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A procedure for evaluating development potential in the area of production capacity

K e y w o r d s: development potential, measures of development potential, quality analysis, categorization

S u m m a r y: Development potential understood in a general sense is a criterion for assessing a given system (companies, institutions or the national economy), measuring the possible achievement of projects at a high level of effectiveness and the ability to increase wealth and stimulate growth in various areas of activity (reflecting the value of strategic potential).

The paper presents the characteristics of a company's development potential and its measurement at the level of a multi-criteria analysis. This formula is presented in the context of qualitative research which is referred to different assessment criteria.

Because of the diversity of primary criteria and sub-criteria, development potential estimations are based on aggregate qualification. It results from the fact that development potential can be considered from the perspective of partial components or as an aggregate. The author proposes IPX_j as a measure for estimating development potential. It refers to a company's production capacity which can be estimated at different qualitative levels: considerable potential, satisfactory potential and the lack of potential.

1. Introduction

The objective of the paper is to present the concept of diagnostic analysis focused on evaluation of development capacity of a company.¹ The production potential constitutes the reference for this estimate, which may be qualified, on the basis of the

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¹ This paper is prepared within a research project financed with the funds of the National Centre of Science, awarded with the decision no. DEC-2011/03/B/HS4/03585.

evaluation procedure, in the following quality levels: significant development capacity, sufficient development capacity, no development capacity.

The basic theses of the presented concept are as follows:²

1. Development capacity is the main criterion for assessment of the actual condition of an organization and functioning of a business, as well as related to projections of possibilities of dynamization of company's business activities in a short-term or long-term planning horizon.
2. Development capacity may be viewed in partial forms (corresponding with the basic and auxiliary assessment criteria) and in the aggregated (synthetic) formula.
3. Aggregated value of development capacity in the proposed procedure is expressed with the index of development capacity IPX_i .
4. Selection of assessment criteria in the evaluation procedure is determined by the specific nature of the examined organization, that is a company, an institution, a social and economic system, or a region (1; 2; 3).

The issue of company development is perceived in the most general view in five characteristic dimensions: economic, organizational, personal, in terms of informational as well as technical and production aspects. These dimensions may be considered in their strict meanings, but we will often assign some extended scope or context to them. The examples come in the form of these dimensions: economic and social, organizational and legal or production and logistics. All these dimensions and their modifications and combinations constitute reference platforms for management systems and processes which shape operational activities and business development.

The realms of changes and development are the correlates of individual dimensions, these being the areas which include specific references for the form of development capacity. For example, in the realm of changes and economic development, financial development capacity is the characteristic class, manifesting in specific forms of, among others, return on assets, creditworthiness, processes productivity, excess costs indexes. Similarly, in the realm of changes and personal and technical development, the intellectual capital class is presented in which development capacity may be represented by such features as: author's property rights, related rights, licences, concessions, rights to inventions, know-how (specialized knowledge in a field of industry, science, organization), successful development works.

The above comments indicate variety, difference and multitude of forms of development capacity of a business, which produces a problem of the need of aggregation of individual (partial) forms of development capacity of a business. This need results from the necessity of applying the principle of systematic approach in diagnostic (as well as design) studies. The essence of aggregation may be expressed as follows: a method which consists in syntheses of heterogeneous, partial forms of development capacity into one unity. Aggregation allows the possibility

² This paper explores the issues of quality research in reference to development process: Stabryła (4; 5).

of conducting a comprehensive assessment of a business, as well as strategic alliances, international commercial integration, organizational and financial restructuring, outsourcing and other.

2. The term of development capacity of a business

Generally understood *development capacity* is a criterion of assessment of the given system, which is the measure of possibility of execution of enterprises at the level of high effectiveness and it expresses the skills of multiplying assets and creating progress in various areas of activities (which corresponds with the value of strategic potential). The term *system* used in the above definition is broadly interpreted and may mean a company, national economy, political and economic block.

Development capacity is marked and classified for the given value dimension, e.g. economic and financial, market, competitive, innovative. These dimensions determine particular forms of development capacity.

In reference to the above interpretation, development capacity may be analyzed in partial (detailed) forms and in the aggregated form. The following are some examples of partial forms: organization of activities, competitive capacity, intensity of international exchange, productivity of labour costs, creativity, external innovative capital, self-financing capacity.³

Aggregative development capacity is a synthetic criterion of assessment of the value of manufacturing potential of the given system, which merges partial (detailed) forms of development capacity into one formula. Production potential is the condition and dynamics of the entirety of material and intellectual resources, practical skills (expertize) and efficiency of activity, that is all the factors which determine functioning of a business. One has to remember that production potential is in a narrow meaning referred only to the operational realm.

3. Dimensions of company development

As it is stated in the preliminary comments, company development is determined by the following basic dimensions: economic, organizational, personal, informational and technical, and production. Detailed by the corresponding realms of changes and development, these form one base within which different variations of development capacity are formulated.

Economic dimension is defined mostly by effectiveness of management over production factors of a business and by management over investment projects and market enterprises. This dimension, just like organizational dimension, very clearly per-

³ Partial (detailed) forms are complex or simple assessment criteria for development capacity.

meates and merges with other dimensions, because economic effectiveness is the primary directive of market economy. Moreover, economic criteria are universal conversion factors for various and often hardly comparable forms of efficiency of activity which are used in assessment of a business and its subsystems.

The realm of changes and economic development is mostly made up of production potential, financial policy, market and marketing, company restructuring. The basic research tool in this area is strategic analysis and economic analysis. It is usually expanded with methods in the fields of organization and management. This applies to such areas as current assets management, work systems, economic programming and planning, motivational systems, supervision and control procedures. This combination is useful not only in diagnostic research, but, in particular, in design work.

Organizational dimension refers to the structure of the management system, production processes and administrative work, behaviour patterns of human teams and adaptation processes, information resources, material production factors and other. Each type of resources, structures, processes or factors then becomes the realm of changes and organizational development, while transformations related to them consist in:

- modifying or creating new company objectives (which corresponds with innovativeness);
- perfecting organizational structure;
- allocating work and specialization;
- selecting production factors;
- coordinating activities in the scope of company functioning;
- preparing conditions for economic cooperation;
- adapting to the rules of competitive market game;
- concentrating business activities.

Personal factor is another dimension of changes and company development. It is found in two areas: the first is the community of company employees, the second is the personal composition of particular organizational units, as well as a single employee. As these areas obviously overlap, they may be regarded as the unity of a system of human resources.

Human resources constitute *the realm of changes and personal development*, and their transformations are determined by:

- employee mobility;
- work performance and production capacity;
- work atmosphere;
- professional qualifications of employees and the system of occupational and managerial careers, potential of knowledge;
- quality of work;
- labour costs and administration costs;
- human capital.

The realm of changes and personal development defined as above is a broad field of management in which take place both employment policy and work organization as well as problems of motivation and development of human behaviours in a company. This area is of strategic significance under any conditions because it always decides about innovativeness and economic growth. Personnel development is the area of management which is best related to broadly understood organizational development.

Information factor is another dimension. *The realm of changes and information development* is determined by the function of preparation of managerial information and communication function. Managerial information is focused on identification, diagnostic and decision-making tasks due to the need of satisfying information needs of the management. The communication function is responsible for communication. The process of communication is determined by the following partial functions: recording and storing of information, hierarchization, processing and transferring information.

The discussed realm includes also the field formed with software and technical equipment. Usability of the system of managerial information is the measure of effectiveness of the whole realm, which means its importance for the management and for other management institutions.

The technical and production factor is the last one of the emphasized dimensions. This realm is mostly determined by:

- research and development (R&D);
- quality of goods (services);
- operational activities.

Research and development is the term which mostly refers to scientific research work (applied studies) and technical preparation of production. R&D is the first stage of life of the product which determines its functionality and modernity. In a broader meaning, R&D is interpreted as a complex of actions in all fields of company activities (and not only in the field of engineering work) aimed at achieving profits and winning a strong competitive position in the market.

Quality of goods (services) means their technical and usability level. Exhibiting ‘quality management in a company’ is defined by the following functions: quality control, change management and coordination of all organizational units which affect quality, quality information system management, marketing and product development, quality control.

Operational activities in production apply to the operational system. They include both the basic and auxiliary and logistic processes. They constitute the most expanded area of company activities, in which the effects of the adopted management strategy are ultimately reflected.

The above functions combined create the realm of changes and technical and production development. It includes the area of scientific and technical progress and quality development of the product. It focuses innovative processes which consist in

introducing original design and technical and organizational solutions to production. The basic feature of innovation is creating novelties on the one hand and its practical application on the other hand. Technical and production development refers also to diversifying products and their modernization.

This realm is strongly intertwined with others, especially when development defined in the context of economy based on know-how is taken into consideration.

4. Examples of forms of development capacity of a company

The following is a review list of standard forms of development capacity of a company and the summary of forms of development capacity of a company in the knowledge potential class.⁴ (Note that forms of development capacity are equivalent to assessment criteria.)

A. Standard forms of development capacity of a company

- 1) company competitiveness (competitive capacity);
- 2) competitive position of a company;
- 3) index of assessment of key competencies of a company;
- 4) assessment of market conditions;
- 5) financial interpretation of development capacity of a company (creditworthiness and other);
- 6) organizational effectiveness (synergy effect, coefficient of organizational effectiveness);
- 7) leadership capacity;
- 8) creativity (innovativeness);
- 9) productivity of human capital;
- 10) learning capacity (adaptation skills);
- 11) the level of flexibility of an organization;
- 12) balancing capacity;
- 13) the level of technology modernity;
- 14) quality and modernity of products.

B. Summary of forms of development capacity of a company. Class: potential of knowledge

- 1) group solving of problems;
- 2) barriers in sharing knowledge;
- 3) frequency of database updating;
- 4) sharing knowledge with cooperating parties;

⁴ Knowledge potential is the set of human substantial competencies (education potential and creative skills) and practical skills (experience) and effectiveness of operation.

- 5) usability of IT systems;
- 6) degree of information system advancement;
- 7) tools supporting knowledge management;
- 8) knowledge of information technologies;
- 9) research and development activities;
- 10) registered and delivered patents and trademarks;
- 11) cooperation in the scope of development;
- 12) expenditures for training events;
- 13) degree of computer equipment support for workstations;
- 14) internal communication;
- 15) development of employee potential;
- 16) appropriateness of IT system use;
- 17) sharing knowledge with clients;
- 18) training duration.

5. Stages of research proceedings

The proposed research proceedings for evaluation of development capacity of a company includes the following stages:

- I. Determining the scope of research.
- II. Formulating assessment criteria for development capacity.
- III. Determining weights of assessment criteria for development capacity.
- IV. Measuring the quality level of development capacity:
 - 1) conducting aggregated check assessment;
 - 2) calculating index of development capacity IPX_i ;
 - 3) categorization of IPX_i index.

Characteristics of the stages is presented below.

Stage I. Determining the scope of research

The adopted scope of research is the production potential of a company, represented in the actual condition of its organization and functioning.⁵ The production potential constitutes the basic reference for assessing development capacity, and its scope may be considered as partial or full. Partial scope corresponds with various type classes, such as human potential, financial potential, technological potential, logistic potential. The selected classes shall be regarded as parts which, taken together, create the full production potential of a company. Thus, any type class may be the subject of analysis (viewed separately) or the full potential.

⁵ Production potential represents the main field of company operations, although other areas may also be named, like the area of social responsibility, the area of political and capital relations and impact, the ethical and cultural area.

Production potential viewed partially or fully may also be considered and determined from the point of valuating view, with the already achieved results taken into account, but also those which may be achieved in the future (6; 7). Such results are, among others, economic, social, ergonomic, operational (material and technical), intellectual and research (conceptual), managerial (planning, decision-making, organizational, control and other) results.

Production potential may be made hierarchical as follows:

- as strategic potential;
- as elementary potential;
- as degraded potential (secondary).

It means that production potential (full or its type classes) may represent a different level of quality, not necessarily assessed positively. Strategic potential indicates that the company has significant resources and skills and features full effectiveness of operation.⁶ Elementary potential reflects satisfactory condition of resources, skills and efficiency of operation. Degraded potential (secondary) indicates unsatisfactory condition of specific factors. Measuring and hierarchization of production potential are effected with the *IPX_i* index of development capacity.

Stage II. Formulating assessment criteria for development capacity

At this stage, assessment criteria are selected which are diagnostic measures. In comprehensive analysis, structure of assessment criteria should be varied, but individual criteria should also be complementary. The basic problems of this stage are determining type and number of criteria because these are the issues which determine comprehensive nature and accuracy of diagnostic analysis.

The following Table 1 presents a proposal for development capacity assessment criteria. There are seven basic assessment criteria with sub-criteria assigned. The latter perform the role of calculation (interpretation) keys which make the measurement more precise. The given assessment criteria may be expressed in absolute or relative values, as well as in a nominative way (with names). For the need of their aggregation, employing a standardization procedure will be required (e.g. scoring).

⁶ Strategic potential thus means the level of creative potential which is considered satisfactory from the point of view of the capacity of increasing the value of the company and dynamizing its specific functions.

Table 1

Assessment criteria for development capacity

Description
<i>(1) Organization of activities:</i> – cohesiveness of the organizational structure; – required employment level; – degree of integration; – functionality of procedures; – level of feasibility; – failure rate.
<i>(2) Competitive capacity:</i> – relative share in the market; – price competitiveness; – distribution; – quality.
<i>(3) Financial development capacity:</i> – ROI; – ROE; – long-term debt to equity; – debt ratio.
<i>(4) Globalization:</i> – significant territorial range of production, trade, logistic and other operations (worldwide, continental, regional); – market community (common access to the market); – universal technology (transnational specialization of production); – legal, organizational, monetary, fiscal uniformity.
<i>(5) Level of business activities:</i> – product development and sales dynamics; – concluding international (export) transactions; – joint enterprises and direct investments; – transfer of capital and scientific and technical thought; – funds obtained from the EU and NCBiR (National Centre for Research and Development).
<i>(6) Knowledge potential:</i> – competencies, advances in science and technology (innovations, R&D) in particular company subsystems; – technologies; – databases and knowledge bases; – copyright law and invention law; – communication.
<i>(7) Level of technology readiness:</i> There are nine (I to IX) levels of technology readiness (8).

Source: Author's own research.

Stage III. Determining weights of assessment criteria for development capacity

Selection of preferential premises is the basis for determination of weights. These are points of reference (planes, dimensions, reasons) according to which validity of assessment criteria is determined, hierarchizing them by assignment of ranks or points. Ranks and points are used to make criteria relative or sequenced (in the sense of a majority, minority or equivalence relationship).

Preference premises are selected in correspondence with the scope and substantial meaning of the conducted research. Various determinants are taken as preference premises which are tangible or intangible values. These may be, for example, economic, organizational, technical, social premises, as well as situations or circumstances according to which weight (significance, meaning) is viewed of assessment criteria.

It has to be noticed that with the specific set of criteria taken as relevant (meaningful) criteria, their weights may be determined based on specific arguments. The latter thus constitute preference premises used to justify the weights adopted for relevant criteria.

After selection of preference premises, weights of assessment criteria are determined. Weights express significance, meaning, importance of a factor (these are measures used in a special way, because they are referred to assessment criteria). Preference premises perform the role of a touchstone according to which justification is offered why a specific weight is assigned to the given assessment criterion.⁷

The following scale is the example of weight values:

- 5–6 points: strictly necessary (dominant) criteria;
- 3–4 points: required (basic) criteria;
- 1–2 points: useful (good) criteria.

Stage IV. Measuring the quality level of development capacity

This stage includes three substages:

- 1) conducting aggregated check assessment;
- 2) calculating index of development capacity IPX_i ;
- 3) categorization of IPX_i index.

■ Conducting aggregated check assessment

Checking assessment is to indicate the degree in which the given system (company, institution) executes the assumed objectives and meets specific requirements (functions). Interpretation of the results and their trends is the basic issue in finding the proper check assessment.

The formula for check assessment is expressed with the ratio of the actual condition of the S system (company, institution) to the M master (master condition). The check assessment defined in this way is at the same time the tool for standardization of assessment criteria, with which aggregated assessment is possible (9).

⁷ To make weights objective, they may be determined as average of the weights awarded by experts (e.g. applying poll or questionnaire research).

Scoring aggregation standardization has been applied in the procedure of evaluating development capacity. It has been assumed that the template scoring for each assessment criterion is 5 points. It is the maximum value which is a reference point for the actual condition of the examined system. Scoring is at the same time the conversion factor for nominated quantity values, indexes and nominative assessments. The scoring chart for checking assessment is presented in Table 2.

Table 2
The scoring chart for checking assessment

Description	
Positive qualification (assessment degrees)	Scoring (positive scale)
I. Very good condition (distinguished)	5
II. Good condition	3 to 4
III. Satisfactory condition (acceptable)	1 to 2
Negative qualification (A) (assessment degrees)	Zero scoring
Ineffectiveness	0
Negative qualification (B) (assessment degrees)	Scoring (negative scale)
I. Limited possibilities condition	-1 to -2
II. Critical condition	-3 to -6

Source: Author's own research.

If the values of assessment criteria are quality nature, scoring based on conventionally interpreted relationship of similarities between the actual condition of the S system and the M master may also be used (Table 3).

Table 3
Quality relationships of similarities and their calculation into points (scoring standardization)

Qualification of quality relationships of similarities between the actual situation of the S system and the M master	Scoring
S is identical with M (or almost identical)	Positive scale and zero 5
S is moderately / clearly similar to M	3 to 4
S is sufficiently similar to M	1 to 2
S is completely different from M	0
S is antisymmetric to M	Negative scale -1 to -2
S is highly antisymmetric to M	-3 to -6

Source: Author's own research.

■ Calculating index of development capacity IPX_i

This index has the following form:

$$IPX_i = \sum_{j=1}^n w_j \cdot q_{ij}, \quad (1)$$

Where:

w_j —weight of j basic assessment criterion,

q_{ij} —check assessment expressed in points, referred to i company, due to j basic assessment criterion,

$i = 1, \dots, m$ —diagnosed companies,

$j = 1, \dots, n$ —basic assessment criteria.

The IPX_i index is calculated for the actual condition of the S system as well as for the M template. Check assessment q_{ij} is the simple arithmetic average from the sum of points assigned to particular subcriteria which are appropriate for the given basic assessment criterion.

■ Categorization of IPX_i index

Categorization is a research procedure which is aimed at determining the level of quality development of the examined system. The calculated score of the IPX_i index is the basis of categorization. Table 4 presents the example of categorization for development capacity.

Table 4
Categorization of development capacity (on the basis of the IPX_i index)

Basic and detailed categories	Main features
A. Master category (over 80%)¹	
Class A.1. Exceptional (96–100%)	– Level of significant development capacity;
Class A.2. High usability (90–95%)	– Strategic potential;
Class A.3. Good + (85–89%)	– Continuous improving and innovativeness.
Class A.4. Good (81–84%)	
B. Category of varied possibilities (50–80%)	– Level of sufficient development capacity;
Class B.1. Satisfactory + (65–80%)	– Elementary potential;
Class B.2. Satisfactory (50–64%)	– Financial and operational restructuring.
C. Unsatisfactory category (less than 50%)	– Level of development incapacity;
Class C.1. Labile condition (40–49%)	– Degraded potential (secondary);
Class C.2. Critical condition (less than 40%)	– Risk of bankruptcy; – Repair restructuring.

¹ Percentage values refer to the maximum value of the IPX_i index—M. The IPX_i index—S (referring to the actual condition) is included into one of the ranges as appropriate.

6. Conclusions

Research in and evaluation of development capacity is a special area of diagnostic analysis of company activities. It is a field in research proceedings which is aimed at assessment of progress in all or selected realms of company activities on the one hand, and at programming changes and development on the other hand.

The basic conclusions from the presented methodological concept are as follows:

1. Analyses of the aggregated development capacity are superior in significance to sectional analyses, in particular those which are only limited to assessment of economic and financial condition.
2. A system of assessment criteria developed with introduction of subcriteria in the evaluation (as well as attributes of efficient activities) facilitates development of causal analysis referring to factors which cause deterioration in development capacity.
3. Evaluation of development capacity constitutes a special variation of rating which may be prepared for internal needs and for comparative needs in the given sector.
4. In reference to item 3, assessment of development capacity should be useful in determining competitive and strategic positions of individual companies within the given sector.
5. The procedure of evaluation of development capacity of a company may be applied (after some modifications) to public sector institutions as well as to larger systems.

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Procedura ewaluacji zdolności rozwojowej w zakresie potencjału twórczego przedsiębiorstwa

S t r e s z c z e n i e: Ogólnie rozumiana zdolność rozwojowa to kryterium oceny danego systemu (przedsiębiorstw, instytucji, gospodarki narodowej), będące miarą możliwości realizacji przedsięwzięć na poziomie wysokiej efektywności oraz wyrażające umiejętności pomnażania majątku i kreowanie postępu w różnych dziedzinach działalności.

Podstawowy problem przedstawiony w artykule to charakterystyka zdolności rozwojowej przedsiębiorstwa oraz sposób jej pomiaru w ujęciu wielokryterialnym. Formuła ta została osadzona w kontekście badań jakościowych, odniesionych do rodzajowo odmiennych kryteriów oceny.

Różnorodność kryteriów podstawowych i subkryteriów, które stosuje się w procedurze ewaluacji, sprawia, iż oszacowanie wartości zdolności rozwojowej przebiega na zasadzie kwalifikacji agregatowej. Takie podejście wynika z tego, iż zdolność rozwojowa może być rozpatrywana w postaciach cząstkowych (szczegółowych), jak również w formie agregatowej. Proponowaną formułą oszacowania zdolności rozwojowej jest indeks IPX_i . Jego odniesienie stanowi potencjał twórczy przedsiębiorstwa.

S l o w a k l u c z o w e: zdolność rozwojowa, wymiary zdolności rozwojowej, badania jakościowe, kategoryzacja
