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TRANSFORMING EDUCATIONAL MANAGEMENT CAPABILITIES: PROBLEM ANALYSIS AND SOLUTION FRAMEWORKS


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ABSTRACT

Introduction: Educational management, like any other field, faces its own set of unique problems. One significant challenge is the rapid pace of technological advancements. Educational managers must stay abreast of new technologies and integrate them effectively into the learning environment. This requires continuous professional development and a willingness to adapt to change.

Another problem is the increasing diversity of student populations. Educational managers need to create inclusive environments that cater to the needs of all students, regardless of their background, ethnicity, or learning style. This may involve implementing culturally responsive teaching practices, providing additional support services for students with special needs, and promoting understanding and respect among students from different backgrounds.

The aims: this research proposes a systematic approach to studying psychological and educational phenomena, exemplified by the administrative ability, a key feature in administrative activity.

The methods: this systematic approach utilizes the "working methods" principle. The empirical results allow for the completion of developing this professionally important feature and potentially controlling its development.

The results: the primary result is that this systematic mathematical solution is broadly applicable, and the current classification of state standards can be replaced by a similar set of indicators reflecting an individual's characteristics as a professional.

Keywords: Managerial ability, methodological approach, analyze, development, level, subject, method.

1. INTRODUCTION

Educational management, like any other field, faces its own set of unique problems. One significant challenge is the rapid pace of technological advancements. Educational managers must stay abreast of new technologies and integrate them effectively into the learning environment. This requires continuous professional development and a willingness to adapt to change.

Another problem is the increasing diversity of student populations. Educational managers need to create inclusive environments that cater to the needs of all students, regardless of their background, ethnicity, or learning style. This may involve implementing culturally responsive teaching practices, providing additional support services for students with special needs, and promoting understanding and respect among students from different backgrounds.

Furthermore, funding constraints often pose a major challenge for educational institutions. Managers must find creative ways to allocate resources effectively and ensure that students receive

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a high-quality education despite limited budgets. This may involve seeking external funding sources, streamlining administrative processes, and prioritizing spending on essential resources.
To address these problems, several solutions can be implemented. Firstly, educational managers should invest in their own professional development. This could involve attending workshops, conferences, or pursuing advanced degrees in educational leadership. Secondly, institutions should prioritize creating inclusive learning environments by providing diversity training for staff and implementing culturally responsive teaching practices. Thirdly, educational managers should explore alternative funding sources and implement cost-saving measures to maximize the impact of limited resources. By addressing these problems proactively, educational institutions can enhance their management capabilities and provide a better learning experience for all students.

The importance and statement of the problem:

The obvious interindustry interest in management issues under conditions of rapid information saturation and technical complication also updates general issues related to the study of the limits of human capabilities in principle and those features that can be generally defined as “managerial” or those that allow complex functions to function stably dynamic systems, including the participation of human activities. This is especially significant in the modern conditions of a professionally personal “crisis”, when, on the one hand, there is no single criterion of “optimality” for the status (position) of the decision-maker, on the other hand, there is many years of scientific experience in applied psychological research that studies the objective features of the so-called “control subjects” ", Or subjects of professional managerial activity. An ambiguous personnel “picture” also appears to objective observation, when at the same time there is a relatively new professionally managerial “potential” that has been formed from the beginning of the introduction of a professional oriented educational standard (Daniel, Pink, 2018) for specialists in this area of human activity, and has already developed (by virtue of “Social personnel” tradition) a regular resource of managers formed on the principle of “appointment from above” or (a) according to the criterion of “production” experience (state organization), or (b) economic criteria (most often large and medium-sized non-governmental organizations), or (c) in the absence of a criterion, only upon the fact of ownership. At the same time, it is impossible to ignore the stratum of subjects of activity whose professional activity a priori can be considered as “managerial” - military, pedagogical, medical, and similar in its responsibility to a person. Moreover, it is precisely in these areas of activity that huge long-term information resources have been accumulated on the results of professional and medical diagnostics. However, their use is traditionally individually directed, the possibilities of targeted scientific programs for studying the development / regression of “human potential” involved in various professional conditions remain open for scientific projects and systematic (and systematic) research. This raises the question of interpectoral disunity, information fragmentation and, as a result, inaccessibility for scientific integration. The problem is probably in the actualization (openness for discussion) of the inter-industry integration of issues and solutions of processing and mathematical analysis, the study of the general laws and limits of development of the “human potential” as a significant “element” of dynamic systems (Dan, 2009) "Risk" of economic, technical, informational, physical and others, "External" and "internal" influences.
In modern industry conceptual mathematical studies of recent years, this problem not only does not contain scientific solutions, but does not even rise in principle. A review and analysis of the topics of 38 abstracts of doctoral studies (Daniel, Pink, 2018) in the mathematical branch of science showed that the problematic direction reflected in the research topic does not contain any questions

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of “development” as a phenomenon, nor questions of the development of “human” activity, nor questions of the development of “human potential”. However, the mentioned specialties contain in their formulas, respectively, “studies of systemic relationships and patterns ... development of objects and processes taking into account industry characteristics, focused on improving the efficiency of their management ...”, studies on the use of mathematical modeling ... to solve ... applied problems”. Both this and the other suggest the fundamental possibility of research using elementary modeling methods and mathematical statistics to create theoretical (abstract, experimental) models and study the laws of development and structural changes in dynamic processes, including professionally important properties such as “managerial abilities".

2. DESCRIPTION OF THE PROBLEM, RESEARCH METHODOLOGY, PRESENTATION AND DISCUSSION OF THE MAIN RESULTS

As an example, to solve a methodological problem, we have chosen quite often used in the practice of psychological research as a priori, but not having an unambiguous mathematical explanation today, the phenomenon of “development” as a process of a dynamic type, directly related to the characteristics and general laws of human development. From the universal dialectic theory and the fundamental psychological theory of activity it is known that this process is objectively associated with the active (initiative) role and participation of man, as involved in the general development process in nature and society. And, therefore, a person has the ability to transform (develop) properties of a general nature. To solve the problem of mathematical support, as one of the possible properties for mathematical processing and analysis, a set of 25 professionally important parameters was adopted, grouped into a professional methodology “Psychological Compatibility”, which is a sub complex of “managerial abilities” (Dan, 2009). This complex is composed on the basis of classical psych diagnostic tests used both in the practice of professional selection of managerial specialists and in the practice of psych diagnostics for compliance with a particular activity. For the analysis, a random sample of about 550 units of observation was used (according to the results of automated, independent diagnostic testing of trainees according to training programs for managerial specialists, in more detail, see monographs (Dan, 2009).(Majory, Harris, 2016)). To solve the problem, the following interrelated theoretical problems were solved: (1) to determine the general mathematical regularity (type, shape of the trend), reflecting the process of development of "managerial ability" (hereinafter referred to as the process of CSS); (2) to determine the mathematical parameters-dominants and indicators showing the limit of the CSS process (if any);

(3) determine the possible mathematical “control” of this Process; (4) to form, on the basis of the methods (1) - (3) applied to solve problems, methods, methods and tools in a systematic methodological complex (system) of mathematical support for the study of a phenomenon significant for applied industries that is directly related to the general properties of a person as a subject of professional activity. To collect digital data, we used an array of random observations of automated psych diagnostics provided for in an independent workstation included (Majory, Harris, 2016) in an automated training complex. The applied methodological approach is alternative to the method of expert assessments, objective in its information due to the application of statistical (mathematical) methods not only of processing the primary database, but also of analyzing the result.

The main difficulty in solving the problems was the conditional methodological restriction (adopted in order to abstract from the applied interpretation of the studied parameters), due to the

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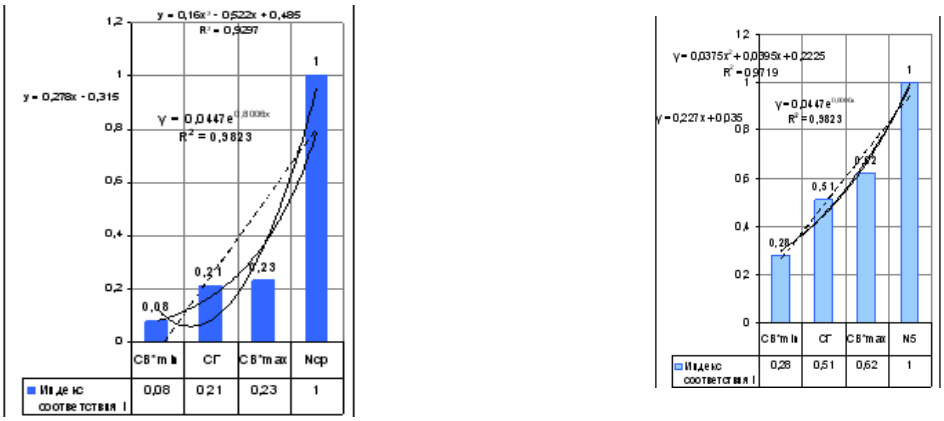
need for accessibility and scientific discussion of the results within the mathematical branch of science. Thus, this condition makes it possible to consider the conducted study in the approximate form, on the one hand, as a borderline interpectoral study, between researches strictly applied psychological and research strictly mathematical. On the other hand, this limitation achieves maximum objectivity of the results of mathematical (statistical) analysis.

To solve the applied problem (1) of determining the general mathematical regularity (type, shape of the trend), which reflects the development process of "managerial ability" (hereinafter referred to as the CSS process), a number of successive sub-tasks were solved - (a) mathematical formalization of the descriptive criterion-classifier of states according to their level of compliance intervals of absolute values; (b) filtering the observations of Y and constructing a sequence of Y-states according to the level of development of the final values of Y. For this, the calculation algorithm is developed in Excel (a detailed description of this professional mathematical technique is given in the author's monograph); (c) index and frequency analysis, with the aim of calculating the relative indicators of subgroups-sets according to their state as defined, accepted as a baseline; (d) perform a comparative graphical approximation and obtain a visual image of the form, the shape of the trend. As shown in Fig. 1, both trends in their closest approximation (Fig. 1a, *R2 = 0987*; Fig. 1b, *R = 0.9911*) correspond to non-linear, in the case of index calculation, to the exponential form of the trend in power-law form *(y = 0,0447e0 , 8006x*), in the case of frequency analysis - polynomial *(y = 0.075x2 - 0.065x + 0.075)*.



a) b)

Fig. 1. Histograms of the empirical Model of the CSS Process, constructed (a) based on index analysis; (b) based on frequency analysis.

The obtained empirical results allow us to do (a) the power-law nature of the development of states; (b) the sequence of transformation of the quality of states, first, by the quantitative value of parameter X, and then, the transition of this parameter to the next level of state Y. Indirectly, this is consistent with the result of analysis of variance, which turned out to be a 95% probability of a positive change the cumulative value of the entire sample of Y-observations is affected by the *MoX* and X mode; a separate observation of Y does not affect it. The analysis of variance and its results are described in detail in the dissertation (Marjory, Harris, 2016) and monographs [(Silvia, Akuna,

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2005),]. On this basis, we can make a generalization that the development of the process of CSS (parabolic) view of the trend.

Thus, as a result of solving the first problem, it turned out to be possible to single out the principal form of the trend of the CSS Process.

To solve problem (1), the following mathematical and statistical methods and techniques (graphical, analytical, calculation, logical) and technical means were used: (a) for data collection - workstation of a training complex; (b) for calculations and analysis - Excel application.

To solve the problem (2) of determining the mathematical parameters-dominants and the margin indices of the CSS Process, the distribution density and pair regression coefficient were calculated, all 25 parameters *X1-25* of the studied complex were used for analysis. As a result, it turned out that all 25 parameters can be divided into two groups that separate these parameters (A and B), according to the type of transformation (development) from the state CB * min to the state *CB * max* (Fig. 2).

Fig. 2 (b) shows a sequence of graphs of the distribution density from the state of CB * min to the state of CB * max, and Fig. 2 (a) shows the difference in dynamics - in one case, the minimum values (*A: minfX2 (CB * min) = 0.05660791*; *B: minfX25 (SG) = 0.303405893)* in the aggregate CB * min, in the other (B) - in an intermediate state. The observed difference is not only in “speed” (slope), but, more interestingly, in the ratio of states. The obtained result allows us to make an assumption about the fundamental difference between these types of parameters, one (A) of which shows positive dynamics (increment), the other (B) shows almost equilibrium values in polar (+/-) states and, therefore, in this case we can assume the difference between intermediate and polar (+/-) states.

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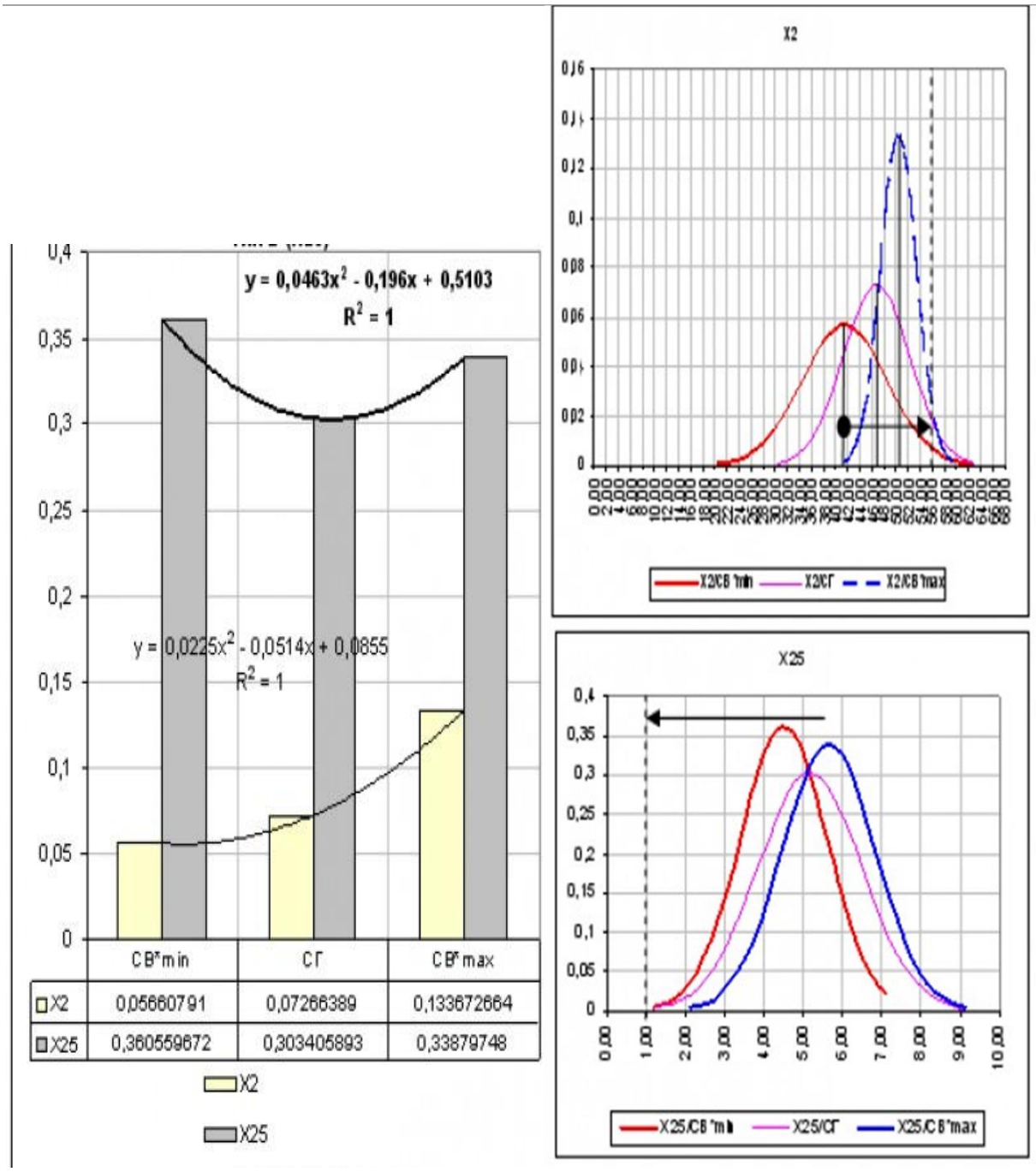

a) b)

Fig. 2. - (a) Two types of parameters ("pair"), different in the nature of the dynamics (development from the state of CB * min to the state of CB * max), using the example of the pair *X2 / X25*; (b) the distribution density of the parameters *X2* and *X25* in 3 analytical states (Jeanblanca, Yor, Chseneg, 2009).

The results of preliminary statistical processing were used to determine the dominant state and the ultimate process of development of CSS. A comparison of the states was carried out according to

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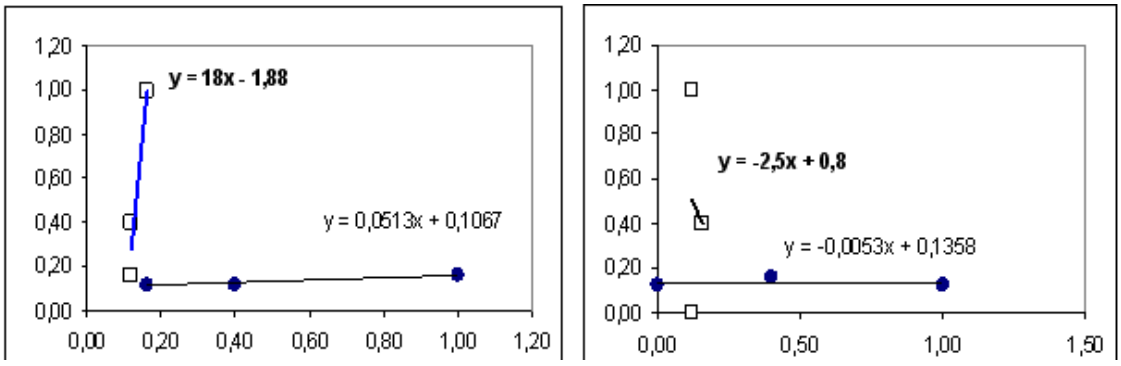
the criterion of the slope coefficient (b) of pairwise regression. Figure 3 shows two results with the highest values of coefficient b. As shown in Fig. 3 (a), in both pairs the most interacting state is basic *(Nopt: b = -1.88 (a); b = + 0.8 (b).*



a) b)

Fig. 3. - Dominant State: Graphs of paired linear correspondence regression (a) *SG and CB * Opt; (b) CB * Nopt and CB * max*.

To determine the "stability" of the process of development of the CSS, the coefficient of relative structural shift was calculated (Fig. 4).

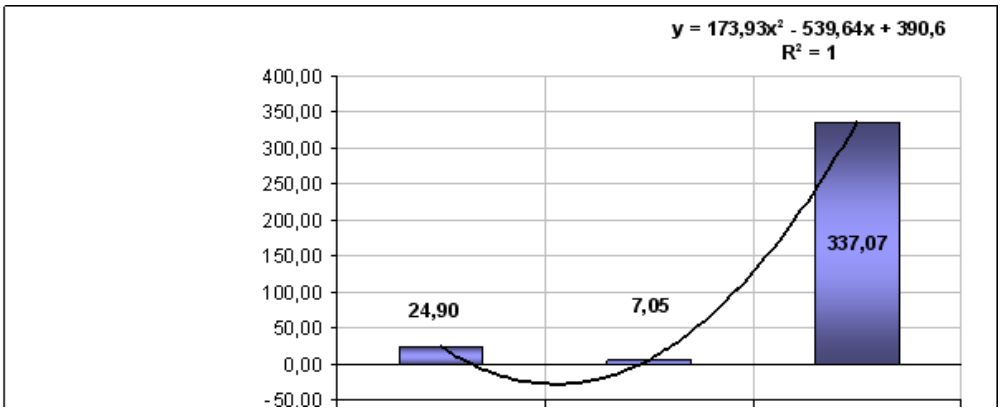


Fig. 4. Histogram of the relative structural shift in the whole sample.

Thus, as a result of solving problem (2), it turned out to be possible to detect general (independent of the specific applied interpretation of the X parameters) tendencies in the development of the parameters of the studied property of the equation of state: (1) nonlinear and ambiguous structural shift; (2) indirect confirmation of the assumption of the ultimate
process of CSS (Kersting 2001). The following indicators are shown: (a) the extremeness of the "stability" of the "speed" of the Process, the coefficient of relative structural shift d; (b) dominance

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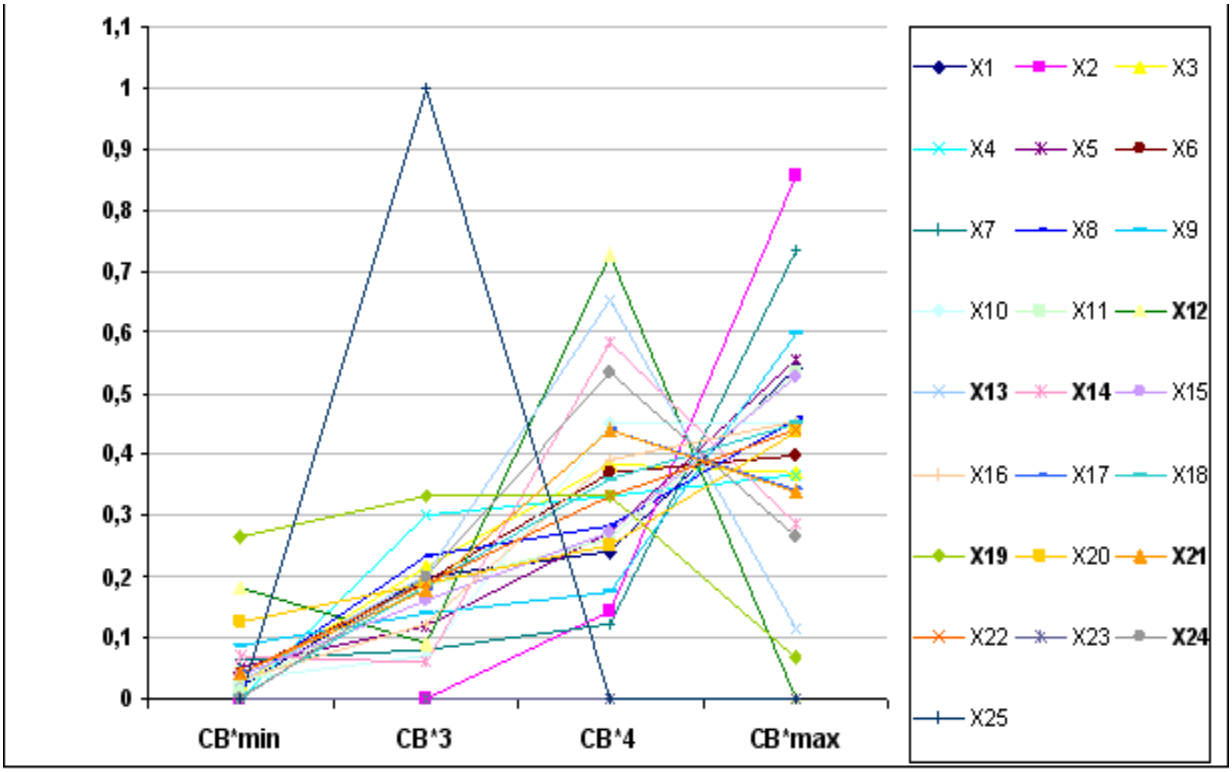
of states — pairwise regression coefficient b (slope, “speed”); (c) differences in parameters in the dynamics of state transformation - f (distribution density X).

5. - The density structure of the N-corresponding Xi in the context of individual Xi.



To solve problem (2), classical methods and techniques have been applied (graphical and calculation methods and construction of histograms and distribution density graphs) and the Excel application.

absolute values of the N-state (N9), for comparison, the state N (N7) is also taken as the “initial” state (Fig. 6). As shown in the histograms, with an increase in the N-base state (Fig. 6c), an increase in the rate is observed (b = | 0.45 |); with a decrease in N (Fig. 6a), on the contrary, a decrease in the rate (b = | 0.035 |).

but a positive change in dynamics. This “impact” is similar to the well-known technical “winch mechanism” (Silvia, Akuna, 2005). It should be noted that in the practice of "control actions" in an environment that includes human participation, a completely different approach is observed, mathematically similar to "removing Y". Therefore, the proposed “control” (undoubtedly requiring experimental confirmation as “general”, in similar mathematical properties of similar complexes), can be considered alternative in principle. The result obtained (as well as the solution of the first two subtasks) showed a general tendency, independent of the applied interpretation — the “subordination” of the speed of the CSS process to the influence of the “norm”, a basic state, which is an abstract (ideal) maximum possible state.

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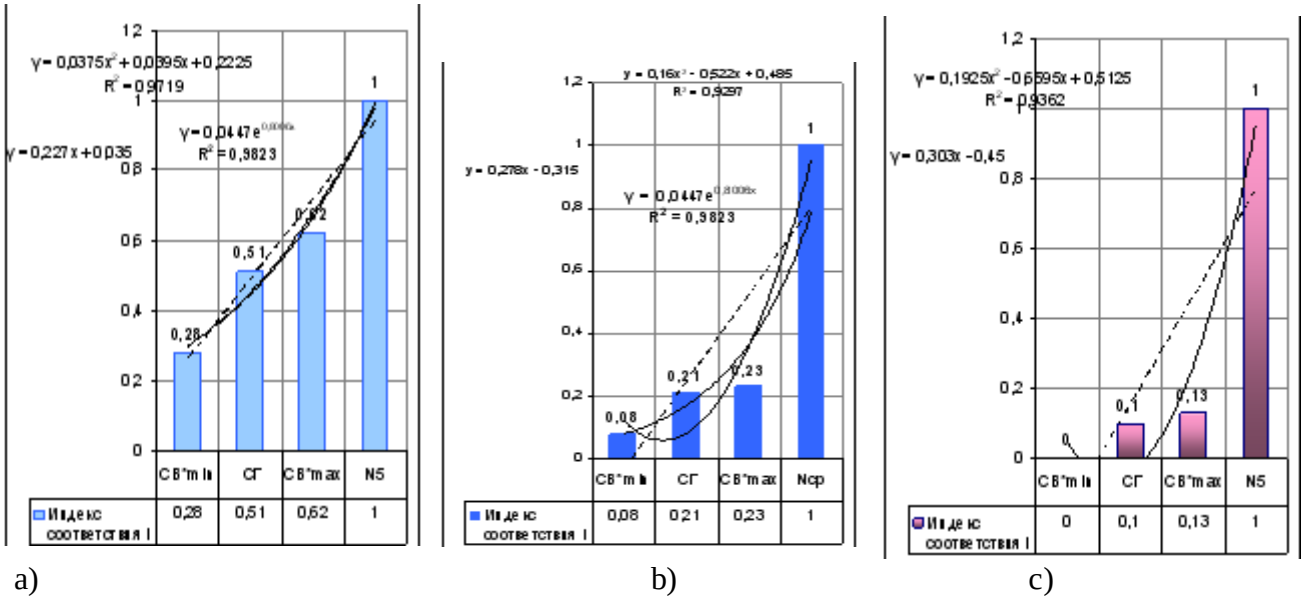

a) b) c)

Fig. 6. - Statistical "experiment - a comparative histogram of the dynamics of the CSS Process: (a) relative to Nmin; b) relative to Nmean; (c) with respect to the Nmax state.

Thus, as a result of solving problem (3), it turned out to be possible to detect a general trend (an independent mathematical indicator) - coefficient "b", with which it was possible to determine "Governing", maximum state in paired regression (N-state). To solve problem (3), classical methods and techniques (graphical, computational, logical) and the Excel application were applied. To solve the methodological problem (4) on the basis of only general scientific and mathematical methods and methods, technical means (workstation of the simulator and Excel application), a systematic methodological complex (system) of mathematical research support has been formed (Shidhara, 2002). This support system is built on the principle of "task - methods", based on applied tasks, which allows us to consider this complex as universal:

A. Technical means used to solve the research objectives:

1. Workstation of a professional training complex (providing for the independent collection of digital information from the monitor screen): Collection of the initial empirical (statistical) database.

2. Excel universal software application: (a) Analytical calculations (estimated, resulting) calculations; (b) Graphical constructions (visual mathematical representation of the results).

B. Mathematical methods applied in the research Problem:

1. Data pre-processing: descriptive statistics; frequency analysis; grouping method:

2. Definition of the criteria-classifier of states Analytical data processing: (a) analysis of statistical relationships and interdependencies of structural indicators: (b) analysis of vibrational series; analysis of variance; graphic regression analysis; (c) index analysis; (d) verification of statistical hypotheses (VSH); (e) calculation of coefficients - determination, elasticity [13].

3. Statistical analysis: (a) analysis of the series of dynamics; (b) graphical methods; (c) structural shift analysis, in the simulated Process.

C. General scientific methods applied in the Research Objective:

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Analysis and synthesis; hypothesis; measurement; comparison; filtration; formalization; observation; idealization (thought experiment); abstraction and concretization; induction and deduction; generalization; modeling.

A distinctive feature of traditional applied (psychological, in particular) research is that the entire analysis is carried out based on mathematical methods and techniques. This made it possible to obtain a number of general trends and patterns in the development of the CSS process, namely:

1. The development of the Process "CSS" (Carlos, 2010) is similar in shape to the parabolic form of the trend.
2. Development as a process of CSS: (a) has the character of a nonlinear and ambiguous structural shift; (b) possesses presumably the ultimate (stage finite) development of the CSS Process; (c) we observe indirectly, through indicators: (a) the coefficient of relative structural shift d; (b) pairwise regression coefficient b (slope, “speed” of the trend line); (c) f (distribution density X) (Rigatos, 2010).
3. Hypothetically, “control” of the process of CSS is possible "Impact" on the pace (indicator d of the structural shift) by the complexity of the requirements

- an ideally abstract N-basis state (maximum in its intervals of absolute values of individual X-parameters), similar to the well-known technical "winch mechanism" [14].

3. THE RESULTS AND DISCUSSION

The primary result is that this systematic mathematical solution is broadly applicable, and the current classification of state standards can be replaced by a similar set of indicators reflecting an individual's characteristics as a professional.

Therefore, we can make generalized results that:

The process of development of CSS can be modeled statistically, analyzed using mathematical and statistical methods, provided that there is a digital database and the applied criteria for classifying states specified in the form of mathematical conditions.

This broadly applicable mathematical solution can replace the current state standards classification with indicators reflecting an individual's professional characteristics. Consequently, CSS development can be statistically modeled and analyzed mathematically, given a digital database and mathematically defined classification criteria.

4. CONCLUSION

Thus, the goal of this stage of the study is achieved - the mathematical solution of the pedagogical (educational) problem: the development of ensuring the study of the laws of the process of developing “managerial ability” as a professionally important quality (fundamental in professional selection for activities in particularly difficult decision-making conditions).

The software is universal methodologically, and the estimated applied methodology “Psychological Compatibility” can be replaced by a similar set of parameters reflecting the property of a person as a subject of professional management activity, a potential subject of developing scientific self-education. Universality turned out to be possible in the conditions of technical availability of collecting a digital database, which can be easily replaced in a similar study by a complex of physical, physiological, or psychological complexes of parameters related to methods for assessing the professionally important qualities of a “subject of managerial activity”. This will allow, only by changing the complexes, to design of similar research and

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development tasks in the programs of scientific self-training for managerial personnel. Today, universities do not offer management training programs at the scientific level of qualification.

The axiological and valuable result of the study is shown: based on a general scientific methodology, applied technical means (workstation simulator for students), and classical mathematical and statistical methods, the initially posed task of studying the patterns of development of "managerial ability" received a mathematical solution (both processing and analysis of the result).

The ontological aspect of the result is shown: to understand the potential educational (actually aimed at personality development)

“Subject of management” as a professional) in the direction of professional managerial training, it is necessary to understand the general principles and bottlenecks (limits) of the development of fundamentally different qualities (properties) - physical, physiological, etc. It is obvious, clear, and that interpectoral studies of management problems are possible only on comparable results.

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