's, Target Values and Strategic Initiatives	
4	Definition of Target Value	What get measured and get done?		
5	Definition of Strategic Initiatives	From Strategy to Action		
6	Priorization and bugeting of Strategic Initiatives	Implementation	Initiative prioritization and Budgeting	

Tab. 8 – Strategic plan and tools for smart city planning (source our elaboration)

This methodology is in direct connection with the Social Balance that is a useful tool for the public authority to evaluate the results of policies and levels of citizen satisfaction among customers (Freeman 2010,1984)

In it, we describe to all stakeholders the policies made and the results that have been obtained showing the characteristic features of the various policies. In it there are also defined the criteria for the quality of services.

The main priority strategy is the valorization of the main touristic attraction that is present in Milano (Region Lombardia 2019).

6 – Conclusion

6.1 – The first research question

Concerning the first research question: "*RQ1: Is the city of Milano smart, and what is the main point of strength and weakness?*", we discover:

A - *FIRST*, the result of our research shows how the main strength of Milano is *the economic contest and the international and innovative culture of the region with a good cultural tradition and educational culture. The main problem is traffic, security, and pollution* (see Figure 5).

Among the critical elements in the implementation of a methodology to improve the main weaknesses are:

a) a clear vision of the goals and mission policy for sustainable behavior (see Figure 6);

b) understanding of the culture to obtain them;

c) the definition of the set of behaviors and profiles required to achieve the desired results;

d) analysis of virtuous circles and interrelation between the various areas of achievement (customers, processes, cost, innovation, and learning).



Smart City

Fig. 6 – The smart city based on environmental and social sustainable behavior (source Khansari *et al.* 2013)

B - SECOND, the definition of a strategy for a smart city needs to follow some steps based on a set of areas (starting phase, planning, development of the projects, monitoring and evaluation, and communication) to implement the global strategy.

The global process can be based on:

1) analysis of the needs of the citizen-customers, the sustainability of the causes of satisfaction and dissatisfaction based on long-run vision (Coda 1988);

2) control model of stakeholder approach;

3) key indicators of success (KPI) for a city;

4) methodology of the balanced scorecard for a city.

5) advanced models of strategic control for the public administration: a) the performance pyramid, b) business navigator, d) intangible monitor, smart city planning, and balanced scorecard (Coda 1986,1988; Riva 2007a, b).

C - *THIRD*, the results of the first question are coherent with past research (Riva 2012; Giffinger *et al.* 2007; Al-Dabbagh 2022; Benevolo *et al.* 2013; Sharifi 2016; Eremia *et al.* 2017; Mella 1997, 2012, 2015; Pilotti 2011, 2019; Pilotti, and Rinolfi 2022a,b).

6.2 – The second research question

Concerning the second research question: *"RQ2: How is it possible to develop a strategy and control system for smart cities?"* We find:

A - *FIRST*, the use of a set of tools of the plan, do (implementation), act, and control (PDCA cycle) based on some methodologies permit to improve of the quality of strategic planning (Mintzberger 1978, 1994; Coda 1988) (see Table 9).

Tab. 9 – Tools for strategy and control for a smart city (source our elaboration)

	TOOLS	AIMS
Ι	SMART CITY MODEL AND KPIS	Technologies to improve their sustainable development in social, economic, and environmental targets following some steps.
II	BALANCED SCORECARD	It aims to discover, assess and manage the risk using a procedure.
ш	TOURISM PLANNING	 <i>Put</i> the customer first; <i>improve</i> the process of the organization; <i>cooperate</i> and connect with suppliers and partners; <i>manage</i> the risk; <i>focus</i> on execution.
IV	KPIS FOR GREEN PERFORMANCE MEASUREMENT	The main model to control the performance is the balanced scorecard.
v	PROCESS MANAGEMENT	 <i>process mapping</i>: there is a description of the process; <i>process diagnosis</i>: the problem in the process is identified; <i>process design</i>: develop an alternative to the process <i>process implementation</i>: validation of the process and the control; <i>process maintenance</i>: monitoring of the process and trying to improve.
VI	SMART VISION	Tools of the plan, do (implementation), act and control (pdca cycle).
VII	MARKETING MANAGEMENT STAKEHOLDERS	Customer relationship management aims to control the satisfaction of the customers.

B - *SECOND*, the method of key success indicators (KPI) where each project of innovation in the public sector is measured using KPIs (key performance indicators) that can be correlated with the various areas of achievement (Freeman 1984) (see Figure 7).



Fig. 7 – The smart city main indicators (source Rahmanzadeh et al. 2018)

The phases of implementation of the method KPIs are:

1) Selection of the processes to be monitored: it is important to identify the processes most relevant and important. You can assign a scale from 1 to 4 to define the various processes. Identification of KPIs: they can be divided into four broad areas: general indicators, cost indicators, quality indicators, and service indicators.

2) Clear definition of the control structure with a map of the processes monitored and measured by the KPI to understand the purpose of indicators and their purpose, the definition of performance targets, reviewing and monitoring results (defined as those who control and detect the information), flow planning, monitoring and control of KPI (planning and control) (see Table 10).

3) Profiling of indicators and reviewing sources and checking robustness.

4) Dimensional analysis: where are segregated KPIs and collect the data, defining the schema of the information systems of the public.

5) Comparisons with the benchmark (actual, objective, desirable). Documentation of the requirements and design of the functional model of the system. The result is a final list of information that the process must produce (Riva and Pilotti 2017).

Tab 10 - Main FCSs	G (Critical Strategic Fa	actors) and importance	(source: our elaboration)

	FCS	IMPORTANCE
1	ANALYSE OF STAKEHOLDERS DEMANDS AND COMMUNITY CONSULTATION	****
2	SHARING OF BEST PRACTICE	****
3	SOCIAL MEDIA STRATEGY	****
4	ENVIRONMENTAL AND RESEARCH ANALYSIS	****
5	VISION AND GOALS AND OBJECTIVE SETTING	**
6	LONG TERM PLANNING	****
7	COMMUNICATION STRATEGY	**
8	VALORISATION OF ART AND MUSEUMS	***
9	GREEN AND ENVIRONMENTAL STRATEGY	****
10	MONITOR AND EVALUATION RESULTS	****
		*low ; ***** high

C - *Third*, the results of the second question are coherent with past research (Riva and Pilotti 2020, 2019; Pilotti, and Rinolfi 2022a,b; Giffinger *et al.* 2007; Benevolo *et al.* 2016; Rosa *et al.* 2017; Sharifi 2016; Eremia *et al.* 2017; Pezzoli 1997; Gazzola and Colombo, 2014; Gazzola and Mella 2003, 2006, 2017; Gazzola *et al.* 2020; De Matteis and Preite 2016; Pilotti 2011, 2017, 2019; Riva 2007; Mella 2014, 2018, 2021a,b; Riva and Pilotti 2019). The construction of scenarios and definition of the vision of Milano is based on an interpretation of the city's present reality.

The limit of this study is to analyze only the case of Milano; future research can analyze other cities.

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