ON DEVELOPMENT CAPABILITY

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Abstract Purpose of the text is to study a concept of development capability and possibility to express it quantitatively. Concept of organization's development is shown as process of eliminating gaps encountered by organization. A mathematical model of "problem cleaning" is used. It is shown that: There is a mathematical model of closing development gap, which involves characteristics of gap, of resources and parameters of development process. There are four quantities that determine performance of development process. They refer to organization's characteristics that are set by the strategic management. Model illustrates impact of strategic decisions on effectiveness of development and shows that "time to gap" is one of key factors that determine development capability.

Paper type: Research paper

1. INTRODUCTION

The word 'development' is used to denote wide range of phenomena which involve certain change. It can be used as a synonym for: growth of prosperity (economic development), maturation (physical and mental development of a child), improvement (technology development), increase of the complexity (system development), etc.

Generally speaking, "organization development is an ongoing, systematic process of implementing effective organizational change". There is a wide spectrum of phenomena which are related with organization development. Examples of organizational development may include such phenomena as:

- Transition through definite phases of organization's life cycle,
- Recovering from crises (economic cycles),
- Transformation programmed by organization's strategy,
- Transformation being response to change of economic system.

Deliberately initiated. development changes may be related with attempts to meet the objectives set by the management or to avoid some risk or to seize some opportunity. It is indisputable that key factor, which enables organization to develop are resources. They are limited in access and are shared among various functions of organization. Development potential is represented by resources and standards of their control that can be used in development and have significant impact on ability to develop (Stabryla, 2004, p. 276) .

Specific resources are people in organization. Development changes are in close relation with transformations in people's attitudes and relationships between them. The dynamics of groups of people can be both a consequence and a factor contributing to the development of the organization. Ability to develop expresses adaptability (organization's intelligence) and innovation. Representative and the creator of this approach is K. Lewin (1898-1947), who initiated research on "groups dynamics" and "action research".

Development is a specific kind of change process. It is oriented on closing gaps and therefore is located in circumstances that trigger the change. However the organization that takes on a change is subject to all adverse impacts that are typical for change management. Seen from viewpoint of organizational ecology, change has positive aspects: enables adaptation and survival, but is a source of risks (Brown, 2002). Business environment selects out optimal organizational traits (Hannan & Freeman, 1977). Selection process favors "reliability" and "accountability" in organizational forms (Hannan & Freeman, 1984). Institution theory warns that institutional pressures are a major source of resistance to organizational change (Greenwood & Hinings, 1996).

The subject of considerations is a general class of development processes that take place in organizations. The purpose is to analyze the way in which development resources contribute to changes in the effectiveness of the organization development.

We show that the efficiency of the development process depends on the adequacy of available resources to predicted work-load related to elimination of gaps.

In the section "Development process" idea of development as process of gap elimination is studied. Concepts of state, development gap and relevance to literature definitions of development is discussed.

In the section "Development capability of organization" a model of development by closing gaps is presented. It is a dynamic process which employs "development" resources of organization to eliminate the development gaps faced by the organization. Efficiency of gaps removal can be described by linear ordinary differential equation of the first order (equation of "problem cleaning"), which parameters are those of the development process.

2. DEVELOPMENT PROCESS

Concept of organization can be perceived from many perspectives which are equally important. It can be considered as an object (organization), which is a result of some function (organizing) and which attains certain level of structure com-plexity (organization) (Kozminski, 2007, p. 29). Organization (in the sociological sense) is a social entity that has a collective goal and is linked to an external environment.

Formally, the organization's development consists in attaining higher level of organization. However, it is just pure semantic game. It cannot explain the substance of higher levels of the organization, or what would result from it.

2.1. State of the organization

A concept of state of organization, is to represent the minimum set of variables that describe the organization that are necessary to determine the characteristics of the dynamics of the organization function. It is also to express changes in organization.
Variability characteristics of organization's state
By the Pareto principle, there is a finite set of processes in organization, which are important for achieving organization's objectives. For this reason, one can distinguish finite number of factors, which determine systematic variability of function's characteristic (Myszewski, 2009). Conditions in an organization can be represented by two sets of factors, which will be referred to as components of organization's state description
   • regular component = (finite) system of factors that generate systematic variability of characteristics of functions performed by the system,
   • chance component = (infinite) system of factors that generate random variability of characteristics of functions performed by the system.
Description of state refers to probabilistic terms: variability causes, characteristics of distribution. It reflects the contribution of randomness in

organization's processes. The randomness is an inherent feature of resources and effect of imper-fection of standards used in the resources control – phenomena are not known well enough to control them effectively.

Equilibrium state

Equilibrium state = state of the organization, in which factors contributing to the regular component of the state are held at fixed levels (common causes are the only source of variation). Equilibrium state represents the so-called "constant conditions" in organization. Inequilibrium state is a state of the organization, which is not a state of equilibrium. The variability of characteristics of some function in this state has a systematic component.

The transition from the state of inequilibrium to equilibrium is associated with the appearance of the stabilizing effects of systematic variation generators.

2.2. Gap – a driver of development

The development of organization is determined by challenges, which the organization is facing, and consequently by actions that are taken in response and effects of these actions. Without reference to the specific challenge it is impossible to assess the adequacy of measures taken. Challenges in the following discussion are represented by the development gaps. Figuratively speaking, they describe the size of steps of stairs that lead the organization through the development.

Development gap = deviation of the desired state (potential) from the real state of company (real achievements) (Tchórzewski, 1992, p. 342), (Fabiańska & Rokita 1984, p. 106).

Characteristics of gap

A gap between two states of organization = ordered pair of states of the organization, with current state of the organization as first and second assumed as reference one.

Any fixed object used to represent state of the organization can be a reference state. It may be some mental construction - representing a desired vision of the organization. It provides an answer to the question of what the organization should be: in the future (strategic vision), or now, taking into account the opportunities and risks of internal and external conditions of its operation.

A gap is used to describe a distance between current and reference states. For any function of organization, it can be described by

- span of the gap – a measure of distance between function's characteristics in compared states,
- distance between the compared states – a characteristic of difference between sets of factors that constitute the initial and final states.

Gaps are evoking some geometric intuition associated with climbing. The distance between the states represents the "length" of step and the span of gap – its "height".

Development gap

Study of gaps may provide valuable diagnosis of terms of organization's operation. Among infinitely many various reference states that could be considered at the moment, relatively few of them provide information crucial for management. The importance of information related to the gap depends on the choice of reference state. Its value is associated with consequences of closing the gap, or alternatively, not taking the action to eliminate.

As significant, associated with some opportunity, can be considered reference states, for which closing the gap would improve organization's performance, if current performance is not at significant risk in the near future. However, if closing some gap could enable to avoid serious risks to the organization, the reference state and respective gap deserves special attention as critical ones.

A term "development gap" is used to denote gaps, which are significant or critical for the organization. Natural tool of gap analysis (to identify significant and critical gaps) is a risk analysis.

Development gap modes

We assume that the essence of development is to overcome development gaps encountered (Tchórzewski, 1992, p. 342), (Fabiańska & Rokita, 1984, p. 106). The variety of possible forms of gaps reflects the diversity of ways of defining organizational development. Sources of gaps may be various decisions and events outside the organization or internal.

PROPOSITION 1 (characterization of gap modes): Particular gap modes can be associated with specific modes of development process.

- Source of gap: environmental changes; Development of business are coordinated changes in the company's systems, adapting them to a constantly changing environment (Rozwój przedsiębiorstw, 2002, p. 7), (Pierścionek, 1998, p. 147).
- Source of gap: goal to be achieved; Development of business means a presence of qualitative changes, provided they have been rated positively in terms of the achievement to which they relate (Rozwój przedsiębiorstw, 2002, p. 17)
- Source of gap: vision of organization; Enterprise development is a process of widely perceived qualitative changes, considered from holistic (overall global) point of view. It can be either intentional or accidental, progressive or regressive, spontaneous or forced, continuous or discrete. Along with the process of company development, it is increasing its capacity to influence the environment (Machaczka, 1998, pp. 13-14)
- Source of gap: goal refering to competitiveness; Development of business is to change the systems and (controllable) environment to provide that company achieves and maintains (and increase) the competitive advantage (Pierścionek, 1998, pp. 12, 147).

2.3. Classification of gaps

Gap of type I - regularity in development

Gap of type I = ordered pair of real equilibrium states. It represents a difference between two different states of equilibrium in the same organization under different conditions (e.g. operating in winter and summer) or in two different organizations.

The main feature of gap of type I is that compared conditions (system of factors) are established on a ground of one or two collections of explicit knowledge. Thus, measures to close the gap can be deduced from the combination of the knowledge.

Gap of type II - rationality in development

Gap of type II = ordered pair of states, with reference state represents some theoretical construction. Reference state represent theoretical constructions – strategic plans, expert opinions and predictions. Represent hypotheses about the opportunities for development.

There are some risks related to closing the gap. There may be no empirical evidence that implementation of reference state will be equilibrium one. Strategic vision may be pure fantasy, and expert judgment may contain significant errors in both the diagnosis and the design vision of the organization. There may be no transition from the actual state to the reference state (state may be not achievable in finite number of steps with available means).

Gap of type III - chaos in development

Gap of type III = ordered pair of states in the organization in which the initial one is an inequilibrium state. The consequences of the inequilibrium state are unwelcome, therefore a transition into equilibrium state is expected as soon as possible.

Reaction on the gap of type III may be symptomatic for assessment of capability of development process. There are two ways to react. Taking a challenge means closing the gap. This consists in permanent eliminating source of inequilibrium, by establishing stabilization measures. Recovering equilibrium without eliminating source by containment action just postpones the gap for the future. Eexcept for cases when it is economically or technically justified, it shows that gaps are perceived as nothing but troubles.

3. DEVELOPMENT CAPABILITY OF ORGANIZATION

"In the literature, there is no universally accepted and coherent concept for explaining the essence of the conceptual category 'development capability of company'" (Bieliczyński, 2010, p. 66).

3.1. Development capability – scope of meaning

Literature selection quoted in (Bieliczyński, 2010) provides a bundle of possible meanings attributed to the development capability in Polish literature. According to the authors cited, the development capability of company:

- is an aggregated measure of the strategic potential of enterprise (Stabryła, 2008, p. 39), (Stabryła, 2004, p. 276).
- expresses the willingness of a company to identify and take such actions lead to qualitative changes that will enable the implementation of the strategy development and competitive advantage (Sysko-Romanczuk, 2005, p. 54).
- is subject to categorization. An example could be the following gradation: a distinctive condition (6), the state of high fitness (5), good condition (4), average condition (3), acceptable (satisfactory) condition (2), unsatisfactory condition – inability (1) (Stabryła, 2008, p. 399).
- is the exponent of the value of its strategic potential, expresses the possibility of creating enterprise wealth and creating value for stakeholders and creating progress in various fields of activity. It expresses the economic value but also the value for the customer, the utility value of product and standards of human behavior (ibidem).

Worth of notice is no reference to social aspect of organization development, related to works of Lewin and others.

Development capability – as attribute of potential

From analysis of the above ideas the following vision of means to ensure development capability can be formulated.

PROPOSITION 2 (general procedure of ensuring development capability). The following functions are contributing to the organization's development capability:

- Identifying opportunities to make changes in various areas of the organization,
- Maintaining resources and methods of their use necessary for accomplish change,
- Implementing changes to exploit opportunities,
- Measuring and consequently, modifying the above factors.

As reference, will be used the following formulation: Development capability of company is a measure of the value of its strategic potential. The strategic potential of enterprise are tangible and intangible resources and skills that have a significant impact on the development and competitiveness (Stabryła, 2004, p. 276).

Development capability – as attribute of strategy

In the previous section, idea of development as a process of closing development gaps was deployed. A direct consequence is the following definition. "Development capability is the ability to eliminate gaps encountered". A measure of the ability may be probability of having a gap from specified class eliminated, if it occurs.

The definition shows that assessments of development capability involves some concerns:
- Risk of failure
- Challenges related to gaps
- Uncertainty related to predicted gaps and to development potential of organization.

Capability assessment involves prediction of needs and opportunities related to state of organization in the future.

PROPOSITION 3. Role of factors that determine ability to develop depends on length of predicted time to closest gap;
- the longer distance to potential gap, the more chances to close it with smaller resources. See model of problem cleaning
- short time and particular gap. Key factors: capital/resources and data on potential gap mechanisms and the measures needed to close the gap;
- long time and unspecified gaps. Key factor: intellectual capital, economic and financial standing.

3.2. Modeling of development capability

There are (at least) two methods of assessing development capability of the company (Stabryła, 2009, p. 598):
- quotient normalization: it is to measure the potential of strategic enterprises,
- partial aggregation: point (specific) aspects of capability of development are the criteria for assessing.

Below, we show a development capability model by equation of "problem's cleaning".

Model of „problem's cleaning" – Myszewski

Objective: To represent impact of gaps, improvement (strategic) resource and standards of control these resources on effectiveness of development process.

It is assumed that for each development gap a project is launched. Closing the gap consists in elimination of series of problems with average number P. If it ineffective, then some problems remain unsolved and are counted as outstanding problems with average Q. There is some amount of resources allocated to the project with average R.

Averages are established upon observation in time intervals of the length h relatively short comparing to the length of the whole project. It is assumed that P and Q are constant for the whole project.

Resources allocated to the project are depleted by various phenomena. Due to organizational shortcomings an average amount $(1-c) \cdot R$ of available resources is wasted). $u \cdot R$ is amount of resources absorbed by containment and other secondary problems. R/x is average number of problems which can be eliminate with resources, provided it could be used free of loss.

Equation of „problem cleaning"

The main components of this model is the equation of "problem cleaning" and functions that represent specific aspects of the elimination of gaps.

Average number of outstanding problems satisfies the following equation:

$$Q' = (1+u)\cdot(Q+P) - (c/x)\cdot R \tag{1}$$

$E := c/(x(u+1))$ is an efficiency of problem cleaning process;

$A := E\cdot R - (P+Q(0))$ is an adequacy of resources used in problem cleaning; it is an indicator of effectiveness of problem cleaning

With fixed values P, R α, β a solution of the equation (1) is

$$Q(t) = Q(0)+A\cdot(1 - exp^{(1+u)\cdot t}) \tag{2}$$

STATEMENT 1. The function Q can be one of the three types:

- decreasing (problems are effectively eliminated), if $A > 0$
- growing (the process cannot cope with problems), if $A < 0$
- fixed (new gaps are eliminated to date, but it is not sufficient to eliminate the outstanding problem), if $A = 0$.

The characteristics of the process of eliminating gaps

STATEMENT 2. Variables: $P+Q(0)$, A, E and R represent four aspects which decide on effectiveness of "problem cleaning" process.

- average number of problems $P+Q(0)$ shows the challenge, which the "problem cleaning" is to cope with,
- average amount R of improvement resources represents costs related to "problem cleaning",
- adequacy of resources A is a key indicator of effectiveness of "problem cleaning" process,
- efficiency E of problem cleaning process is a key factor to control costs of problem cleaning.

Resources consumption related to closing gap

Assume that given some fixed development gap, a project to close the gap has been established. Estimated total number L of problems to be solved within the project is deployed into a sequence of tasks: $L = \Delta L1 + .. + \Delta Lk$. ΔL_i denotes a number of problems assigned to the *i-th* task scheduled to time interval of the length *T (i=1,2,..,k)*. ΔL is an average number of comparable problems assigned to one of tasks. Assume that *Q(0)* is a number of outlying tasks at moment, when implementation of closing gap was started.

PROPOSITION 4 (minimal resources). If ΔL is an average number of comparable problems assigned to one of tasks, then the minimum average amount

of development resources necessary to close the gap is given by the formula $R > (\Delta L + Q(0))/E$.

Sketch of the proof: with assumptions and symbols as above, we have $A > 0 \Leftrightarrow R > (P + Q(0))/E = (\Delta L + Q(0))/E$.

Corollary 1 (optimal schedule): Given any fixed amount of resources R (not necessarily sufficient),

- a maximal number of problems assigned to one task of duration T is $\Delta L = E \cdot R - Q(0)$, and
- average time to implement elimination of gap is not bigger than $T \cdot L/(E \cdot R - Q(0))$.

Sketch of the proof: Assume that we are going to establish an average number ΔL of problems assigned to one task. It is expected that problems will be eliminated effectively. $A = R \cdot E - (\Delta L + Q(0)) > 0 \Leftrightarrow \Delta L < R \cdot E - Q(0)$.

If k is number of tasks scheduled in the project, and $L = k \cdot \Delta L$, then we have $k = L/\Delta L$. If we take the above ΔL then $k < L/(E \cdot R - Q(0))$.

Corollary 2 (improvement in development): There are two basic factors to reduce amount of development resources necessary to close the development gap:

a. to increase efficiency E of development process and

b. to improve effectiveness of identification gaps and reduce delay in starting procedure of gap closing.

Sketch of the proof:

Ad a.: The bigger the efficiency E, the bigger the number of problems, which can be assigned to one task of the duration T, the shorter overall time kT necessary to implement the whole project.

Ad b: The earlier the project is implemented, the lower a number of outlying problems $Q(0)$, the bigger a number of problems that can be assigned to one task of duration T, the shorter is overall time necessary to implement the project.

4. CONCLUSION

"Time to gap" turns out to be one of key factors, which contributes to development capability.

- If there is sufficient reserve of time, then it is possible to plan and implement a development project with tasks which are less resources – consuming.
- The earlier the development project can be started, the less resources may be necessary.
- The more advanced is process of improving the development process, the bigger the overall efficiency E of development process, the smaller amount of.resources is necessary to ensure effectiveness of development.

- The shorter the time estimated to next gap, the bigger role of economic and financial standing and level of technological progress.
- The longer the time estimated to next gap, the bigger role of intelectual capital, which can be used to close potential gaps related to financial standing and level of technological progress.

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