Chapter 2
Definitions and Development of Systems Thinking

The goal of this chapter is to explain what systems thinking is—to furnish the reader with the basics of systems-thinking "language." Considering that the first systemic ideas were expressed by Aristotle, who coined the dictum that a whole is more than the sum of its parts (Metaphysica 10f-1045a), systems thinking can be said to date back to ancient Greek philosophy. Our focus, however, lies on the contemporary meaning of systems thinking. Accordingly, our review concentrates on the development of systems thinking over the last century, while tracing its earlier influences. Indeed, as seen below, deeper analysis of the roots of systems thinking reveals that its emergence in the last century represented a powerful shift in how systems were conceptualized—a shift that forsook the previously dominant approach of reductionism.

The scattering of the literature pertaining to systems thinking among various fields hinders any one accurate definition of systems thinking. Inasmuch as no single central ongoing discussion exists concerning the construct, systems thinking has not secured a well-accepted single definition. Hence we first present and discuss several systems-thinking definitions that sprouted in different domains, and we then attempt to draw some central conclusions about the major meanings of systems thinking, as a foundation for the educational approach proposed in the current book.

2.1 Definition of Systems Thinking

Simply, systems thinking is a way for human beings to understand systems. Unfortunately, the word "system" is one of the most loosely used expressions employed in everyday discourse as well as in academic literatures. For our purposes, a system can be defined as a functionally related assemblage of interacting, interrelated, or interdependent elements forming a complex whole. The variety of systems falling under such a definition is endless, encompassing natural systems such as the human body, the earth, and space; human-made systems ranging from

tiny hi-tech chips to global commercial conglomerates; conceptual systems like ethics and policy; and many more.

What is important to emphasize about systems thinking is that it examines systems holistically. It does not try to break systems down into parts in order to understand them; instead, it focuses attention on how the system's constituent parts act together in networks of interactions as well as on how systems work over time and within the context of larger systems. Put differently, systems thinking provides a means of seeing the system as an integrated, complex composition of many interconnected components that need to work together for the whole to function successfully.

Systems thinking is a way of thinking about systems of all kinds. It is not a discipline with defined borders but rather comprises an interdisciplinary conceptual framework that can be adapted to an exceptionally wide range of areas. This advantageous flexibility and versatility for systems thinking, however, has led to a wide range of definitions for it. Indeed, there is no single agreed-upon definition for systems thinking. Forrester (1994) even claimed that "systems thinking is coming to mean little more than thinking about systems, talking about systems, and acknowledging that systems are important. In other words, systems thinking implies a rather general and superficial awareness of systems" (p. 251). Nevertheless, for years, numerous intellectuals and researchers around the world have attempted to devise definitions and refine explanations for systems thinking. Here are some such attempts made by scholars in recent decades, presenting in chronological order:

• A discipline for seeing wholes. It is a framework for seeing interrelationships rather than things, for seeing patterns of change rather than static 'snapshots.' It is a set of general principles… It is also a set of specific tools and techniques (Senge 1990, p. 68).

• The art and science of making reliable inferences about behavior by developing an increasingly deep understanding of underlying structure (Richmond 1994, p. 141).

• A way of thinking about, and a language for describing and understanding, the forces and interrelationships that shape the behavior of systems. This discipline helps us to see how to change systems more effectively, and to act more in tune with the natural processes of the natural and economic world (Senge et al. 1994, p. 6).

• Seeing beyond what appear to be isolated and independent incidents to deeper patterns. You recognize connections between events, to better understand and influence them (O'Connor and McDermott 1997, p. 7).

• An epistemology which, when applied to human activity, is based upon the four basic ideas: emergence, hierarchy, communication, and control as characteristics of systems. When applied to natural or designed systems, the crucial characteristic is the emergent properties of the whole (Checkland 1999, p. 318).

• The ability to see the world as a complex system, in which we understand that 'you can't just do one thing,' and that 'everything is connected to everything else' (Sterman 2000, p. 4).

• The art of systems thinking involves the ability to represent and assess dynamic complexity (e.g., behavior that arises from the interaction of a system's agents over time), both textually and graphically (Sweeney and Sterman 2000, p. 2).

• Utilizing modal elements to consider the componential, relational, contextual, and dynamic elements of the system of interest (Davidz 2006, p. 119).

• System thinking—includes holism, an ability to think about the system as a whole; focus, an ability to address the important system level issues; emergence, recognition that there are latent properties in systems; and trade-offs, judgment and balance, which enable one to juggle all the various considerations and make a proper choice (Engineering Systems Division 2007, p. 6).

• Systems thinking is thinking, scientifically, about phenomena, events, situations, etc., from a system perspective, i.e., using systems methods, systems theory and systems tools. Systems thinking, then, looks at wholes, and at parts of wholes in the context of their respective whole. It looks at wholes as open systems, interacting with other systems in their environment (Hitchins 2007, p. 17).

• Systems thinking can be thought of in two ways. First, and the obvious one, is to think about systems… A second and crucial way to exhibit systems thinking is to think from systems (Boardman and Sauser 2008, p. xix).

• The art of simplifying complexity. It is about seeing through chaos, managing interdependency, and understanding choice (Gharajedaghi 2011, p. 335).

• A set of synergistic analytic skills used to improve the capability of identifying and understanding systems, predicting their behaviors, and devising modifications to them in order to produce desired effects. These skills work together as a system (Arnold and Wade 2015, p. 675).

Although these explanations do reveal some differences, it is quite clear that, overall, definitions of systems thinking share two common features. Namely, systems thinking may be conceived as involving the following two main meanings, which complement each other: On the one hand, systems thinking *rises above the separate components to see the whole system*, and, on the other hand, systems thinking *views each separate component as a part of the whole system*. These two central meanings of systems thinking—seeing the whole beyond the parts and seeing the parts in the context of the whole—are used in this book as the foundation upon which to examine the characteristics, sources, and development of systems thinking.

TWO MAJOR MEANINGS SHARED BY SYSTEMS-THINKING DEFINITIONS:
- Seeing the whole beyond the parts
- Seeing the parts in the context of the whole

2.2 Systems Thinking Versus Reductionism

Systems thinking, as it developed in the last century, is a major departure from the longstanding way in which scholars traditionally attempted to understand systems. In particular, systems thinking as it emerged in the 20th century stands in staunch contrast to its predecessor—the scientific reductionist approach that pervaded Western thinking since the time of René Descartes in 17th century Europe.

2.2.1 Reductionist Paradigms for Systems

Considered to be one of the most influential thinkers in Western history, Descartes (1985) developed the notion of reductionism in the 1600s as an approach for understanding systems by reducing them to their simpler basic parts. According to this approach, the best strategy for examining any complex entity would be to attempt to explain its smallest possible component entities, thus aiming to explain macroscopic properties in terms of its microscopic constituents. In other words, the reductionist answer to every *What is this*? question would always be "*This*" *is what it is made of*.

Using such reductionist methodology, Descartes asserted that the world was like a machine, whose pieces could be taken apart and put back together in order to understand its underlying mechanisms and its larger picture. Likewise, Descartes (1985, pp. 58–59) compared a healthy person's body to a well-made clock, "constructed with wheels and weights… a kind of machine equipped with and made up of bones, nerves, muscles, veins, blood and skin." In turn, he compared a sick person's body that "suffers from dropsy, for example" to a badly constructed clock that tells the wrong time. Both the broken clock and the ill person were described as deviating from their natural, normative, smoothly working condition:

> When I consider the purpose of the clock, I may say that it is departing from its nature when it does not tell the right time; and similarly when I consider the mechanism of the human body, I may think that, in relation to the movements which normally occur in it, it too is deviating from its nature (Descartes 1985, pp. 58–59).

The reductionist perspective became one of the most central, vastly accepted beliefs of the modern era (Ahn et al. 2006). Thus, the entire universe, as well as everything in it, came to be regarded as a clockwork-like mechanism. Scholars upheld that to understand anything, human beings need only to investigate its separate parts and then put them together correctly. Indeed, according to reductionism, the only meaning of research was analysis, which is the process of breaking a complex thing into smaller parts in order to gain a better understanding of it. Recognition of the smallest components in isolation from each other was believed to

enable the analyst to know the sum total; the analyst's only task would be to reassemble all of the components in order to recreate the whole (Mazzocchi 2008).

> **ACCORDING TO REDUCTIONIST THINKING:**
>
> The whole can be broken down into its parts and put back together from its parts.
> Parts are related through a simple cause-effect relationship.
> Thus, its defining characteristics exist in its parts.

In the modern era, reductionism came to dominate Western thought, manifesting itself in all areas of Western knowledge. Physicists, for example, stated that all physical objects could be broken down into indivisible particles of matter called atoms. Chemists held that the indivisible units of materials were the elements, and biologists considered the cell as the indivisible unit of organisms. Analysis became so ingrained that even today the words thought and analysis are often considered synonymous (Rosenberg 2006).

As time passed, during the first half of the twentieth century thinkers began to concede that the reductionist paradigm was insufficient in many cases when attempting to understand particular systems. Sometimes systems defied reductionist analysis because by concentrating on the system's parts, analysts missed the whole, which often took on a form that was not recognizable from the reassembled parts. A paradigm shift was required to account for these cases, and in what may be seen as an antireductionist development (Baetu 2012), a more holistic perspective emerged: systems thinking.

2.2.2 Holistic Paradigm for Systems

In contrast to the reductionist approach, systems thinking is a holistic perspective—claiming that the whole is not the *sum* of its parts but rather is a product of the parts' *interactions*. This systems-thinking approach upholds that the whole emerges from the interactions that transpire among its parts, and once it has emerged, it is that very whole that gives meaning to the parts. Thus, the car gives meaning to the engine, gearbox, and brakes; and the family gives meaning to the roles of parents, children, and grandchildren. Accordingly, the only way to fully understand a system is to understand its parts *in relation to* the whole, because the system's defining characteristics indeed comprise the characteristics of that very whole, which cannot

be found in the isolated parts. Importantly, once the system is analyzed—i.e., taken apart—these defining characteristics of the whole get lost.

> **ACCORDING TO SYSTEMS THINKING:**
>
> The whole emerges from the interactions among its parts.
> Parts are related through complex multiple influences.
> Thus, its defining characteristics do not exist in its parts.

Importantly, the systems-thinking paradigm differs from the reductionist paradigm in terms of how parts interact or interrelate within the system. Just as reductionist scientists were of the opinion that everything could be reduced to indivisible parts, they also believed that relationships among parts were reducible to one simple relationship: that of cause and effect, emphasizing the relation between a first event (the cause) and a second event (the effect). According to systems thinking, the many interactions that transpire within each system cannot be reduced to a single cause-effect relationship. The first event is likely to contribute to the second event, but many additional events are also seen as contributing to that second event. Thus, all explanations for the second event should take into account the influence of multiple factors. Systems thinking thereby diverged from the predominant reductionist paradigm by upholding that the explanation for any phenomenon within a system cannot be too simplistic, and that the impact of the environment cannot be ignored.

The concept of "holism" can be seen as the epistemological basis of systems thinking. The term "holism" was coined by Jan Smuts in his 1926 book, *Holism and Evolution*, defined as the "fundamental factor operative towards the creation of wholes in the universe (Smuts 1926, p. 88). In its broadest sense, holism is the idea that systems function as wholes, having an existence other than, and beyond, the mere sum of their parts. The parts of a system operate in intimate interconnections, with the interactions among them creating the whole. Therefore, the functioning of a system cannot be fully understood solely in terms of its component parts, and the parts can only be understood in terms of their contribution to the significance of the whole system. This concept of holism facilitated the development of systems thinking several years later. Providing a more holistic perspective for coping with problems of complexity, systems thinking evolved in two main directions: as a method for scientific investigation, and as a means for dealing with real-world problems. These two directions are described in the following two sections.

2.3 Systems Thinking as a Method for Scientific Investigation

Ludwig von Bertalanffy, an Austrian-born biologist (1901–1972), was one of the pioneers of systems thinking. It is not surprising that systems thinking evolved among biologists, because biology is concerned with the study of living organisms, which are actually living systems. Inasmuch as the study of biology essentially comprises a study of systems, the encounter of systems thinking with biology was particularly fruitful.

At one point in his work, von Bertalanffy (1933) resisted the reductionist paradigm as a panacea for investigating all scientific problems. His challenge to reductionism first arose when he addressed the conflict between mechanists and vitalists regarding the definition of life—the question of what separates living matter from non-living matter. In fact, he disagreed with both schools of thought. Mechanists, on the one hand, claimed that what we call life is simply epiphenomena resulting from physical and chemical processes. The mechanists believed that all natural phenomena could be explained by physical factors. Thus, they considered living things to be like machines or artifacts, composed of parts that have no substantive connections among them. Mechanists attributed the source of an apparent object's activities not to the whole itself but rather to its parts, or to an external influence on the parts. Vitalists, on the other hand, believed in a life force that animated all living matter. Thus, vitalists upheld that the functions of a living organism stem from a vital principle, which was often referred to as the "vital spark," "energy," or "élan vital" that some equate with the "soul". This vitality of life was considered to be distinct from biochemical reactions, asserting that life processes are not explicable by the laws of physics and chemistry alone (Banchetti-Robino 2011; Lash 2006).

Although von Bertalanffy did not believe in the vitalist idea of an unperceivable life force, he also resisted the mechanists' attempt to define life solely at the molecular level, without taking into account those molecules' organization and webs of interrelationships. In his opinion, both mechanists and vitalists were making the same mistake by attempting to define life solely at the molecular level. As their method, neither group was taking into account the complexity of how those molecules were organized together and how they interrelated with one another.

According to von Bertalanffy (1933), to answer the question of what separates living matter from non-living matter, one needs to understand not just the microscopic particles, but also how those particles influence each other within the whole. Thus, "we must therefore try to establish a new standpoint, which… takes account of organic wholeness, but… treats it in a manner which admits of scientific investigation" (p. 46). His proposed new standpoint was to espouse systems thinking as the scientific method of choice:

> Every organism represents a system, by which term we mean a complex of elements in mutual interaction. From this obvious statement the limitations of the analytical and summative conceptions must follow. First, it is impossible to resolve the phenomena of life

completely into elementary units; for each individual part and each individual event depends not only on conditions within itself but also to a greater or lesser extent on the conditions within the whole, or within superordinate units of which it is a part. Hence the behavior of an isolated part is, in general, different from its behavior within the context of the whole… Secondly, the actual whole shows properties that are absent from its isolated parts (1933, pp. 11–12).

From within the domain of biology, von Bertalanffy used his conceptual framework of systems thinking to explain organisms. According to his explanation, every organism is a whole that emerges from the relationships among its parts, which affect each other through complex networks of interactions. The parts themselves do not exhibit the same properties as the whole that arises through interactions among them; the parts are smaller and simpler, while the whole is a living creature.

Later, von Bertalanffy (1968) expanded his position about the definition of life into a wide scientific approach that stood in clear contrast to scientific reductionism, claiming that the only way to fully understand a system is to understand its parts in relation to the whole. Every phenomenon must be viewed not only from the perspective of its components but also from the perspective of the relationships among these components. Thus, von Bertalanffy explicitly distinguished between the traditional scientific method and the new systems-based scientific method that he proposed:

Classical science in its diverse disciplines, be it chemistry, biology, psychology or the social sciences, tried to isolate the elements of the observed universe—chemical compounds and enzymes, cells, elementary sensations, freely competing individuals, what not—expecting that, by putting them together again, conceptually or experimentally, the whole or system—cell, mind, society—would result and be intelligible. Now we have learned that for an understanding not only the elements but their interrelations as well are required (1968, p. XIX).

2.4 Applied Systems Thinking

While von Bertalanffy, from his perspective as a scientist, saw systems thinking mainly as a method for scientific investigation, in the 1940s systems thinking began to receive increasing attention as a potentially valuable means for addressing real-world problems related to World War II (Jackson 2009). In Britain, the efforts of military planners in this regard resulted in the formation of a formal discipline—*operational research*—for dealing systemically with the application of advanced conceptual methods in real-world situations. Likewise, analysts associated with the United States Air Force were tasked with examining what equipment to produce and develop, leading to the emergence of *systems analysis*, which is the process of learning an organization in order to identify its objectives and create systems and procedures that would achieve them effectively (Bentley and Whitten 2007). Moreover, *systems engineering*—a discipline in engineering that focuses on how to design, create, operate and manage complex engineering systems involving many

interacting components—can also be traced back to that time period. After the war, these methods were more widely applied to problems in industry and society. It was pioneered in the USA at Bell Telephone Laboratories to meet the networking challenges faced in the communications industry, then it spread to the space and energy industries, and subsequently to other industries (Jackson 2003).

Decades later, Checkland (1981), recognizing similarities between these different approaches developed during and immediately after World War II, labeled this kind of mathematically precise systems work *hard systems thinking*. According to hard systems thinking, real-world problems can be described as follows: There is a desired state, S1, and a current state, S0, and there are alternative ways of getting from S0 to S1. Problem solving consists of defining S1 and S0 and selecting the best ways to reduce the gap between them. After formulating the problem and screening the alternatives, a model, primarily a mathematical model, is built and used to capture as accurately as possible the workings of the system that underlies the problems being investigated. The model is convenient for analysis; thus, the final decision results from predicting consequences and ranking alternatives.

The "hardness" of hard systems thinking is not a characteristic of the system to be addressed; there is no distinction between "soft" and "hard" systems. Hardness characterizes the way of thinking about the system (Jackson 2003). Hard systems thinking assumes the existence of a clear, almost mathematical problem definition: A gap exists between the desired future state and the present state, and the problem is how to make the gap disappear (about soft systems methodology see Sect. 3.4). Because of its simplistic and inflexible nature, hard systems thinking has been successful for dealing with structured, technical problems like developing computer systems that are technically efficient and effective as information providers. Criticism, however, has been leveled at the inability of hard systems thinking to handle real-world management's unstructured of "fuzzy" problem situations, where it is impossible to distinguish exactly which elements are contributing to the problem situation, to identify the relevant interactions among them, and to quantify their influence. In such situations, different stakeholders may have different opinions or perspectives that are equally legitimate. Thus, today, despite its many achievements and strengths, hard systems thinking is generally considered to be limited in its range of applications. Nevertheless, hard systems thinking was a breakthrough in terms of applying systems thinking to real-world problems (Jackson 2010). Newer approaches advocating applied systems thinking, which grew out of hard systems thinking and improved upon it, are reviewed in the next chapter.

Taking a broader view, the generational change from reductionism to systems thinking can be linked to the end of the Machine Age. This era nearing the end of the Industrial Age was associated mostly with the late 19th century and early 20th century and the two world wars. The end of the Machine Age coincided with the beginning of the contemporary era of high technology, which demanded solutions to much less mechanical and much more complex tools compared to the machines of the past. In parallel, systems thinking evolved naturally within this environment, thereby enabling effective coping with the emerging complexity of high technology.

2.5 Practical Uses of Systems Thinking

The current section reviews several contemporary examples of systems-thinking implementation to manage complex situations, as described in the research literature. These examples illustrate the practical benefits of systems thinking in a wide range of fields such as public health, information systems, enterprise risk management, tourism, transportation, and telecommunications.

Leischow et al. (2008) described how systems thinking was used by public health agencies to effectively minimize the risk of the H5N1 Avian influenza (bird flu), which is deadly to humans. So far, there is no evidence of sustained human-to-human transmission of this virus; however, the virus is of paramount concern because it can rapidly spread if mutations allow it to easily pass from human to human. Pandemic influenza prevention requires cooperation across a variety of disciplines and fields, including global surveillance to catch new outbreaks, rapid laboratory analysis of new viral strains so that effective medications can be developed, and creation of broad communications and informatics infrastructures so that communities can prepare and respond effectively. Each separate activity to address pandemic influenza is necessary but insufficient in itself. Public health agencies worldwide used systems thinking to reduce the risk of a future communicable-disease pandemic to the smallest possible degree, seeking to bring together those who are critical to the discovery, development, and delivery of the knowledge, products, and services that can most effectively prevent and treat communicable disease.

Van Mai and Bosch (2010) demonstrated the benefits of systems thinking in the development of the tourism industry in the Cat Ba Reserve of northern Vietnam. Tourism is an open, dynamic, and complex system, which includes many interacting components and involves diverse stakeholders, each of whom holds different management objectives. The development of the popular tourist destination of Cat Ba Reserve was threatened by various causes such as overuse of underground water, lack of skilled workers, and poor infrastructure. Systems thinking was an effective tool for explaining the complexities of the tourism system. It helped to simplify, clarify, and integrate isolated problems associated with the tourism industry, and provided a mechanism for group learning and decision making to achieve desirable outcomes. In less than 3 years, the Cat Ba Biosphere sustainability became a notable project in Vietnam, involving senior politicians from district to central government, academics, donor organizations, field officers and managers at various levels of the government as well as villagers and commune residents.

Management in the field of information systems may offer a natural arena for the practical application of systems thinking. For example, the use of systems thinking to enhance the effectiveness of a student record system at a UK university was explored by Bentley et al. (2013). Their research indicated that systems thinking enabled those employees who were involved in the record system's modification to view its design and implementation as a holistic system. These employees ability to critically reflect upon broad and complex human, technological, and organizational

issues from different perspectives thereby helped them identify creative solutions. The final outcome was the successful implementation of an improved student record system within the context of the university's information systems development process.

Another empirically explored practical application of systems thinking was for the purpose of improving organizational resilience in British service organizations in the realm of building maintenance and repairs services. Organizational resilience is the ability of the organization, irrespective of its type, to effectively rebound from adversity and thrive. The construct of organizational resilience is embedded in a set of individual level attributes and organizational level processes. The study recently conducted by Jaaron and Backhouse (2014) showed that employment of systems thinking in two service organizations in the UK operationalized two-dimensional determinants for improving organizational resilience: an organically structured organization (i.e. organizational level), and highly affectively committed core employees (i.e. individual level).

Systems thinking may be used also for enterprise risk management. Enterprise risk management processes are used to identify, assess, communicate, and manage the multitude of risks facing an organization. Lee and Green (2015) asserted that although existing enterprise risk management frameworks do provide much needed guidance on how an entity can manage risks, events such as the 2008 financial crisis revealed that implementation of these traditional frameworks in isolation is insufficient. Thus, Lee and Green advocated incorporation of a systems-thinking perspective into traditional enterprise risk management frameworks. The systems-thinking approach helps managers understand the business organization from a holistic world-view perspective, which includes the enterprise's fit with and relationship to its environment.

Andrew and Petkov (2003) pinpointed the advantages of using systems thinking in planning a rural telecommunications infrastructure in South Africa. Telecommunications infrastructure is generally considered as merely a technological system, and its planning is often executed solely from a technological point of view, focusing mainly on advancing and improving the technology. For the most part, planners do not take into account the possible indirect social benefits of providing telecommunications to rural areas, which are essential for the development of the area. The researchers found that the rural telecommunications system in developing countries is not just a technological system but a complex system of people and technology interdependent on other systems and subsystems, spanning multiple fields like the sociological, cultural, political, and economic domains. Thus, planning it through the systems-thinking approach yielded far better results for all concerned than linear planning approach.

Similarly, O'Kane (2015) pointed out the benefits of using systems thinking by product development teams for transportation products. Traditionally, vehicle design teams' scope of responsibility is limited to the vehicle itself, including all its own systems, subsystems and other elements. Yet, vehicle designers' focus only on the production of the vehicle to which they are assigned does not allow them to consider aspects of the environments in which their products will operate.

Specifically, designers usually do not take into account contemporary transportation challenges such as increasing population, various types of pollution, and urban density. Integrating systems thinking into the vehicle design process could manifest a significant shift toward the development of more ecologically suitable products environment, because systems thinking gives product development teams essential tools for a deeper understanding of the forces at play that influence human interactions with systems (see also Darzentas and Darzentas 2014).

These examples, and many others in the literature, indicate that systems thinking delivers better results. Considering that most real-world situations are complex, a holistic lens enables more effective coping with these situations, unraveling the existing complexity. Optimizing the entire system as a whole, and the system's elements in the context of the entire system as whole, yields better outcomes with fewer unintended consequences than analyzing and improving each element on its own.

2.6 Conclusion

The systems-thinking approach advocates viewing the issue at hand as a whole and emphasizing the interrelationships among its components rather than the components themselves. Despite the absence of a consensual definition across the multifaceted disciplines that have deliberated this construct, we identified two main meanings of systems thinking—*seeing the whole beyond the parts* and *seeing the parts in the context of the whole*—which are used in this book to examine the characteristics, sources and development of systems thinking in the specific case of school leaders.

Systems thinking, which was first suggested as a method for scientific investigation, later underwent extensive discussion as a means of facing real-world problems. As an investigative methodology, systems thinking claims to offer a broad view, which enables more in-depth and more accurate understanding of phenomena. Based on the assumption that this scientific expertise may also permit coping with real-world situations, applied systems thinking was proposed as a means for gaining deeper understanding of reality and thus for dealing effectively with various assignments and challenges, and is currently used in a wide range of areas.

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