

Scientific Methods in Educational Management: The Metasystems Perspective

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Abstract—Although scientific methods have been the subject of a large number of papers, the term ‘scientific methods in educational management’ is still not well defined. In this paper, it is adopted the metasystems perspective to define the mentioned term and distinguish them from methods used in time of the scientific management and knowledge management paradigms. In our opinion, scientific methods in educational management rely on global phenomena, events, and processes and their influence on the educational organization. Currently, scientific methods in educational management are integrated with the phenomenon of globalization, cognitivism, and openness, etc. of educational systems and with global events like the COVID-19 pandemic. Concrete scientific methods are nested in a hierarchy of more and more abstract models of educational management, which form the context of the global impact on education, in general, and learning outcomes, in particular. However, scientific methods can be assigned to a specific mission, strategy, or tactics of educational management of the concrete organization, either by the global management, local development of school organization, or/and development of the life-long successful learner. By accepting this assignment, the scientific method becomes a personal goal of each individual with the educational organization or the option to develop the educational organization at the global standards. In our opinion, in educational management, the scientific methods need to confine the scope to the deep analysis of concrete tasks of the educational system (i.e., teaching, learning, assessment, development), which result in concrete strategies of organizational development. More important are seeking the ways for dynamic equilibrium between the strategy and tactic of the planetary tasks in the field of global education, which result in a need for ecological methods of learning and communication. In sum, distinction between local and global scientific methods is dependent on the subjective conception of the task assignment, measurement, and appraisal. Finally, we conclude that scientific methods are not holistic scientific methods, but the strategy and tactics implemented in the global context by an effective educational/academic manager.

Keywords—Educational management, scientific management, educational leadership, scientific method in educational management.

I. INTRODUCTION

THE educational system has been in transition for years now. Global competitiveness and autonomy are the buzzwords. The profession of an education manager is growing in significance because of new important functions related to design, management, control, and organization of effective educational enrichment systems, learning environments, and spaces, including, but not limited to

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educational policy, course curricula, and teaching materials. However, in many places, education managers must still fight for recognition. This is because the impact of globalization, cognitivism, and openness of educational systems and rapidly changing environments requires innovative and feasible approaches and, thus, new scientific methods.

According to Lynch et al., educational management is one of trilogy of overlapping concepts, along with educational administration and educational leadership [1]. The scientific method is an important concept in all these areas. However, despite a growing body of scientific literature addressing opportunities and limits of the scientific method in educational management, the term scientific method in educational management is still not well defined.

More than 15 years ago, Heck and Hallinger acknowledged “greater diversity and flexibility in conceptual models and methods have brought a sense of contested space about the field’s direction. Theoretically, conceptual frameworks and methodology all are at the core of how we construct knowledge. Conflicts over their use in research should draw the attention of scholars in our field” [2].

More recently, Oleksenko et al. stated the need to update the system of pedagogical skills of teachers of different profiles based on the European integration movement because of the insufficient studies in theoretical, methodological, and practical aspects of educational management [3].

In the following, we argue that a definition of the term “scientific method in educational management” is required to constrain the frontier area of university pedagogy and the scope of multitasking, and transdisciplinary research in educational management, to clarify what paradigms, strategies, and methods are important to perform to broaden our understanding of interference between various methods.

Thinking in systems methodology, the term “scientific methods in educational management” could be understood as a way used by the educational manager to solve current problems in real educational settings and identify invisible connections between human(s) and/or organizational factors. All these allow educational managers to develop and implement innovative ideas in education. Moreover, the meaning of this term cannot be separated from the methodology of problem-solving and decision-making. However, the required actions for the practical implementation of the scientific methods in an effective educational organization may not be specified only by the assignment of the task to the educational manager, either at a high or low level. There are at least four types of educational management (e.g., centralized/decentralized; external/internal;

authoritarian/democratic, and creative educational management), which differ in principles of planning, organizing, directing, coordinating, supervising, controlling, and evaluating. Thus, the scientific methods for each model may vary in the level of “understanding” by the educational manager the complexity of the task, including but not limited to the global context of education, the scope of curricula, didactic processes, and learning outcomes.

Conversely, in epistemological papers related to theories of past centuries, the term scientific methods in educational administration are well treated. Thus, for example, an article by Dimmick [4] highlights the actuality of nature and place of theory in the methodology of educational administration raised by Griffiths [5] and Walker [6]. However, if we apply the traditional scientific method in terms of Francis Bacon we need experimental observation, conclusions and generalizations. Ulugbekovich noted in his study of Bacon philosophy “only true knowledge gives people real power and ensures their ability to change the face of the world; two human aspirations - for knowledge and power - find here their optimal resultant” [7]. Then, it was observed that future events could not be observed. Therefore, philosophical statements are descriptions rather than the meaning of a scientific method and do not help to identify the definition of the scientific method in educational management.

The next "cognitive" step was a dialogue between Gagne and Merrill related to integrative goals of educational management in instructional design. The notion of enterprise schema and integrated learning objectives emerged from these discussions. “Each such schema contains slots to be filled by the details of any specific enterprise” [7]. Nevertheless, the notion of enterprise schema is related to the capacity of the educational manager to learn all life. In sum, the educational enterprise is an activity planned by the educational manager, which depends on the execution of a combination of intellectual skills, the verbal and non-verbal capacities to deal with new fluxes of data, and on adequate use of the cognitive and metacognitive strategies. All these rely on the functions of the educational manager to be actively involved in the achievement of the common goal and, thus, in achieving the goals for effective educational enterprises. However, various architectures of cognitive structures of educational managers, known also as mental models, are in the memory of educational organizations and, thus, represented within different strategies of educational enterprises. It is unclear what scientific methods should be used to achieve the global goal of educational management – sustainability.

The vague definition of the scientific method leads to serious ambiguities in the understanding of the psychology role and affordability in educational management. To give an example, it remains unclear if Karl Popper’s argument such as the logic veritable theory is feasible in the daily activities of an educational manager [9]. Chitpin states, for example, that “the role of the principal is to assist and encourage teachers to lead the students to question, discover, discuss, appreciate, and verbalize the new knowledge generated through students’ activities” [8]. Nevertheless, learning is the process of error

elimination leading to effective learning outcomes, which are continuous and often unconscious. Thus, educational management is not only about decision-making and problem-solving in real educational settings, but also about the capacity of educational managers for self-life-long learning.

We concur with the view of Dimmick that logic is not necessary for forming new ideas [4]. Inspiration, intuition, guesswork may all yield new theories. Concerning Einstein’s statement, we have concluded that theory is prim and that the scientific method is only a derivative of a theory. Miller, through a comparative study of Henri Poincare and Albert Einstein, states that aesthetics and intuition are essential to scientific research as is mental imagery in descriptive and depictive modes [36]. However, creative scientific thinking is carried out in a metasystems network or analog fashion rather than linearly or systematically.

In our opinion, the educational manager cannot think either linearly or systemic in solving complex multitasking problems. Throughout time, humans use educational management to solve real societal issues. In the Age of Globalization, Anthropocentrism, and Existentialism (known as GAE paradigm), the educational manager should be a source of inspiration, creativity, and competence development.

The purpose of this article is to comment on educational management as a field of research, focusing especially on research in the past 10 years. We look at the area of scientific methods in educational administration more broadly than in the past works of [5] and [6]. Our aim in the paper is to describe global changes in scholarly direction from the metasystems perspective as well as to discuss whether cumulative progress in philosophy and psychology noted in scientific literature reflects progress in educational management more generally.

II. THE METASYSTEMS PERSPECTIVE

A. Research Statement

Interest in what scientific methods educational managers use and how these scientific methods make a difference has long captured the attention of scholars. In time, researchers in educational management have borrowed various theories of learning and models of instructional systems design, as well as developed knowledge management systems to improve the activity of the educational organization, taking into account the global perspectives of scientific methods development in philosophy, psychology, pedagogy, and cybernetics.

Understanding the historicism of the scientific methods in educational management can be achieved by metasystems delimitations. We described this method in [9, p.242] as follows: 1) identification of reference concept concerning the related domain (in our case research method); 2) identification of subdomains that study the proposed concept); 3) the comparative analysis of research peer-reviewed articles, and 4) the identification of the research methods.

Identification of the reference concept could be archived by combining the method of metasystems delimitations with Google Books Ngram Viewer. The benefit of the Google

Books Ngram Viewer consists in the graphical representation of data obtained by “an online search engine that charts the frequencies of any set of search strings using a yearly count of n-grams found in sources printed between 1500 and 2019 in Google's text corpora in English” [12], as is related in

Wikipedia. In our case, this is philosophy, pedagogy, psychology, cybernetics, and educational management. Therefore, Google Books Ngram Viewer allows, viewing the trends in educational management compared with above mentioned subdomains (Fig. 1).

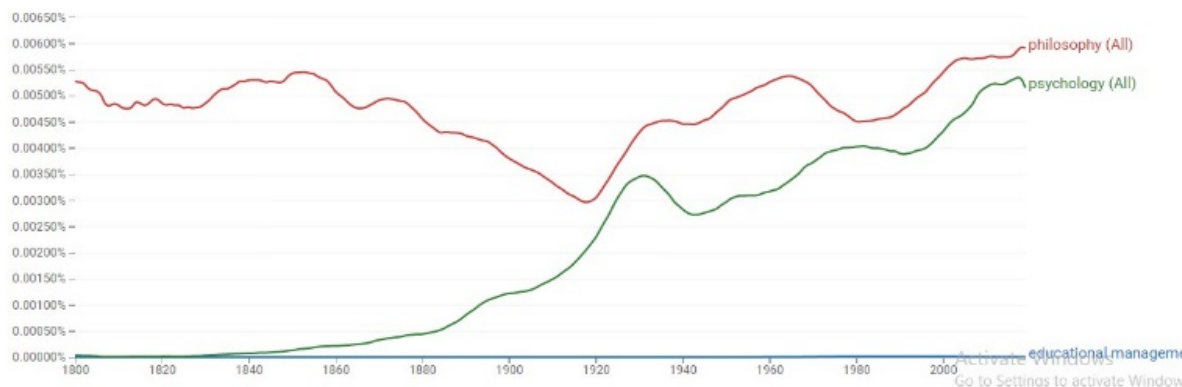


Fig. 1 Global trends in educational management

Conceptually, the philosophical delimitations could be identified based on the significant phenomenon, events, or processes, which allows distinguishing several stages of rethinking scientific methods in educational management.

According to Fig. 1, there are three phases:

- I stage: XVI century – 1960;
- II stage: 1963 – 2005;
- III stage: 2006 – present.

The period of the XVI century – 1960 is called the time of total knowledge and it is attributed to the knowledge management paradigm or/and knowledge age. The paradigm states that each student should assimilate the knowledge from simple to complex and that the educational manager should find and implement the high-level decisions to achieve this result. However, as stated by [11], knowledge is neither intelligence nor correctness nor truth, because intelligence implies capacity and potential and the truth does not imply knowledge. As such, the scientific methods used in educational management can be identified based on characteristics, capacities, and outputs of people involved in problem-solving and decision-making processes; used systems, structures embedded in the management context, and their environments.

In the second period, in the field of educational management is used multimedia, artificial intelligence, and Internet connection in schools, which leads to the acceptance of knowledge management systems with interactive communication and immediate feedback via computer-based assessment. Origins of the new paradigm that centers on interactivity were widely debated; however, the period was attributed to the model of informational management. It was argued, for example, that “the informational management can create convenient conditions for the international management of colleges and universities” [12]. The scientific methods are both qualitative and quantitative, using data and therefore, based on information available in the educational settings.

The third period is describing the norms of the fourth industrial revolution and their impact on the educational organization. The educational organization is becoming more open and, therefore, available for everyone with an Internet connection. Everything is data and data are everywhere (i.e., open data, metadata, and database). We can call this model data management. The scientific method should take into account the rapidly actualized data and the educational manager needs to know how to identify relevant data and develop adequate solutions to manage all possible challenges and problems.

From an evolutionary perspective, the foundation of educational management, as the scientific area, was laid in the early 1950s and the full recognition was in 1960. According to Melissopoulos and Stravakou [13], educational management is a systematic process, which is planned, organized, and implemented by the Ministry of Education, and refers to a course of action that is comprised of the sensible deployment of resources, both human and material, to realize the objectives aimed at by educational organizations. If this is true, the educational manager does not need any scientific methods of research, just to comply with political decisions.

Our narrow definition of scientific methods in educational management overcomes the problem that global phenomenon, events, and processes can be comprehensively by metasystems thinking instead of linear or/and systems thinking. In our understanding, linear thinking refers to scientific management of processes toward achieving the total knowledge of students and systems thinking - to inform management of the educational organization through various systems.

The concept of metasystems thinking derived from the Metasystems Transition Theory [14] describing that higher levels of complexity and control are generated in a complex evolutionary process. Traditionally, the term *meta X* is used as a name for more organized systems, having a higher logical structure, or analyzed in a more general sense. In contrast to

linear and system models of thinking, metasytems thinking is one of adaptivity, dynamism, flexibility, and self-regulation.

Metasystems are large (very complex) systems organized according to the principle of interchangeability (i.e., the system as a whole can function without separate subsystems) and include relatively independent components; in relation to an educational organization – “a branch” in each student’s mind.

Metasystems are dynamic, flexible, and hyperconnected. However, the concept of hyperconnectivity relies on ubiquitous forms of communication and, as such; these well-organized structures are like the glue that holds the various systems together in a synergetic manner. Its nature is more than a sum of systems because each of the metasystems includes, at least, one enterprise kernel. This creates challenges and new opportunities, for both educational managers and educational actors, including teachers, students, and stakeholders.

The concept of metasystems continues to gain more and more important because of its application in digital education, data management, and self-regulated learning [15]. The role of educational managers is to prove the dynamicity and flexibility in the integrative structure of competence and to integrate this approach in their strategies and tactics. For this, in the establishment of the knowledge strategy is important to identify data, analyze information, and understand the role and place of scientific methods. The not less important task is the identification of suitable assessment, testing, and measurement strategies in analyzing the effectiveness of educational systems based on the individual performance of each actor (e.g., teacher, student, etc.).

B. The Scientific Method or Scientific Methods

According to Bates, the origin of leadership and educational management as a field of study and training began in the United States of America, where it moved through several distinct periods with quite different orientations. Most controversial of these was the Theory Movement whose pursuit of a science of administration dominated the three decades of the mid-twentieth century. [16]. But, in this period, the theories and models in educational management were abstract because were developed independently of changes in the global context of schoolings, such as globalization, cognitivism, etc.

The reconnection of educational management with real concerns in education was from 2006. This period started with the model of 3.0 education, characterized by the emergence of global cross-institutional and cross-cultural opportunities, where the learners themselves play a key role as the creator of knowledge artifacts, social networking, and social benefits outside of the immediate scope of activity.

The transition from the closed to more open educational systems provides the challenges for accepting the new paradigm of learning in hyperconnectivity of systems and resources, as well as the emergence of new concepts and technology for developing the model of the integrative structure of competence. The model describes a student as a

life-long learner and the central focus of global challenges. In our opinion, 2006 serves as the starting point for the emergence of a large number of educational management models, like education 4.0— education 7.0.

To the best of our knowledge,

- education 4.0 refers to self-directed learning in a global community widely connected via the Internet of Things, smart machines, and media, able to change the linear and systems patterns of thinking through communication;
- education 5.0 refers to self-regulated learning in a world of smart devices, which change the aim of educational models toward stronger emphases on personality development;
- education 6.0 refers to the extrasensory perception of the earthly matters, like luck, instinct, beauty, harmony, and high ideals;
- education 7.0 refers to spiritual intelligence valued at global security, safety, healthy and active rest [17, pp.3-4].

All these models use *data* (e.g., metadata, open data) instead of information or knowledge. Moreover, it was observed that academic institutions have become less rigid and more open and flexible to rapidly changing global contexts and environments. “Implication” of the global phenomenon, events, and news focuses educational managers to investigate and apply in practice the meaning of abstract concepts of critical thinking, metacognition, intelligence, creativity.

The rapidly changing models of the educational management describing teaching, and assessment in various learning environments aroused scientific questions aim to understand the ecology of learning and communication. One of the most important scientific questions refers to the sustainability of educational models. The term “knowledge ecology” refers to the investigation and epistemological theorizing of the various way of knowing for sustainable development.

In their book, Koulopoulos and Frappaolo note three stages in management science, called scientific management, informational management, and knowledge management. In the knowledge management model, there are complex dynamic processes of intermediation, externalization, internalization, and cognition [18]. Now we can learn every time and everywhere in the diversity of learning environments (e.g., teacher-centered learning environments, learner-centered learning environments).

Nowadays, the significance of scientific methods in educational management has primarily grown for, at least, two reasons. On the one hand, the competition within education systems is increasingly intense. On the other, the global influence on local educational systems becomes deeper. Universities are more independent than in the past centuries.

Having emphasized the stages of development of the science of educational management, we now turn to the definition of the scientific method. It is a widely accepted axiom that an education manager plays a decisive role in the development of the organization and that is not any excellent educational organization without excellent management.

Moreover, behind every successful educational organization is excellent management expertise. These entire tasks require a rapid understanding of the situation, identification of the problem based on data, and providing effective solutions. Above all, the education manager must have an affinity for school life, be familiar with its particularities and possess the methodology capabilities, such as the organization of educational activities, communication, and self-regulated learning skills. Furthermore, education management tasks are extremely varied (e.g., school management, quality management, diversity management, multiliteracy management).

III. METHOD

A. Description of Method

The method consists of searching for relevant literature in Google Scholar. Previous research on scientific methods in education management has provided us with several relevant codes. Based on these results, we applied the following search term: "educational management" AND "philosophy" AND "psychology". In this article, we will investigate the issue of scientific methods in educational management/ administration within the third stage (i.e., since 2006 – present).

We selected studies that met the following criteria:

- educational management as a keyword;
- full articles;
- published papers;
- empirical qualitative and quantitative research studies in education management, conducted in the educational management system;

Applying these inclusion criteria reduced our database to 13 studies. The summary of the finding is presented in Table I.

TABLE I
 MAPPING OUT EXISTING LITERATURE AND RESEARCH ON RESEARCH METHODS IN EDUCATIONAL MANAGEMENT

Analysis Levels	Grounding		
	Theory and epistemology	Qualitative/ quantitative/ descriptive research	Practice and social relevance
Micro-level (individual)	Vlieghe [29]	Taghavinia et al. [37]	Brinia et al. [30]
Meso-level (group, organization)	Usman [24] Jufri et al. [27]	Newman [38]	Skinner et al. [23]
Macro-level (society)	Melissopoulos [15]	Bocoş and Raduţ-Taciu [28]	Sun [40]
Mega-level (intercultural)	Tomlinson [22] Deslandes [33]	Crow & Moller [39]	Surya [41], Sekerci [31]

IV. RESULTS

A. Professional Identity of Educational/Academic Manager

Understanding the professional identity of an educational/academic manager is a way of analyzing the external and internal factors that influence the mind and behavior in problem-solving and decision-making. Recently it was observed that educational managers are like mediators in diverse school contexts; they take on different and sometimes contradictory identities in different social contexts [19].

Moreover, the consideration of experience is important in educational management, but more important is the present activities and actions and the capacity to plan the future. As was noted by Tomlinson “now” in logic is a very fuzzy term. Postmodern, the label for our now, is historical and chimerical. In other words, “now” does not mean right now. “It means rather a blurry spread of contemporary events stretching back a bit and forward a bit. In administration, it may be fairer to say that it stretches back a lot and forward a bit so we stumble into the future hobbled by plans and commitments made in the past and our forward reach exceeds our grasp” [20, p.49].

The professional identity of educational managers, called “managerialism in school” [21], accomplished the teacher's sense of self, but, also, can hurt teachers’ morale and sense of professional identity, which lead to an erosion of autonomy and impact on mental well-being. That is in the case when is used linear and systemic methods of research of professional identity and not the academic progress of students.

B. Educational Management and Its Sociological Fundament

Educational management has a sociological fundament because the school is a social system. However, the area of educational management integrates managerial, administrative, and organizational leadership activities. “It deals with the educational practices, whereas educational philosophy sets the goals, educational psychology explains the principles, educational management tells how to achieve educational objectives and principles” [24]. Instead of educational management, the educational leadership is focused on vision, motivation, the teacher’s (leader) administrative role mainly related to his/her vision; the teacher's political role as a leader, and the teacher's social role [25]. The task of educational leadership is to deal with global challenges, which influence changes in an educational organization. This means that educational leadership considers different perspectives, which led to the development of numerous theories and models.

According to Hallinger et al. [26], the scientific methods could be attributed to a variety of ‘schools of thought’. Thus, between 2010 and 2018 the most cited articles described leadership for learning, shared leadership for change, leading teachers, school effectiveness, and school improvement.

The educational manager has the following functions: forecasting, planning, and organization of activity, coordination of team/collective work, decision-making, remedial measures, choose of best alternatives, personnel training, the anticipation of future development of the organization, and, finally, monitoring and evaluation of the quality of educational services. Problems of leadership are complex and multifaceted, and, therefore, require a comprehensive approach to their solution. The task of the scientific methods is not solved yet and the most used research methods are observation and expert survey. The abstractness of the scientific method may depend on the level of expertise of the educational manager. This has a direct implication for

the conceptualization of the method and its implementation in practice.

C. The Added Value of Educational Psychology

Educational psychology influences the affordability of scientific methods in educational management and leadership. Research in learning theory and design has shown that “educational psychology principles and techniques are applied to the development of educational strategies, teaching-learning situations, results/findings” [25].

The contribution of educational psychology to the science of educational management consists of the development of innovative strategies for management, administration, and leadership in designing effective learning processes and achieving the learning outcomes; designing effective teaching methods and metacognitive strategies focused on active learning and facilitating the students to be more creative and inclusive in all forms of learning. In all cases, the emphasis should be on interest, curiosity, and motivation.

To illustrate the idea of innovative scientific methods in educational management, it is important to consider conflict management. In educational psychology, conflict management deals with the ability of an individual to take the decision or to choose the most suitable situation between the two or more situations. Therefore, the findings of educational psychology help the educational manager to identify the most suitable solutions in a decision-making situation.

The problem of scientific methods in educational management needs to be solved starting with the primary significance of educational management as the “art to do something together with other people”. [26]. From this perspective, the science of management needs a strong scientific character focused on analyzing the concrete situation deep thinking of emerging future trends, deeper transdisciplinary research to make up its corpus of paradigms, theories, models, strategies, and algorithms.

D. Position of Educational Philosophy

In a recent paper, Vlieghe [27] claimed that the philosophy of education is a field of reconstruction of other fields. This is because the meaning of the philosophy of education resides in the opening of a limited space in which both students and teachers can experience the global impact on educational transformation. In another paper, Brinia et al. [28] observe that participatory decision-making and emotional intelligence are the essential elements for ensuring an efficient and open-ended school culture.

In the opinion of Sekerci [29], education management entered the process of creating its own identity. In our opinion, this impacts educational philosophy on the development of more innovative scientific methods, which emergence at the global level. However, nowadays, such methods are conceptualized in the global war of classical and non-classical paradigms and approaches. As a result, “as opposed to the generalizing, universal, objective, value-independent, deterministic, reductionist science understanding of positivism, issues such as nongeneralizability, contingency,

subjectivity, value-ladenness, relativism, and qualification come to the fore” [30]. From these perspectives, identification of the scientific methods is a complex task of educational managers focused on achieving lifelong learning competence.

Starting from Deslandes [31] one could observe that scientific methods in educational management should integrate the situating management training within the context of geopolitical, aesthetic, and ethical factors. What is wrong with this philosophical statement is that the educational manager is only the identifier of the global issues and implementer of the real models, derived from specifics of education in real contexts.

Essential elements of educational philosophy related to scientific methods are visibility, accessibility, usability, learnability, reliability, solvability, readability, legibility, and affordability. All these elements use real data. However, as noted by Nnorom et al. [32], “a clear educational philosophy seeks to identify and elucidate broader, often implicit, principles and themes that are not necessarily exemplified in a school’s textbooks or syllabus, but are consistent with the beliefs and values that define and focus the vision and mission”.

Educational philosophy is concerned, also, with psychological issues of learning and communication and its impact on resource management [33]. Learning and communication are inseparable elements of each educational system and process. It is a proven fact that everything is energy in motion. Therefore, all managerial tasks and activities in education require mental energy and action.

V. CONCLUSION

The article explores the metasystems perspectives in educational management. The arguments are made for the merits of metasystems thinking in analyzing the evolution of philosophy, psychology, and management. We define the issue of scientific methods in educational management as the metasystems thinking process focused on real problem solving and decision-making in rapidly changing environments. In such context, the scientific methods can be assigned to education/academic manager through the teaching of innovative ideas, and if this person accepts this assignment, it becomes his/her life-long aim for self-development or development of organization in which he/she work.

Finally, we considered the difference between linear, systems thinking and metasystems modes of thinking. In our opinion, the main difference is in the conceptualization of scientific methods following emergent paradigm in educational philosophy, psychology, and management. Thus,

- In the first case, an educational/academic manager can undertake linear scientific methods to make a decision, which is suitable in a well-established educational system. He/she may apply “new principals have to adopt a new identity, consciously or unconsciously, when they make the transition from teacher to senior leader” [27].
- In the second case, the managerial task is assigned to a managerial team or an institution. The leader of the team/institution is like a catalyzer of sustainability -- the

globally accepted mind and behavior. The person that is performing the managerial task is focused on solving the real problems and apply scientific methods, which help to understand the situation and estimate trends.

- In the case of metasystems thinking, the managerial task is assigned to the person able to perform complex, adaptive, and dynamic multitasking.

In sum, the scientific methods are not a synonym of a holistic scientific method, but a well-defined lifelong strategy of educational managers, adaptive to the diversity of learning environments. Their acceptance depends on the professional competence and of his/her model of thinking regarding the most successful life-long learning strategies and tactics.

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