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BALANCING KNOWLEDGE SHARING AND HIDING IN SMART WORKING. THE CASE OF CAVA DE' TIRRENI MUNICIPALITY.

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Abstract

This thesis explores the dynamics of knowledge sharing and hiding within the evolving context of Smart Working, focusing on a detailed case study of the Cava de' Tirreni Municipality. The research is structured into four chapters, each contributing to a holistic understanding of how digitalization and flexible work arrangements impact knowledge management in public sector organizations.

The first chapter lays the theoretical groundwork by employing General Systems Theory (GST). This framework conceptualizes organizations as dynamic, open systems that continuously negotiate boundaries between internal operations and external environments. It emphasizes the systemic balance between openness – encouraging the free flow of information – and closure – preserving strategic knowledge, both crucial in managing knowledge effectively.

In the second chapter, the research delves into the implications of digital technology for knowledge management. While digital platforms and tools can enhance transparency and ease of information exchange, they also have a paradoxical effect: the same technologies that support collaboration may also encourage individuals to hide knowledge. This tension arises from factors such as internal competition, cultural norms, and perceptions of surveillance within digital work environments.

The third chapter adopts a socio-technical perspective, identifying the key competencies required to navigate the complexities of Smart Working. These competencies encompass digital literacy, autonomous time management, and effective virtual communication skills. The chapter further examines how these skills influence knowledge-sharing practices and tendencies to withhold information. It introduces the notion of digital resilience – the capability to adapt to continuously changing work contexts – as critical for fostering a collaborative digital work culture.

The fourth chapter is dedicated to the empirical study of the Cava de' Tirreni Municipality, utilizing a grounded theory approach. Through qualitative interviews, the study captures the experiences of employees adapting to Smart Working. The findings reveal that digitalization facilitates access to information and promotes sharing, particularly in administrative functions. However, the lack of physical interaction in a virtual environment can diminish interpersonal trust, thereby increasing the inclination to hide knowledge, especially in more operationally focused roles.

The thesis concludes by proposing a theoretical model that illustrates the delicate balance required to foster effective knowledge-sharing practices in digital work contexts. It underscores the importance of strategically managing digital tools and organizational policies to enhance transparency and collaboration without undermining trust and cohesion among employees. The study's implications extend to organizational strategies, suggesting a need for targeted policy interventions, the cultivation of relevant competencies, and the careful design of digital infrastructures to support a resilient and knowledge-rich work culture.

Key words: Smart Working, Knowledge Sharing, Knowledge Hiding, Digital Transformation, Public Sector, Grounded Theory, Socio-Technical Competencies, Digital Technology

Introduction

The digital revolution has profoundly transformed organizational processes and how individuals interact within organizations. Digitalization has introduced tools and platforms that allow for greater fluidity in the sharing of information, potentially enhancing the capacity of organizations to innovate and respond to competitive challenges. However, the growing digital interconnection has also raised new questions regarding knowledge management, particularly the balance between *knowledge sharing* (the sharing of knowledge) and *knowledge hiding* (the withholding of knowledge). In this context, Smart Working, or agile work, has emerged as an increasingly popular work modality that offers greater flexibility, but also raises concerns about how knowledge is shared and retained.

This thesis explores two fundamental questions: What is the role of digital technology in balancing the processes of *knowledge sharing* and *knowledge hiding*, and what is the role of Smart Working in this context? These research questions stem from the need to better understand how organizations can harness the potential of digital technology and new work models to promote a culture of knowledge sharing, without neglecting the possible barriers and resistances that may incentivize *knowledge hiding* behaviors.

The role of knowledge in modern organizations is widely recognized as a crucial element for competitive advantage and innovation capacity. However, the act of sharing or withholding knowledge is not a neutral process: it is influenced by multiple factors, including organizational culture, hierarchical structure, the presence of incentives or disincentives to share, and increasingly, by how digital technologies are integrated into daily activities. Smart Working represents a new work paradigm that promises to increase worker autonomy and flexibility, but the lack of face-to-face interactions, typical of traditional work environments, can also reduce transparency and trust, with ambiguous effects on knowledge management.

Thesis Structure

This thesis is organized into four main chapters, each of which addresses a specific theme related to the dynamics of digital work and knowledge management. Each chapter contributes to answering the research questions, creating a logical progression that begins with the theoretical foundations of systemic management in organizations, moves through a reflection on the role of digital technology, and culminates in an empirical study of a specific case of Smart Working implementation.

The first chapter provides a solid theoretical framework based on General Systems Theory (GST), with the aim of understanding how organizations function as open and complex systems. GST, developed by Ludwig von Bertalanffy, is essential for analyzing

organizations not as static entities, but as dynamic systems that continuously interact with the external environment through flows of resources, information, and energy.

In this context, the concept of *homeostasis* becomes particularly relevant: organizations, like biological systems, seek to maintain a dynamic balance in response to environmental changes. However, the nature of the system also depends on how information is managed internally, raising the issue of balancing openness and closure of organizational boundaries. This concept is directly related to the processes of *knowledge sharing* and *knowledge hiding*, as organizations must find a balance between the need to share information to grow and innovate, and the tendency to protect certain strategic or confidential knowledge.

Another relevant dimension in this chapter is the concept of *autopoiesis*, developed by Maturana and Varela, which describes systems as entities capable of self-organizing and self-renewing. Applied to organizations, this concept allows us to understand how workers autonomously develop skills and manage knowledge, both in response to external pressures and because of internal processes of learning and innovation. Moreover, the issue of internal system differentiation is addressed, which enables organizations to develop specialized subsystems to manage increasing complexity.

This chapter, therefore, introduces the necessary theoretical foundations to address the research questions related to the role of digital technology and Smart Working in knowledge management processes.

The second chapter addresses the process of balancing *knowledge sharing* and *knowledge hiding* in digital environments. Digitalization has introduced advanced technological tools such as collaborative platforms, knowledge management systems, and asynchronous communication tools, which facilitate the sharing of information among organization members. However, the ease of access to information does not necessarily guarantee a culture of sharing. In fact, in many contexts, digital technology may exacerbate *knowledge hiding* practices, as workers may withhold information to preserve their competitive advantage or avoid internal conflicts.

In this chapter, the role of digital technology is explored as both an enabler and a potential limiter for knowledge sharing. The concept of “digital transparency” is discussed, referring to how technology can facilitate the visibility of information within organizations, but also how it can create new barriers, such as lack of trust or the perception of control by superiors. It also explores how digital systems can foster or hinder the emergence of a culture of knowledge sharing, focusing on how the design and implementation of such systems influence organizational dynamics.

The chapter offers an in-depth analysis of the opposing forces at play in knowledge sharing and hiding processes, developing a theoretical framework that integrates the role of digital technology as a strategic lever to balance these two phenomena. The organizational and technological conditions that can promote greater openness in sharing processes and reduce the tendency to hide knowledge are analyzed.

The third chapter focuses on the role of competencies in the context of Smart Working and how these influence the processes of *knowledge sharing* and *knowledge hiding*. Smart Working represents a significant transformation in work modalities, requiring the development of new digital and transversal competencies to effectively operate in virtual and flexible work environments.

Through a socio-technical lens, this chapter explores the competencies necessary to navigate complex digital environments, including the ability to use collaborative platforms, autonomously manage time, communicate effectively through digital tools, and quickly adapt to changes. It also discusses how Smart Working can incentivize *knowledge sharing* practices using technologies that facilitate communication and collaboration, but at the same time how it can also promote *knowledge hiding* practices due to the lack of face-to-face interactions and reduced supervision.

A crucial element addressed in this chapter is the concept of *digital resilience*, or the ability of workers to adapt and thrive in continuously evolving work contexts, effectively managing both digital technologies and interpersonal relationships mediated by digital tools. It explores how the development of these competencies can positively or negatively influence the propensity to share knowledge in Smart Working environments, depending on the level of autonomy and support offered by organizations.

The fourth chapter is dedicated to the case study of the Municipality of Cava de' Tirreni, a public sector context in which the adoption of Smart Working has led to significant changes in knowledge management practices. This chapter represents the empirical core of the thesis and utilizes a methodology based on *Grounded Theory*, with the aim of exploring how Smart Working has influenced *knowledge sharing* and *knowledge hiding* processes within a public organization.

Through semi-structured interviews and a detailed data analysis, the chapter explores how digitalization has created opportunities for knowledge sharing but has also exposed some critical issues related to the lack of direct interactions between employees. It also examines how the role of certain employees (e.g., administrative roles versus operational roles) influences how knowledge is shared or withheld.

The empirical results show that while digital technology facilitates access to information, the lack of a physical relational context can reduce trust among colleagues and incentivize *knowledge hiding* behaviors. This chapter, therefore, discusses the critical role of Smart Working in balancing these two phenomena, highlighting how digital technologies and the management of work relationships must be strategically integrated to promote a culture of knowledge sharing.

The thesis concludes with a reflection on the findings and the theoretical and practical implications for organizations that implement Smart Working and use digital tools to manage knowledge. A theoretical model is proposed that highlights how digital technology and Smart Working can influence the balance between *knowledge sharing* and *knowledge hiding*, with implications for skills development, human resource management, and the design of technological infrastructures.

Chapter 1. A systems reading of the firm

1.1 First systems thinking formulations

The term system is widely used in everyday language and is used in many disciplinary contexts: we speak of open, living, dynamic, cognitive systems; of systems theory, of general systems theory; of systemic approach, of systemic thinking. And again, in business studies, of the enterprise as an open system, of enterprise systems, of production systems, of vertical marketing systems. The spread of systemic thinking and its transversality have enabled considerable progress in the approach to the observation of phenomena, providing a valuable investigation methodology for the study of old and new problems in different disciplinary contexts. Systemic studies in the natural sciences, neuroscience and social contexts, together with the formalization of the so-called mathematics of complexity, are a clear manifestation of the disruptive scope of systemic thinking. In these fields, a cultural and scientific paradigm - i.e. a constellation of endpoints (or conclusions), comprising concepts, technical values, shared by a scientific community and such as to represent the starting point for subsequent investigations and to confer legitimacy on problems and their solutions (Kunh, 1994) - has gradually developed.

The scientific paradigm places particular emphasis not only on the relevance of the phenomenon studied and the elements that characterize it, but also on the interactions between the elements and the synergies that form within the phenomenon itself and extend to the relationships between different phenomena.

The origins of systemic thinking can be traced back to the first decades of the 20th century, when a set of relevant conclusions, reached in various scientific disciplines, led to a radical change in the investigation methodology traditionally used to observe phenomena for scientific research. Systemic thought contributed significantly to the formation of a new conception of phenomenal reality, as a synthesis of philosophical, epistemological, sociological, mathematical, physical and biological paths. Rapidly spreading across all disciplines, the systemic approach must be understood as the result of the sedimentation of reflections, theoretical contributions, and training that qualify an epistemological path of research and study of complex reality. The reinterpretation of business reality and its definition in a systemic key require a presentation of the various interdisciplinary contributions that have characterized the systemic approach over time and a specification of the axiomatic assumptions of the general theory of systems, first and foremost the concept

of viable system, as well as its fundamental theorems and postulates, such as the structure-system dichotomy. The first epistemological reflections aimed at answering a series of questions about phenomenal reality can be found in Greek philosophy. It was above all Aristotle and the categorical limits, in investigating the relationships existing between an observed object and its component elements, that questioned the concepts of form and substance of things, aspects of significant importance for understanding the components of the structure of a system and the relationships between them. The first work focusing on systemic thinking is represented in the 1920s by A. Bogdanov (Tectology). This work represents the first attempt to create a science of structures, based on the formulation of organizational principles that explain the structure of living and non-living systems. This attempt anticipates the reflections carried out a few years later by Bertalanffy. According to Bogdanov, the organizational form represents the totality of connections between the parts of the system: based on these, three types of systems can be identified. Organized systems are characterized by the fact that the whole is greater than the sum of the parts; disorganized systems are characterized by the inverse condition, in which the whole is less than the sum of the parts; neutral systems are those in which organizing and disorganizing cancel each other out.

In the same period, another Russian scientist, Vernadsky, began a reflection on living systems and their relationship with the surrounding physical world, arriving at conclusions in agreement with Bogdanov's. Using the systemic approach to the study of the biosphere, he highlights how the biosphere is not an isolated phenomenon influenced by specific causes, but rather represents a living system, characterized by strong interconnections between all the living organisms that populate it and that, through exchange processes, feed its life.

The term system is part of the traditional usages of ordinary language and many disciplines, such as mathematics and philosophy. However, a rigorous definition of the term has only recently been attempted, when technological and scientific developments have posed the need for an explicit and conscious definition, capable of rescuing the word from undue use on the ideological level, and misleading interpretation on the semantic level. The official emergence, so to speak, of a theory explicitly devoted to the study of systems must be traced back to 1954, when in Palo Alto a group of European and American scholars from different disciplinary backgrounds-such as economist Kenneth Boulding, biomathematician Anatol Rapoport, physiologist Ralph Gerard and the father of systemic theories, biologist Ludwig von Bertalanffy, founded the Society for general systems research. Their original purpose was to develop a theory that could isomorphize traditionally separate fields of knowledge from each other. The system concept offered the possibility of relating together fields

traditionally studied in exclusively specialized ways. A globalizing approach, that is, oriented toward elaborating the rules of empirical totality, defined as wholeness, was the basis of the project, whose interdisciplinary vocation was certainly influenced by von Bertalanffy's biological studies. Indeed, from his idea of organismic totality, where no single causalities but entire interdependent causal complexes operate, derives the so-called principle of equifinality, according to which a system can reach the same final state of homeostasis, or dynamic equilibrium, regardless of the intervention of individual causal factors. This principle was developed by von Bertalanffy precisely to show how insufficient deterministic explanations were in the analysis of complex phenomena: no longer single causalities, but entire causal complexes interrelated with each other determine the evolution of systems. The metaphor of the organism, as an autonomous totality capable of self-organization to achieve an end state characterized by dynamic equilibrium, was established as a fundamental model to be used for other forms of thought, especially the social sciences. Subsequent advances in computer science and the cognitive sciences have provided general systems theory with further opportunities for development, enabling it to transform Bertalanffy's organismic-totalizing intuition into an avenue for solving particularly chaotic cognitive and operational problems that are irreducible to monocausal explanatory imputations. The destiny of general systems theory from the 1960s onward will be not so much to provide an isomorphic metalanguage for the hyperspecialized sciences as to deal with complexity, that is, the emergence of phenomena that, cognitively and operationally, exhibit high degrees of uncertainty and undecidability. Such a theory is thus confronted not only with some of the most daunting problems of knowledge, but also with the growing anxiety of the contemporary world, which is incapable of controlling that complexity which it produces. Before delving into the specifically social problems encountered by the theory, it is necessary to clarify a fundamental concept for accessing that of system: entropy.

In concise form, entropy can be defined as the measure of elementary disorder to which necessarily, that is, deterministically, all natural processes tend. The second principle of thermodynamics describes, as is well known, the fate of all natural systems, including organic systems, which tend to settle down into equiprobable states of chaos and that is, elementary disorder, where organization and differences are irreversibly destroyed. The mechanical and deterministic nature of the entropic process finds its correlate in the concept of negative entropy, understood as a measure of the order that comes to form in a system already characterized by states of elemental disorder. Information, understood in the etymological sense of the term, is precisely a process of negative entropy, which places some order between signs or signals otherwise unrelated to each other. As such it would therefore

represent a deviation from the second principle of thermodynamics and that is from the universal increasing curve of entropy. This definition of information, elaborated by Norbert Wiener, naturally refers to the properties of an ordering message, capable of 'shaping' a system and thus decreasing the entropy curve. There is – and this must be said to do justice to the history of the concept – also a definition of information according to which the reduction of entropy, i.e., disorder, is not a property of the information itself, but of the source of the message, namely, of the statistically defined possibility for that source to transmit order, as Claude E. Shannon and Warren Weaver argue. In the most general terms, then, a system is an organized set of relations between objects, resulting from a process of selective reduction of disorder. Put another way: a system is an organized order of relations, the emergence of which is relatively unlikely because the natural and most likely tendency, given the principle of entropy, is that of disorder.

Edgar Morin defines the improbability of order and thus of systems in an icastic and suggestive way: "All the objects of physics, biology, sociology, astronomy, atoms, molecules, cells, organisms, societies, stars, galaxies, constitute systems […]. Our organized world is an archipelago of systems in the ocean of disorder. Everything that is an object has become a system" (Morin, 1977, p. 99).

Although the term system has come into common usage and has long since become synonymous, often with negative connotations, with 'apparatus', 'technical domain', 'conceptual prepostulation', etc., a rigorous definition of it is hard to find even among those who have made it the subject of their epistemological and ideological critiques. Von Bertalanffy's definition (1968, p. 54) that "a system is a complex of elements that stand in interaction" is intuitively understandable, but it does not clarify on a formal level what the elements themselves are and especially what the criterion for their identification is. Any reference to the criteria for the selection of elements and their constitution as systemic entities remains excluded from the definition. Indeed, in von Bertalanffy's definition there is a strong organicist hypothecation arising from the biological origin of the concept, which takes as its model that of the cell. This circumstance did not prevent Talcott Parsons and Edward Shils from referring to von Bertalanffy to define the system: "The most general and fundamental property of a system is the interdependence of its parts or variables. Interdependence consists in the existence of certain relations between the parts or variables" (Parsons and Shils, 1951, p. 107).

A more precise definition is that provided by A.D. Hall and R.E. Fagen (1956, p. 18): "A system is a set of objects and relations among objects and between their attributes".

Common to all the above definitions is the lack of a defining element that current systemic theory considers fundamental: any reference to the criterion of choice of either the objects or the relations to which systemic character is conferred is absent, i.e., the observer of the system is missing. Instead, the criterion of choice, proper to the observer, seems to appear in James Grier Miller's definition (1971, p. 52), according to which the system is "a bounded region in space-time", where the term 'bounded' evidently refers to an observer who delimits and thus chooses. This observer-dependence is in turn defined by Alessandro Pizzorno (1973) as "incompleteness of systems" and thus presented as a drawback of the theory itself, which is unable to self-describe without recourse to an external observer. In contemporary systems theory, no one refuses to introduce the observer into the arguments of the theory itself, and such now-accepted observer-dependence is considered not so much a flaw as a constructivist 'virtue'.

1.1.1 From the environment to the context

In the nineteenth-century cultural tradition, the environment was seen as the set of factors comprising the external world of a living being or social system, capable of determining both the characteristics of the individual organism and those of society through so-called 'conditioning.' Such conditioning can be defined, as the set of evolutionary challenges, capable of determining not only the possibility of individual survival of each organism, but also the structure of human personality and, by analogy, of social relations. The biological sciences, but especially the social sciences, have in the past attributed every imaginable responsibility to the external environment as the deterministic cause of behavior. With the appearance of the first discoveries about the genetic code, environmentalism, from time to time theorized as determinism or as behaviorism, began to decline as an all-encompassing criterion of explanation. The phenomena of autonomy of the living, centered on internal processes of coding, which relativize – without annulling it – the significance of environmental conditioning, have become increasingly important. Today the living and social are no longer considered totally plastic entities, conditioned *ad libitum* by the environment, but systems endowed with a strong autonomy.

Systems theory immediately grasped the importance of the phenomena of autonomy and gene encoding and attempted to reconsider in no longer reductive ways the complex issue of the relationships between system and environment, which are bound to interact in a very complex situation of "dual interdependence", as Heinz von Foerster argues. It is useful to recall von Foerster himself, who made a fundamental contribution to systems theory: the environment is regarded in two respects: as a set of properties of the physical world acting

on an organism, and as an accumulation of successful solutions of the problem of selecting those conditions in the physical world that are at least sufficient for survival. In this discussion, the environment and the organism associated with it will be dual to each other in the sense that a particular organism O implies its environment E(O), and vice versa, that a particular environment E implies its appropriate organism O(E) (von Foerster, 1968, p. 171). Thus, there is no external environment *per se*, but only the specific environment of a specific system. That is, each system deals only with its environment, that is, with that portion of the external world that its encodings allow it to include in its representations and thus in its operations. The environment – and here the name of Jean Piaget must also be recalled – is no longer an external datum of the system but is closely related to the performance of certain internal operations, based on which alone it is possible to stabilize an internal-external boundary. This boundary – which also depends, but not only, on internal encodings and thus on the operations already provided for by those encodings – acts as a difference between external and internal. However, this difference also makes available possibilities for connection in terms of exchanges of matter, energy, and information. We can argue at this point that the relationship between the system and the environment is not a zero-sum game, but on the contrary that increased internal autonomy corresponds to an increase rather than a decrease in environmental conditioning, since each system would thereby be placed in a position to increase its possibilities of interacting with flows from the environment.

Accordingly, a system can interact with its environment only based on specific codes, which identify and organize the detections of the external world in such a way as to separate them from the background noise, and the equiprobable clutter, thus making them relevant to the system itself. The codes enable the system to recognize as an environment only certain elements and events, which the codes themselves enable it to consider. Among the merits of systems theory is that it has challenged many conceptions taken for granted as absolute truths. One of these is surely that of the external environment as already given, which ignores the incidence of the system itself on the reference environment. In its more recent developments, systems theory has introduced the concept of self-reference, with values that we might call cognitive. According to this concept, which we will discuss below, the identity of a system is determined by an organizational closure to the outside world, that is to say: every environment is the product of an observational operation, by which a system 'decides' to consider itself a system by drawing a boundary. A system, write J. Gougen and F. Varela, originates through a distinction that "divides the world into two parts, such as that and this or environment and system" (see Gougen and Varela, 1979). The environment is also the effect of a constructive operation, in the mental and cognitive meaning of the term. With

self-reference (we shall see this in the paragraph on the observer), systems theory accomplishes its final departure from any, albeit remote, realist-organicist heritage, to move closer, even in the ways of defining the environment, to the cognitive perspective.

This conceptual change fits perfectly within the General Systems Theory (GST), developed by Ludwig von Bertalanffy. GST offers a theoretical framework that not only overcomes the limitations of 19th-century environmental determinism but also introduces a more sophisticated view of the relationship between system and environment. In this perspective, systems are not entities passively shaped by external conditions, but autonomous structures that actively interact with their environment, defining and transforming it through cognitive and constructive operations.

1.2 General Systems Theory: fundamentals and applications

General Systems Theory (GST) is one of the most influential and pervasive paradigms developed in the 20th century, with implications that reach far beyond the field of natural sciences to touch humanities, social sciences, economics, and engineering disciplines. Conceived and promoted by Ludwig von Bertalanffy, GST aims to transcend traditional disciplinary boundaries, providing a unifying theoretical framework for the analysis and understanding of complex systems. This section aims to explore in detail the foundations of GST, trace its historical and methodological evolution, and analyze its applications.

1.2.1 Historical developments

General Systems Theory (GST) has a history that is intertwined with the development of modern science, responding to the growing need for a theoretical approach capable of dealing with the complexity of natural and social phenomena. GST was born in the 1930s, when Ludwig von Bertalanffy, dissatisfied with the mechanistic reductionism that dominated biology at the time, began to develop a theoretical framework that could describe living organisms not as isolated machines, but as open systems in continuous interaction with the environment (Bertalanffy, 1950).

Bertalanffy argued that living organisms must be understood as complex systems, characterized by an internal organization that emerges from the interactions between their parts. He introduced the concept of an ‘open system’ to describe organisms as entities that exchange energy and matter with the environment, maintaining a dynamic equilibrium through self-regulating processes. This concept revolutionized biology and provided a new framework for understanding life as a phenomenon emerging from a complex of interactions (Bertalanffy, 1968).

As the scholar states, general systems theory is a logical-mathematical discipline, purely formal but applicable to the various empirical sciences. In relation to the sciences concerned with organized complexes, it would have a significance analogous to that assumed by probability theory in relation to those sciences based on random events. Among the most significant aspects of such thinking are the concepts of openness and closure of systems, of homeostasis and self-regulation, and of equifinality, all of which are characteristics or properties of systems. Open systems have the structural possibility of achieving a state that is in the form of increasing organizational complexity and therefore never bound to an unchangeable equilibrium condition. This is the so-called steady state, which, characteristic of living organisms, allows them to maintain a permanent consistency despite the constant exchange of activated components with their environment. The stationary state, in the continuous process of intake and expulsion, destruction and regeneration of elements by the system, leads to ever greater forms of order and complexity. Thus, the system remains constant in terms of its composition even though continuous irreversible processes take place in it. This state is equifinal in the sense that an open system, even if it starts from different initial conditions than other open systems, can still reach a certain established end.

In the 1950s and 1960s, GST spread rapidly to other disciplines, influencing sociology, economics, psychology, and engineering. Talcott Parsons, a prominent sociologist, adopted the principles of GST to develop a theory of social action that described society as a system of interconnected systems, each with its own functions and interactions (Parsons, 1951). Parsons argued that social stability depended on the balance between different subsystems, such as the family, the economy, and the political system, each of which played a crucial role in maintaining social order. This systemic approach profoundly influenced sociology and contributed to the birth of social systems theory.

In parallel, cybernetics, closely related to GST, was developed by Norbert Wiener to study control and communication systems in biological and mechanical systems. Wiener introduced the concept of feedback, a mechanism through which systems can self-regulate in response to internal and external variations (Wiener, 1948). This concept found application in a wide range of contexts, from automatic control systems to biology, influencing the development of new technologies and the understanding of human and animal behavior.

In the 1970s and 1980s, GST continued to evolve, influencing the development of new interdisciplinary disciplines. A significant example is sustainability science, which integrates knowledge from different disciplines to address global challenges related to the environment, economy and society (Kates et al., 2001). GST provides a theoretical basis for understanding

how human and natural systems interact and how they can be managed sustainably. This approach has led to the development of new models and strategies for natural resource management, urban planning, and climate change mitigation.

Over the years, GST has undergone several revisions and extensions, incorporated new findings and adapted to changes in the scientific and technological landscape. For example, complexity theory, which explores how dynamic systems can develop complex behavior from simple rules, has enriched GST by offering new perspectives on the dynamics of complex systems (Kauffman, 1993). Complexity theory has found application in numerous fields, from computational biology to artificial intelligence, where understanding emerging dynamics is crucial for modeling and managing systems.

Moreover, GST has seen considerable development due to the integration of new concepts from information theory and cognitive science. For example, information theory, developed by Claude Shannon, provided a theoretical framework for understanding how open systems can exchange and process information efficiently (Shannon & Weaver, 1949). This concept has been further developed in the digital age, where information systems, such as social media and communication platforms, must manage a continuous flow of data and ensure the quality and integrity of the information exchanged.

1.2.2 Foundations

General Systems Theory developed as a response to the growing need for an interdisciplinary approach to deal with the complexity of systems in nature and society. One of the pioneers of this approach was Ludwig von Bertalanffy, for whom systems, regardless of their specific field, follow common principles that can be studied in an integrated manner. According to Bertalanffy, a system can be defined as a set of interacting components that form an organized totality, characterized by emergent properties that cannot be reduced to the individual parts (Bertalanffy, 1968).

The concept of a system, according to GST, extends to a wide range of phenomena, from biological systems to ecosystems, from social organizations to technological systems. This extension has enabled GST to provide a theoretical framework capable of linking different disciplines, overcoming traditional boundaries, and promoting an integrated approach to scientific research. One of the main objectives of GST is to identify and formalize the general laws that govern systems, making a comparative analysis between systems of different natures and complexity possible. This specific objective has proved particularly useful in fields such as systems engineering, biology, and sustainability science, where understanding

the complex interactions between the components of a system is essential to meet modern challenges.

GST has also expanded its application in information and data management, with a focus on networked systems and digital platforms. The analysis of information systems such as interconnected networks has enabled the development of models to understand information diffusion, social influence, and control of digital platforms (Van Dijck, Poell & De Waal, 2018). This set of studies has found how digital platforms, considered complex systems, can have a significant impact on society through their ability to shape communication, public perception, and collective behavior.

A further recent development is the application of GST in the field of environmental governance and sustainability. In this case, GST is used to model complex interactions between natural and social systems, offering tools to understand how these interactions can be managed sustainably. GST, for example, provides a framework for analyzing the resilience of ecosystems and human societies in the face of environmental disturbances and climate change, enabling the development of more effective adaptation and mitigation strategies (Folke et al., 2021).

1.2.3 Key principles

As seen, in a world where the fragmentation of knowledge risks obscuring the understanding of reality, GST invites us to consider the intrinsic connection between the parts of a system and to recognize how these interactions give rise to emergent and unpredictable behavior. The principles of interrelation and interdependence, as well as those of totality, holism, and equifinality, provide a theoretical framework for analyzing how systems can achieve states of equilibrium and adapt to change while maintaining the coherence of the whole. Concepts such as feedback, homeostasis, and self-regulation recall the importance of feedback processes in maintaining the stability and resilience of systems. This section outlines how these principles are not just abstract theoretical constructs, but find practical application in a variety of fields, from biology to sociology, from economics to engineering.

Interrelation and interdependence. The principle of interrelation and interdependence states that the elements of a system cannot be understood in isolation but must be considered with the other elements of the system and the system. This principle has been confirmed by numerous recent studies in various fields, including biology, neuroscience, and sociology. In biology, it has emerged that the functionality of complex systems such as the human brain depends on the interaction between neuronal networks (Bullmore & Sporns, 2009): the brain itself operates as a complex network, in which the integrity and functionality of the system

depends on the connections between different brain areas. Dysfunction in one part of the network can have cascading effects on the entire system, affecting behavior and cognitive abilities.

In sociology, the principle of interrelation and interdependence has been used to understand social dynamics and networks of relationships between individuals and groups. The analysis of social networks has revealed how interactions between individuals can influence the spread of ideas, innovations and behavior, creating patterns of social influence that can have a significant impact on the structure and dynamics of society (Castells, 2011). Studies in this field show that social systems are characterized by a complex network of interactions, in which the behavior of one individual can influence and be influenced by the behavior of others, with effects that can extend to the entire social system.

Totality and holism. The principles of totality and holism hold that a system is more than the sum of its parts and, in this sense, have been further explored by complexity and emergence studies. Complex systems, such as economic and social systems, exhibit emergent properties that cannot be reduced to the behavior of individual elements. Consider, for example, global financial crises, which are usually not the result of single isolated events, but more often of complex interactions between economic actors (Haldane & May, 2011). Research in this area has highlighted the importance of considering system dynamics to understand emerging phenomena.

These principles have also been applied in the biological field to understand processes of cell development and differentiation. For example, embryonic development has been studied as a holistic process in which cells interact with each other and their environment to give rise to a complex organism. This has led to the realization that the emerging behavior of the organism cannot be explained simply by examining individual genes or cells but requires an analysis of the interactions between the different components of the system (Gilbert, 2014).

Equifinality. The notion of equifinality is a key principle of GST that refers to the ability of a system to reach the same final state from different initial conditions and through different pathways. This concept contrasts with classical determinism, according to which the same result can only be achieved through a specific sequence of events.

In organizational dynamics, different strategies can lead to success depending on resources, competencies, and environmental circumstances (Gavetti, Levinthal & Rivkin, 2005). This principle is particularly relevant in the context of globalization, where different nations can achieve similar levels of economic development through unique historical and cultural paths. Recent research has also applied the principle of equifinality to evolutionary biology, demonstrating how different species can develop similar characteristics in response to

similar environmental pressures through different evolutionary pathways. This phenomenon, known as ‘evolutionary convergence’, has been observed in numerous contexts, from the evolution of wings in bats and birds to the capacity for echolocation in different mammalian species (Conway Morris, 2003).

In the social sciences, equifinality is applied to understand how different organizations can achieve similar goals through different strategies and pathways. For example, two companies may achieve market success by adopting completely different approaches to human resource management, production or marketing. In the context of globalization, the principle is relevant because nations with different cultures, political and economic systems can achieve similar levels of economic development through unique and distinct paths.

In social systems, equifinality manifests itself in the ability of communities to achieve social cohesion or political stability through different forms of social organization or governance. Some societies, for example, may achieve a high level of social cohesion through a strong sense of collective identity and community participation, while others may achieve the same through strong institutions and inclusive policies.

Equifinality is also an important concept in public policy analysis, where different approaches may lead to similar social or economic development outcomes. The difference with respect to closed systems is considerable, since in this the final state is defined and determined by the initial conditions and the laws that regulate its evolution and is achieved through the progressive destruction of order, in the presence of entropy. The principle of equifinality, in its original formulation, refers to a property of open systems of the physical type which, unlike closed systems and thanks to the continuous exchanges of matter and information, can reach the same final state of the structure, originating from different initial states of the structure itself. In physical type systems, it is therefore possible to state the principle of equifinality in relation to the states of the structure, given the coincidence between structure and system; therefore, the system’s purpose is a direct expression of the principles and laws of operation of its structure. Conversely, in social systems, including the enterprise, the system does not coincide with the structure but, rather, emerges from it if it is oriented towards a specific purpose. Thus, it can be said that in social systems, assuming a certain structure does not necessarily correspond to a system. In the case of social systems, the property of equifinality must be stated by assuming that more than one system can emerge from a structure over time.

A case in point may be welfare policies, which may vary considerably from one country to another but can still lead to comparable levels of social welfare and reduced inequality.

As has been shown, equifinality has significant implications for theory and practice in several fields. First, it challenges the idea that there is a single 'best' path or solution to achieve a given goal, encouraging instead the exploration of multiple pathways and strategies. This is relevant in complex and dynamic contexts where flexibility and adaptability are crucial. Secondly, equifinality implies that the evaluation of strategies or policies should not only be based on the paths followed, but also on the results achieved. This approach can lead to greater open-mindedness and creativity in dealing with complex problems, recognizing that different solutions may be valid in different contexts.

Feedback and feedback loops. Feedback processes, both positive and negative, are fundamental to the regulation of complex systems. Contemporary research has deepened the understanding of feedback in ecological and climate dynamics, showing how feedback loops can amplify or mitigate the effects of climate change (Steffen et al., 2015). Positive feedback, such as the melting of polar ice that reduces the earth's albedo and increases heat absorption, can accelerate global warming processes. Conversely, negative feedback, such as an increase in vegetation that absorbs CO2, can help stabilize the climate.

In social systems, the feedback between the actions of individuals and the reactions of the social environment has been studied to understand phenomena such as political polarization and the spread of fake news. One example is the spread of fake news on social media, which can be seen as a positive feedback loop, where repeated exposure to false information reinforces individuals' beliefs and increases the likelihood that this information will be shared further, creating a vicious cycle of misinformation (Vosoughi, Roy & Aral, 2018).

Degree of openness. The distinction between open and closed systems remains a fundamental concept in GST but has been expanded and refined with the advent of information theory and computational complexity. In open systems, continuous interaction with the environment is essential for survival and evolution. For this very reason, the principle has been applied in biology to understand the dynamics of ecosystems and the evolution of species (Levin, 1998).

Systems biology has used the distinction between open and closed systems to model the metabolic processes of organisms, which depend on the continuous exchange of energy and matter with the external environment. The homeostatic regulation of the human body, for example, can be seen as an open system that maintains internal balance through interaction with the environment, such as food intake and waste elimination (Cannon, 1932). This dynamic has also influenced the study of evolutionary biology, where organisms are seen as open systems that continuously adapt to changing environmental conditions through the evolutionary process. In computer science, GST has been applied to understand the dynamics

of computer networks and distributed systems. Open systems, such as the Internet, are characterized by a continuous interaction and exchange of information with the external environment and must constantly adapt to changes in the network (Barabási, 2016). GST provides a theoretical framework for understanding how networks can self-organize and maintain their functionality despite disruptions, such as cyber-attacks or technical failures. This has led to the development of robust algorithms and control systems that can handle the complexity of global networks and ensure their security and reliability. In the social sciences, the notion of open systems has been used to analyze global organizations and economies. In this vein, recent studies on the resilience of cities and economic systems have shown how adaptability and flexibility are crucial in dealing with global crises, such as the COVID-19 pandemic (Folke et al., 2021). GST offers tools to model these complex interactions and to develop resilience strategies that consider the need to adapt rapidly to changing circumstances. Resilient cities are designed to be open systems that can adapt to economic, social and environmental shocks through flexible governance and a robust infrastructure. Another application of the distinction between open and closed systems has been made in information theory, where it is studied how open systems can exchange and process information efficiently.

Homeostasis. The concept of homeostasis was introduced into the biological context by Walter Cannon in the 1930s to describe the ability of living organisms to maintain a stable internal equilibrium despite changes in the external environment (Cannon, 1932). Homeostasis refers to a set of physiological processes that regulate various internal parameters, such as body temperature, blood pH and glucose levels, ensuring the stability and functionality of the organism. The principle of homeostasis was quickly adopted by GST as it represents a classic example of how a system can self-regulate to maintain equilibrium. In general, homeostasis can be applied to any system that needs to maintain a dynamic equilibrium to function properly. Developments in cybernetic studies have shown that certain mechanical systems, such as the steam engine or the thermostat, are also endowed with the capacity for self-regulation, i.e. they are systems that do not require external regulation, relying on the mechanism of informational feed-back (or feedback) (Wiener, 1968; Boringhieri, 1966).

Social organizations, for example, need to maintain stability to ensure cohesion and continuity, while ecological systems need to balance energy and matter flows to sustain biodiversity and productivity. GST uses the concept of homeostasis to analyze how these systems react to perturbations and how they stabilize through feedback mechanisms.

Homeostatic mechanisms operate through feedback loops, in which a change in a parameter is detected by internal sensors (in the case of biological organisms) or other monitoring tools, which trigger a response to correct the change and return the system to its equilibrium state. These cycles can be seen in a wide range of systems, from biological to technological.

In the case of body temperature regulation, the hypothalamus in the brain acts as a thermostat that senses body temperature and, if it detects an alteration, triggers physiological responses such as sweating to cool the body or shivering to warm it up. Similarly, in technological systems, a household thermostat detects the room temperature and switches the heating on or off to maintain the set temperature.

In organizations and social systems, homeostasis mechanisms may include governance structures, regulations and policies that ensure that the organization can adapt to external changes without losing its internal cohesion. The homeostatic attitude is essential for long-term stability, as it allows organizations to respond flexibly to external pressures while maintaining a sense of continuity. A crucial aspect of homeostasis is its relationship with resilience, the ability of a system to resist and recover from external disturbances while maintaining its structure and functionality. While homeostasis focuses on the preservation of equilibrium, resilience includes the ability to adapt to new conditions and, if necessary, reorganize itself to continue functioning effectively.

For example, in ecosystems, resilience can be seen as the ability of an ecosystem to return to a state of equilibrium after a disturbance, such as fire or species invasion. GST uses these concepts to model and understand how natural and man-made systems can maintain their functionality in the face of change and disturbance.

Self-regulation. Self-regulation is closely related to the concept of homeostasis but refers more specifically to the ability of a system to autonomously manage its internal processes to maintain stability or to achieve a specific goal. While homeostasis is primarily concerned with maintaining equilibrium, self-regulation includes the system's ability to modify its own behavior or structure in response to internal or external stimuli.

In biology, self-regulation manifests itself in processes such as gene regulation, where genes are switched on or off in response to environmental or internal signals, allowing the organism to adapt to different conditions (Alon, 2007). This process is fundamental to development, growth and stress response in living organisms.

In social and organizational systems, on the other hand, self-regulation manifests itself through an organization's ability to monitor and correct its operations to respond to changes in market conditions, regulations or customer needs. In managerial terms, a company that

adjusts its production according to market demand is exercising a self-regulating mechanism to optimize its operations and maintain competitiveness.

Self-regulation in complex systems often involves a combination of positive and negative feedback. Negative feedback tends to stabilize the system by reducing deviations from normal functioning, while positive feedback can amplify certain processes, leading to more significant changes.

In organizations, self-regulation mechanisms may include performance monitoring procedures, incentive systems and employee feedback mechanisms. These tools enable the organization to quickly adapt to new circumstances and make the necessary changes to achieve its objectives.

Self-regulation is also closely linked to the capacity for innovation in a system. A system that can self-regulate is often also able to experiment with new approaches, adapt to new opportunities and face challenges in creative ways. This capacity for innovation is particularly important in dynamic environments, where adaptability is crucial for long-term success.

Self-regulation also manifests itself in the technology sector where companies show the ability to adapt their research and development processes in response to changes in the technological landscape or consumer preferences. This type of self-adaptation can lead to product innovations that ensure competitive advantage.

1.2.3.1 Openness and closeness: the issue of boundaries

In von Bertalanffy's definition, quoted above, the open character of systems clearly emerged, as complex identities of interacting units, themselves engaged in a continuous exchange of energy and matter with the environment. Within the framework of general systems theory, the author devotes particular attention to open systems in physics and biology, introducing this new category to try to explain the behavior of living systems. With reference to interactions with the environment, a System is said to be open if it exchanges not only energy but also matter and information with it. It follows that the functioning of an open System can be represented by the following logical sequence: input flows - transformation - output flows, with which we wish to highlight precisely the importance of the exchange of materials and information with the external environment and of the internal processes of use and transformation of these elements. A system, on the other hand, is said to be closed when it does not have exchanges of information with the outside, but only of energy. The law in question, observing thermal machines, argues that physical phenomena closed physical systems tend to move from order to disorder; to proceed spontaneously towards states of

increasing disorder, tending towards a maximum that at the end of the process, identifies the final state of equilibrium (Amit, 1999).

According to this still traditional version of the theory, the continuous system-environment interaction, understood as an uninterrupted flow of input-output, makes the system a complex entity in continuous evolution, characterized by dynamic equilibria. What von Bertalanffy and the early systemists overlooked are precisely the phenomena of construction and preservation of the identity of complex formations. More precisely, the theorization of the openness of systems, as a precondition for the maintenance of dynamic equilibrium and as a fundamental characteristic for the very definition of the living, ended up underestimating not only the aspects relating to the autonomy of the living in terms of codification but also those relating to the conservation of identity. With the concept of self-referential closure, theory has considered the problem of preserving the boundaries of a system, whether living or social. This can only take place through the formation of a boundary, which organizationally closes off the internal operations of the system. However, the fundamental fact is that the closure operation is not performed by the environment but by the system itself, which 'decides' to draw a boundary between itself and the outside. All the operations of a system are thus self-referential, in that they refer to itself and not to other external entities. A system can only refer to what its codes enable it to refer to. The operations that enable a man to preserve his identity over time and not turn into something else are precisely self-referential, in the sense that they reproduce the elements, their relations, and the organization of relations that constitute the system of operations that in turn constitute identity. The autopoiesis of which Humberto Maturana and Francisco Varela spoke is precisely the reproduction of the system's maintenance structures by the system itself.

But closure does not mean the exclusion of relations with the environment, where other systems operate; on the contrary, the closure made possible by self-reference makes openness possible, even if only under the conditions established by internal codifications. A social system, for example, can communicate with other social systems precisely by its self-referential closure, since it is only by maintaining stable the reproduction of its own identity that it can interact with the outside world: only closure makes openness possible since what is not closed cannot even be opened. Exemplifying in terms of social systems, it can be said that a judicial system can communicate with a political system not by an openness that would lead to its dissolution, but precisely by its closure, i.e. the self-referential maintenance of its identity as a judicial system. When magistrates claim that they only recognize the code, they are alluding to the self-reference that closes the system and reproduces it before an environment of other systems.

1.2.3.2 Systems: an endowment of variety

A *system*, as defined, essentially has the purpose of surviving in its *context*, interacting with other *systems* that populate it (Beer, 1972). To pursue this purpose, the *Government* must dynamically make choices to cope with problems (Barile & Colarusso, 2005). The *system* (or, more properly, its *government*) detects the problematic areas that could primarily compromise the planned objectives and, through a continuous learning process (Hedberg, 1976) proceeds with the reorganization and adaptation of its *knowledge* to identify a possible solution and, therefore, comes to a choice (decides). Solutions' effectiveness and efficiency condition the system's life and determine the viability path's quality.

Having thus reiterated the existence of a close connection between *decision and knowledge*, it is necessary to better investigate the characteristics of the latter.

Knowledge is primarily interconnected with other concepts such as *learning* (Bandler, 1985) and *reasoning*; it can and must be understood as a cyclical process in which *perception, action of the intellect, memorization, and processing of information* (*reasoning*) create a virtuous path that determines an ever-increasing supply of ... *things that are known*. It should be noted that the concept of *knowledge* must necessarily recover a possible descriptive, discrete representation as an endowment of things known at a given moment. We share the idea, prevalent in literature, of knowledge as a process, as a continuous elaboration, rather than as an accumulation of information. However, we believe it is reasonable to hypothesize that the comparison between two temporally distinct moments t_1 and t_2 can highlight that knowledge at moment t_1 is different from knowledge at moment t_2. We outline, the concept of *knowledge endowment* fixed at a certain instant t_1, defined as the *Information Variety* at time $t[V_{inf_t}]$ owned by a *system* (Rullani, 1984).

Now, if it is appropriate that knowledge as a process also includes the result of the action of the intellect, then the information variety possessed at a certain moment must also be understood as inclusive of the knowledge generated because of intellectual activity. Cognitive activity, aimed at learning and understanding, is not only achieved through perception but also through reflection, understood as the autonomous determination of new knowledge. It comes to synthesis in those informative and conceptual elements that emerge by arranging themselves at the various levels of articulation of the mind (Minsky, 1988).

In the following, we will see how the system, identified as an entity with its own capacity for intelligence and a specific information variety (which varies dynamically), interacts with other systems when a decision must be made to manage a problem. We will study the contextual conditions and the factors that prevail when the decision to be made, in the mind of the subject who must decide, appears strongly influenced by elements that cannot be

adequately controlled (problematic area of complexity). In such cases, a phase of abduction is needed, because of which, almost out of nowhere and generally completely unexpected, the idea of a solution hypothesis occurs in the mind of the decision maker.

Thus, there is a significant relationship that binds the solution of a problem both to the factors of the decision maker (values, models and elements of knowledge) and to context factors (suprasystems of reference and the related value systems), as well as to the logical intellectual dynamics typical of human thought (abduction, induction, and deduction).

A specific study on socio-behavioural dynamics concerning the information variety endowment possessed by a subject committed to making decisions proposes a formal definition of the dimensions and characteristics of the information variety endowment. In particular, the information variety is defined through three factors that can be expressed in a coherent measurement system (Barile, 2006b; Audi 1998; Shannon 1948):

$V_{inf}(k) = [U_{inf}(k), S_{int}(k), C_{val}(k)]$

Where:

$V_{inf}(k)$ = ***Information variety*** *of the system* ***k****;*

$U_{inf}(k)$ = ***Information units (****of the information variety) of the System* ***k****;*

$S_{int}(k)$ = ***Interpretative schemes (****of the information variety) of the system* ***k****;*

$C_{val}(k)$ = ***Value categories (****of the information variety) of the system* ***k****.*

The elements $U_{inf}(k)$, $S_{int}(k)$ and $C_{val}(k)$, which characterize the *Information Variety of the system K* $V_{inf}(k)$, are not to be understood as dimensions. In fact, they do not explain the proportions of the *information variety* concerning orthogonal dimensions, such as *height*, *depth* and *width*, which are typical expressions of the spatial representation of material bodies; rather, they are to be understood as expressive quantities of specific properties possessed by each *information variety* and, consequently, as factors capable of conditioning the evolutionary dynamics of knowledge (Pareto, 1964).

Specifically, we can assume that the three factors are representative of the following characteristics, respectively:

– *the "structural" composition of knowledge.*
– *the forms of knowledge*
– *the resistance that the owned knowledge opposes to change.*

Let us see, in greater detail, the essential contents of each characteristic.

a) *The "structural" composition of knowledge*

It is given by the quantitative endowment of *Information Units* $U_{inf}(k)$ owned by a *system k*. It is what can be perceived through the five senses or is determined by subsequent processing. They derive from that set of data that aims to contribute to the formation of

elements of an accomplished thought and to fit into a path of the experiential subject so that he can process them, transforming them into *information* relating to defined knowledge processes (Pessa & Penna, 1994).

These premises imply the existence in the experienced reality of implicit and therefore not obvious information contents. Different observers involved within the same systems environment (*context*) perceive an observed reality that is not the same. This diversity of perception is linked as much to psychic laws that bind the procedural behaviour of perception, as to the characteristics of the *system* (previous *information variety* owned) and to the relationship that he establishes with the environment in which he is active (purpose of the interaction).

The lack of distinction between *environment* and *context* justifies many possible errors of interpretation and evaluation concerning problematic situations in which choices must be made. Lack of attention to the "*context*" factor can mislead even capable decision-makers.

Having noted that the *environment*/*context* distinction significantly affects perception, and therefore the acquisition of information, should not distract from considering another equally important aspect. The reference is to language, that is to the means through which information is conveyed. It is evident that, regardless of the attention that is placed by the subject "*who perceives*" on some representative aspects of the observed reality rather than on others, what determines the level of "*understanding*", of full acquisition of information, is in close correlation with the level of sharing of the language used (not just verbal). Language intervenes, in a first instance, by reason of the ability to "*label*" the information perceived; secondly, in its complete articulation, it qualifies *interpretative schemes* that go well beyond the lexical meaning of a single word. Furthermore, the level of formalization of the common language varies from one subject to another and from one *system* to another; therefore, for efficient communication, it becomes essential to consider the principle of "*requisite variety*" (Ashby, 1956).

In conclusion, it should be observed that the *structural composition of a variety* can be technically defined as a *data warehouse* (*dw*).

b) *The forms of knowledge*

The issue concerns how information is organized within an *information variety*. Thus, the *architecture* that the data must assume to be transformed, through contextualization, into information (Bartlett, 1932; Pessa & Penna, 1994). The hypothesis accepted here consists in believing that the forms assumed by the information correspond to specific *interpretative schemes* adopted by the experiencer. The modality has universal validity, it concerns both topics that require high profiles of thought, such as the scheme that allowed Ernest

Rutherford in 1911 to hypothesize that the structure of an atom was attributable to that of a planetary system, and more as usual, such as those that allow every individual, even with little education, to understand with a simple observation whether a pet, even if seen for the first time, is a dog or a cat. It is the *interpretative scheme* that allows to rationalize the different perceptions that intervene in everyone's daily life. Without the availability and the help of such a logical structure, we would be helpless with respect to any perceived novelty. We would have to consider every event, whether natural or social, as innovative with respect to the *information variety* we have and, therefore, we would be forced to elaborate each time a new model capable of interpreting and explaining it.

It is precisely the *interpretative schemes* that determine the transformation of non-specific data into information relating to a specific context. Murray Gell-Mann points out that, in the presence of new information sent from the environment, the compressed patterns unfold to provide a prediction or an indication of behaviour or both. Compression, on the other hand, occurs when behavioural habits are identified and, precisely, synthesized. The rest of the experience is attributable to changes or regularities so slight that they cannot be identified, and therefore cannot be extrapolated in such a way as to be traced, through compression, to a pattern. When a scheme is used, it is integrated by new elements – generally randomly – consisting of "updated information", or in any case perceptions of various kinds coming from the real world (Gell-Mann, 1992). Furthermore, he states that: when complex adaptive systems emerge, they operate in a cycle of variable patterns, accidental circumstances, phenotypic consequences and the feedback of selective pressures on the competition between patterns (Gell-Mann, 2000). What is to be understood by the *Interpretative Scheme* covers a very wide range of "addresses" available to an *Information Variety*. The need made explicit by Gell-Mann to distinguish between "compressed" schemes, as he defines them, and "uncompressed" schemes allows us to introduce an important distinction for what is exposed in the second part of the volume. It is necessary to distinguish the *interpretative schemes* in *general* and *synthesis*. The *general interpretative schemes* define a broad organizational "*mesh*" for the rationalization of information. The *Specific scheme* provide a tight "*mesh*" through which specific information can be filtered. Thus, for example, the following statement by Pier Luigi Luisi: "*Starting from small molecules, compounds with an increasingly complex molecular structure and new properties would then develop, until the most extraordinary of emerging properties appeared: life itself*" (Luisi, 1993) refers to a *general interpretative scheme*. It is easy to understand that a lot of information can be traced back to a similar pattern, not least the information concerning the spread of an epidemic, rather than the mechanism of development and propagation of a fire or even the process of

nuclear fission. Otherwise, the scheme relating to the binding together in a certain way of atoms of oxygen, carbon, and hydrogen, to produce glucose, is to be considered *a specific scheme*.

The existence of a *general scheme* can also be deduced by ascertaining the effects it has produced. Think of the word "*soul*": in Sanskrit the translation is *atman*, in Greek pneuma, in Latin *spiritus*, in Hebrew *ruah* and in all cases the meaning associated with the terms is "breath". It is evident that metaphorically the concept of soul refers to a *general interpretative scheme* that wants it to be immaterial, distinct from the body and elusive, just like the air we breathe. Again, imagine hearing someone utter the sound "*sobaka*", we could note that for many individuals this data does not mean anything; no image is born in the mind of the listener. Only when you are informed that the sound concerns a Russian word meaning "*dog*" comes from the given information. The term originates a concept that is linked to a *synthetic interpretative scheme* and the mind of the listener produces, for example, depending on the imagined context, the pleasant idea of petting a dog or the less pleasant one of a growling and barking dog (Minsky, 1988).

Much of the shared patrimony of *general schemes* owned by a community is contained in the lexicon, syntax, and semantics of the language. In this regard, Marvin Minsky argues that language seems to play a role in many activities of our consciousness. This happens because our linguistic agency performs functions with respect to our way of thinking, as it has a strong control over the memory systems of other agencies and therefore over the large accumulations of knowledge they contain.

The history of humans teaches that the people of the most diverse ethnic groups have progressively "codified" their uses, customs, and knowledge in their language. A significant confirmation is in the words of the historian A. Bailly, who in his biography of Julius Caesar states: "*Caesar […] tried above all to replace Latin for Celtic as an official language; and this was perhaps, among his decisions, one of the richest in consequences: with the language even, the Roman mentality gradually imposed itself on the Gallic intelligence*" (Bailly, 1933). Therefore, the availability of *interpretative schemes* strongly conditions the ability to understand reality (Johnson-Laird, 2013).

An interesting aspect concerns the possibility that there are *interpretative schemes* referable not so much to the single individual (understood as a *system*) as to communities of human beings (of *systems*). Language would seem to have, in addition to other specific properties, the ability to provide the conditions for a possible *consonance* both decision-making and operational between members of the same community and between similar communities. On the subject Giambattista Vico affirms that common sense, judgment

without any reflection, commonly felt by an entire order, by a whole people, by a whole nation or by the whole human race, affirms that there is in the nature of human things a mental language common to all nations, which uniformly understands the substance of things that can be used in human sociable life and explains it with many different modifications for how different aspects these things may have (Vico, 2013).

c) *Resistance to change*

The third factor concerns the *Value Categories*, which represent the *system of* reference *values* possessed by the *system*, the set of "*strong beliefs*" of a *system*. It is the *Value Categories* that are responsible for the refusal or acceptance of rationally justifiable processes. It is the *Value Categories* that guide the formation and define the methods of use of the *interpretative schemes*. In this regard, referring to some categories of values, the philosopher Mark Taylor explains that among the various lessons. He learned both from Hegel-Kierkegaard and from the events of the 1960s, two assume particular importance. First, the existence of a religious dimension within all cultures. To understand its significance, it is necessary to go beyond the more visible aspects of religion and examine the subtle and complex ways in which it affects personal, social and cultural development. Religion is often more penetrating and incisive precisely where it is least taken for granted. If we want to understand network culture, we must train our gaze to see religion in the places where it emerges with less evidence. Furthermore, religion is inseparable from philosophy, literature, literary criticism, art and architecture, as well as from science, technology, capitalism and communism. The complex networks in which we find ourselves wrapped today are composed of infinite threads intertwined together, which, if on the one hand they are difficult to dissolve, on the other, can serve to trace the lines of development of contemporary experience (Taylor, 2001).

The *value categories* are strictly connected with the emotional level of the decision maker. They represent the subjective "filter" that personalizes the criteria for using the *interpretative schemes*; they qualify states of unawareness cantered on what is "good" and "bad" perceived in the facts analysed; characterize the ethics of the context concerning the generic morality (Barile, 2006a); they inspire and allow to activate the criteria through which it becomes possible to express an opinion on events and facts (Maslow, 1987).

Another conceptually significant element relating to the Value Categories derives from the aptitude to be normally shared by individuals who belong to a specific social group. Fritjof Capra explains that: the social network produces a body of shared knowledge – which includes information, ideas, technical skills – which, together with values and beliefs, help to shape to the characteristic way of life of that culture. Furthermore, the values and beliefs

of a culture exert an influence on the body of knowledge produced in it; that is, they are part of those lenses through which we see the world, and they help us to interpret our experiences and to decide what kind of knowledge is relevant, meaningful. This significant knowledge, continuously modified by the communications network, is transmitted from generation to generation with the values, beliefs and rules of conduct that characterize that culture. Systems of shared values and beliefs create an identity between the members of the social network, an identity that is based on a sense of belonging. People who belong to different cultures have different identities, because they share different sets of values and beliefs (Capra, 1996).

1.2.4 General Systems Theory Applications

The following table provides a summary of the main applications of General Systems Theory (GST) in different subject areas. GST, developed by Ludwig von Bertalanffy, has had a significant impact on multiple fields, providing a theoretical framework for understanding and analyzing complex systems in an integrated manner. Table 1 illustrates how GST has influenced the biological sciences, social sciences, engineering, computer science and ecology, outlining the key contributions of the theory in each field and how it has enabled complex problems to be addressed and solved through a systems approach.

Tab. 1 - Contributions of General Systems Theory (GST)

Discipline	Contributions of General Systems Theory (GST)
Biological Sciences	GST provided a theoretical framework for analyzing living organisms as complex, integrated systems, emphasizing the importance of multiple, often conflicting interactions that generate emergent stability. It has influenced the study of ecosystems, viewed as open systems characterized by continuous flows of energy and matter, and evolution, conceived as a dynamic, non-linear process of adaptation and selection. Systems biology, which integrates GST with molecular biology, has enabled the development of sophisticated models to understand cellular and genetic dynamics, such as gene regulatory systems and microbial networks, offering new perspectives for biomedical research and personalized therapies.
Social Sciences	GST has transformed the understanding of societies, viewed as self-referential communication systems with autonomous yet interdependent subsystems (e.g., economy, politics, law). It has provided tools for analyzing the autonomy and interaction of social subsystems, the evolution of organizations as open systems, and the dynamics of social networks. Additionally, GST has influenced the study of globalization and global governance, modeling economic, political, and environmental interdependencies. GST has also enriched the analysis of power dynamics and social inequalities through its integration with critical theory and political sociology.
Engineering and Computer Science	GST has had a significant impact on the design and management of complex systems, influencing the development of cybernetics and systems engineering. It provided a theoretical framework for modeling engineering systems as

	networks of interacting components and contributed to understanding emergent intelligent systems and computer networks. GST has improved the resilience and robustness of digital infrastructures and supported the development of artificial intelligence through the analysis of learning and adaptation dynamics.
Ecology	GST has made a fundamental contribution to understanding the complexity of ecosystems, analyzed as complex systems of interactions between organisms and the environment. It has influenced the study of ecosystem sustainability and resilience, modeling these emergent properties through the analysis of ecological interactions. GST has also guided the development of predictive models to analyze environmental dynamics and design strategies for sustainable natural resource management and long-term sustainability.

Source: author elaboration

1.3 Revisions and additions

Although GST has been widely adopted in multiple disciplines, it has also faced significant criticism. In the 1970s, some scholars began to question the ability of GST to adequately explain complex phenomena, accusing it of being too general and abstract (Bunge, 1979). These criticisms focused mainly on the universal approach of GST, which attempted to apply the same principles to systems of a very different nature, without considering the specificities and peculiarities of individual systems.

In response to these objections, new approaches were developed that integrate GST with other theories, such as chaos theory and complexity theory. Chaos theory, introduced by Edward Lorenz, showed that small changes in initial conditions can lead to unpredictable behavior in dynamic systems (Lorenz, 1963). Chaos theory has found application in fields such as meteorology, economics, and biology, where it has emerged that even seemingly stable systems can become unpredictable and highly sensitive to small variations. This has led to a revision of GST, which now incorporates the idea that many complex systems do not follow linear and predictable patterns but may exhibit chaotic dynamics. Chaos theory has found application in fields such as meteorology, economics, and biology, where it has emerged that even seemingly stable systems can become unpredictable and highly sensitive to small variations.

Another criticism of GST concerns its alleged inability to adequately consider power dynamics and social inequalities. Hence, several approaches have developed that are more attentive to these aspects, such as critical systems theory, which integrates GST with concepts from critical theory and political sociology to analyze power relations in social systems (Midgley, 2000). Critical systems theory aims to examine how power structures influence the functioning of social systems and how structural inequalities can be addressed and mitigated.

In addition to theoretical criticism, GST has faced practical challenges related to the modelling of complex systems. The inherent complexity of real systems makes it difficult to develop models that are both accurate and manageable. For example, GST-based economic models often need to simplify the interactions between economic actors to be usable, but these simplifications can reduce their ability to accurately predict economic phenomena. This issue has been addressed through the integration of GST with advanced computational techniques, such as computer simulation and agent-based modeling, which allow the dynamics of complex systems to be explored in a more detailed and realistic manner (Epstein, 2006).

1.3.1 Autopoietic Systems

A significant contribution to GST is the theory of autopoietic systems, proposed by Humberto Maturana and Francisco Varela in the 1970s. This theory describes living systems as entities capable of self-generation and self-maintenance through processes of self-production and self-organization (Maturana & Varela, 1980). The concept of autopoiesis, which literally means 'self-creation', has revolutionized biology and cybernetics, offering a new understanding of life and cognitive processes.

Autopoietic systems theory argues that living organisms are not just machines that respond passively to external stimuli but are active systems that produce and maintain their own internal organization through processes of feedback and adaptation. This theory has had a significant impact on neuroscience and cognitive psychology, where it has been used to explain phenomena such as consciousness and intelligence (Thompson, 2007). Indeed, autopoiesis theory suggests that cognition is not simply a matter of information processing but is intimately linked to the autopoietic organization of living organisms.

Autopoietic systems theory has also been applied in the social sciences, particularly in the work of Niklas Luhmann, who developed a theory of social systems based on the concept of autopoiesis (Luhmann, 1995). Luhmann described societies as self-referential communication systems, in which each social system (economy, politics, law, etc.) operates according to its own logic, but interacts with other systems to maintain social stability.

Recently, autopoietic systems theory has also been applied in fields such as ecology and natural resource management, where it has been used to understand how ecosystems can maintain their functionality and resilience despite environmental perturbations (Capra & Luisi, 2014). For example, ecosystems can be viewed as autopoietic systems that maintain their internal organization through feedback processes between different ecosystem

components. This perspective has led to a better understanding of ecological resilience and influenced the development of sustainable natural resource management strategies.

Furthermore, the theory of autopoietic systems has raised important ethical and philosophical questions. Indeed, the concept of autopoiesis challenges the traditional distinction between subject and object, suggesting that knowledge and perception are active and constructive, rather than passive and reflexive, processes. This has led to a rethinking of theories of knowledge and science and has influenced the debate on topics such as intentionality, embodied cognition, and the nature of reality.

Autopoietic systems theory has also been influential in the field of artificial intelligence and robotics, where it has been used to develop autonomous systems capable of adapting and self-organizing in complex environments (Froese & Ziemke, 2009). This approach has led to significant developments in artificial intelligence, offering new possibilities for the creation of more intelligent and flexible machines.

1.4 From GST to social systems theory: unveiling social systems' logic

1.4.1 Social systems theory, organicism, and sociological functionalism

During an early phase, which lasted until about the mid-1970s, social systems theory was identified and sometimes generically confused with the organicist approaches that, long before von Bertalanffy himself, but without any conscious use of the conceptually isomorphising virtues of the system, had characterized the sociology of Auguste Comte, Herbert Spencer, and Émile Durkheim. Above all, with its fundamental concepts of division of labor and solidarity, Durkheim's sociology anticipated not only the Parsonsian themes of functionalism but also the systemic themes of differentiation. In contrast to von Bertalanffy, however, for whom the system concept took on an eminently and explicitly conceptual meaning, albeit derived from the concept of the cell, in Durkheim the systemic aspect remains fundamentally implicit. It is derived indirectly through the concept of solidarity, understood as the objective bonding of elements that are differentiated from each other by the division of labor, and yet functionally connected. Here in Durkheim, 19th century organicism is already combined with the functionalist culture of Parsons' 20th century sociology.

In short, in the contemporary formulation of social systems theory both the nineteenth-century organicist tradition, the functionalist tradition, and the properly systemic

Bertalanffian tradition converge. Yet none of the three traditions mentioned above can *sic et simpliciter* be incorporated into the theory without profound transformations, which concern epistemologically determinant aspects. In systems theory, in fact, the system is above all a description of reality that can take on either the realist connotations proper to the Bertalanffyan proposal, or the perspectivist (observer-dependence) ones, or the constructivist and self-referential ones of the current dominant formulation. In the second and third cases, the system is seen not as a mere object of the theory, but as how the observer argues and describes objects that are relevant to him. The system is here neither an organicistic conceptual construct nor an objective and realistic representation of what exists, but a way of observing. It is now necessary to address the proper sociological aspects of the theory, trying to show what its influence has been so far and above all what its results have been.

While on the epistemological level, there are still unresolved divergences regarding the relations between systemic theory, organicism, and sociological functionalism, on the level of the continuity of research and its results it is already possible to draw a balance, which leads directly from the original Durkhemian formulations on the division of labor to Parsons' symbolic media theory of interchange and the Luhmannian theory of self-reference.

1.4.2 The roots

"Social systems originate only under the condition of double contingency" (Luhmann, 1988, p. 273). This proposition by Niklas Luhmann is contained in a book published in 1988, but its significance and scope for sociology can only be fully appreciated if, precisely, we start with Durkheim and then, through Parsons and Bertalanffy, arrive at the current theory of self-reference.

The problem of social order, which was already tackled by Thomas Hobbes and later by the English utilitarians, was, as is well known, one of the main problems also for Durkheim, who rejected any psychological or individualist solution: the order of society does not derive, according to Durkheim, from any automatic confluence of individual egoisms - as the utilitarians wanted - nor from a contract between individuals who freely negotiate their reciprocal expectations on the basis of natural law. On the contrary, for Durkheim the order of society is based on the so-called 'pre-contractual conditions of every contract', i.e. on a set of social rules independent of individuals, their intentions, passions and interests. These rules could today be said to be systemic, in the sense that, by making possible the orderly and continuous coming together of the competing perspectives of action of the various individuals, they thus decrease disorder and thereby lead society towards states of

organization and differentiation. The division of labor is nothing other than the form taken by solidarity, i.e. social order, at an advanced stage of social evolution. The premises of order, those ground rules that reduce disorder, i.e. the Hobbesian selfish conflict of all against all, belong to the sphere of the very prerequisites of society.

When order is not realized, it means that the actors in society have failed to find stable forms of encounter or communication capable of making mutual expectations comparable. And when forms of encounter or communication are not realized, it means that each actor remains a prisoner of his or her own expectations, which depend on the contingency of the temporal, or psychological, or political, or simply random moment. Overcoming the 'double contingency', as Parsons calls it, is the basic systemic mechanism that allows society to exist and function as such. Parsons' theory of the system of social action is explicitly indebted to Durkheim, in that it removes the realization of order from the conditioning of individual contingencies, but at the same time it is indebted to the new concept of the system, understood as order, as a process of negative entropy, that is, as organization. The social system thus emerges as overcoming the double contingency into which actors have, so to speak, fallen when they appeared on the social scene.

Talcott Parsons, as is well known, entrusts systemic mechanisms – 'the communicative media of symbolic interchange' – with the task of reducing the double contingency. Symbolic media, among which Parsons places money, influence, power, affectivity, perform the function of orderers through the constitution and codification of expectations, which can thus become reciprocal.

1.4.3 The issue of meaning

Social systems differ from biological systems, with which they are interrelated, in that they are constituted and organized based on meaning. Although individual actors are biological organisms, social systems present themselves as predominantly non-organic entities, in that they are held together by symbolic processes, capable of providing decision-making guidance and criteria for mutual orientation. In short, meaning is a symbolic resource that makes mutual understanding and communication possible and plausible.

Systemic theory achieves here a first, significant departure from 19th-century organicism, in that social systems are fundamentally constituted by an 'immaterial matter', by an organization of reciprocal referrals of meaning between actors and between systems, i.e. by a symbolically realized order. Differentiation, i.e. the division of labor, not only between individuals but also between systems, between law and politics, between economics and science, between private and public life, is based on boundaries of meaning, i.e. on the

codified attribution of a shared reference to the boundary, which precisely differentiates the social systems themselves. The codification of the boundary does not derive from the nature of things, from an ineluctable necessity, but only from the forms that the overcoming of the double contingency may take from time to time during historical evolution, in the communicative situations of society where the overcoming itself becomes necessary. For this reason, the boundaries of meaning, i.e. the specific ways of overcoming the double contingency in law, politics, and economics, may differ from time to time. Nothing is necessary in the evolution of systems, and even less so in the evolution of social systems, whose possibilities of achieving organization and order belong, as we have seen, to the sphere of the improbable. An improbable that actors experience and interpret as normal, thanks precisely to the systems of sense that are societies. Sense makes the improbable appear as normal, as necessary what could also be different, as plausible what is highly problematic. The overcoming of double contingency, the attainment of order, does not, however, imply that systems settle into unchangeable states, that their organization becomes deterministically necessary, that security has now permeated society. On the contrary, sense, whose task is to ensure order, also makes possible the representation of the limitedness of systems and sometimes uses fear as an extreme alarm mechanism in the face of contingencies that seem insurmountable.

Sense is a selective indication of orientation that makes it possible for actors to overcome the double contingency and thereby communicate with each other. But for the overcoming of the double contingency to take place concretely, it is necessary that the selective indications, made available by sense itself, take on a symbolically codified form. Symbolic codes, what Parsons - as already mentioned - called symbolic media of interchange, are structures that make possible the coordination of expectations in the specialized forms required by each differentiated system: the economy, law, politics, science, private life, etc. The communicative codes thus pre-establish the conditions for the formation of the social order between the actors (Ego and Alter), to make some communicative relationship or exchange accessible to them in determined and specialized situations. Codes do not contain prescriptive rules that impose determined conduct or behavior, but only alternatives of choice that reduce the complexity of the decision for the actors, who find themselves having to overcome the double contingency, i.e., as we have already seen, to build a bridge between reciprocal expectations. The code model par excellence, already dealt with not only by Parsons but also by Luhmann, is that of money, which arranges the alternatives of choice between buyer and seller through the possibility of determining the price of a commodity. In this way, the possibility of achieving a commercial exchange is ensured, without the actors

having to construct for themselves the procedure of the exchange itself and without the actors having to reinvent from scratch for each new transaction the way of comparing reciprocal expectations. Similarly, power ensures communication in the political system, creating the possibility for actors to negotiate and compete according to codified alternatives: majority-minority, progressive-conservative, and government-opposition. The provision of alternatives reduces the complexity of political decision-making, allowing actors not only to present comparable expectations but also to agree or possibly conflict. Political conflict also requires overcoming the double contingency. The function of codes such as money, power, scientific truth, love, etc. is therefore, lato sensu, technical, in that they make communication accessible and available and thereby the formation of a non-ephemeral social order in economics, politics, academic life, and personal relationships. Symbolically codified guidelines thus generalize meaning and at the same time specialize it, depending on the specific demands of each differentiated system. Another function of the communicative codes is to maintain the boundaries of meaning between systems and thus differentiation, so that the conditions of dedifferentiation and thus a diminution of the communicative order do not arise. In making available the overcoming of the double contingency in specialized and differentiated situations (economics, politics, law, etc.), each code prevents the criteria and languages of communication from being confused: that politics interferes in law, that personal life interferes in economics, and so on. Codes, therefore, as we shall see more clearly later, organically close systems, while at the same time collectively validating boundaries through communicative sanctions. However, it is in no way permissible for the symbolic code to be questioned and thus become contingent, as it is itself transformed into an object of exchange or communication. In such cases, the code, which has also become contingent, no longer allows the double contingency to be overcome, but must necessarily have recourse to another code that acts as a functional equivalent. This may happen, for instance, when the code of politics – power – is no longer able to permit political communication. Here, another code may intervene but expose the system to de-differentiation risk.

1.4.4 The issue of differentiation

Previous sections have already alluded to differentiation as the formation of a boundary between the system's interior and exterior, determined by the system's needs, which now it assumes its identity necessarily distinguishes itself from its surroundings. Every identity presupposes the formation of a differentiation which, as Niklas Luhmann writes (see, 1984,

p. 244), 'is not ontological' but dependent on the operations by which the system maintains and reproduces its structure concerning the outside over time.

There is also internal differentiation, which can be briefly defined as the reproduction within the system itself of the system-environment difference. The development of differentiated subsystems corresponds in fact to the formation of system-environment differences, in which each system operates as an environment concerning every other and vice versa. Differentiation, in short, is the multiplication of the, so to speak, original difference between the system and the environment within the system.

It is necessary, however, to clarify in what sense current systems theory speaks of differentiation after this concept was introduced into sociological theory in the last century – from Comte and Spencer to Durkheim – as the very cornerstone of organicism. The concept of differentiation, of which we have already attempted a definition, partly following Luhmann's approach, is substantially different from that proposed by organicism, in that it has no realistic, let alone ontological, claim. In the organicist phase that the social sciences went through in the last century, from Comte to Durkheim, differentiation was fundamentally considered as an increase in complexity, that is, as a proliferation of parts and organs. The analogy with biological science is obvious, but less obvious is the profoundly ideological ambition of this analogy, which nurtured the hope of being able to export the laws of matter into the territory of society. In this way, it would have been possible not only to give nomological-explicative certainty to the sciences of society but also and above all to deliver to the turbulent industrial societies of the time a set of laws, founded no longer on uncertain human wills but on nature itself. The social division of labor – the terminology Durkheim uses to designate differentiation – is above all how an unequal society organizes its internal solidarity and crystallizes what Marx called class relations. 'Differentiation' here has a profoundly realistic meaning and refers to the spirit of an era, in which the persistence of Enlightenment confidence in reason still gave hope for a scientific solution to industrial conflict.

Beyond the reference to the representation of difference as synonymous with order, there is very little of the old organicist approach in the contemporary concept of differentiation. Not only epistemologically, but also ideologically, differentiation as an empirical state of society does not correspond to any law that governs systems in a deterministic manner: on the contrary, it is a mode of self-representation on the part of a system, which may find itself in the condition of choosing one form or another of differentiation depending on the concrete imperatives imposed by the need to overcome the double contingency. The concrete division of labor, or to use Marx's language, the material relations of production are not the

crystallization of any natural or historical necessity, but depend on the contingency, of the way it will be useful to overcome it from time to time. Thus, each system, which as we have seen is born under the impetus of double contingency, finds itself having to 'draw' within itself certain differences instead of others, but everything could also be drawn in another way. The concept of differentiation therefore no longer introduces the operational, let alone the epistemological, security of a tranquilizing realism. It is, on the contrary, a very fragile principle of order, which risks dedifferentiation and disorder with each new cycle of self-reproduction. The tranquil representation of a society differentiated into political, economic, legal, scientific, personal, etc. systems does not correspond to any cogent necessity but is merely the result of a complex interplay of reciprocal referrals between systems of meaning. Differentiation therefore loses all ontological connotations, assuming exclusively semantic values. It is boundaries of sense and not of matter that guarantee orderly social reproduction.

1.5 Systems' environment and context

A system, as such, does not exist objectively in reality. It is the result of a cognitive operation that an observer performs by distinguishing a certain entity from an indistinct environment and attributing its meaning to that entity. Therefore, systems do not "are", but "observe" and this presupposes that the observer is also specified: faced with the same *structure*, different observers can observe different *systems*, and the same *system* can be described in quite different forms (Von Foerster, 1982).

This confirms that it is not possible to arrive at objective and complete knowledge, but only at subjective and approximate knowledge.

In many paths of knowledge, what matters is not so much to grasp reality in its objectivity and wholeness, but to ensure that the perspective of investigation assumed, and the relative observations are consistent with the logical premises and with the aims of the research.

Historically, the study of business phenomena, in the context of economic and social sciences, is aimed at building models and formulating theories that can explain and support the action of the subject responsible for conducting the decision-making processes of business organizations. In this sense, in the rest of the discussion, the identification of the person appointed to assume the perspective of observation is fundamental. In the theoretical framework that is assumed here, that subject is the government interpreted as the top decision-making entity – composed of one or a group of individuals – in any system.

However, having identified the person to whom to report both governance and management events is not sufficient to prevent or exclude interpretative ambiguities. It is also necessary to share notions, schemes, and models which allow to synthesize the regularities observed

over time in the study of certain phenomena and which represent, for the business decision maker, a guide to orient themselves in the decision-making activity and, for those who study the phenomenon, an instrumental endowment with interpretative value useful for understanding the phenomena themselves. To assert itself and be shared, to become a paradigm recognized and accepted by the scientific community, a conceptual scheme must prove logically convincing and rationally justified. That is, it must be able to overcome critical and refutation phases; he must also be able to propose interpretative and, if possible, predictive, and objectively shareable laws (Baert, 1998).

1.5.1 Observation and self-observation: from the environment to the context

"Everything that is said is said by an observer". This phrase by Humberto Maturana and Francisco Varela has become famous among those concerned with systems. Indeed, on the one hand, it appears as a radical critique of any positivistic duality between observer and reality, and on the other hand, it constitutes the premise of a new way of thinking that systems theory has helped to elaborate in an explicit polemic against all traditional idealism. But to understand Maturana and Varela's statement correctly, it is better to start from the definition of a system, which necessarily requires a reference to an observer who delimits the system itself, i.e. decides which portion of the external world is to be considered a system. This observer-dependence, which for many critics of systems theory is an insuperable weakness in that it renders the concept of a system devoid of objectivity, is for others an epistemological virtue that introduces the observer himself into the observed, thereby laying the foundations for a constructivist approach to knowledge.

According to systems theory, the observer is neither the depository of an objective language, positivistically understood, for the designation of the elements constituting reality, nor the depository of transcendental categories, idealistically understood as a priori cognitive possibilities. The observer is an empirical entity, and to observe means to make distinctions that differentiate objects, relations between objects, and systems of relations. Distinguishing and thus delimiting systems means making the world available both cognitively and operationally, making it emerge from the indistinct and disordered background, thus making it meaningful to us.

However, the rejection of both realism and idealism does not lead to any dissolution of the object, but to its redefinition in pragmatic terms. If reality is to be regarded as wholly observer-dependent, this in no way precludes the possibility of a 'structural coupling' between different observational perspectives. The systemic uniformity and homogeneity with which the world presents itself to us daily derives from the recursive coupling of

different observations and thus different ways of distinguishing. Observing therefore has a meaning exclusively related to the problems of knowledge but given the very definition of a system, it also has a meaning related to the problems of operating. Observing, Heinz von Foerster wrote, is a form of 'cognitive managing'. But the observer is not to be understood as an individual, but in turn as a system. Every observer is a system that observes, that is, that distinguishes and delimits through its operations. This is where the notion of systemic self-reference comes in: every observation depends on the cognitive structure of the observer. What we can observe, we observe within and through our minds. What our mind is not enabled to observe, or our visual organs to see, it is as if it did not exist. For this reason, there is no difference between observation and self-observation. The same criterion of observational closure is applied to the observing system as is applied to observed systems, such as the social systems we have already discussed. Heinz von Foerster, Gregory Bateson, Gordon Pask, and Humberto Maturana have argued in different forms for the circularity of all observation, which can only come out of itself, out of its organization, through self-reference, which alone can permit hetero reference: only through closure is openness possible.

1.5.2 Systems' postulates

As seen, the concept of system is intimately connected to those of environment and context (Barile et al., 2014) . It is not possible to talk about systems without referring to the environment in which these systems are immersed and to the result of the process of perception, by the government of the system, of this environment.

The system, therefore, while being characterized by reference to the principles, is determined by the continuous contextualization processes implemented in a specific environment.

The survival capacity of the system is expressed in its aptitude to satisfy properly – that is, by combining effectiveness, efficiency, and sustainability – the projected expectations of the suprasystems perceived as relevant by its governing bod (Mele et al., 2010; Caputo et al., 2018). The satisfaction of the expectations of the suprasystems creates a path of value creation by the system. This value is addressed to each of the suprasystems identified in the environment and selected by the government to be part of the context in response to the resource obtained, allowing the system to guarantee itself the "consent" necessary for the dynamic maintenance of its own survival in the reference context.

The *Eidos* is a form, a concretion of meaning that has a sensitive image as its terrain of manifestation. It can then be said that the *eidos* is the visible immaterial form, the figure,

understood as an invariant character that opposes the different appearances caused by changes in perspective. It therefore concerns the shape, appearance, or more clearly the "how they are made" of systems.

Nicolaj Hartmann, referring to Aristotle's *Metaphysics*, affirms that in *Metaphysics*, the *eidos* is determined as a formal substance, in such a way that an *eidos* is assigned to each class of things. It must not exist by itself outside of things, but neither should it be resolved in the individual case (Hartmann, 1942) .

In other words, with the principle of the *Eidos* we intend to refer to the universal and invariant form of the systems, that is, to that form which is always recognizable in every system regardless of the observer's points of view and the specific context in which the observation takes place. The universal and invariant form (*eidos*) of the systems is substantiated by the possibility of identifying a *structure* and a *system*. This means that one of the conditions for a given entity to be qualified as a system is represented by the necessary identifiability of a *structure*, that is, of a set of interrelated components, placed at the basis of every system manifestation.

At this point, as already mentioned, it is necessary to make an important clarification. All systems can be traced back to the structure-system *eidos*, but not all entities having this characteristic are systems. Reiterating the importance of the coexistence of all principles, the *eidos* constitute a necessary but not sufficient condition for a given identity to be a system.

It is therefore specified and for the benefit of what will be said in what follows, that there are entities which, although manifesting a "form" attributable to a structure and a system, cannot be considered systems.

The property of *isotropy* pertains to the way of being, to nature, to the ideal character that distinguishes systems. From this point of view, systems are isotropic, that is, they have the same way of being, regardless of the objectives they intend to pursue and the results they achieve.

This means that in every system at any level of observation (a person, a for-profit or non-profit organization, a Municipality, a Region, a country, etc.) it is always possible to find a way of being based on two areas logically distinct: government and management.

It is crucial to emphasize that the distinction between the two areas originates from the domains of government decisions and management decisions. This separation is meaningful only for analytical purposes and for studying the system's identity; in practice, neither area can exist autonomously or independently within the system, nor can it function in isolation. Therefore, a system is fundamentally characterized by the necessary coexistence of these two distinct but interacting areas in a symbiotic synthesis. This third principle is of great

importance for a complete understanding of the meaning of a system. Its acceptance, combined with the provisions of the previous principle relating to *Eidos*, provides a unique interpretation of the system *entity*.

While the principle of *Eidos* highlights the anatomy of a system, the principle of *isotropy* concerns the physiology of a system. Also, while the fundamental system – man – for the principle of *Eidos* turns out to be a system as it is characterized by a structure (corporal, intellectual endowment, including technological ex-tensions) based on which it (man) contextualizes different systems – as a member of a family unit, as engaged in his work, as on vacation, etc.; for the principle of isotropy, man is characterized in his "way of being", regardless of the system he implements from time to time (man member of a family unit, man engaged in his work, man on vacation, etc.), i.e., by those processes that manifest uniformity concerning the macro-categories of activities of which they are composed, namely: the government and the management.

The *ethos* principle states, first, the finalized nature of the behaviour of systems; that is, that the decisions and actions implemented by a system are related to the implementation of specific objectives functional to the achievement of a very specific purpose: the survival of the system (Schendel & Hofer, 1979).

It is appropriate, in fact, to state that the aims and objectives pursued by the subjects connected or included in the system must not be confused with those of the system as an autonomous entity. The former is usually multiple due to the needs of the various connected parties, and in various circumstances they can be conflicting. In the case of companies, what has been said is quite evident. The system, understood as a unit, on the other hand, has as its sole purpose its own survival (that is, the persistence of its identity as an independent entity concerning the environment with which and in which it interacts) and defines its objectives according to this last. This applies to all systems: from the most elementary level of analysis in the economic and social sciences (individual) to the most complex social organizations.

To clarify the above, think of a company in difficult economic and financial conditions. The ownership system could exert pressure on the government activity to reduce the company's structural costs, thus guaranteeing the return on risk capital; this cost reduction could take place through a significant downsizing of employees. The human resources involved in this choice, of course, will try to pursue the purpose of their survival as workers of the company, expressing their opposition to this decision. To achieve their survival, therefore, both categories of systems (property and employees) will project expectations and pressures on the corporate government. The latter, according to the importance attributed to said systems and in relation to the assessments made on the possible consequences in other

intersystem relations, takes those decisions which, it seems to him, best guarantee the survival of the business system.

The following principle of exhaustiveness establishes that all observed contexts can be sufficiently interpreted and understood as "places" populated by systems and by components of systems. In this sense, what cannot be qualified as a system, by virtue of non-compliance with the principles reported above, must necessarily be considered a component of a system that can be found at the same level of observation or, by translating the perspective, to a higher or lower systems level.

Having qualified, through the enunciation of the principles outlined above, what is meant by a system – from individual to increasingly inclusive social systems – allows us to introduce in the discussion the further important principle of *exhaustiveness*. Having specified that the concept of system is necessarily inclusive, and that in its existential dynamics it has no boundaries, everything that perceives, at the very moment in which it is perceived by the system, becomes part of the system itself. Therefore, in the fluid dynamics of what "happens", the system is not given the opportunity to perceive its existence as distinct from the context. It is in the moment in which it becomes aware of itself, and only in that moment, that the "scheme" of what is "inside" (internal) and what is "outside" (external) emerges; it is at that precise moment that the system "collapses" on the structure, it becomes possible to distinguish the components and the relationships between them; the role that the different components play concerning each possible process analysed becomes evident. In the extensive literature concerning systems, the concept of systems boundary has been widely debated, even if the analysis perspective has not always turned out to be coincident (Schendel & Hofer, 1979). The boundary is an appropriate concept in the structural analysis of the system. When an observer places himself in a third position concerning any system, and analyses the individual components, or the relationships between them, he causes a staticization of the system. Imagine that you are focused on watching a movie. If we are involved in the actions and scenes, our perception is captured by the overall meaning. When we come to be attracted, then, the film breaks down, our mind records a precise frame, memorizes it, and analyses it. Consequently, the film is no longer a continuum, but a set of frames, and each frame a complex of related elements. In essence, the system dissolved to leave the structure in evidence.

The passage to the structure allows to recover the fundamental "schemes" of the objects such as the comparison in temporal and dimensional terms. Concepts such as *membership*, *state*, *phase*, *boundary*, *dimension*, *level*, and others acquire justified meaning. Representing a system by considering its structure involves the immediate identification of one or more

systems of a higher level, which can be defined as superordinate systems or, and of one or more systems of a lower level (subordinate), thus making clear also the existence of a hierarchical principle.

The representation on the three levels of analysis L_{-1}, L, L_{+1} can be extended both upwards, including increasingly larger systems structures, and in the opposite direction, going down to the level of more elementary systems structure relating to the succession of events being analysed.

Placing itself at a level of investigation L, it is noted that the system at level L_{+1}, turns out to be included in a system – which concerning perspective L_{-} is located at level L_{+2} systems at level L_{+2} is in turn included in systems at level L_{+3} and so on.

In other words, given a system of level L, we define the superordinate system, or of higher order, the external system of level L_{+1} that includes it. It is easy to deduce that, by overturning the observation point (i.e., focusing the analysis on what we have defined system of level L_{+1}), the system at level L will be a subordinate system or of a lower order than the one positioned at level L_{+1}. It is also obvious that the system of level L_{+1}, superordinate concerning that at level L, may in turn be a subordinate system concerning a system of level L_{+2}. In this regard, consider the production system of any firm. Evidently, the latter will qualify as a superordinate system or of a higher order than the former. If we broaden the analysis perspective, we can easily see how the company is in turn included in each sectoral system, which, therefore, will qualify as a superordinate system.

A different meaning assumes the concept of suprasystem. By suprasystem we mean a system which, in a specific space-time context, assumes in the perception of government of another system, the so-called characteristics of relevance, i.e., whose relationship is characterized by the criticality of the released resource and by its power of influence.

The difference between the concepts of a *superordinate system* and a *suprasystem* is clear. The first, through the inclusive perspective typical of the hierarchical principle, tends to focus a logic of relative positions between systems, which are, moreover, relatively stable: the production system is included by the firm system, just as the latter is included by the sectoral system which qualifies, therefore, as the system of a higher or superordinate order concerning the firm and the latter assumes the same position concerning its production system. The second concept, that of suprasystem, on the other hand, does not consider relative positions, to aim to highlight which of the two related systems, in the dynamics of interactions, assumes relevance. The relationship between the two systems is expressed not in terms of relative positions, but through the relevance that each express towards the other.

It is important to note that this relationship is not static, it can change from moment to moment, depending on the context.

Returning to the example of the company and the sectoral system, the latter is a superordinate system compared to the former; if, however, the company in question should be a leader and express a dominant position towards the entire sector, on specific issues it may assume the role of suprasystem concerning the sectoral system. For example, in situations where the sector needs to take unanimous positions towards the external context to protect its interests, the other companies in the sector system, as a whole (and therefore the sector system as such), will have the need to obtain the consent and participation of the former, to effectively implement one's plan.

Furthermore, it has been said above that the business system qualifies as of a higher order than its own production system (what is traditionally defined as the production function); also in this case, there are situations in which the production system can assume significant importance in relation to the business system that includes it, to the point of being qualified as a suprasystem, for example when particular technical skills or innovations concerning products or processes are held at the within it (e.g., the exclusive endowment of a single professional resource in the workforce), are not easily replicable and are likely to generate conditions of competitive advantage that are particularly important for the survival prospects of the company.

Finally, it is particularly useful to refer precisely to the case of the consumption system: this, if it was in an embryonal condition, did not take on any relevance for manufacturing companies, nor for distribution ones, nor for the institutional system. Now, with the evolution of its degree of fulfilment, the signs of growth become evident, in the perception by other interacting systems, of the criticality and the ability to influence expressed.

To this set of reflections, a further must be added, suitable for clarifying even more the relationship between the concepts of a higher or superordinate system and of a superordinate system: to verify whether, and in which cases, the qualification of a superordinate system is to be considered causal condition concerning the possibility of presenting itself as a suprasystem of a system of a lower or subordinate order.

From the considerations set out so far, it can also be stated that the condition of a system of a higher or superordinate order is not in itself a necessary condition for the purpose of qualifying as a suprasystem, since there are cases of relevance of a system of a lower order compared to a system superordinate to it, as seen in the example of the production system.

The question then arises: are there cases in which a higher order system does not also

qualify as a suprasystem concerning the subordinate system (subsystem)? In other words, is the qualification of a higher order system –which, as it has been said, is not a necessary condition for the assumption of that of a suprasystem – instead a sufficient condition?

We believe that we can answer in the affirmative to this second question: the inclusive position of a systems structure in relation to another systems structure means that the system that emerges from the second is inserted in a correlation of constraints and rules defined by the system (superordinate) that emerges from the first systems structure, therefore, albeit in relation to specific performance situations, a relevant conditioning derives from it which, indisputably, allows us to affirm that the system emerging from the second systems structure ends up qualifying itself as a subsystem concerning the emerging system from the higher order systems structure.

If every system – by virtue of the isotropy principle – can be represented through the distinction of an area of government (deciding) and one of management (acting), then – regardless of the level of analysis focused – the scheme of recursion of systems will be rendered by designing one area of government and one of management (level L_{-1}) included in an area of management of an L level system, which – together with the connected government area – will be contained in an L_{+1} level management area and so on. The close link between the principle of recursion and the principle of isotropy is therefore evident.

1.5.3 Bounded rationality and problem creating

Alexander Herbert Simon's contributions are grounded in a scientific principle that has sparked breakthroughs across various fields: the concept of bounded rationality in human beings. This significant idea, which diverges sharply from the classical notion of human omniscient rationality, emerged directly from his doctoral dissertation published in 1947. The considerable influence of positivist psychologists also played a crucial role in shaping Simon's development of bounded rationality, a concept primarily centered on three major constraints that humans invariably face: i) incomplete knowledge; ii) difficulties in anticipating consequences, and iii) limited understanding of all possible behaviors. These constraints are fundamentally rooted in restricted computational capacities, limited access to information, and physical limitations (Simon, 1947; 1955; 1957). The cumulative effect of these limitations is that individuals do not make 'optimal' decisions but rather 'satisficing' ones, which in turn means that the organizations in which they operate cannot fully maximize their goals. In this context, Simon's groundbreaking shift is from economic substantive rationality to administrative procedural rationality, emphasizing a move from focusing on what decisions are made to how decisions are made (Simon, 1978b).

From the above discussion, it is evident that Simon's intellectual revolution was more philosophical and sociological than purely economic; he firmly rejected the implicit and explicit identification of Adam Smith's rationalism and Jeremy Bentham's utilitarianism as the foundation of human behavior (Simon, 1978a, 1978b), aligning himself more closely with Freud's unconscious view of human beings and Vilfredo Pareto's sociological perspective on society.

The conceptual foundations of bounded rationality have deeply influenced current understanding of decision-making processes, building on the initial insights of Chester Irving Barnard (1938) about the non-scientific reasoning that may occur among some individuals in organizations. However, Barnard's "fallible man" is one who relies on intuition—defined as a non-logical process based on personal knowledge and experience—to make decisions; yet the individual who deviates from the canonical model is seen more as an exception rather than the norm in organizational settings (Simon, 1987).

In a similar vein, other scholars later used the term irrationality to describe these non-scientific behaviors, but often misunderstood Simon's original ideas. For instance, Becker (1962), as cited by Simon in his Nobel Memorial lecture, suggested that irrational behavior is a decision rule underpinning utility maximization. Conversely, it is noteworthy that Simon consistently acknowledged that human beings tend towards rationality, arguing that reason "is a tool that enables those institutions to act effectively toward goals" (Simon, 1973, p. 353).

On this premise, Simon's revolution resides on the delicate boundary between the terms rationality and irrationality as discussed above; his concept of bounded rationality situates itself between the "economic man" of classical economists and the man, influenced by Freudian thought, whose cognition is wholly driven by affect. Furthermore, Simon did not overlook the important role of certain sources of irrationality, such as those stemming from emotions (though his focus was predominantly on the role of motivation; see March and Simon, 1958; Simon, 1973).

This trajectory, in which the cognitive functions of human beings are placed at the center of investigation to predict human behavior, was further advanced by Simon (1992) with the rise of cognitive psychology.

Chapter 2. Decoding the impact of agile working on knowledge hiding and knowledge sharing[1]

2.1 Introduction

For several years, researchers and practitioners have underlined the need for changing the approach to investigating and analysing socio-economic configurations to point out how it is possible to promote agility of organized entities in facing emerging strategic challenges (Giancotti & Shaharabani, 2008; Bernardes & Hanna, 2009; Weber & Tarba, 2014; Obradović *et al*., 2018). Multiple contributions have focused on the possibility for organized entities to adopt a project-based view (Huchzermeier & Loch, 2001; Olsson, 2006) and/or a modularity-based configuration (Ding & Jie, 2008; Gualandris & Kalchschmidt, 2013) with the aim of reducing risks for structured entities to be unable to react quickly to external changes.

All these contributions have shown their relevance during the Covid-19 pandemic from which several challenges have occurred for socio-economic organizations (Dwivedi *et al*., 2020; Faraj et al., 2021; Zito *et al*., 2021). During Covid-19 pandemic, 'traditional work processes' have been rapidly rethought and restructured using digital instruments to ensure organizations' activities without compromising the health of their workers (Almeida *et al*., 2020; Leonardi, 2020; Iandolo *et al*., 2021). Several researchers and practitioners have referred to such changes as a sort of digital revolution of socio-economic organizations (Soto-Acosta, 2020; Nundy et al., 2021; Kryshtanovych et al., 2022) calling for new managerial approaches and business models which include digital devices and instruments in organizations' plans and activities (Ritter & Pedersen, 2020). Despite the excitement around the rapid digitalization of work processes during the Covid-19 pandemic, the scenario seems to be completely different nowadays (Ewe & Ho, 2022). A large part of companies and organizations have returned to 'traditional' offline, and in-person work processes and Agile Work (AW) seems to be an 'old' utopia.

According to Basile and Beauregard (2020), "agile working involves liberation from traditional ways of working, such that boundaries between work and home (both physical and temporal) can become blurred" (p. 35). Therefore, AW seems to be the natural evolution from approaches to work processes based on strong hierarchy and

[1] This chapter is adapted from Cirielli De Mola, I. G., Napoli, L., Giancotti, F., & Caputo, F. (2024). Decoding the Journey Towards Digital Work Processes. Reflections on the Impact of Agile Working on Knowledge Hiding and Knowledge Sharing. *Journal of the Knowledge Economy*, 1-14.

control (Grant & Russell, 2020). AW offers the opportunity for staff to better manage their activities and processes by focusing the attention on the outcome and not only on the commitment of work processes (Charalampous, 2020). In addition, "Agile working practices increasingly involve connecting with new technologies in order to operate more flexibly, efficiently and responsively" (Russell, 2020: 49) facilitating – in this way – the digital transition of socio-economic entities (Perkin & Abraham, 2021). Despite all the above-mentioned advantages of AW, the general orientation of Human Resource Management (HRM) seems to still prefer offline, and in-person work processes. In such a vein, there emerges the need for reflecting on the reasons why AW has been radically reduced after the Covid-19 pandemic and for investigating why both public and private companies have forgotten the multiple advantages typically related to AW. To provide a possible contribution to such debate, it is here adopted the interpretative lens provided by Knowledge Management (Soto-Acosta *et al*., 2018; Del Giudice *et al*., 2012; a,b, 2019; Cillo *et al*., 2021) and Systems Thinking (Beer, 1985; Ackoff, 1994; Frank, 2000; Golinelli, 2010; Barile & Saviano, 2011; Caputo *et al.*, 2018) for depicting a conceptual framework useful for investigating AW from a different perspective. Thanks to this proposal the constructs of knowledge sharing, and knowledge hiding can be seen as domains through which it is possible to explain the risks and opportunities of AW in a holistic view. Proposed reflections are then summarized in a possible conceptual model able to support both researchers and practitioners in understanding how digital work processes can influence knowledge hiding and knowledge sharing inside organized entities.

2.2 Conceptual framework

2.2.1 A systems view of work processes in digital era

Work processes and human resources are typically considered as two of the main drivers for socio- economic organizations' success and survival over time (Devanna et al., 1981; Schneider & Bowen, 1993; Boudreau et al., 2003; Caputo et al., 2019c). For a long time, human resources have been approached as 'simple raw materials' or 'elements' to insert in ex-ante defined processes without considering their specifics (Caputo et al., 2019a). Nowadays, the scenario is completely different (Lengnick-Hall et al., 2011; Del Giudice et al., 2017; Caputo et al., 2020). The relevant role of human resources' specificities is highly recognized in all economic sectors and new business models have been progressively developed and shared to enhance the potential

contribution that each worker can provide to the whole work process in terms of subjective and non-replicable assets (Macke & Genari, 2019).

The above-mentioned change in perspective can be considered as a valuable example of shift from the reductionist approach to the holistic view. Several contributions have been provided for supporting this change in perspective by underling the need for overcoming a view of socio-economic organizations simply based on standardizable processes and objectively valuable resources (Benea-Popuşoi, 2022; Saks, 2022; Caputo et al., 2021). All these contributions are rooted to the challenging research stream related to Systems Thinking in its multiple configurations such as the Systems Dynamics (Forrester, 1994), the Systems Model (Beer, 1989), the System Approach (Golinelli, 2010; Barile, 2013), and the Ecological view (Folke, 2006) among others. The key contribution of Systems Thinking in business and managerial studies can be summarized in the opportunity to investigate socio-economic entities considering their functions, their resources, their structures, their motivations, and their purposes through a common and holistic conceptual framework (Barile et al., 2012; Tronvoll et al., 2018; Saviano, 2014). In such a view, the Systems Approach offers opportunities for investigating socio-economic entities combining their structural configuration and dynamic behaviors using the same framework (Barile, 2009) and to extend this framework to the study of any kind of organized entities aimed at surviving over time (Barile, 2013).

By adopting the interpretative lens provided by Systems Thinking, it is possible to underline that work processes are not only ways through which socio-economic organizations perform their activities, but they are the results of the combinations among multiple 'parts' with expectations, needs, motivations, and values individually able to influence the success and the survival of whole entities (Polese et al., 2009; Golinelli & Bassano, 2012). In such a vein, the interpretive model of Information Variety offers the opportunity for decoding work processes in terms of Information Units, Interpretive Schemes, and Categorical Value. Specifically, such a model – used for describing and analysing the entity of each kind of organized system – can be applied to the study of work processes, offering us the following information:

- each work process depends on the total amount of data *(Information Units)* that each worker can use.
- each work process needs to define a path and/or scheme (*Interpretative Scheme*) that supports actors in performing planned activities in better ways.

- results and outcomes of work processes depend on reasons and motivations (*Categorical Values*) that stimulate or obstacle workers' engagement and commitment.

The use of the above-summarized models offers us the opportunity to better understand work processes within the digital age. Therefore, it is possible to underline that digitalization has radically changed the ways through which work processes are organized, building the foundation of new Interpretative Schemes such as Agile Working. By adopting proposed interpretative schemes, it emerges that AW is only a 'different way' through which to organize consolidated activities. Such recognition requires investigation into how the emergence of this new scheme can influence the other identified drivers: Information Units and Categorical Values.

2.2.2 Knowledge management and digital work processes

Knowledge management is without doubt a challenging research stream that has radically evolved during the last thirty years to recognize, underline, and schematize emerging social and economic trends (Carayannis, 1999; Del Giudice et al., 2012; Del Giudice & Maggioni, 2014; Mårtensson, 2000; Carayannis et al., 2021). From the traditional approach strictly focused on the use of data as a valuable resource for supporting practitioners in both decision-making and problem-solving processes, nowadays knowledge management can be defined as "a system that integrates people, process and technology for sustainable results by increasing performance through learning" (Gorelick & Tantawy-Monsou, 2005: 125). Such evolution can be summarized in terms of the shift from a structural representation of knowledge management – focused on specific elements of organizations – to a dynamic view of knowledge management in which it becomes the interpretative lens through which to represent the ways in which data is exchanged and how data flows engage human resources over time (Carayannis et al., 2018; Caputo et al., 2019c; Daňa et al., 2020).

Because of the above-described evolution, the interest around knowledge management has increasingly pointed attention on the role of technologies in promoting and stimulating data flows among multiple kinds of actors (Schultze & Boland, 2000; Marwick, 2001; Bose & Sugumaran, 2003). Studies about knowledge management have then progressively investigated the role of tools such as social networks (Marouf, 2007), platforms for data sharing (Leung, 2014), QR codes (Martínez-Martínez et al., 2018), Virtual and Augmented realities (Mueller et al., 2011), and Artificial Intelligence (Liebowitz, 2001) in promoting knowledge sharing and in ensuring an increasing

number of contact points among involved actors.

Despite the relevant advancements in knowledge provided by the above-mentioned contributions, among others, it seems that attention is only focused on the possibility for increasing contact points among actors endowed by useful data while little attention is reserved for the reasons and motivations for which actors decide (or not) to exchange data. The result of this approach is the emergence of a speculative approach to knowledge management in the digital age that can be easily observed with reference to digital work processes (Li & Herd, 2017). Workers involved in AW seem to be more oriented to share only the data strictly related to work activities (Grant, 2020). Each work process within AW is evaluated in terms of effectiveness without considering the relevant impact that it can have on the efficiency of the whole organization (Russel & Grant, 2020).

According to this conceptual flow, it seems that Knowledge Management is losing – within digital work processes – its nature of 'philosophy' interested in analysing how and why actors interact to contribute to the emerging of a shared organizational identity. In response to this emerges the need to understand how and if emerging forms of digital work processes such as AW can be managed in a way that avoids the organization's collapse in 'atomistic' activities. With this aim, the intriguing constructs of knowledge sharing, and knowledge hiding seem to be useful for understanding how AW is affecting organizations' behaviours and structures.

2.3 Theoretical Background

2.3.1 Knowledge sharing in digital work processes

As underlined before, digital processes are based on the use of technology to improve flexibility and autonomy of people during work activities (Gong et al., 2020). In such a scenario, "Agile working involves liberation from traditional ways of organizing and structuring work by: i. Promoting temporal and spatial flexibility, ii. Integrating resources (people, knowledge, skills, facilities, infrastructure), iii. Engaging in innovative activities, iv. Utilizing new communication and digital technologies, to respond dynamically to evolving work, service, and market priorities and to produce outputs that espouse core work and personal values towards achieving core work and organizational goals" (Russell & Grant, 2020: 6). This definition offers us the possibility to underline how AW can represent a useful way for improving people's ability to self-manage their work activities by improving their efficiency

(Jeyasingham, 2016; Charalampous, 2020).

According to current literature, AW can be considered as a useful scheme for stimulating knowledge sharing within work processes (Moe et al., 2016; Gervigny et al., 2017). Therefore, it is worth remembering that knowledge sharing within organizations is not only related to work processes, but it is – more generally – aimed at "capturing, organizing, reusing, and transferring experience-based knowledge that resides within the organization and making that knowledge available to others in the business" (Ngah & Jusoff, 2009: 218). Reflecting upon this, it clearly emerges how AW cannot be considered a useful path for knowledge sharing because it is only focused on data sharing as a way for ensuring the efficiency of work processes. Recalling the Information Variety Model (Barile, 2009), proposed in previous sections, it is possible to state that AW acts on drivers of Information Units by reducing the focus only on the data strictly related to the work processes with several relevant implications for the functioning and survival of whole organizations. In its actual form, AW seems to reduce organizations' workflow to its 'atomistic' part. The result can be summarized in the possibility for a better control of activities performed by each person and by the impossibility for effective knowledge sharing through which to support the emergence of an organization's identity based on a combination of different people's culture and not only on the sum of people's data. In a nutshell, it is possible to state that AW – in its actual form – risks to reduce organizations' competitive advantages based on human resources' soft skills and to compromise organizations' survival over time due to the focus only on the composition of work processes by underestimating the relevant role of human resources' socialization for ensuring organizations' viability.

2.3.2 Knowledge hiding in digital work processes

In response to the increasing relevance that knowledge sharing is acquiring both for researchers and practitioners, as a way for ensuring organizations' functionalities and survival over time, in recent years the process of knowledge hiding has been proposed as "an intentional attempt by an individual to withhold or conceal knowledge that has been requested by a co-worker" (Connelly et al., 2012: 65). Several researchers have approached knowledge hiding as the opposite representation of knowledge sharing (Shin & Kwag, 2017; Gagné et al., 2019) but the link between these constructs seems to be more articulated.

Using the interpretative lens provided by Systems Thinking and the Knowledge

Management, it is possible to note that knowledge hiding refers to an individual actor within the organization while knowledge sharing refers to the ways in which several actors interact within the organization. Differently from the knowledge sharing, the knowledge hiding does not show its relevance with reference to the Information Units because its application is related to actors' Categorical Values.

Workers decide – or implicitly perform – knowledge hiding in the case in which they want to preserve their competitive advantages at the expense of the organization within they work. In such a vein, information and knowledge are considered the elements trough which it is possible to ensure a competitive advantage to the owner respect to the co-workers. The explanation of this approach can be identified in the prevalence of Competitiveness on Collaboration inside the organization (Saviano et al., 2018). According to Connelly et al. (2012), knowledge hiding can be defined trough three dimensions:

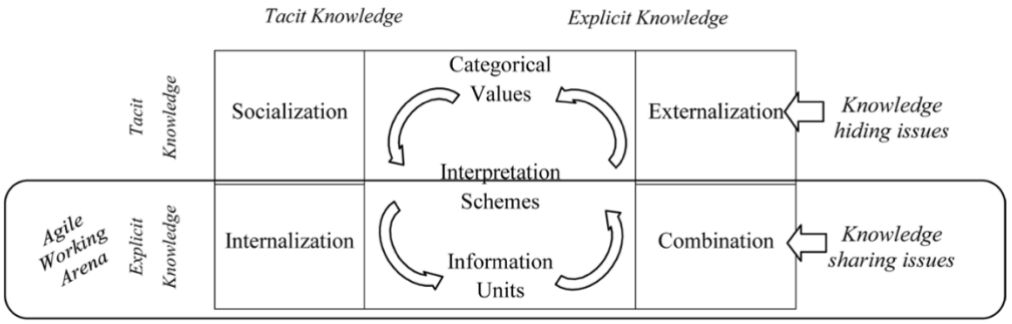
1. *playing dumb* that occurs when workers pretend to be ignorant of the relevant knowledge.
2. *evasive hiding* that occurs when workers provide incorrect information to co-workers.
3. *rationalized hiding* that occurs when workers simple does not provide information to co- workers. Reflecting upon these three dimensions, it is possible to underline that they emerge because of an individualistic approach of workers that could be stimulated by the AW in its actual form. AW offers to the organizations the possibility for control and supervision of all the activities conducted by people both in real time and trough ex-post control (Keeling et al., 2015). Such possibility could push people in reducing as much as possible the total amount of transferred information to avoid any kind of mistakes and errors (Charalampous, 2020). The consequence is that AW could represent a potential stimulus for knowledge hiding within organizations' structure and it could stimulate the emergence of an 'atomistic' approach in which everyone is considered as an independent part not correlated to the whole system.

2.4 A conceptual model

According to the reflections stated in the previous sections, the AW emerges as an interesting research domain in the light of the highly spread attention towards the digitalization as a way for improving the efficiency of organizations' processes and structures. Recognizing the manifold contributions that current literature provides

with reference to the multiple advantages than AW can offer for a better managing of workers, it is required to reflect about the impact that AW can have on the whole organization as a system composed by interrelated elements and not only as a simple aggregation of work processes. In such a vein, building upon the Information Variety Model and the SECI Model, a possible conceptual model can be derived for enriching current knowledge about AW in digital Age as represented in the following Fig. 1.

Fig. 1 - Decoding AW through SECI Model and Information Variety Model



Source: Authors' elaboration based on Nonaka & Takeuchi (1996) and Barile (2009).

The conceptual model proposed in Figure 1 offers us the opportunity for systematizing reflections stated in previous sections. It is inspired by Nonaka and Takeuchi model (1996), so called SECI, which represents the ways in which knowledge processes can 'evolve' inside an organized entity in relation to the interplay between tacit and explicit knowledge, where tacit knowledge is personal and hard to codify and communicate, while explicit knowledge can be communicated in formal language and easily stored.

According to the SECI model, there are four modes of knowledge conversion:

- socialization, namely the process of sharing tacit knowledge through observation, imitation, practice, and guidance (tacit to tacit),
- externalization, that is the process of articulating tacit knowledge into explicit concepts (tacit to explicit),

- combination, that is the process of integrating concepts to create new knowledge (explicit to explicit),
- internalization, that is the process of embodying explicit into tacit knowledge (explicit to tacit).

Building upon the SECI model, the Information Variety Model proposed by Barile (2009) is used for identifying which drivers are involved in each knowledge process summarized as follows:

- *Internalization* and *Combination* are based on the total amount of information endowed by each actor (Information Units), on the way in which they organize them (Interpretation Schemes) and on the individual abilities to reshape knowledge organization over the time.
- *Socialization* and *Externalization* depend on the willingness/interest of each actor to be part of a knowledge community (Categorical Value) and on their capabilities to recognizing advantages and opportunities to be part of a knowledge community (Interpretation Schemes).

Thanks to the conceptual model proposed in Figure 1, it is also possible to clarify what are the conditions and configurations under which Knowledge Hiding and Knowledge Sharing issues emerge. Specifically:

- *Knowledge hiding* is strongly affected by actors' perception of knowledge hiding in respect to the knowledge community of which it is a part (Categorical Values). In such a vein, actors' orientation towards collaboration reduces risks for knowledge hiding while actors' inclination to competitiveness stimulates knowledge hiding.
- *Knowledge sharing* is mainly linked to the total amount of information available inside the knowledge communities and individually owned by each participant (Information Units). In such a vein, higher is the amount of information individually owned by each participant lower are the opportunities for knowledge sharing, while higher is the amount of information freely accessible higher are the opportunities for knowledge sharing.

Finally, the proposed conceptual model also clarifies the favourable grounds where it is possible to build an effective approach to AW. With reference to this point, the model justifies that AW is mainly convenient in the case in which knowledge processes are strictly related to the use and management of available information and it can be applied for facing and solving the issues related to knowledge sharing. In different configurations where knowledge processes are mainly based on the

awareness and cognitive participations of involved actors, AW cannot be considered as a suitable path due to its uselessness in facing the challenges related to knowledge hiding and to its potential role in promoting an atomistic view of work processes despite a holistic representation of the whole work system.

2.5 Final remarks, implications, and future directions for research

The fast spread of digital technologies inside companies and organizations triggered by the Covid-19 pandemic has recalled the attention of both researchers and practitioners in the challenging debate about the ways for combining human and digital dimensions under the common umbrella of social and managerial studies (Priyono et al., 2020; Bai et al., 2021; Akpan et al., 2022).

Among the different instruments and tools proposed by business practices for enhancing the use of digital technologies in organizational entities, the AW as a path for ensuring more flexibility in performing work processes has been highly discussed (Schmidtner et al., 2021). Recognizing the contributions offered by multiple studies interested in underling the advantages that AW can provide from multiple perspectives (Grant, 2020), the chapter aimed at investigating what are the conditions for a suitable use of AW and what are the impact that it can have on organizations' functioning and survival over the time.

Thanks to interpretative contributions provided by Systems Thinking and Knowledge Management, a conceptual model has been defined and discussed for defining the boundaries within which the AW can be a valuable path for managing work processes. From such a model multiple implications can be derived both from theoretical and practical perspectives.

From a theoretical perspective, the model highlights the relevant contributions that the SECI Model and the Information Variety Model can provide in better understanding and managing work processes in digital age. In such a vein, reflections herein could represent a possible structure on which reflect for enriching the proposed model in the light of the multiple and emerging dimensions that are affecting the digital transitions.

From a practical perspective, the model can support practitioners interested in evaluating the validity and suitability of AW as a path for managing people inside their organizations. Enlarging the perspective from the variable linked to work processes, to elements related to the evaluation of viability of the whole organizations, the model can be used as a possible base for developing a tool to evaluate which kind

of approach is better in the light of features and knowledge processes that characterize the organization. In fact, leadership studies extensively explore collective action's dynamics through the digital dimension and can therefore give indications on how to address the criticalities highlighted by the model. Systemic leadership approaches focus on value promotion, sense-making and empowering of people, also through knowledge sharing and well correspond to the model proposed. From that perspective, knowledge hiding is an ethical failure and therefore its correction is a leadership responsibility. According to its aim, the chapter only proposes a conceptual framework under which the challenging domain of AW can be approached in a more structured way. In such a vein, reflections herein require to be tested in further studies and validated through case studies and in-depth interviews to understand how the model can be applied to multiple cultural, geographical and organization realities.

Chapter 3. The rise and fall of competencies for Smart Working: a socio-technical analysis in changing workplaces

3.1 Introduction

The growing allure of flexible and mobile work methods experienced in recent years can be attributed to the changing requirements of the workforce (Rubery et al., 2016) and advances in digital technology (Valenduc & Vendramin, 2016). Indeed, Flexible Working Practices (FWPs) provide a departure from traditional work locations, schedules, and contracts (Cooper and Baird, 2015; Groen et al., 2018), becoming more prevalent with the rise of the digital era (Hirsch-Kreinsen, 2016). Media exposure has further increased their appeal (Yu et al., 2019).

Original practices like telecommuting, part-time jobs, flextime, telework, and freelancing are now commonplace (Müller & Niessen, 2019; Laker et al., 2021). This shift is mirrored in the revival of FWP-focused research amid global economic changes that have introduced unpredictability in business functions and prompted the formation of new organizational structures and work methods (Niles, 1998; Uddin et al., 2021). The escalation of FWPs, further spurred by remote work during the COVID-19 pandemic, has blurred the boundaries between professional and personal time, prompting a reevaluation of the true meaning of flexibility in such work models. While there have been many studies investigating FWPs and their benefits, the interpretation of "flexibility" is often controversial and can hide a variety of drawbacks (Rubery et al., 2016; Furmanczyk & Kazmierczyk, 2020; Hill et al., 2021). Acknowledged problems include social isolation (Mulki & Jaramillo, 2011), the difficulty in maintaining work-life equilibrium (Como et al., 2020), and effects on teamwork (van der Lippe & Lippenyi, 2020). This suggests potential sustainability issues for FWP in a continually digitizing work environment, highlighting the need to understand FWP-related challenges (Chen & Wellman, 2004).

This research is dedicated to revealing the concealed risks of FWP as more individuals turn to digital technologies for a range of remote work setups. Moreover, FWPs differ from traditional work models that hinge on fixed contracts, set working hours, and strongly regulated labor markets (Choi, 2018; Rubery et al., 2016). Numerous FWP-related terms such as "co-working spaces," "on-call employment," "on-demand work," "self-employment," "telework," "remote work," "mobile work," "telecommuting," and "virtual work" (Groen et al., 2018; Tudy, 2021) are often used synonymously, promoting benefits

like encouraging business collaboration and innovation (Spinuzzi, 2012), reducing energy costs and office rent (Richardson & McKenna, 2014), enhancing job satisfaction (Bentley et al., 2016), balancing work-life pressures (Golden et al., 2012), supporting women with caregiving needs (Carlson et al., 2010), and reducing traffic congestion (Vallicelli, 2018).

However, the shift to flexible work (FW) models has significant consequences for organizational structures, digital technology platforms, employee well-being, and the layout of physical workplaces (Bentley et al., 2016; Johnson et al., 2020), needing continuous learning for both individuals and organizations (Cascio & Montealegre, 2016). This also poses the need of a radical rethinking of workforce attitudes and competencies, their impact on performance, and strategies for their cultivation. New competencies emerge as cornerstones of the Smart Working paradigm. Digital literacy, going beyond the use of software and digital tools to encompass an understanding of their implications on business operations, is paramount (Makarius & Larson, 2020). Resilience and adaptability are now essential in the volatile, uncertain, complex, and ambiguous context of Smart Working (Bennett et al., 2018); self-management - coupled with emotional intelligence - is vital in remote work settings where supervision is minimal (Müller & Niessen, 2019); remote communication skills have become indispensable as teams operate across diverse geographies and time zones (O'Leary & Cummings, 2007).

Conversely, some of the traditional competencies such as hierarchical thinking, long-term planning capabilities, and physical presence as a measure of productivity have seen a decline in relevance (Spreitzer et al., 2017; Choudhury et al., 2021).

Furthermore, the COVID-19 pandemic has revealed new issues, shedding light on hidden challenges associated with FW models (Furmańczyk & Kaźmierczyk, 2020). These challenges include aspects like worker supervision and control mechanisms, leading to regulatory debates (Choi, 2018). The demand for regulation subtly indicates the existence of problems with FWP that impact the rights of both employees and employers (Pedersen, 2017; Kraus et al., 2020). Accordingly, relying on a narrative review of the literature and adopting a socio-technical lens, this study aims to answer the following questions:

RQ. 1: What are the pitfalls associated with FWP, and how have they been represented in literature over the past decade?

RQ. 2: How does the rise of Smart Working (SW) influence the requisite competencies for successful job performance?

RQ. 3: How can organizations foster the development of emerging competencies within their workforces?

3.2 Literature review

3.2.1 Methodological note

Anchored by a comprehensive narrative literature review, the research aims to formulate testable hypotheses for future empirical investigations (Jaakkola, 2020). The literature review serves a dual purpose: it not only consolidates existing knowledge but also aspires to extend or reinterpret the understanding of smart working using the lens of sociotechnical systems (Fulmer, 2012). In pursuit of these goals, the study undertook an exhaustive examination of scholarly articles that address four principal domains: a) smart-working; b) competency; c) digital technology; and d) socio-technical approach. This inquiry was conducted across several academic databases, including Google Scholar, Web of Science and Scopus in a time frame that ranges from 2011 to 2023 (the choice is justified by the industry 4.0 advent), focusing on business management and social science literature published in academic journals and in English. The following combination of target keywords has been used:

- smart work* AND competence* (12 results)
- digital technology* AND socio-technical approach* (115 results)
- smart-work* AND socio-technical approach* (4 results).

Nevertheless, the study intentionally refrained from employing a systematic literature review approach, thus results have not been filtered in terms of journals selected. This methodological choice was made to retain flexibility in the selection of academic works, thereby enabling a more nuanced and adaptable analytical framework (Petticrew & Roberts, 2008; Lukka & Vinnari, 2014).

3.2.2 From flexibility to smartness in working contexts

The transformation of work in the contemporary era is a subject of immense complexity (Barile, 2009; Rullani & De Toni, 2018) influenced by a myriad of factors ranging from technological advancements to societal shifts. This transformation is not merely a superficial change in the location or timing of work but represents a seismic shift in the very fabric of how work is conceptualized, organized, and executed. The digitalization process that has characterized recent years has not only opened new avenues for change but has also presented significant challenges for the future (Rapp et al., 2006; De Toni et al., 2013). The urgency for organizational models that can adapt to societal needs, ensure employee well-being, and integrate ongoing technological changes has never been more pressing (Chiaro et al., 2015; Barile et al., 2023).

Flexible Working Practices (FWPs) have emerged as a cornerstone in this transformative landscape. These practices, which include telecommuting, part-time jobs, flextime, and freelancing, offer a radical departure from traditional work locations, schedules, and contracts (Cooper and Baird, 2015; Groen et al., 2018). The digital era has not only made these practices more feasible but has also popularized them through media exposure (Yu et al., 2019). However, the term "flexibility" is often laden with controversy and can conceal a plethora of drawbacks.

The flexibility afforded by FWPs can lead to social isolation as employees may find themselves working in silos, detached from the collaborative atmosphere of a physical office (Rubery et al., 2016). This isolation can have profound psychological impacts, including increased levels of stress and decreased job satisfaction. Moreover, the blurred boundaries between work and personal life can make it exceedingly difficult to maintain a healthy work-life equilibrium (Mulki & Jaramillo, 2011; Torre & Sarti, 2020). The lack of a clear demarcation between 'work time' and 'personal time' can lead to overwork and burnout, affecting not just the individual but also their families and social circles. Furthermore, the lack of face-to-face interaction can have detrimental effects on teamwork and organizational cohesion (Como et al., 2020). The absence of spontaneous interactions that a physical workspace provides can lead to reduced creativity and innovation, as well as potential misunderstandings that could have been easily resolved through direct communication.

Smart Working takes the concept of flexibility a step further by incorporating greater flexibility in terms of schedules and logistical organization: unlike FWPs, Smart Working is not just about "working from home" but represents a profound innovation in organizational culture and the very conception of work (Moreira Dias, 2017). It shifts the focus from a management style oriented toward physical presence and control to one based on trust, collaboration, flexibility, and delegation. This shift is not merely logistical but philosophical, requiring a rethinking of long-standing managerial paradigms (Soga et al., 2022).

Smart Working challenges the traditional power dynamics within organizations (Torre & Sarti, 2019). It demands a level of trust between employers and employees that goes beyond mere oversight and delves into the realm of mutual respect and shared objectives. This shift towards a more democratic workspace can have far-reaching implications, including increased employee engagement, higher job satisfaction, and a more robust organizational culture. However, it also requires a significant investment in change management strategies to ensure that both managers and employees are equipped with the skills and mindset needed to navigate this new landscape successfully (Tab. 2).

Tab. 2 – Smart Working levers

Smart Working designing lever	Description	Supporting literature
Flexibility	Allows employees to choose their working hours to some extent.	Pfefferbaum & North, 2020
Location independence	Employees are not tied to a specific location and can work from various places.	Moreira Dias, 2017
Focus on output	Emphasis on the quality and quantity of work produced rather than the time spent in the office.	Bentley et al., 2016
Technological proficiency	Use of advanced technology and software to facilitate remote work and collaboration.	Vallicelli, 2018
Trust	A shift from oversight and control to trust and autonomy.	Moreira Dias, 2017
Teamwork	Use of digital tools to facilitate team collaboration and maintain organizational cohesion.	van der Lippe & Lippenyi, 2020
Adaptability and self-organization	The ability for both employees and employers to quickly adapt to changes in work conditions.	De Toni, 2011; Vallicelli, 2018
Well-being and psychological support	Availability of mental health resources and support for employees, improving work-life balance and reducing stress.	Donini, 2017; Bentley et al., 2016; Calafà, 1998

Source: author elaboration

The COVID-19 pandemic has acted as a catalyst in this transformation, serving as a "nudge" that has accelerated the adoption of Smart Working. While the pandemic has forced many to work from home, it has also highlighted both the advantages and challenges associated with this work model (Bentley et al., 2016; Vallicelli, 2018). The pandemic has, in many ways, served as a large-scale experiment that has validated many of the theoretical benefits of Smart Working. Organizations have reported increased productivity, reduced operational costs, and improved employee well-being.

However, the pandemic has also exposed the darker sides of this work model. The forced nature of the transition to remote work has meant that many of these challenges have been exacerbated, as organizations and employees were not given the time to adapt gradually to this new way of working. Concerns about work-life imbalance, increased isolation, and challenges in communication and supervision have come to the forefront (Mulki & Jaramillo, 2011; van der Lippe & Lippenyi, 2020; Como et al., 2020).

The psychological impact of this rapid transition to Smart Working cannot be overlooked. The pandemic has led to increased levels of stress, anxiety, depression, and panic, affecting both emotionally vulnerable individuals and those with greater emotional stability (Barile et al., 2019; Brooks et al., 2020; Pfefferbaum & North, 2020). These emotional states are exacerbated by the challenges associated with Smart Working, such as lack of communication, isolation, and controlling behaviors from supervisors, increasing the perceived discomfort and the risk that difficulties become chronic and are perceived as

insurmountable obstacles (Donini, 2017; Calafà, 1998). In this complex landscape, the role of psychological support becomes crucial, offering invaluable care in managing and preventing the individual and organizational consequences related to Smart Working and COVID-19. Services range from psychological support to change management and individual and group counseling, aimed at optimizing both the practical and psychological aspects of work from home. While offering numerous advantages, however, it also poses significant challenges, both logistical and psychological: the need for adaptive strategies and psychological competence-driven support becomes increasingly evident.

3.2.3 Smart Working: a socio-technical reading

The contributions of research and practice show that it is possible to organize remote work in a more evolved way than simple teleworking, which was already studied during the 1990s. In Smart Working, the service is rendered in places and times that are not predefined and that change over time and, in a changing relationship between the worker and the organization, based on different assumptions that define flexible working methods, leaving the employee autonomous and making him or her responsible for achieving agreed performance.

Accordingly, Smart Working rests on three fundamental pillars: the social dimension, about human resource management practices and workers' behavior within organizations; the technological dimension, referring to digital technologies that enable remote working; the physical reorganization of spaces (Raguseo et al., 2016). This conceptual framework constitutes an excellent basis for interpreting the Smart Working phenomenon through the lens of the socio-technical approach, in which organizations are qualified as socio-technical open systems, broken down into two dimensions, technical and social, which are closely interdependent and complementary to each other (Dossena & Mochi, 2020). In detail, the socio-technical approach assumes that change requires a human-centered design perspective, as work systems involve one or more people interacting with each other and/or interacting with machines (Bednar & Welch, 2019). Therefore, this approach suggests that variables that are typically the subject of distinct disciplines are combined into a single representation from a cross-disciplinary perspective. In particular, the technical dimension is associated with business processes, articulated in activities, and with technology, recognized as the main driver for implementing processes, and thus transforming inputs into valuable outputs for the organization and all its stakeholders. More recent developments in the socio-technical approach also deal with the internal functioning of the organization in relation to the environmental context of individual processes, roles, organizational units, networks, and

ecosystems (Mohr & van Amelsvoort, 2016). The typical representation of a socio-technical system contemplates (Bostrom & Heinen, 1977; Cherns, 1976; Cooper & Forest, 1971):

- a technical subsystem, consisting of technologies, means, tools and know-how that support the process of converting inputs into outputs;
- a social subsystem, consisting of people working individually or in groups, managing various levels of responsibility and formalizing their relationships through the organizational structure.

Depending on the opportunities from the external environment, and considering the constraints imposed by it, the organization defines its priorities and objectives. From the interaction between human resources and technologies comes the organizational behavior, aimed at achieving the objectives, which produces the results. Variables internal to the organizational system include (Cuel et al., 2021):

- human variables, relating to the characteristics of the people operating in the organizational system (qualifications, attitudes, motivation, personality);
- social variables, i.e., the set of interpersonal relations created within the organizational system;
- technical variables, relating to the technologies used;
- organizational variables, i.e., the ways in which the connections between the elements of the organizational system are realized.

Organizational structure, operational systems, leadership styles and, more generally, the whole organizational culture are normally considered organizational variables.

3.3 Unpacking competencies for Smart Working

The advent of Smart Working represents a tectonic shift in the traditional paradigms of work, necessitating a new set of competencies that extend beyond mere technical skills. This transformation is not a mere logistical adjustment but represents a profound reconceptualization of the nature of work, organizational culture, and the employer-employee relationship (Iapchino et al., 2018). Such a shift finds resonance in socio-technical systems theory, which posits that organizations are complex systems comprising interdependent and complementary social and technical subsystems.

Indeed, the socio-technical approach offers a comprehensive framework for understanding and navigating the complex, multifaceted transformation toward Smart Working. It provides valuable insights into the interplay between the social and technical dimensions, highlighting the need for a multidisciplinary, integrated approach to competency development. By

adopting such an approach, organizations and their workforces are better equipped to leverage the myriad opportunities and navigate the complex challenges presented by the Smart Working paradigm (Li, 2018).

The first point to address attains to the FWPs bottlenecks (RQ1). Indeed, literature warns that the blurred boundaries between work and life can lead to increased conflict and reduced job satisfaction.

In this line, the "Always On" phenomenon, as cited from Krause (2017), represents one of the most salient challenges in the era of Flexible Work Practices (FWP). This concept encapsulates the risk of employees being constantly connected to their work through digital means, blurring the boundaries between professional and personal life. The risk here is multifaceted, affecting both individual well-being and organizational health (Torre, 2022).

From an individual perspective, being "Always On" can lead to a range of psychological and physical health issues, impacting stress levels, causing potential burnout, and a decline in overall well-being, disrupting work-life balance. This could, in turn, affect their long-term productivity and job satisfaction.

From an organizational standpoint, an "Always On" culture can create an environment where employees feel obligated to respond to work-related communications outside of regular working hours. This can lead to a culture of presenteeism, where employees are physically or virtually present but not fully engaged or productive. Such a culture can be detrimental to team dynamics and can stifle creativity and innovation, as employees may not have the mental space to engage in deep, focused work. The socio-technical approach would view the "Always On" phenomenon as an imbalance between the social and technical subsystems: organizations need to implement strategies to restore this balance, delineating clear spatiotemporal boundaries and encouraging digital detoxification and disconnection during non-working hours.

Switching the attention to the competence issue (RQ2), the managerial metamorphosis in the era of Smart Working is particularly noteworthy, as it mandates a transition from a task-centric focus to a more holistic, service-oriented approach. This aligns with the socio-technical perspective that emphasizes human-centered design, where managerial roles evolve to focus on performance outcomes rather than task completion. In this evolved context, managerial functions transcend traditional supervisory roles to encompass elements of coaching, mentoring, and facilitating team dynamics (Brooks et al., 2020). This reflects the socio-technical essence of Smart Working, where digital proficiency is seamlessly integrated with effective communication and collaboration, inherently social skills (Cuel et al., 2021).

Moreover, the autonomy afforded to employees in Smart Working environments presents its own set of challenges and opportunities, requiring competencies in time management, self-discipline, and digital tool proficiency. These competencies are interconnected, mirroring the socio-technical interplay between the social and technical dimensions of work. Autonomy, in this context, is deeply embedded within a network of social and technical factors, such as collaborative tools and organizational culture, that shape employee behavior (Soga et al., 2022).

The psychological dimensions of Smart Working are also non-trivial, emphasizing the critical role of emotional intelligence for both employees and managers (Rullani e De Toni, 2018). This is congruent with the socio-technical framework, which recognizes that work systems involve human variables like attitudes, motivation, and personality, interacting with technical variables such as digital tools. Emotional intelligence becomes a pivotal competency in managing the social subsystem of Smart Working, especially in remote settings where traditional emotional cues are absent.

Furthermore, the rapid pace of technological advancements underscores the importance of adaptability and continuous learning. These competencies are crucial in navigating the dynamic interplay between the social and technical dimensions of Smart Working. This resonates with the socio-technical approach, which acknowledges that the technical subsystem is not static but evolves in response to external environmental factors. The need for adaptability is accentuated by the increasing prevalence of artificial intelligence and automation technologies, which redefine the scope and nature of various job roles (Makarius & Larson, 2020).

Therefore, adaptability emerges as the most salient competency in the age of Smart Working, reflecting the need for a multidisciplinary approach to competency development that integrates both hard and soft skills (Barile, 2009; Barile et al., 2023). This comprehensive perspective aligns closely with the socio-technical approach, recognizing that the transformation toward Smart Working is a complex, multifaceted process that necessitates an integrated approach to prepare the workforce for future challenges and opportunities. This approach should focus not only on the acquisition of new skills but also on the cultivation of a mindset open to continuous learning and adaptation. Through such a comprehensive approach, organizations and their workforces can fully leverage the myriad opportunities and navigate the complex challenges presented by the Smart Working paradigm (Tab. 3).

Tab. 3 - Unpacking competencies for Smart Working

Socio-technical dimension	Smart Working Designing Lever	Competencies	Description

Social Dimension	Flexibility	Time management	Allows employees to choose their working hours to some extent.
	Trust	Emotional intelligence, communication skills	A shift from oversight and control to trust and autonomy.
	Teamwork	Collaboration, communication skills	Use of digital tools to facilitate team collaboration and maintain organizational cohesion.
	Adaptability, self-organization	Resilience for decision-making	The ability for both employees and employers to quickly adapt to changes in work conditions.
	Well-being and psychological support	Stress Management: emotional well-being and work-life balance	Availability of mental health resources and support for employees, improving work-life balance and reducing stress.
Technological Dimension	Location independence	Digital Literacy, remote communication skills	Employees are not tied to a specific location and can work from various places.
	Focus on output	Efficiency, focus on quality	Emphasis on the quality and quantity of work produced rather than the time spent in the office.
	Technological proficiency	Technological skills for problem-solving	Use of advanced technology and software to facilitate remote work and collaboration.

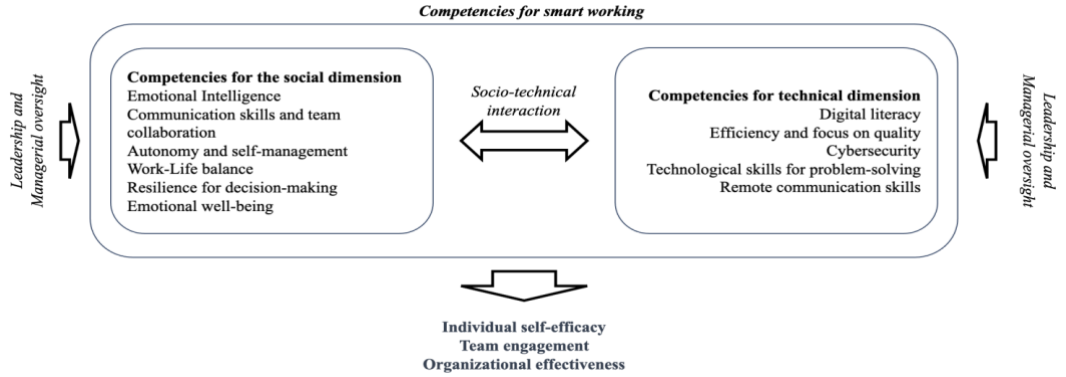
Source: author elaboration

Eventually, focusing on the role organizations may play in fostering the development of emerging competencies within their workforces (RQ3), the socio-technical approach also highlights the importance of organizational culture in facilitating or hindering the adoption of Smart Working. A culture that values innovation and adaptability is more likely to successfully implement Smart Working practices. This involves a shift from a hierarchical to a more networked organizational structure, where information flows freely, and decision-making is more decentralized. Such a structure is more conducive to the flexible, autonomous nature of Smart Working, allowing for quicker adaptation to changing circumstances (Hill et al., 2021; Hitchcock et al., 2017).

In addition, the socio-technical perspective emphasizes the role of external environmental factors, such as regulatory frameworks and societal attitudes toward work-life balance, in shaping the adoption and effectiveness of Smart Working. Organizations do not operate in a vacuum; they are influenced by a myriad of external factors that can either facilitate or hinder their transformation. Eventually, the socio-technical approach provides a framework for evaluating the effectiveness of Smart Working practices. This involves a holistic assessment

that considers both the social and technical dimensions, from employee satisfaction and well-being to productivity and performance (Fig. 1). Such an evaluation is essential for continuous improvement, allowing organizations to fine-tune their practices and adapt to evolving challenges and opportunities.

Fig. 2 - Competencies for Smart Working: a socio-technical reading



Source: author elaboration

3.4 Implications, limitations, and conclusion

The advent of Smart Working has engendered a complex socio-technical landscape, where the interplay between social and technical subsystems is continuously evolving. This landscape is further nuanced by the inescapable digitization that characterizes modern life, manifesting as a pervasive online presence in both private and professional spheres (Spreitzer et al., 2017; Krause, 2017). This omnipresence has not only catalyzed scholarly inquiries into the concept of "digital detoxification" in private life (Ferraris et al., 2018; Santoro & Usai, 2018; Ayeh, 2018; Dickinson et al., 2016) but has also spurred legislative discourse around the notion of "disconnection" in professional settings (Mathieu-Géniaut et al., 2016; Di Meo, 2017).

As said, the impending process of digitization leads to a constant online presence of the user, both in private and professional life (Krause, 2017). This phenomenon has led scholars to explore detoxification processes from new technologies in private life domains (Ferraris et al., 2018; Ferraris et al., 2017; Santoro & Usai, 2018; Ayeh, 2018; Dickinson et al., 2016; Fournier & Mick, 1998; Kuoppamäki et al., 2017; Lee et al., 2017; Löchtefeld & Böhmer, 2013; Paris et al., 2015; Ugur and Koc, 2015). This "disconnection" (Mathieu-Géniaut et al., 2016) refers to the right not to respond to calls, emails, and messages from the office, both in a vertical bidirectional sense – towards and from managers – and in horizontal terms, among colleagues, between the hours of 8:00 PM and 7:00 AM.

Indeed, dematerializing the concept of time and place incurs in the risk of remaining "Always On" (Krause, 2017). To avoid this, it is good practice to delineate spatiotemporal boundaries to effectively benefit from the flexible performance characterizing SW (Di Meo, 2017; Torre, 2020).

This additional perspective enriches the socio-technical understanding of Smart Working by introducing the concept of "digital detoxification" and "disconnection." These concepts resonate with the socio-technical systems theory, which advocates for a balanced interplay between social and technical subsystems. The idea of disconnection aligns with the need for delineating spatiotemporal boundaries, a concept deeply embedded in the socio-technical discourse. It serves as a counterbalance to the "Always On" culture, mitigating the risks associated with constant connectivity. This also underscores the role of regulatory frameworks and collective agreements in shaping the adoption and practice of Smart Working, thereby adding another layer of complexity to the socio-technical landscape. The notion of disconnection and digital detoxification can be viewed as adaptive strategies within the socio-technical system, aimed at preserving the well-being of the human subsystem while optimizing the technical subsystem for greater efficiency and flexibility.

This study aims to delve deeply into the subject matter of Smart Working (SW), exploring its potential and areas for improvement in the relationship between technology and workers. Literature analyzed suggests that SW has the potential to foster a more relaxed work environment and promote an objective-oriented work model. Conversely, it also may result in an inverse correlation with work motivation. This has significant implications for managerial practices.

From a managerial perspective, this study could lead to significant internal changes, starting with the very concept of flexibility. This flexibility can be perceived within the company not only as a logistical element, involving agreements on workdays and modes, but also as a behavioral one. For instance, in industrial sectors, this could mean reducing employee presence while potentially increasing spaces for interaction. Moreover, the inherent flexibility of SW could facilitate the creation of significant partnerships and synergies with geographically distant companies. This could be achieved by leveraging technology and weekly meetings to plan projects with a goal-oriented approach, thereby expanding the organization's operational scope.

Furthermore, attention towards mobility and flexibility confirms the theories posited by Moreira Dias (2017). It suggests that workers gain greater organizational capacity and a heightened sense of responsibility through the application of a flexible and dynamic schedule. This aligns with the socio-technical perspective, which recognizes that the

transformation toward Smart Working is a complex, multifaceted process that necessitates an integrated approach to prepare the workforce for future challenges and opportunities. This approach should focus not only on the acquisition of new skills but also on the cultivation of a mindset open to continuous learning and adaptation. This integrated perspective adds another layer of complexity to the socio-technical model of Smart Working. It emphasizes the role of collective agreements in shaping the adoption and practice of Smart Working. It also introduces the notions of digital detoxification and disconnection as adaptive strategies for Smart Working. These concepts serve as counterbalances to the risks associated with constant connectivity, thereby enriching the socio-technical understanding of Smart Working. Thus, having established a theoretical understanding of how organizations and their workforces can fully leverage the myriad opportunities and navigate the complex challenges presented by the Smart Working paradigm, Chapter 3 focuses on an empirical examination of these dynamics within the Municipality of Cava de' Tirreni. The chapter employs a grounded methodology to investigate how different organizational roles, and digital competencies influence knowledge sharing and hiding behaviors, providing a more granular understanding of the practical implications of Smart Working.

Chapter 4 - Smart Working between Knowledge Hiding and Sharing. The case of Cave de' Tirreni municipality

4.1 Framing the context: Cave de' Tirreni municipality

The Municipality of Cava de' Tirreni, following the principles established by the general laws of the Italian Republic, is configured as an autonomous entity, exercising functions determined by state and regional laws, as well as by its own Statute. This autonomy is manifested not only through the exercise of its own functions but also in the representation of the local community, promoting the development and welfare of citizens according to the principles of human solidarity. An example of this vocation is the commitment of the City of Cava de' Tirreni to characterize itself as a city of quality of life and health, emphasizing the importance of policies that promote the physical and mental well-being of citizens. The territory of the Municipality of Cava de' Tirreni, as defined by the national topographic plan, includes a main town and sixteen hamlets. The city, already recognized as a resort in 1934, boasts a distinct vocation in tourism, culture, agriculture and trade. This recognition is accompanied by a commitment by the municipality to maintain its territory as a denuclearized zone, banning the presence of nuclear facilities, nuclear weapons and radioactive waste, and promoting the use of eco-friendly alternative energies. In addition, the municipality strongly opposes introducing, cultivating and testing genetically modified organisms (GMOs) on its territory. The municipality also recognizes a special bond with citizens who, although relocated elsewhere out of necessity, maintain strong ties to the city by bestowing on them the honorary status of out- of-towners.

Proclaimed a city on August 7, 1394, by Pope Boniface IX, the name Cava is much debated. According to some it draws its etymology from *cavea*, the ancient amphitheater; while according to others the name Cava means *cave* and derives from the presence of some caves, such as Arsicia, where the Benedictine Abbey of the Holy Trinity was founded. Another hypothesis is the derivation from Caba, referring to the Caba road that connected Salerno to Naples already in the Middle Ages and ran through the entire valley. The appellation de' Tirreni given to the city of Cava is due to the identification, now considered unreliable, of the first settlement present in the valley with the Etruscan settlement of Marcina, mentioned by the geographer Strabo in the first century A.D. It was attributed on October 23, 1862, by Victor Emmanuel II, with Royal Decree No. 935. Since the coasts of the Gulf of Salerno

were often plundered by marauders from the sea, the first inhabitants of the valley were those who retreated inland to escape the frequent raids, establishing their first dwellings. Meanwhile, Roman legions from the city of Nuceria Alfaterna often crossed the Marcina valley to southern Italy. Neither the actual geographical location nor the origin of the name Marcina has yet been ascertained: several hypotheses have been made in this regard. The most credited one suggests the origin of the name from *mar+china*, meaning refuge by the sea. Another hypothesis considers the name to derive from *mar+Kerya*, where Kerya means a pre-existing city founded by the people of the Tyrrhenians, who gave the names of their cities to the new lands to be colonized. The territory was inhabited in Roman times: this is evidenced by finds from the imperial period (1st-2nd century AD). However, there was no settlement of a certain size: Roman patrician families, including that of Consul Metellus stayed in the Cava Valley. Proof of this are some archaeological finds in the localities of Pregiato, Santa Lucia and San Cesareo. The remains of an imposing aqueduct dating from the imperial period rise downstream from the Frestola spring, at the foot of the Abbey of the Holy Trinity, with a triple order of arches. With the sudden decline of the Roman colony Nuceria Constantia the inhabitants took refuge in Cava. The first records of rural settlements in this *area outside the city of Salerno,* where the castle of Sant'Adiutore arose at the summit of Monte Castello, date back to this period, particularly in the 8th-10th centuries. Of the castle, destroyed by Allied bombing during World War II today only a post-war reconstruction remains. The first traces of human settlement in the valley of Cava de' Tirreni date back to pre-Roman times. The first inhabitants were probably the Tirreni, an Italic people who gave the area its name. The strategic location of the valley, protected by mountains and close to the sea, favored the development of a thriving community. During Roman times, the area became an important crossing point between the coast and the hinterland. With the fall of the Roman Empire, the valley suffered barbarian invasions but managed to maintain a certain autonomy due to its isolated location and the natural defense offered by the surrounding mountains.

The Middle Ages was a crucial period in the history of Cava de' Tirreni. In 1011, a Benedictine monk named St. Alferio founded the Abbey of the Holy Trinity of Cava, which soon became a center of great religious and cultural importance and contributed to the spread of Christianity in the region. During the 11th and 12th centuries, the abbey acquired numerous lands and fiefdoms, extending its influence over much of Campania. The local population grew, and the town began to fortify itself with walls and towers to defend itself against raids by Saracen pirates and feudal strife. During the Renaissance, Cava de' Tirreni became an important commercial center, thanks to its strategic location on the route

connecting Naples with Salerno and Calabria. Local noble families-built palaces and churches that still characterize the city's historic center. In the 16th century, Cava de' Tirreni was granted the title of royal city by the King of Spain, Charles V, which gave it special privileges and autonomy.

In the 19th century, with the unification of Italy, Cava de' Tirreni was integrated into the Kingdom of Italy. The city experienced a period of urban and industrial transformation. The ancient medieval walls were partly demolished to make room for urban expansion, and new infrastructure was built to improve communications with neighboring towns. During World War II, Cava de' Tirreni was hit by Allied bombing, but it recovered quickly after the war.

Programmatic principles and goals of the municipality

The Municipality of Cava de' Tirreni pursues the goal of promoting the full development of the human person by removing economic and social obstacles that limit the freedom and equality of citizens. This commitment translates into initiatives aimed at ensuring the active participation of citizens in the political, economic, social and cultural organization of the country, as well as promoting civic education. A cardinal principle of municipal action is that of *horizontal subsidiarity* which provides for the exercise of municipal functions, where possible, through the autonomous initiative of citizens and social formations. The municipality also promotes cooperation with other local authorities, particularly with municipalities on the Amalfi Coast, to improve the effectiveness of its administrative action. Citizen participation in municipal administration is considered an essential element for the democratization of the relationship between elected bodies and the community. The Municipality of Cava de' Tirreni guarantees citizens, through free associative forms, the possibility to intervene in decisions regarding issues of general interest. These associations, which include trade unions, voluntary, cultural, sports and environmental protection associations, are recognized and valued by the municipality, which facilitates their registration in special registers and promotes their active participation through specific councils. These bodies perform consultative and propositional functions vis-à-vis the City Council, ensuring a continuous dialogue between the administration and civil society.

Organs of the municipality and operation

The City Council of Cava de' Tirreni, composed of the mayor and 24 councilors, represents the body of political direction of the entity and performs functions of control over the implementation of municipal policies. The Council elects from among its members a President and a Vice President, ensuring respect for minorities and representation of all

council groups. Council meetings are public, and decisions are made by majority vote, with special attention to the transparency and effectiveness of deliberations. The City Council, chaired by the mayor and composed of a maximum of 10 aldermen, collaborates with the mayor in the implementation of the general guidelines of government, playing a proactive and impulsive role vis-à-vis the City Council. The Mayor of Cava de' Tirreni, as head of the municipal administration, represents the municipality, supervises the operation of the offices and services, and coordinates the activities of the aldermen and managers. The mayor exercises the functions assigned to him by law, the Statute and regulations, promoting the unity of the political-administrative direction of the municipality. In addition, the mayor is responsible for issuing urgent ordinances in cases of health emergencies or public hygiene and for coordinating the hours of business establishments and public services according to the needs of the population. In the event of a motion of no-confidence, resignation, or permanent impediment, the mayor lapses from office, resulting in the dissolution of the City Council and the City Council.

The municipality, using its own powers and those conferred by the state and region, is committed to implementing the principle of subsidiarity in various areas for the good of the community.

First, it has the priority goal of protecting the health and improving the quality of life of citizens, combating pollution and deforestation, and enhancing the natural and urban environment.

The municipality promotes employment and seeks to solve the housing problem, especially by rehabilitating and upgrading existing buildings, because it considers these actions essential to ensuring a good standard of living for citizens. It is also committed to providing basic services, such as education, cultural promotion, social security, transportation, and opportunities to play sports and spend leisure time.

Another important commitment is to ensure effective social welfare, with special attention to the elderly, minors, people with disabilities, and those who are less protected. It strives to ensure that young people grow up healthy, both physically and morally, respecting their individuality and providing them with adequate protection and services.

The municipality promotes cooperation as a tool for social development and participation of the people in the production process. In administration, it strives to be transparent, effective, efficient, economical and to simplify procedures. For young people, the right to actively participate in public life and democratic institutions is guaranteed. The municipality promotes targeted training policies, collaborating with public and private entities, with special attention to the most vulnerable social groups.

It supports the economic and social development of the community, enhancing local initiatives and fostering cooperation at the national and international levels. It is also committed to respecting and protecting ethnic, linguistic, cultural, religious, political and gender diversity, promoting integration through culture and tolerance.

Finally, the municipality promotes and spreads an environmentalist culture, educating citizens to take care of the environment in which they live. In doing all this, the municipality is guided by the principle of subsidiarity, actively cooperating with citizens and others to carry out its functions effectively. After the first meeting, the City Council is convened by the President, who is also in charge of setting the day of the meeting. If the Chairman is not elected, it is up to the senior counselor to convene the council. At the request of the mayor or at least one-fifth of the councilors, the chairman is obliged to put the requested items on the agenda, convening the meeting within twenty days after the request is made. In urgent situations, the meeting may be convened with at least twenty-four hours' notice. The agenda of council meetings is set by the chairman. The manner of convocation, except in urgent cases, shall be determined by law and the specific regulations. The Chairman shall ensure that there is wide publicity about the date and agenda of the Council. In addition, subject to budgetary availability, the President may arrange for the broadcasting of council meetings on local broadcasting stations, especially for those concerning the budget, management accounts, policy lines, and other topics of significant public interest. Municipal Councilors represent the entire local community and perform their functions without any mandate constraints. They may receive temporary assignments from the mayor for specific business and have the right to propose deliberative initiatives on all matters within the Council's jurisdiction. They may submit petitions, questions, interpellations and motions as provided for in the council rules. In addition, Councilors have the right to timely access to all documents useful for the performance of their mandate from municipal offices, companies and entities dependent on the municipality, and other investee companies. They also have the right to obtain from the Chairman of the Council adequate and prior information on matters under discussion, including through the conferences of group leaders.

Each Councilor must elect a domicile in the municipal territory to receive notices of Council meetings. The legal status, resignation and replacement of councilors are regulated by law. If a Councilor fails to attend three consecutive meetings without a justifiable reason, he or she may be declared disqualified by the City Council. In such a case, the Council President shall contest the unexcused absences in writing, and the Councilor shall be given a time limit to provide explanations. The Council shall decide on disqualification by an open vote by an absolute majority.

Resignation as a councilor is irrevocable, does not require acknowledgement, and is effective immediately. Councilors must abstain from participating in discussions and votes that affect their own interests or those of relatives up to the fourth degree, except for measures of a general nature, such as city plans, unless there is a direct correlation with specific personal interests.

Councilors may form themselves into groups, as provided for in the regulations, and the regulations govern the resources to be allocated to council groups. Councilors are entitled to an attendance fee for attending council and committee meetings, which may be converted into an attendance allowance.

Meetings of the City Council shall be public, and voting shall be by open ballot, unless otherwise provided for in the Rules of Procedure. The Council meets validly with the presence of at least half of the assigned councilors, excluding the mayor. Resolutions are valid only if approved by most of those voting, with certain exceptions provided for by law or the Bylaws. In case of a tie, the youngest is elected.

Proposals to be considered by the Council must be deposited in the secretary's office at least forty-eight hours before the meeting, or twenty-four hours in case of urgency, to allow Councilors to view them.

The City Council is the body of political policy-making and political-administrative control. It is responsible for fundamental acts affecting the interests of the local community. It has powers of statutory, regulatory, organizational and economic, financial and territorial planning autonomy. The council remains in office until the election of the new one, limiting itself to adopting urgent and unpostponable acts after the publication of the decree calling the election meetings. Elections, term of office, composition and dissolution of the Council are regulated by law.

The President of the City Council, elected according to the rules established in the bylaws, plays a key role in guiding and representing the Council. The President is responsible for convening Council meetings and setting the agenda, based on requests from the Mayor, Council or Councilors. He/she works with the Mayor and the Conference of Group Leaders to set meeting dates, ensuring proper coordination.

During meetings, the chairperson is responsible for opening, directing, coordinating, and closing discussions, ensuring that all councilors can express themselves, with special attention to protecting the rights of the minority. He also has the power to suspend or adjourn meetings if necessary and has police powers to maintain order during meetings.

The Chairman, in addition to convening and presiding over the Conference of Group Leaders, must ensure that the council groups receive all necessary information in a timely

and complete manner so that they can adequately prepare for Council discussions. He or she also has powers of direction and control over the management of the resources allocated to the operation of the Council, and performs all other functions assigned to him or her by law, the Statute, or the Regulations.

The President's term lasts as long as that of the City Council. If the President is absent or temporarily impeded, he/she is replaced by the Vice-President. The President receives an allowance for his activities, in accordance with current legislation.

In the event of the death, disqualification, or resignation of the President, the Vice- President temporarily assumes his or her role until a new President is elected. In addition to the cases provided for by law, the President may be removed from office if a reasoned motion is submitted by at least 40 percent of the councilors and approved by an absolute majority, for repeated violations of the law, the Statute, or the Regulations, or for conduct that seriously impairs the proper functioning of the Council.

The City Council consists of the mayor, who presides over it, and a maximum of 10 Aldermen, a number determined by the mayor himself. The Assessors are appointed by the mayor, who ensures the presence of both sexes in the group. From among the Aldermen, the Mayor appoints a Vice-Mayor. Once the appointments have been made, the mayor shall notify the City Council.

Councilors may be chosen either from among Councilors or citizens from outside the Council, provided they meet the eligibility, eligibility and compatibility requirements for the office of City Councilor. However, once appointed, an Assessor may not simultaneously hold the office of City Councilor. The causes of incompatibility, legal status, and the manner of disqualification and removal of Councilors are established by law. An Alderman who fails to attend three consecutive meetings without a justified reason automatically forfeits his or her office. In addition, persons who are related up to the third degree to the mayor, or spouses or affiliates, cannot be members of the Council.

The mayor has the power to delegate specific powers to the Assessors and may change them at any time. In case of necessity, the mayor may remove one or more Councilors, communicating the decision in a reasoned manner at the first useful meeting of the Council, even if only in case of the loss of trust. Councilors participate in the meetings of the City Council with the right to speak in the debate, make proposals, reply and report, as provided for in the council rules. Regarding the powers of the Council, it cooperates with the mayor in the government of the Municipality and in the implementation of general policies. The Junta carries out all activities of direction and control that are not reserved by law for the City Council or the Mayor, Secretary or managers. In particular, the Council approves

projects, proposes regulations, sets tax rates and tariffs, and appoints members of commissions for public competitions, among other functions.

In situations of urgency, the Council may adopt resolutions that normally pertain to the Council, such as budget changes, but these must be ratified by the Council within 60 days, but no later than December 31 of the current year. The work of the Council is conducted collegially, and decisions are made with the presence of at least half plus one of the members, including the mayor. Meetings of the Council are not public. The mayor makes permanent assignments to the Councilors on specific groups of subjects or projects and may also make temporary assignments for specific business. In the absence of the Mayor and Vice-Mayor, the functions are performed by the most senior Alderman, unless otherwise ordered by the mayor.

The mayor, as the head of the municipal administration, represents the body and is responsible for overseeing the operation of municipal offices. He or she provides directives to the City Secretary, the General Manager (if appointed) and managers to ensure effective administrative management of all offices and services. The mayor exercises the functions assigned to him/her by laws, statutes and regulations, and supervises state and regional functions delegated to the municipality.

In case of health or public hygiene emergencies of a local nature, or in other emergencies provided for by law, the mayor issues contingent and urgent ordinances to deal with the situation. In addition, he or she coordinates and reorganizes the schedules of commercial establishments, public services and public offices, considering the needs of the population and, in case of traffic or pollution emergencies, may modify them.

The mayor appoints and removes representatives of the municipality in external bodies and agencies, excluding those within the competence of the City Council, and has the power to appoint and remove aldermen, establishing their number at the beginning of the term of office, within the limits of the law. Convenes the Council and sets the agenda for its meetings, as well as presiding over the first meeting of the City Council. Participates in the conference of council leaders and responds to questions, interpellations, and motions in the Council, based on the reports of the relevant Councilors.

The mayor may make temporary and specific assignments to city councilors and ensures the unity of the political-administrative direction of the municipality by coordinating and directing the activities of the councilors and intervening when necessary. He is also in charge of promoting and concluding program agreements with other public entities, calling municipal referenda, and legally representing the municipality. In the event of his absence,

he may delegate an Assessor, who assumes the role of Vice-Mayor, to replace him also as government official.

The mayor appoints the Municipal Secretary and the General Manager, and assigns managerial and external collaboration positions, following the regulations in force and the regulation on the organization of offices and services. He/she informs the population about dangerous situations or those related to civil protection, using all available means.

In case of no-confidence, resignation, death, permanent impediment, removal or suspension of the mayor, the procedure is regulated by law. The motion of no-confidence must be substantiated and signed by at least 40 percent of the councilors and is debated within 30 days of submission. If approved, it leads to the disqualification of the Mayor, the Council and the dissolution of the City Council, with the appointment of a commissioner.

The resignation of the mayor, submitted in writing to the President of the Council, becomes effective and irrevocable after 20 days, causing the disqualification of the Council and the dissolution of the City Council. If the Mayor is permanently incapacitated due to serious illness, the Council shall take note and notify the Prefect.

Municipal administrators must abstain from participating in discussions and voting on resolutions that affect personal interests or those of relatives within the fourth degree, except in cases of regulatory or general measures. In addition, members of the council who are responsible for urban planning or construction must abstain from professional activities in the construction sector within the municipal territory. This obligation also extends to the mayor if he delegates such matters to aldermen. Administrators, including municipal councilors, must refrain from participating in services, supplies, contracts or paid assignments concerning the municipality or bodies subject to its supervision.

4.2 Methodology: the grounded approach

The research methodology adopted for this thesis is based on Grounded Theory, which allows for the development of a theoretical framework grounded in the data collected. The study follows a three-stage coding process: open coding, axial coding, and selective coding, each of which plays a critical role in theory development.

Grounded theory (GT) is a qualitative methodology developed by Barney G. Glaser and Anselm L. Strauss in 1967 in response to the predominance of quantitative approaches and hypothesis testing in the social sciences. In their pioneering work, *The Discovery of Grounded Theory*, Glaser and Strauss proposed an alternative method that would allow theories to be generated directly from data, without theoretical preconceptions or a priori

assumptions. The key concept of GT is to make theory emerge from observed empirical reality by grounding it in the data collected systematically and iteratively. This methodology is distinguished by its inductive approach, which rejects the application of predefined theories in favor of a process in which concepts and theoretical categories emerge directly from the analysis of empirical data.

In its methodological and philosophical context, grounded theory contrasts with the deductive and verificationist approaches typical of the social sciences of the time. Instead of starting from pre-established hypotheses, researchers adopting GT seek to explore social phenomena through an open and flexible lens. Glaser and Strauss (1967) criticized the use of pre-established theories, which they considered distant from the complexities of social phenomena and encouraged researchers to maintain an open attitude toward data. Grounded theory developed, therefore, as a highly flexible and iterative methodology capable of dealing with complex and ever-changing social phenomena. In this sense, the GT approach allows the development of theoretical concepts that are sensitive to the empirical context, through a continuous cycle of data collection and analysis.

In the years since its original formulation, GT has undergone several modifications and extensions. Strauss and Corbin (1990) developed a variant of grounded theory involving a more structured and systematic approach to data coding. Their work introduced the concept of axial coding, which aims to identify relationships between theoretical categories and subcategories. This variant of GT, more prescriptive than Glaser's original version, was welcomed by many researchers who sought more methodological guidance in the analysis process. On the other hand, Glaser's more flexible and less structured approach has remained popular, particularly among researchers who favor theoretical emergence and spontaneity in data analysis.

A significant development in the history of GT is the introduction of constructivism by Kathy Charmaz (2006). Charmaz developed an approach that redefines grounded theory in terms of the interaction between researcher and data, emphasizing the active role of the researcher in the meaning-making process. According to constructivist GT, theory is not simply discovered in data but co-constructed through dialogue between the researcher and participants. In this perspective, social reality is seen as plural and situated, and the emerging theoretical concepts reflect the interpretations and experiences of the participants, as well as the interactions between them and the researcher. This approach represents a significant break with the idea of objectivity traditionally associated with Glaser's classical grounded theory and reflects a broader epistemological shift towards social constructivism in the contemporary social sciences.

One of the cardinal principles of grounded theory, shared by all its variants, is theoretical sampling. In this approach, data collection does not follow a fixed pattern but is guided by the emergence of theoretical categories. Theoretical sampling, introduced by Glaser and Strauss (1967), implies that decisions on who to interview or what events to observe are made iteratively as data are collected and analyzed. This process differs from probability or representative sampling, typical of quantitative research, in that it does not attempt to generalize the results to a larger population. Rather, theoretical sampling aims to develop an in-depth understanding of emerging categories, enriching and refining the theory as the research progresses.

A crucial concept related to theoretical sampling is that of theoretical saturation. Theoretical saturation occurs when the collection of new data does not bring additional information or significant contributions to the emerging theoretical categories. Corbin and Strauss (2015) describe saturation as the point at which the researcher can stop collecting data because theoretical concepts and relationships have been fully explored and understood. Reaching saturation requires continuous analysis parallel to data collection, so that the researcher can identify early on when the collected data is no longer contributing to the expansion of theoretical categories.

Data analysis in grounded theory is structured through a coding process, which is one of the central stages of the methodology. Coding in grounded theory consists of three main phases: open coding, axial coding and selective coding. In the open coding phase, the researcher fragments the raw data to identify emerging concepts and categories. In this phase, the data are analyzed in an exploratory manner, without theoretical preconceptions, to identify patterns, themes and ideas that emerge directly from the empirical material. As Charmaz (2006) points out, open coding is a highly exploratory and iterative process, in which the researcher must maintain an attitude of open-mindedness and analytical flexibility.

After identifying preliminary concepts and categories in the open coding phase, one moves on to axial coding, which aims to link emerging categories and identify relationships between concepts. Axial coding, introduced by Strauss and Corbin (1990), is a phase in which the researcher attempts to construct a broader and more coherent conceptual structure by identifying causal, temporal and logical relationships between categories. In this phase, the researcher focuses on questions such as: What are the causes of a given phenomenon? What are its effects? What strategies or conditions influence these dynamics? Axial coding represents a crucial moment in the development of a coherent and systematic theory.

The final stage of the coding process is represented by selective coding, in which the researcher identifies the central category that unifies all developed theoretical categories.

The central category represents the main concept around which the emerging theory revolves, and which explains the studied phenomenon. According to Glaser and Strauss (1967), selective coding makes it possible to synthesize and integrate the different elements of the theory, constructing a coherent and parsimonious theoretical framework. The central category thus becomes the core of the emerging theory, capable of explaining the dynamics and relationships between the various conceptual elements.

An essential element in the grounded theory development process is memoing, which consists of taking reflective and theoretical notes while analyzing data. Birks and Mills (2015) consider memoing to be a crucial tool for the researcher, as it allows them to keep track of emerging theoretical connections, stimulate new insights and deepen their understanding of the data. Memoing helps the researcher to reflect on categories and their relationships, maintaining an ongoing dialogue between theory and data. This process of theoretical reflection helps to deepen the analysis and improve the quality of the emerging theory.

Another useful tool in grounded theory is the use of diagrams, which make it possible to visualize the relationships between categories and concepts. Diagrams provide a visual means to organize theoretical thinking and facilitate understanding of the connections between various conceptual elements. Corbin and Strauss (2015) suggest that diagrams can be used to clarify the dynamics and relationships between categories, both during the analysis process and when presenting results. They help to maintain a clear and coherent view of the developing theory, especially when the number of categories and concepts begins to grow.

One of the main goals of grounded theory is the construction of an emergent theory that arises directly from the data rather than being applied a priori. Glaser (1992) emphasizes the importance of allowing concepts to emerge naturally from the data, without forcing the theory onto them. This approach allows grounded theory to be closely linked to specific empirical contexts and to offer theoretical explanations that resonate with participants' lived experience. However, one of the main challenges of GT is to ensure the validity of the grounded theory. In this regard, Charmaz (2014) introduces criteria such as adaptability and explanatory capacity as key parameters to assess the quality of an emergent theory. A valid emergent theory must not only be analytically sound, but also relevant and applicable in different social contexts.

Grounded theory, moreover, has developed in different methodological directions, giving rise to several variants reflecting different epistemological orientations. Glaser (1992) insists on maintaining the original GT approach, characterized by the spontaneous emergence of

concepts from data. This classical approach emphasizes the flexibility and naturalness of theoretical emergence, without imposing external interpretative frameworks. On the other hand, Strauss and Corbin (1990) developed a more structured version of GT, involving the use of techniques such as axial coding to guide the researcher in constructing relationships between categories. Finally, Charmaz's (2006) constructivist approach represents an important development, emphasizing the active role of the researcher in co-constructing meaning through interaction with participants. Grounded theory has found wide application in numerous disciplinary fields, including sociology, psychology and organizational sciences. Due to its flexibility and ability to adapt to complex phenomena, GT has been used to explore issues such as organizational resilience, innovation and cultural change. A significant example is Orlikowski's (1993) study on technology adoption in organizations, in which she applied grounded theory to develop a theory on the use of information systems in everyday practices. This demonstrates how GT is a powerful tool for exploring dynamic and evolving phenomena, offering theories that are rooted in concrete experience and reflect the complexities of social interactions.

4.3 Problem setting and research design: a changing public context

This research took place within the municipality of Cava de' Tirreni, a complex public organization that had to face a profound change in the way of working following the Covid-19 pandemic. Before the pandemic, most work activities were carried out in the presence, with a heavy reliance on face-to-face interactions and the use of paper documents to manage processes. The introduction of smart working and digital technologies represented a significant change, accelerated by circumstances, which forced the municipality to reorganize a large part of its workflows. The 30 interviews conducted with employees from various departments - including building management, security, registry, urban planning and technical support - provided a detailed insight into the challenges and opportunities that emerged during the digital transition. The experiences gathered reflect a diversity of perspectives: while some roles were able to benefit from digital technologies to improve information sharing and collaboration, other roles, more closely linked to operational activities, encountered more difficulties.

In the research setting, employees perform tasks that vary widely in terms of content and mode of execution. For example, those involved in document management and planning were able to adapt more easily to working remotely, while those working in operational contexts such as security, maintenance or registry management continued to require a

physical presence to perform tasks related to accessing physical documents or field supervision.

This exploratory study is based on the GT adopting a constructivist lens (Glaser and Strauss, 1967; Strauss and Corbin, 1998; Mills et al., 2006). GT has been chosen given its usefulness in exploring single, yet fuzzy, contexts of investigation. Indeed, while quantitative research aims at verifying pre-existing theories in a causative sense, GT aims to systematically collect and analyse research data consistent with the context of detection adopting an interpretative lens when it is uneasy or challenging to set variables and statistical relations among them (Corbetta, 2003).

4.3.1 Data collection and interview protocol

The interviewed sample consisted of 30 employees of the municipality of Cava de' Tirreni, selected to represent different functional areas and hierarchical levels within the organization. Of these, 40% (12 people) hold operational roles, while the remaining 60% (18 people) are engaged in management or managerial positions. The age distribution shows that 30%of the participants (9 people) are between 30 and 40 years old, 40% (12 people) are in the 41-50 age bracket, while the remaining 30% (9 people) are over 50 years old.

In terms of work experience, 20% of the participants (6 people) have between 5 and 10 years of service in the organization, 50% (15 people) have between 11 and 20 years of experience, while 30% (9 people) have more than 20 years of experience. About work mode, 50% (15 persons) work mainly in smart working or hybrid mode, while the remaining 50% (15 persons) work mainly in presence.

Finally, about educational level, 40% of participants (12 people) have a diploma, while 60% (18 people) have a bachelor's or master's degree.

Three rounds of in-depth interviews were conducted following a semi-structured questionnaire with open questions (Patton, 1990). This technique has been chosen because it is suitable for the analysis of elaborated in this research since it collaboratively builds intersubjective representations and interpretations of variables under investigation through the reciprocal process of perception, interaction, communication and meaning exchange between interviewers and the interviewees (Charmaz, 2006).

The first round of interviews involved all the participants and included general questions aimed at knowing what is meant by smart working.

The second round involved less respondents, identified as those knowledgeable on emerging opportunities and issues.

Then, the last round of interviews was conducted again involving all the participants.

4.3.2 Data analysis: coding process

Data were analysed over five months along three coding rounds, 1) "open coding", 2) "axial coding", and 3) "theoretical coding": the first two rounds attain to the substantive coding phase; the third attains to the conceptualization phase (Strauss and Corbin, 1998; Charmaz, 2017).

During the first round, open interviews were audio-recorded and later listened. The first listening did not involve transcription but only the recovery of key concepts. After a second listening, interviews were transcribed and read again. The first reading stressed issues to be addressed, and subsequent ones allowed a first memorising process.

After this initial open coding process, it followed axial coding. This was aimed at bringing out possible interpretative paths through the identification of "units of minimal meaning" and after the attribution of names to categories (Strauss and Corbin, 1998). This allowed proceeding to the "method of comparisons" among key concepts, highlighting differences and similarities and saturate the "theoretical sampling" by extending the initial sample (i.e., freelance accounts). Therefore, salient themes, interpretative categories, relationships among them were achieved, and causal links were hypothesized.

Nvivo software was used for automatic and semi-automatic analysis of qualitative data and text interpretation by adopting the technique of Verbatim. By testing causal links emerged from axial coding, and identifying core categories, the theoretical coding led to a more abstract conceptualization of data according to which new theoretical concept have been detected.

4.4 Results

4.4.1 Open Coding

In the open coding phase, interview data were analyzed line by line, and key concepts were extracted and organized into codes. This phase focuses on identifying recurring phenomena described by participants regarding the use of digital technologies in the Municipality of Cava de' Tirreni, particularly concerning knowledge sharing and knowledge hiding.

During this initial phase, each interview was broken down into key concepts, which were then coded. The codes (Tab. 4) represent specific phenomena related to knowledge sharing (e.g., facilitating collaboration) or knowledge hiding (e.g., selective sharing, lack of trust). At this stage, no assumptions were made about the relationships between these actions; the aim was to remain open to all possible interpretations of the data.

Tab.4 - Codes

Code	Verbatim excerpt	Description
Difficulty accessing documents	"I can't work from home because many documents are still in paper format." (Interview 4)	The employee lacks access to necessary digital documents.
Facilitating collaboration	"PEC and iDoc have made it faster to share data." (Interview 7)	The use of digital platforms has improved data sharing and collaboration.
Lack of trust in platforms	"I don't trust these platforms; they may not be secure." (Interview 12)	The employee expresses concern about the security of digital technologies.
Lack of digital training	"We have the tools, but no one taught us how to use them." (Interview 3)	The staff received insufficient training on how to use the new digital tools.
Selective information sharing	"I only share what is strictly necessary, I don't fully trust it." (Interview 9)	The employee shares only minimal information with colleagues.

Source: author elaboration

4.4.2 Axial Coding

In axial coding, the codes generated from open coding are grouped into broader categories. These categories represent central phenomena observed in the organization. This phase helps to organize the various codes and understand how they relate to each other, forming more abstract concepts. In this phase, codes related to technological problems and the use of platforms were grouped into the categories of technological barriers and lack of trust in technology, which highlight factors impeding knowledge sharing. At the same time, facilitating knowledge sharing describes the advantages of using digital platforms for knowledge sharing processes.

Tab. 5 – Categories

Category	Related Codes	Verbatim excerpt	Description
Technological barriers	Difficulty accessing documents; Lack of digital training	"I can't work remotely because many of our documents are still in paper form." (Interview 11)	The lack of full digitization limits remote work possibilities.
Facilitating knowledge sharing	Facilitating collaboration; Improved data access	"PEC and iDoc have made sharing faster, we can work better even from remote." (Interview 5)	The use of digital platforms has made collaboration between teams more efficient.
Lack of trust in technology	Lack of trust in platforms; Selective information sharing	"I don't trust sharing all the data, I'm not sure it's safe to do so through these platforms." (Interview 16)	Limited trust in the technologies leads employees to share less information.

Source: author elaboration

4.4.3 Selective Coding

In the selective coding phase, the main categories are integrated to construct a central theory. This final phase connects the emergent categories into a cohesive explanation, describing the balance between knowledge sharing and knowledge hiding within the organization (Tab. 6).

Tab. 6 – Emerging Theory

Emerging theory	Main categories	Theoretical explanation
Digital technologies facilitate knowledge sharing, but they amplify knowledge hiding when there are technological and cultural barriers.	- Facilitating knowledge sharing - Technological barriers - Lack of trust in technology - Knowledge hiding	Digital technologies facilitate collaboration, but where there are technological barriers or lack of trust, knowledge hiding increases due to a possible

Source: author elaboration

4.5 Discussion and theory development

4.5.1 Knowledge Sharing: opportunities created by digital

The introduction of digital tools such as PEC, iDoc and Linkmate has had a positive impact on employees' ability to share information in a faster and more accessible way. Particularly in administrative roles, where document management and inter-office collaboration are central, the use of these platforms has reduced the time needed to exchange data and make decisions. Interviewees reported that the use of digital platforms has improved the efficiency of internal communications by enabling asynchronous sharing of documents, which has eliminated the need for constant face-to-face meetings.

A specific example that emerged from the interviews concerns the urban planning sector, where digital document sharing has made it easier to consult projects and approve files. Employees in this sector have been able to work on shared files, collaborating more smoothly with other offices and reducing waiting times for access to necessary information. Another benefit of going digital was the improved accessibility of information through centralized archives. Employees reported that being able to access documents digitally improved their ability to retrieve historical information and manage complex files. This had a positive impact on knowledge management within the municipality, especially in areas that handle a high volume of administrative data.

However, these benefits have not been evenly distributed. In operational roles, information sharing has been limited by the lack of complete digitization of documents. In contexts such as registry management or community policing, employees continued to work predominantly with paper documents, which limited the possibilities for remote collaboration and maintained a strong need for physical presence.

Indeed, a recurring theme that emerged from the interviews was the incomplete digitization of processes. Many of the employees, particularly those involved in operational or direct citizen management roles, complained that the lack of complete digitization of documents limited the potential of digital in facilitating knowledge sharing.

For example, registry staff described how access to paper records prevented the effective sharing of information with other offices or colleagues remotely. The absence of an integrated digital platform to centrally manage this information has created a discontinuity between employees working remotely and those working in the field, generating frustration and reducing the effectiveness of knowledge sharing.

In parallel, the use of digital technologies has accentuated knowledge hiding phenomena. Reduced face-to-face interactions and increased physical distance between employees have contributed to reduced opportunities for spontaneous knowledge sharing. In some cases, this has led to unintentional knowledge hiding, resulting from a lack of opportunities to exchange information in an unstructured manner.

One of the main factors fostering knowledge hiding was the fewer spontaneous interactions that took place in the office prior to the introduction of smart working. Many respondents reported that, despite having access to digital platforms, the lack of informal conversations made it more difficult to solve complex problems or share important details about ongoing projects. In an environment where remote working has become the norm, communication between employees has often been limited to formal exchanges via e-mail or collaborative platforms.

This change has reduced transparency in work processes, leading to knowledge retention phenomena, not necessarily by deliberate choice, but because of fewer opportunities to interact informally. Physical distance amplified the feeling of isolation, and many employees reported finding themselves in situations where information was not shared promptly.

Another factor contributing to knowledge hiding was the widespread fear about the security of information shared via digital platforms. Several respondents expressed concern about the vulnerability of the platforms used, which in some cases were considered insecure or inefficient. This has led to a limitation in the sharing of sensitive information, favoring an attitude of caution in the transmission of data. Some administrative employees reported that, due to a lack of confidence in the security of the platforms, they tend to withhold information until it can be shared in person. Perceptions of technological inadequacy have thus incentivized knowledge retention practices, with employees feeling more secure in keeping information until it can be transferred to a perceived more secure environment. This phenomenon has harmed collaboration, increasing divisions between those who work

remotely and those who work in the presence. From the analysis, therefore, digital has played a dual role: while on the one hand it has facilitated knowledge sharing in administrative roles, on the other hand it has amplified knowledge hiding phenomena, especially in those areas where digitization was incomplete or where the organizational culture did not fully support its adoption.

4.5.2 Knowledge Sharing: administrative vs. operational roles

In balancing the processes of knowledge sharing and hiding, a dichotomy clearly emerges between administrative and operational roles. In administrative roles, digital technologies have improved information flow, enabling greater collaboration between employees. In these contexts, centralized document management systems and collaborative platforms have made it possible to keep work processes active, despite the physical distance. Administrative roles have benefited from greater accessibility to information, which has helped improve the quality of decisions, reducing the time needed to obtain data and share critical knowledge. The ability to collaborate on shared documents has enabled smoother operations than in the past, reducing the need for formal face-to-face meetings and increasing asynchronous knowledge sharing.

However, in operational roles, where activities require continuous access to paper documents and physical presence for field supervision, digital has created significant barriers. The lack of appropriate digital tools has prevented a full transition to smart working, keeping some workers anchored to a traditional working model. For example, in the supervisory sector and in registry management, employees reported that access to paper documents was a critical barrier to remote collaboration. Without full digitization, knowledge sharing continued to depend on physical presence, negatively impacting productivity and the ability to respond to organizational needs promptly.

4.5.3 Knowledge Hiding and its enabling factors: a mixed organizational culture

Knowledge hiding found fertile ground especially in contexts where organizational culture and technology were not properly aligned. The interviews revealed that knowledge hiding is not always intentional: it often occurs because of structural factors related to physical distance and lack of trust in the technologies adopted.

One of the phenomena that emerged during the interviews was selective information sharing behavior. The possibility of working remotely has given employees more discretion on what to share and with whom. This led to a segmentation of knowledge, with information being shared only within small circles of colleagues, while others were excluded from the

information flow. The reduction of spontaneous interactions made it easier to retain information, as contacts took place mainly through digital platforms, where group dynamics were more formal and structured.

Another factor that contributed to knowledge hiding was the lack of confidence in the security of the digital platforms used. Some employees expressed concerns about the vulnerability of the systems and preferred to withhold information rather than share it through digital channels perceived as insecure. In these cases, the technologies adopted were not perceived as a secure means of handling sensitive data, leading to an increase in knowledge retention.

Platforms used for smart working were viewed with distrust, especially in contexts where the management of privacy and data security was considered crucial, such as in the registry sector and in finance management. Concern about security prompted some employees to share only minimal information, delaying the dissemination of more critical knowledge.

A further factor affecting knowledge hiding was the reduction of spontaneous interactions due to physical distance. In pre-pandemic work contexts, informal conversations between colleagues allowed a continuous exchange of knowledge that extended beyond formal meetings or project discussions. These interactions, which took place naturally in common office spaces, disappeared with the introduction of smart working.

The absence of these interactions reduced opportunities to share tacit knowledge, which is usually conveyed through informal dialogue. Interviews revealed that many employees, working remotely, tended to communicate only the strictly necessary information, limiting the exchange of useful but non-essential details. This situation increased the phenomenon of organizational silence, in which information was not shared completely, contributing to a perception of isolation and fragmentation between teams.

4.5.4 The role of digital in balancing knowledge sharing and knowledge hiding

One of the recurring themes in the interviews was the call to invest in a more robust and integrated digital infrastructure. The lack of comprehensive digitization and the absence of well-integrated platforms were perceived as significant barriers to effective knowledge sharing. In operational roles and document management, fragmented systems hindered the ability to access information on time, fueling knowledge hiding phenomena. To effectively balance these processes, the organization must invest in technologies that enable secure and centralized data management, accessible both remotely and in-person. The implementation of secure and integrated platforms could reduce the gap between smart working employees and those working in-presence, fostering greater transparency in information flows.

Another key aspect in balancing knowledge sharing and hiding is the role of organizational culture. The interviews revealed that knowledge hiding phenomena were not only the result of technological barriers, but also of cultural barriers related to the lack of trust in the technologies adopted and the perception of isolation among employees. Promoting a culture of trust and transparency is essential to encourage employees to actively share information and reduce the fear of losing control over data. Organizations should work to create work environments where knowledge sharing is encouraged and valued, both through improved technologies and organizational practices that foster collaboration.

4.6 Final remarks, future directions and organizational implications

The case study of the Municipality of Cava de' Tirreni has offered valuable insights into how Smart Working has transformed the dynamics of knowledge sharing and hiding within a public organizational context. The introduction of digital tools has acted as a double-edged sword: on one hand, it has enabled new forms of knowledge sharing, particularly in administrative roles; on the other, it has exacerbated difficulties in operational roles and fostered knowledge-hiding practices, largely due to a mixed organizational culture and an incomplete adoption of technological solutions. The implementation of digital platforms like PEC and iDoc has facilitated the management and circulation of information, streamlined certain processes and enhanced accessibility. However, significant gaps remain, particularly in areas requiring direct, collaborative interactions between employees. While administrative roles, for which digitalization has delivered clear efficiency benefits, have adapted relatively smoothly to Smart Working, operational roles have struggled more with this transition. The lack of fully integrated digital infrastructure in these roles has hindered knowledge-sharing efforts and increased the risk of informational isolation. These challenges have been further compounded by a prevailing mistrust in digital technologies, with some employees hesitant to share knowledge due to concerns over losing control or visibility of their contributions.

The Role of Organizational Culture and the Impact of Digital Technologies

The organizational culture at the Municipality of Cava de' Tirreni plays a central role in this delicate balance between knowledge sharing and knowledge hiding. Trust is a crucial factor in enabling the spontaneous sharing of knowledge, but the shift to Smart Working has diminished face-to-face interactions that are key to the transfer of tacit knowledge. The rigid structures and hierarchical nature of many public sector organizations do not naturally lend themselves to the informal knowledge-sharing practices that flourish in more flexible environments.

The incomplete adoption of digital transparency practices has further reinforced knowledge-hiding behaviors. This phenomenon is not always intentional—often, employees feel less inclined to share information simply because they do not trust the new tools or are unsure whether their contributions will be properly recognized. The lack of visibility in digital interactions, compared to in-person exchanges, has reduced the perception of accountability, leading some employees to retreat into more individualistic behaviors.

The dynamics of knowledge hiding at the Municipality of Cava de' Tirreni are complex and multifaceted. One of the most intriguing insights from the analysis is how employees perceive their roles within the organization. In some cases, knowledge hiding becomes a defensive strategy, employed to maintain control over critical information or to safeguard one's status within the organization. This is particularly evident in senior or decision-making roles, where possessing exclusive knowledge is seen as a source of power and influence.

Another notable factor is the generational divide among employees. Older workers tend to be more resistant to adopting digital tools, often viewing them as a threat to established practices. This reluctance results in reduced knowledge sharing, as these digital platforms are perceived as less effective in replicating the relational dynamics that these workers traditionally rely on. Conversely, younger employees, while more comfortable with technology, may hide knowledge out of fear of making mistakes or due to uncertainty regarding expectations in a digital work environment.

Leadership plays a critical role in fostering or impeding knowledge sharing in Smart Working environments. The ability of leaders to create a climate of trust and transparency is essential in breaking down barriers within the organization and promoting a culture of collaboration. However, the case of the Municipality of Cava de' Tirreni reveals that, in many instances, leaders have been slow to adapt to the new digital context, often relying on standard policies without directly addressing employees' concerns.

To overcome these challenges, leaders need to adopt a more proactive approach, creating structured opportunities for knowledge sharing and encouraging active participation from all organizational members. For example, regular feedback mechanisms and informal exchange sessions—albeit digitally mediated—could help bridge gaps and rebuild the trust necessary for effective knowledge sharing.

The findings from the Municipality of Cava de' Tirreni's experience highlight that the transition to Smart Working requires more than just upgrading technological infrastructure. It necessitates a deeper transformation of organizational and cultural dynamics. Digitalization, if not accompanied by a change in mindset and effective leadership, risks amplifying knowledge-hiding behaviors rather than promoting collaboration and sharing.

To achieve a balance between knowledge sharing and knowledge hiding, the municipality will need to further invest in technologies that promote greater transparency and accessibility of information. More importantly, the organization must foster a culture based on trust and cooperation. This requires ongoing efforts not only to train employees in the use of new technologies but also to promote a work culture that rewards sharing and openness, rather than control and internal competition.

Finally, the implications of this research extend far beyond the specific context of the Municipality of Cava de' Tirreni. Other public and private organizations facing the challenges of digital transformation and remote work can derive valuable lessons from this case. Managing knowledge in a Smart Working environment requires an integration of technological, cultural, and human factors. The success of such initiatives will depend on an organization's ability to adopt a holistic approach that addresses these multiple dimensions.

Looking ahead, further research could explore similar dynamics in different cultural and organizational contexts to validate the findings and deepen our understanding of the long-term impact of Smart Working on knowledge management processes. The balance between knowledge sharing and knowledge hiding is not just a technological issue; it is a fundamental challenge that shapes the future of work and the capacity of organizations to foster collaboration, innovation, and resilience.

Appendix 1 – Interview backbone

Personal information

1. How long have you been working with Cave de' Tirreni municipality? (Less than 1 year, 1-3 years, 4-6 years, more than 6 years)
2. What is your role in the municipality? (open-ended)
3. How frequently do you engage in remote work? (Daily, Several times a week, Weekly, less than once a week, not at all)

Part A: Background Information

1. Please describe your current role and responsibilities at the municipality.
2. Could you recount how your work processes have changed with smart working?
3. Reflect on your experience with remote work and how it compares to traditional office work.
4. Discuss how the transition to smart working has impacted your daily work routine.
5. Share your thoughts on how smart working might evolve within the municipality in the coming years.

Part B: Daily Work Experience

6. Describe a typical day of remote work for you.
7. Tell us about a challenge you have faced while working remotely and how you addressed it.
8. Can you detail a situation where smart working has significantly benefited your work?
9. How do you stay connected with your colleagues during a remote workday?
10. What strategies do you employ to manage work-life balance in a smart working environment?

Part C: Knowledge Sharing

11. Describe an instance where you successfully shared knowledge with a colleague remotely.
12. Explain how you approach sharing complex information without face-to-face interaction.
13. Can you share an experience where remote knowledge sharing did not go as planned?
14. Detail how you seek out new knowledge or skills in a remote working environment.
15. Talk about how you document or codify knowledge gained through experience to share with others.

Part D: Obstacles and Help in Sharing Knowledge

16. What do you find are the main barriers to sharing knowledge in a smart working context?
17. Describe a time when you felt that knowledge was being withheld in the workplace. Why do you think that was?
18. How do you feel the municipality could improve knowledge sharing among employees?
19. What practices or tools do you think would enhance knowledge transfer in smart working?
20. Can you provide insights into how team dynamics affect knowledge sharing in your department?

Part E: Using New Knowledge

21. Share an example of how you integrated new knowledge into your work practices.
22. Describe how you adapt to new information and incorporate it into your existing knowledge base.
23. Tell us about a time when new knowledge significantly changed the way you work.
24. Discuss the role of collaboration in generating and applying new knowledge within your team.
25. Reflect on a piece of knowledge you gained that was unexpected or surprising.

Part F: Support and Improvement

26. How do you perceive the current support system for knowledge sharing in your workplace?
27. Discuss any recent initiatives by the municipality to foster knowledge sharing and your thoughts on them.
28. What changes would you like to see to encourage more effective knowledge sharing?
29. Explain any personal methods or systems you've developed to better share or document knowledge.
30. Share your vision of an ideal smart working environment that optimally facilitates knowledge sharing.

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