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EVALUATING LINEAR-NONLINEAR THINKING STYLE FOR KNOWLEDGE MANAGEMENT EDUCATION

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Abstract. *The purpose of this paper is to present a new perspective of the linear-nonlinear thinking style and its critical role in knowledge management education. Previous works in this field identified linear thinking as being rational, logic and analytic, and nonlinear thinking as being based on intuition, insight and creativity. In this perspective, linear thinking is related mostly with cognitive intelligence, while nonlinear thinking is related mostly with emotional intelligence. These interpretations have a slight connection with the generic concepts of linearity and linear spaces developed in science. Our research changed the cognitive-emotional perspective into a new one based on the fundamental properties of linear spaces, as they are defined in Mathematics. Basically, a linear model is characterized from operational point of view by a linear equation. That means that outputs of this model should be proportional with inputs. For instance, the temperature level indicated by a familiar thermometer is proportional with the mercury dilation. If the operational model is based on a nonlinear equation, then the model is nonlinear. Thus, cognitive thinking can be linear or nonlinear, while emotional thinking is by its nature nonlinear. Based on this new theoretical construct we developed an investigation instrument to measure the linear-nonlinear thinking style, and applied it to our students in master programs of business administration where there is an important module of knowledge management and learning organizations. The initial sample consisted of 500 graduate students in attending courses in master programs at the Faculty of Business Administration, Academy of Economic Studies from Bucharest, the most important and best considered university for economics and business in Romania. The questionnaire contains 50 items, with answers evaluated on a Likert-type scale. Using the STATA program we performed various analyses, and interpreted the final results in connection with the educational curricula at the Bachelor and Master levels. Conclusions show a dominant role of the linear thinking style, which might constitute o severe limitation in knowledge management and business decision making process.*

Keywords: Education, knowledge management, linear, mental models, nonlinear, thinking style.

1. Introduction

In a challenging book about the future of management, Hamel and Breen (2007) stated: *„Management is out of date. Like the combustion engine, it's a technology that has largely stopped evolving, and that's not good. Why? Because management – the capacity to marshal resources, lay out plans, program work, and spur effort – is central to the accomplishment of human purpose. When it's less effective than it could be, or needs to be, we all pay a price*" (p. X). Actually, Hamel

and Breen refer to the industrial management designed to operate industrial processes, and to control industrial workers (Drucker 1993; Fayol 1966; Taylor 1998). Although it has been conceived about a century ago, and its momentum has been increased almost exponentially after the Hawthorne experiments (Wren 2005), its inertial force is still powerful. However, the new business environment characterized by complexity, turbulence and uncertainty requires a new management paradigm based on a new organization pattern and a dynamic equilibrium at the functional interface between the inner and outer environments (Carpenter and Sanders 2007; Drucker 2001; De Geus 1999; Davenport 2005; Hamel and Breen 2007; Millson and Wilemon 2008). Experts demonstrate the need for developing intelligent organizations (Pinchot and Pinchot 1996; Gardner 2006), able to generate knowledge (Dierkes et al 2003; Nonaka and Takeuchi 1995; Von Krogh, Ichijo and Nonaka 2000) and to learn like living organisms: *„The organizations that will truly excel in the future will be the organizations that discover how to tap people's commitment and capacity to learn at all levels in an organization. Learning organizations are possible because, deep down, we are all learners."* (Senge 1999, p. 4).

We learn using mental models, which are *cognitive approximations* (Bratianu 2007; Gardner 1993; Sherwood 2002; Simon 1996) of the infinite world we are living in. These thinking patterns have been developed through our education in family, school, university and a given cultural environment. As Senge (1999, p. 175) remarked, our *„mental models determine not only how we make sense of the world, but how we take action*". The problem with these mental models is not if they are right or wrong, but if they are capable enough to represent *the complexity* of the world we would like to understand and use in our decision making process (Goodwin and Wright 2004; Baron 2000). As Senge remarked (1999) we are taught in schools to deal with complexity by breaking apart problems and finding solutions for their components which are simpler problems. Then, we put together these simpler solutions and add them up. Sometimes it works, but most of the time we generate errors which hardly can be accepted. Successful leaders don't break down a problem into its components and work them separately. They see the entire architecture of the problem, with all of these components interconnected. They are integrative thinkers and make use of systemic thinking, which is holistic and synthetic (Atwater et al. 2008; Martin 2007).

2. Linear & nonlinear thinking

Changing the mental model from industrial management to knowledge management can be done only if we switch from *linear* thinking to *nonlinear* thinking (Bratianu 2006, 2007, 2009; Davenport 2005; Davenport and Prusak 2000; Senge 1999). Metaphorically, Senge (1999, p. 73) would say: *„Reality is made up of circles but we see straight lines. Herein lie the beginnings of our limitations as systems thinking. "* In a seminal book about strategic thinking, Ohmae (1982, p. 13) showed that "*Phenomena and events in the real world do not always fit a linear model. Hence*

the most reliable means of dissecting situation into its constituent parts and reassembling them in the desired pattern is not a step by step methodology such as system analysis. Rather, it is that ultimate nonlinear thinking tool, the human brain. True strategic thinking thus contrasts sharply with the conventional mechanical systems approach based on linear thinking".

In mathematics and physics *linearity* is the fundamental characteristic of the *linear spaces*. A space is considered to be linear if all linear combinations of its elements yield entities which are also elements of this space. It is easy to understand if we think of numbers. Roughly, this is to say that multiplication by numbers, and addition of elements are operations defined on this space. These properties define also the linear equations, which can describe processes. Any such process, regardless of its nature, is considered to be linear if the output is proportional to its input. In other words, a causal relation is considered linear if the effect is proportional to its cause, which means that it can be described by a linear equation. A direct consequence of these properties is the principle of superposition. According to this principle complex problems can be broken down into simpler problems, which can be solved individually. We learn this principle in high school physics for linear energy fields, and then apply it to many other domains, which are more or less linear.

Linear thinking is based on such linear cause-effect relationships, which represent actually cognitive approximations of more complex relationships and processes. Linear thinking is based on *linear metrics*, regardless of specific field of applications. Due to its simplicity, linearity became almost a universal characteristic. Our social life has been strongly linearized by the time metric, by the measuring systems and devices for physical quantities, by legislation, by many infrastructures and operations, and by democracy. For instance, any measuring system is based on linear thinking since the total cost of any goods we buy is always equal to the purchased quantity times the unit cost of that stuff. The value of temperature of a certain material is proportional to the linear dilatation of mercury or some other liquid. The work productivity and many economic indicators are measured using linear metrics. The European Credit Transfer System introduced by the Bologna process in higher education is linear. The budgetary salary system is linear. Even in the academic life, performance is judged in many universities using linear thinking: the more papers published, the better. Not the content of ideas or the intensity of novelty, but the number of published papers in well known research journals. Schools and universities are evaluated and ranked based on linear metrics. We are almost prisoners of linear thinking, since it is really difficult to escape from such a mental framework.

In a series of papers (Groves et al 2008; Vance et al. 2006, 2007), the concept of linear thinking has been extended to designate any rational and logic decision making process. In these authors view *„This model defines linear thinking style as a preference for (1) attending to external, tangible data and facts, and (2) processing this information through conscious logic and rational thinking to form knowledge, understanding, or a decision for guiding subsequent action*" (Groves, Vance and Paik 2008, p. 309). In our view, this extension has no scientific framework, since linear

thinking is only a sub-domain of the rational and logical thinking. Accepting their extension means to ignore the properties of linear spaces, and to reach the wrong conclusion that even the knowledge field is linear.

Any process that is based on a nonlinear equation is considered to be nonlinear. In such processes, the effects are no longer proportional with their causes or efforts. One of the most known example is the Pareto principle, according to which roughly 80% of the effects come from 20% of initial efforts or causes. Actually, the initial observation was in connection with income and wealth. Pareto discovered that 80% of Italy's wealth was owned by only 20% of population. Even if we don't know the right correlation between inputs and outputs, we can evaluate its nature for known processes. For instance, experience is not proportional with the number of years spent in the same position, learning outcomes are not proportional with the number of hours dedicated to study, emotions are not proportional with stimuli, and the waiting time in a supermarket queue is not proportional with the number of individuals in front of you. In knowledge management *nonlinearity* is the rule and linearity the exception. Knowledge, intelligence, talent, innovation, change, excellence, quality, emotions, ethics, corporate values and many others are all strongly nonlinear concepts which cannot be managed using linear thinking. For managing complex processes based on these concepts we need to adopt nonlinear thinking.

Education has been traditionally been based on linear thinking models and styles due to the influence of the Newtonian cause-effect analysis, and the Cartesian geometric representation of objects. However, the management education must switch completely from linear to nonlinear thinking since the real business environment is strongly nonlinear due to its increasing complexity. Our university programs must be based on the cognitive and emotional intelligence competencies future managers should have. Also, our business schools must create learning environments able to stimulate students interests and talents. *„These three domains of capability (i. e., knowledge, competencies, and motivational drivers) help us to understand what a person can do (i. e., knowledge), how a person can do it (i. e., competencies), and why a person feels the need to do it (i. e., values, motives, and unconscious dispositions)*" (Boyatzis, Stubbs and Taylor 2002, p. 150).

Knowledge management education cannot be done properly using linear thinking models and styles, since its fundamental concepts are strongly nonlinear. Thus, new methods and experiences should be developed in management education, especially in MBA programs (Boyatzis, Stubbs and Taylor 2002; Mintzberg 2004). Organizational knowledge is a nonuniform and nonlinear field of forces, free of mass and spread in space as a continuous domain (Bratianu and Andriessen 2008; Brown and Duguit 1998). Similar to the energy field, the knowledge field contains different forms of knowledge which can be transformed one into another. The most important transformations are: *externalization* – tacit knowledge transforms into explicit knowledge, and *internalization* – explicit knowledge transforms into tacit knowledge (Debowski 2006; Nonaka and Takeuchi 1995; Nonaka and Konno 1998). Tacit knowledge comes directly form experience, and thus it is a strongly nonlinear entity

(Polanyi 1983). Experiential learning is based on generating tacit knowledge, and on how managers transforms it into explicit knowledge (Armstrong and Mahmud 2008). *„Business works and companies perform when executives extract from past experience only what is meaningful, use it to make sense out of the present, and seek new kinds of experiences that offer opportunities for development*" (Jiang and Murphy 2007, p. 33).

3. Methodology and descriptives

We used a 50-items questionnaire which was filled in by 400 master students, in various fields of business. This means that every tenth master student in the Bucharest University of Economics has filled in a questionnaire. The structure of the questionnaire was modular, comprising five topics. The first one investigated is the proportionality bias, that is, the predisposition towards thinking that outputs are always a *k* times inputs. The second one investigated the sequential bias, that is, thinking that processes and activities are successive, rather than simultaneous. The third investigated the effects superposition bias, that is, thinking that effects of interrelated processes will add following arithmetic rules. The fourth investigated the deterministic bias, that is, thinking that between processes there is, normally, a cause-effect linkage. Finally, the fifth investigated the structure bias, that is, thinking that in the world there is, always, an underlying structure.

All these latent concepts were subject to factorial analysis in STATA, with Varimax rotation and Kaiser normalization, in order to outline which are their independent components, leading to a predominantly linear or, on the contrary, predominantly non-linear way of thinking.

The descriptive statistics for the first set of variables, investigating the proportionality bias, is presented in Table 1.

Table 1

Descriptive statistics – proportionality

VARIABLE	OBS	MEAN	STD. DEV.	MIN	MAX
the shorter a road, the faster it ends	489	3. 132275	1. 241338	1	5
someone speaking much tells more than a concise person	490	1. 773684	1. 00071	1	5
the more tired you are, the more profoundly you sleep	491	3. 08377	1. 339009	1	5
a more intense stimulus will trigger a more obvious reaction than a weaker stimulus	486	3. 833333	1. 049667	1	5
the mercury in a thermometer dilates proportionally to temperature	490	3. 789474	1. 356113	1	5
professional experience is proportional with the number of years	489	3. 15873	1. 351197	1	5

VARIABLE	OBS	MEAN	STD. DEV.	MIN	MAX
spent in the same job					
you decide which queue to take by the number of persons already there	491	3. 010471	1. 174239	1	5
a company's profit is proportional with work productivity	489	3. 322751	1. 343448	1	5
the results of learning are proportional with the learning time	489	2. 624339	1. 685874	1	5
as a manager, you think that people's salaries should be proportional to their working hours	491	3. 157068	1. 340243	1	5
a talk show's success can be expressed by a constant increase of its public	490	4. 210526	1. 087638	1	5
if a poet wrote two poems in two days, he will write seven poems a week	489	3. 904762	1. 072593	1	5

As it can be seen, the respondents in the sample tend to recognize, on average, the situations where proportionality is logically involved, like the dilating of the mercury in the thermometer, or can be accepted, with a certain tolerance, like in the case of the increasing intensity of the reaction, depending on the intensity of the stimulus. Learning is recognized as a non-linear process, but creativity (the poetry production of a poet) is not recognized as such.

The descriptive statistics for sequence variables is presented in Table 2.

Table 2

Descriptive statistics – sequence

VARIABLE	OBS	MEAN	STD. DEV.	MIN	MAX
only in the dictionary „success" is prior to "work"	490	3. 710526	1. 232451	1	5
you prefer sequential lectures to jumps from one subject to another	483	3. 409836	1. 267216	1	5
a novel's chapters should follow one another in the precise order of events	489	1. 518519	1. 003147	1	5
in a process, you can start a new activity only after finalizing the current one	487	3. 229947	1. 189362	1	5
you learn for your exam chapter by chapter	488	2. 957447	1. 24887	1	5
in problem solving you prefer algorithms	486	3. 860215	1. 177183	1	5
in problem solving you prefer heuristics	485	3. 254054	1. 204745	1	5

VARIABLE	OBS	MEAN	STD. DEV.	MIN	MAX
when confronted with many problems, you approach them one by one, as they appeared	487	4. 13369	1. 176969	1	5
you read a book page by page, without browsing through it	486	3. 048387	1. 324539	1	5
managerial hierarchies should be climbed step by step	486	3. 596774	1. 015443	1	5

The respondents clearly prefer a sequential approach to problem solving, although their preference for algorithms or heuristics is not clearly outlined. Still, they do not extend sequence to areas where it is not appropriate, like the reading of books.

The descriptive statistics for effects superposition is presented in Table 3.

Table 3

Descriptive statistics – effects superposition

VARIABLE	OBS	MEAN	STD. DEV.	MIN	MAX
you see more with your both eyes than with only one eye	484	3. 125	1. 178415	1	5
if you read three management books, you'll know more than by reading only two	486	3. 22043	1. 148353	1	5
if you have simultaneously sinusitis and otitis, you suffer twice	487	2. 737968	1. 182672	1	5
when several persons solve a problem together, their intellectual effort adds	487	3. 417112	1. 243186	1	5
the collective intelligence of a group increases with the number of persons in the group	476	3. 659091	1. 334264	1	5
two or more simultaneous emotions are added into a more intense emotion	486	3. 284946	1. 185265	1	5
any complex problem can be broken to easier ones, who solutions are then added to give the initial problem's solution	476	3. 659091	1. 334264	1	5
two electric bulb illuminate twice as much as one bulb	479	2. 201117	1. 082962	1	5
the cumulated effect of more medicines taken together equals the sum of their individual healing powers	479	3. 653631	1. 007068	1	5
the team spirit allows the cumulated effect of the team efforts to be greater than the sum of individual efforts	478	3. 842697	1. 056579	1	5
you see more with your both eyes than with only one eye	475	2. 811429	1. 141629	1	5

The perception of the respondents on the effects superposition is generally sound, effects superposition being associated with team spirit and with the possibility to solve complex problems in steps.

The descriptive statistics for determinism is presented in Table 4.

Table 4

Descriptive statistics – determinism

VARIABLE	OBS	MEAN	STD. DEV.	MIN	MAX
the earlier you leave, the earlier you arrive	473	3. 508671	1. 184289	1	5
a child who is allowed everything will grow into an undisciplined adult	479	4. 134078	1. 15822	1	5
if are the first to subscribe to a lottery, your chances to win increase	477	3. 717514	1. 229088	1	5
a person's face tells much about that person's character	477	3. 033898	1. 043913	1	5
if in the beginning of a novel there appears a gun, until the end someone will use it	477	3. 271186	1. 198918	1	5
in management, simple and predictable activities are preferred, as they are easier to control	475	3. 84	1. 076179	1	5
you prefer those problems whose solutions are easily predictable, to avoid uncertainty	473	3. 317919	. 9927483	1	5
incremental change is preferable to disruptive change, as it is easier to predict and control	474	1. 793103	1. 164384	1	5

Respondents prefer radical to incremental change, which may be explained by their young age, and relatively little work experience. Still, they tend to prefer simple and predictable activities, which don’t involve uncertainty. Also, determinism in social life is present, as they think that freedom allowed in childhood would turn into mature age insubordination.

Finally, the descriptive statistics for structure is presented in Table 5.

Table 5

Descriptive statistics – structure

VARIABLE	OBS	MEAN	STD. DEV.	MIN	MAX
cities with straight streets are preferable to urban maizes	476	3. 238636	1. 260334	1	5
a well structured process is more efficient than an unstructured one	475	4. 154286	1. 01945	1	5
you prefer well structured lectures to those making digressions	468	4. 011905	1. 094286	1	5
you concentrate better in a tidy office	474	4. 08046	1. 199406	1	5
you prefer rhyme and rhythm to free verse	469	3. 467456	1. 336464	1	5
you prefer straight facades to highly ornamented ones	474	3. 189655	1. 23237	1	5
a repetition is better expressed by successive arrows than by a spiral	470	3. 323529	1. 252703	1	5
it's better for you to use a map than to listen to someone's explanations	476	3. 630682	1. 138908	1	5
untidy employees are not efficient	474	3. 028736	1. 255868	1	5
nothing important was ever achieved randomly	476	2. 596591	1. 24753	1	5

The scores for structure are generally high, indicating that respondents tend to perceive efficiency in terms of problem structuring, although they allow some important things to be achieved randomly.

The results of the factorial analysis are presented in the following section.

Results and interpretations

The factors of proportionality are presented in Table 6 below.

Table 6

Factors of proportionality

VARIABLE	FACTOR1	FACTOR2	FACTOR3
the shorter a road, the faster it ends	0. 1689	0. 4187	-0. 0800
someone speaking much tells more than a concise person	-0. 0121	0. 1759	-0. 2449
the more tired you are, the more profoundly you sleep	0. 0385	0. 3879	-0. 0837
a more intense stimulus will trigger a more obvious reaction than a weaker stimulus	0. 2141	0. 4280	0. 0798
the mercury in a thermometer	0. 1668	0. 4233	-0. 1190

VARIABLE	FACTOR1	FACTOR2	FACTOR3
dilates proportionally to temperature			
professional experience is proportional with the number of years spent in the same job	0. 1418	0. 4573	-0. 0126
you decide which queue to take by the number of persons already there	0. 1911	0. 3108	0. 1503
a company's profit is proportional with work productivity	0. 9735	-0. 2111	-0. 0897
the results of learning are proportional with the learning time	0. 1411	0. 0807	0. 0826
as a manager, you think that people's salaries should be proportional to their working hours	0. 1750	0. 1791	0. 2606
a talk show's success can be expressed by a constant increase of its public	0. 1302	-0. 0013	0. 4452
if a poet wrote two poems in two days, he will write seven poems a week	0. 1081	-0. 0139	0. 4522

The analysis identified three relevant factors, as follows: *managerial proportionality common sense proportionality, pars pro toto proportionality*. The managerial proportionality is a dangerous trait of the thinking of the sample, accounting for the putting in place of an industrial management model, concerned only with linear increases in productivity. Common sense proportionality, although it relies on outputs that are generally proportional with the outputs (the mercury dilating more as temperature increases), can lead to practically invalid assumptions (the shorter queue will advance more quickly). Finally, pars pro toto proportionality reflects a tendency to judge the whole according to something which is true for a part of it, not taking into account that they might not be linearly connected. For instance, the number of the poems a poet wrote during one day may reflect a momentary inspiration and commitment to work, not his general speed of writing which is not, nevertheless, constant. Similarly, the size of a talk show's public expresses a momentary interest, not a tendency that repeats regardless of any other factors than the quality of the talk show.

The factors of sequence are presented in Table 7 below.

Table 7

Factors of sequence

VARIABLE	FACTOR1	FACTOR2	FACTOR3
only in the dictionary „success" is prior to „work"	0. 1559	-0. 2042	-0. 0235
you prefer sequential lectures to jumps from one subject to another	0. 2419	0. 0978	0. 1407
a novel's chapters should follow one another in the precise order of events	-0. 0691	0. 0258	0. 5245
in a process, you can start a new activity only after finalizing the current one	-0. 0411	0. 3683	0. 0824
you learn for your exam chapter by chapter	0. 0516	0. 3186	0. 1457
in problem solving you prefer algorithms	0. 2471	0. 3258	-0. 2262
in problem solving you prefer heuristics	0. 3000	-0. 0644	-0. 0226
when confronted with many problems, you approach them one by one, as they appeared	0. 2649	0. 0079	-0. 0871
you read a book page by page, without browsing through it	0. 2186	-0. 1628	0. 1757
managerial hierarchies should be climbed step by step	0. 4928	0. 0605	-0. 0353

The analysis identified three factors, as follows: *managerial sequence*, *general sequence*, *normative sequence*. Managerial sequence refers to the perceived need of a step by step approach in managerial processes, while general sequence extends this need to every-day processes driving to a specific goal (learning for exams, etc.). Normative sequence further extends this preference for sequence to areas which are normally excluded from it and out of the respondent's span of influence (the way a novel is structured).

The factors of effects superposition are presented in Table 8.

Table 8

Factors of effects superposition

VARIABLE	FACTOR1	FACTOR2	FACTOR3
you see more with your both eyes than with only one eye	0. 3686	-0. 0183	0. 0472
if you read three management books, you'll know more than by reading only two	0. 3804	-0. 0497	-0. 0438

VARIABLE	FACTOR1	FACTOR2	FACTOR3
if you have simultaneously sinusitis and otitis, you suffer twice	0. 4265	0. 1154	-0. 1581
when several persons solve a problem together, their intellectual effort adds	0. 5405	0. 0254	-0. 2022
the collective intelligence of a group increases with the number of persons in the group	0. 4532	0. 0490	0. 2436
two or more simultaneous emotions are added into a more intense emotion	0. 3758	-0. 1367	0. 3167
any complex problem can be broken to easier ones, who solutions are then added to give the initial problem's solution	0. 2310	0. 1393	-0. 1202
two electric bulb illuminate twice as much as one bulb	0. 3855	-0. 0714	0. 0298
the cumulated effect of more medicines taken together equals the sum of their individual healing powers	0. 0696	-0. 5810	-0. 1704
the team spirit allows the cumulated effect of the team efforts to be greater than the sum of individual efforts	0. 0425	0. 6504	-0. 0122

The analysis identified three factors, which are: *logical effects superposition*, *synergy*, *general effects superposition*. Logical effects superposition and synergy express situations when effects normally add, following non-linear rules. General effects superposition, on the contrary, expresses a tendency to apply linear adding rules to circumstances that exclude this simplistic addition (as in the case of emotions).

The factors of determinism are presented in Table 9.

Table 9

Factors of determinism

VARIABLE	FACTOR1	FACTOR2
the earlier you leave, the earlier you arrive	0. 2465	0. 3483
a child who is allowed everything will grow into an undisciplined adult	0. 2446	-0. 0601
if are the first to subscribe to a lottery, your chances to win increase	0. 5050	0. 1448

VARIABLE	FACTOR1	FACTOR2
a person's face tells much about that person's character	0. 4742	0. 1453
if in the beginning of a novel there appears a gun, until the end someone will use it	0. 4643	-0. 1760
in management, simple and predictable activities are preferred, as they are easier to control	0. 3826	0. 3260
you prefer those problems whose solutions are easily predictable, to avoid uncertainty	0. 4050	0. 3740
incremental change is preferable to disruptive change, as it is easier to predict and control	-0. 1179	0. 3115

There are two factors of determinism, as identified by the analysis: *general determinism*, and *managerial determinism*. Both account for the tendency to treat as simple, predictable, deterministic situations which, actually, require a more complex perspective.

The factors of structure are presented in Table 10.

Table 10

Factors of structure

VARIABLE	FACTOR1	FACTOR2
cities with straight streets are preferable to urban maizes	0. 2986	0. 1104
a well structured process is more efficient than an unstructured one	0. 4231	-0. 3393
you prefer well structured lectures to those making digressions	0. 4493	0. 1055
you concentrate better in a tidy office	0. 4691	-0. 0350
you prefer rhyme and rhythm to free verse	0. 1865	-0. 0118
you prefer straight facades to highly ornamented ones	0. 2439	0. 1855
a repetition is better expressed by successive arrows than by a spiral	0. 4148	0. 2307
it's better for you to use a map than to listen to someone's explanations	0. 1040	-0. 1726
untidy employees are not efficient	0. 2431	0. 2046
nothing important was ever achieved randomly	0. 3722	0. 5724

Two factors, outlined by the analysis, account for the perception of structure, in the sample: *linear structure*, seeking the linear path in every structure, the "spine" in every process, and *prescriptive structure*, pretending that every success should follow a prescribed course of action.

5. Conclusions

The factorial analysis we performed on the survey data on a sample of business graduates outlined the main factors of linear thinking, which is predominant in our sample, confirming the initial hypothesis, that simpler decision making models are preferred in the managerial practice, and that this thinking model was inherited by these respondents with little or no professional experience from their families and social groups, and consolidated by education. Some of the factors identified should appear, as they reflect the innate linearity of some of the processes composing our world. More others are blockers of creativity and flexibility, which signal lack of proper adaptability to the non-linear nature of processes and, thus, limited span of decision making, under uncertainty and risk.

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